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Taxonomic notes on *Pelor* Bonelli, with description of a new species from Greece (Coleoptera: Carabidae: Zabrini)

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Abstract: Based on examination of the male genitalia, in particular the structure of the inner sac, a new species of *Pelor* is described: *Zabrus* (*Pelor*) *hiekei* sp. n. (type locality: island of Kefalonia, Greece). The new species is an insular endemic and adelphotaxon of *Z.* (*P.*) *incrassatus*. The male genitalia of *Z.* (*P.*) *incrassatus* and *Z.* (*P.*) *bischoffi* are also illustrated and described. Three species are gathered in a distinct subgroup within *Pelor*. *Zabrus* (*P.*) *incrassatus tuleschkovi* Mařan, 1933 is treated as junior synonym of *Z.* (*P.*) *incrassatus incrassatus* (Ahrens, 1814).

Key words: Coleoptera; Carabidae; *Zabrus*; Balkan Peninsula; taxonomy

Introduction

Until now the genus *Zabrus* Clairville, 1806 has been represented by 28 species in the Balkan Peninsula (Serrano & Andújar 2003; Guéorguiev 2007). The species form two subgenera – *Zabrus* s. str. (2 species) and *Pelor* Bonelli, 1810 (26 species). The systematics of the last subgenus is highly complex and has never been a subject of a critical review. Whilst the revision of *Pelor* is under preparation (Anichtchenko, unpublished), we consider the group in the latest sense (Lorenz 2005). However, the preliminary results demonstrate a significant number of sibling species in the genus (Anichtchenko unpublished). Those species have very slight or no differences in the external morphology, but they are distinct in the structure of the internal sac of the aedeagus and are clearly separated geographically or ecologically (Anichtchenko & Ruiz-Tapiador 2008).

At present, the structure of the inner sac of aedeagus is increasingly used in the systematics of the Carabidae: Cicindelinae (Matalin 1998, 1999a, b), *Nebria* (Dudko & Shilenkov 2001; Ledoux & Roux 2005), Pterostichini (Berlov & Berlov 1996, 1999; Berlov 1998, 2000; Berlov & Anichtchenko 1999, 2005), *Platyderus* (Anichtchenko 2005), *Zabrus* (Anichtchenko & Ruiz-Tapiador 2008).

Material and methods

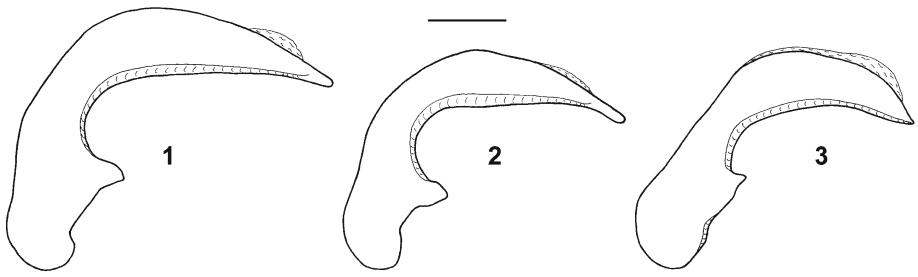
The material of the following institutions was examined:
MIZ – Museum and Institute of Zoology, Polish Academy of Sciences, Warszawa, Poland (P. Wegrzynowicz)
MNHUB – Museum fur Naturkunde der Humboldt Universitat zu Berlin, Bereich Zoologisches Museum, Berlin, Germany (M. Uhlig, B. Jaeger)
NMNHS – National Museum of Natural History, Sofia, Bulgaria (S. Beshkov)
MNST – Museum of Natural Sciences, Tirana, Albania (V. Andoni)
NMW – Naturhistorisches Museum Wien, Vienna, Austria (H. Schönmann)
cAA – private collection A. Anichtchenko, Madrid, Spain

The study of the external morphology of both the body and the male genitalia followed traditional techniques. Morphology of the inner sac of aedeagus was studied by the method proposed by Berlov (1992), with some modifications. The following abbreviations of morphologic terms are used: BLR – basolateral right protuberance; DA – dorsoapical protuberance; GON – gonopore; SP – setiferous puncture/s; VA – ventroapical protuberance.

***Zabrus* (*Pelor*) *incrassatus* (Ahrens, 1814)** Figs 1, 4, 7, 10, 13–14)
= *tuleschkovi* Mařan, 1933 syn. nov.

Description of male genitalia. Median lobe of aedeagus in lateral view rectangularly bent in middle, basal bulb large, massive, apical part long and at apex clearly bent downwards (Fig. 1); apical part in dorsal view long, with sides not parallel, and asymmetrical apex forming distinct distal protuberance on left side (Fig. 4). Right paramere semi-falcate, apical part bent inward, tip with well-formed hook (Figs 7, 10). Endophallus with distinct VA, orientated to right paddle-like DA, and BLR not differentiated (Figs 13–14).

Intra-specific variations. Mařan (1933) described



Figs 1–3. Left lateral view of median lobe of aedeagus: 1 – *Zabrus incrassatus*, Albania, "Rapsa"; 2 – *Zabrus hiekei* sp. n. (paratype); 3 – *Zabrus bischoffi*, Albania, "Albanien M. i. Dajtit Ing. Meschnigg". Scale 1 mm.

"*Zabrus incrassatus* var. *Tuleschovi*". The differentiation of this variation from the nominotypical form is based mainly on the different extent of punctuation on the head, pronotum, elytral striae and underside of the body, as well as on different shape of the apical part of the right paramere. The examination of the genital structures in specimens from southwestern Bulgaria, traditionally considered as *Z. incrassatus tuleschkovi* Mařan, 1933 and specimens from the western part of species range have shown that they have identical structure of endophallus and differences of the right parameres of no importance. The fine punctation on the head shows a clinal nature in *Z. incrassatus*; it decreases or reduces in a western direction and increases in the eastern direction. In our opinion, the characters used by Mařan (1933) to separate distinct races are unstable or insignificant, moreover there is no geographical isolation to conserve any specificity: *Z. incrassatus tuleschkovi* Mařan, 1933 [type locality: "bulgarischen Macedonien (Kresnensko-Defillé, Petritsch, Marjanopole, Petrovo)"], syn. nov. of *Z. incrassatus incrassatus* (Ahrens, 1814).

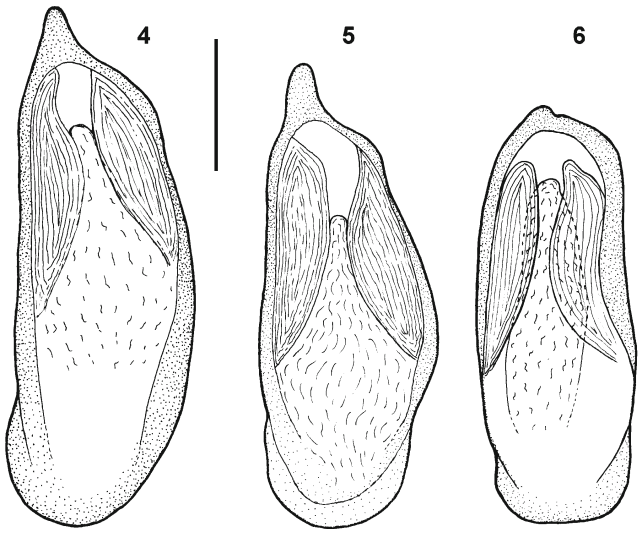
Material examined. Type material: Bulgaria: 1 male syntype labelled "Ali Botuš Exp Maced. Mařan et Táborský lgt." [round white typeset label] / "Paratype" [red handwritten label] / [*Zabrus incrassatus Tuleschkovi* Mařan 1933 > Dr. J. Mařan det." [mixed handwritten and typeset white label] (NMNHS).

Other material examined. Albania: "Südalbanien Kopstein", 2 s (NMW); "Albanien Ochrida", 1 s (NMW); "Hani Grabom Mai" / "Alban. montenegr. Grenze, Penther'14", 2 s (NMW); "Rapsa 10–18.V." / "Alban. montenegr. Grenze, Penther'14", 4 s (NMW); "Alban. Exp. 1918 Bicaj 14.15.VI.", 3 s (NMW); "Ibë, 2–11.VII. 1962", 1 m (MNST); "Shkoder, 15.V.1963", 3 m, 1 f (MNST); 2 km N Durrës, 24.V.1993, 1 m, P. Stoev leg. (NMNHS); Vlorë, 1.V.1994, 2 m, 3 f, P. Stoev leg. (NMNHS); Saranda District, Himarë, 3–4.V.1994, 1 f, P. Stoev leg. (NMNHS); Saranda District, Borsh, 5.V.1994, 1 f, P. Stoev leg. (NMNHS); Saranda District, Ljukova, 3–4.VI.1995, 1 f, G. Blagoev leg. (NMNHS); Vlorë District, Llogora Ridge, 1027 m, 4.VI.1995, 1 f, G. Blagoev leg. (NMNHS). Bosnia Herzegovina: "Herzegow. Trebinje", 2 s (MIZ); "Mostar Hrz., Czerny", 1 s (MIZ); "Ruiste Hrz. coll. Pazourek", 1 s (MIZ). Bulgaria: "Bulgaria Haskovska Bania ad Haskovo 11.9.1950 leg. A. Goljan", 1 m (MIZ); Kozhuh Hills, south slope, 19–20.IV.1996, B. Gueorguiev leg. 2 m; Maleshevska Mtn, W from Vulkovo, 190 m a.s.l., soil trap in open place 4.V.–4.VII.2003, T. Lyubomirov leg. 1 m; Maleshevska Mtn, W Vulkovo, 4.X.–4.XI.2003, S. Lazarov leg, 2 m Croatia: "Dalmatia", 1 s (MIZ); "Dalmatien", 7 s (MIZ; NMW); "Dalmatien Lesina. Reitter.", 1 s (MIZ); "Gruž Dalmatia", 4 s (NMW); "Sturany 91 Zara Vecch.", 7 s (NMW); "Lessina Kaufmann", 4 s (NMW); "Spalato Dr. Karam.", 8 s (NMW); "Dalmatia: Zara-Bocagnazzo, IV.25", 3 s (MIZ); "Dalmatia Pitve, Hvar F. Werner IX.29", 2 s (NMW). Greece: v.Xiropotamos, 10.4.1993, P. Beron leg., 3 m; Kalambaka, Meteora, 4.I.2007, Anichtchenko A. leg., 1 m, 1 f; Parnasso, prato 1250 m a.s.l., 10.V.94, Sabella leg., 1 f; Ioannina, M.ti Timfi, Klidonia 940 m a.s.l., 17.V.2005, F. Angelini leg. 1 m; Etolia, Lessini, 1.V.1999, F. Angelini leg., 1 m; Serres distr, Menikio Mt, Timios Prodromus Monastery, vill Lakosh 500 m a.s.l., 20.IX.00, 1 m (cAA). Macedonia: "Sturany 91 Dojran Macedonien", 1 s (NMW); "Pobreg Doiran-See Macedonien 16.IX.16", 2 s (NMW); Mazedonien Üsküb 16.5.17 P. Schulze S.G.", 15 s (MNHUB); "Mazedonien – Hudova am Vardar, 20 IV.1918 Dr. Fehringer", 4 s (MNHUB); "Mazedonien Ochrid 1000 m a.s.l. 13.9.1934 Zwick S.", 11 s (MNHUB); "Jugoslawien Macedonien leg. F. Hieke" / "Gevgelia a. Vardar 20.–21.5.1980", 1 s (MNHUB); "Jugoslawien Macedonien leg. F. Hieke" / "Žeden plan. b. Raduša 27.5.1980", 1 s (MNHUB); "Kitka, 800 m a.s.l. 20 km S v. Skopje 28.5.1980", 1 s (MNHUB). Montenegro: "Kelecsényi Montenegro", 1 s (NMW); "Kelecsényi Cattaro", 1 s (NMW). Serbia (? Kosovo): "Mazedonien Moravatal 3.9.1934 Zwick S.", 1 s (MNHUB).

Distribution. The locality "Moravatal" refers to the low stream of the Morava River, but is not clear which country, Kosovo or Serbia, it concerns. This species is known from Albania, Bosnia Herzegovina, Bulgaria, Croatia, Greece, Macedonia, Montenegro, Serbia.

***Zabrus* (*Pelor*) *hiekei* sp. n.** (Figs 2, 5, 8, 11, 15–16)
= *beieri* Schweiger, nomen nudum

Diagnosis. The new species is recognisable from its closest relative, *Z. incrassatus*, by the lateral and dorsal aspects of the median lobe of aedeagus (Figs 1–2, 4–5), the lateral shape of the right parameres (Figs 7–8, 10–11), and the structure of the everted inner sac of aedeagus (Figs 13–16). The median lobe of aedeagus in *Zabrus hiekei* sp. n. (lateral view) is smaller, with a less massive bulb and thinner apex bent downwards than that of *Z. incrassatus*. Furthermore, the median lobe of the latter species is longer dorsally and less parallel sided than the median lobes of the former species. The right paramere of *Zabrus hiekei* sp. n. (lateral view) is smaller, with a shorter apical part, and apex having distinct denticle, while the right paramere of *Z. incrassatus* is larger, with a longer apical part, and apex



Figs 4–6. Dorsal view of median lobe of aedeagus: 4 – *Zabrus incrassatus*, Albania, "Rapsa"; 5 – *Zabrus hiekei* sp. n. (paratype); 6 – *Zabrus bischoffi*, Albania, "Albanien M. i. Dajtit Ing. Meschnigg". Scale 1 mm.

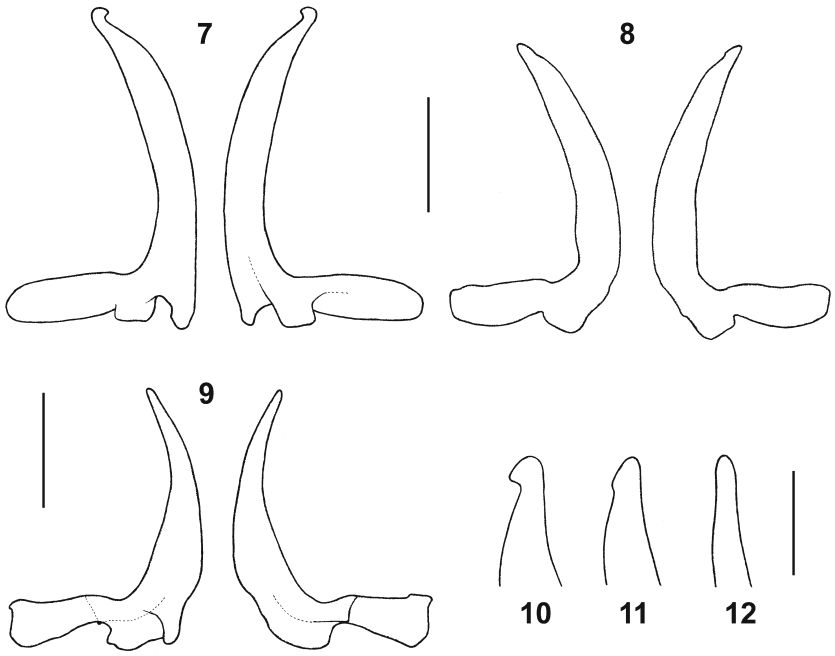
without distinct denticle. Finally, the endophallus of the former species has reverse S-curved overall aspect (vs. not S-curved overall aspect in latter species), dorsally orientated DA with semi-ovoid form (vs. right-oriented cylindrical DA in latter species), and the apical part of the endophallus with a well-formed VA protuberance (vs. apical part of endophallus with no well-formed VA protuberance in latter species).

Description. A wingless, oval and strongly convex *Zabrus*-species, body length 14.5–15.9 mm and maximum width 6.4–7.0 mm. Colour black, antennomeres 1–4, labrum, palpomeres, epipleurae, body underneath and legs more or less brown-reddish, antennomeres 5–11 reddish. Microsculpture of tegument very fine, isodiametric and distinct on elytra, missing on head and pronotum; lustre of tegument present.

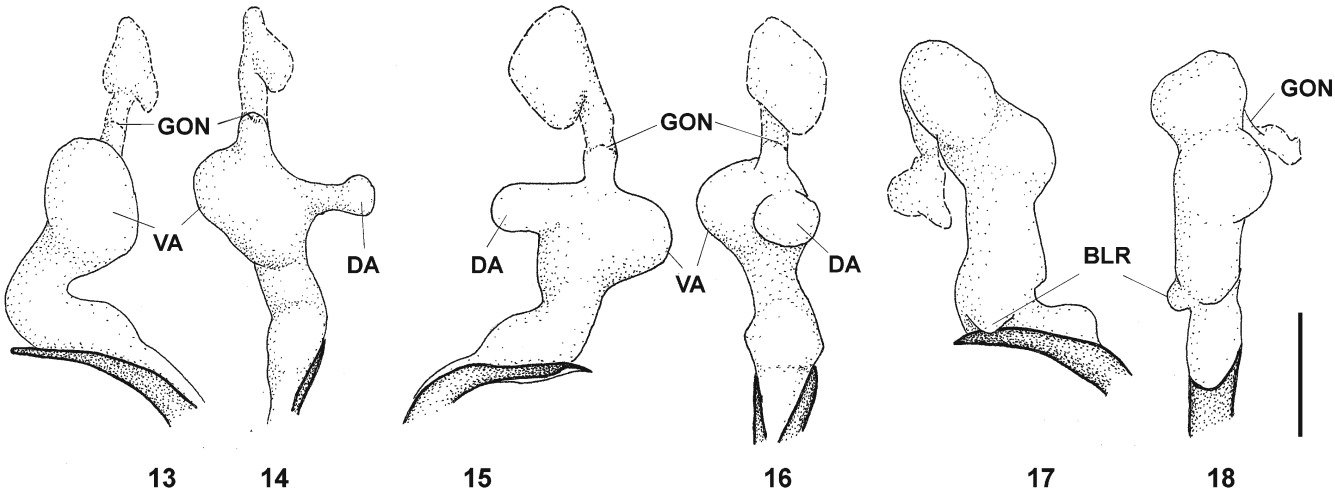
Head large, wide (width bigger than half width of pronotum), not punctate; frontal furrows round. Eyes small, prominent. Labrum rounded anteriorly, with 3+3 marginal SP (distance between pores 1 and 2 pores bigger than distance between pores 1–2 and pore 3). Clypeus emarginate anteriorly, anterior margin well-beaded. Antennae short, not reaching pronotum base, pubescent from distal part of article 4; size of antennomeres small compared with dimension of body.

Pronotum transverse (ratio width / length > 1.6), widest at basal third. Disc highly convex, coarsely and roughly punctuated in middle of anterior part, entire basal part and along lateral borders; midline fine. Lateral bead of pronotum thicker from middle to base, fine in anterior third; lateral groove very wide in basal quarter, very fine in anterior half. Anterior and posterior margins concave, both slightly emarginate in middle; lateral margins highly convex, narrower anteriorly than posteriorly. Basal impressions indistinct. Hind angles obtuse at tip.

Elytra oval, strongly convex, widest in second third, becoming slightly narrower towards base, strongly narrower towards apex; both elytra tightly coalesced along suture. Shoulders distinct, with round tip. Basal bead wide, complete, reaching stria 1; elytral striae fine and punctuated; intervals flat, first



Figs 7–12. Lateral views of right paramere, entire paramere (Figs 7, 9) and apex (Figs 10–12): 7, 10 – *Zabrus incrassatus*, Albania, "Rapsa 10–18.V."; 8, 11 – *Zabrus hiekei* sp. n. (paratype); 9, 12 – *Zabrus bischoffi*, Albania, "Albanien M. i. Dajtit Ing. Meschnigg". Scales 1 mm (Figs 7–9), 0.5 mm (Figs 10–12).



Figs 13–18. Inner sac of aedeagus: 13, 14 – *Zabrus incrassatus*, Albania, "Rapsa 10–18.V."; 15, 16 – *Zabrus hiekei* sp. n. (paratype); 17, 18 – *Zabrus bischoffi*, Albania, "Mal i Dajtit Alp. Alb. Strupi". Scale 2 mm.

one narrower than intervals 2–8. Hind wings absent.

Epipleurae and proepisternae smooth; pro-, meso-, and metathorax, meso- and metaepisternae, as well as abdominal sterna laterally coarsely and roughly punctuated. Abdominal sterna with one pair paramedial setae. Legs relatively short and robust.

Median lobe of aedeagus in lateral view rectangularly bent in middle, basal bulb well-formed, apical part long with thin apex bent downwards (Fig. 2); apical part in dorsal view long, with sides not parallel, and asymmetrical apex forming distinct protuberance on left side (Fig. 5). Right paramere falcate, apical part bent inward, tip without clear hook (Figs 8, 11). Everted inner inner sac of aedeagus (endophallus) with distinct VA, orientated to right cylindrical DA, and BLR not differentiated (Figs 15, 16).

Type material. **Holotype**: 1 ♂, labelled "Aenos, Kephal. 1000–1600 m, 10–13.V.29. Beier" [typeset white label] / "ssp. *Beieri* m. et. Schweiger det. Schweiger" [typeset white label] / "Holotype *Zabrus hiekei* sp. nov. Anichtchenko & Guéorguiev det. 2007" [typeset red label] (NMW). **Paratypes**: 5 ♂♂ 4 ♀♀, labelled as holotype; 1 ♂, labelled "Kephallinia, A.Winkler" / "Paratype *Zabrus hiekei* sp. nov. Anichtchenko & Guéorguiev det. 2007" [typeset red label]; 2 ♂♂, 1 ♀, labelled "Kephallenia, Paganetti" / "Paratype *Zabrus hiekei* sp. nov. Anichtchenko & Guéorguiev det. 2007" [typeset red label]; 1 ♂ "Cephalonia, Elevtherios" / "*Zabrus incrassatus* det. Ing. Jedlička" / "ex coll. Sz. Tenenbaum, Mus Zool. Polonicum Warszawa 38/47" / "Paratype *Zabrus hiekei* sp. nov. Anichtchenko & Guéorguiev det. 2007" [typeset red label] (MIZ; NMNHS; NMW; cAA).
Type locality. Greece, island of Kefalonia.

Etymology. This species is dedicated to our colleague and prominent entomologist-taxonomist Dr. Fritz Hieke from Berlin.

Remarks. The combination of three characters of importance, e.g. pronotum widest at basal third, lateral bead of pronotum strongly thickened from middle to hind angles, and apex of basal lobe of aedeagus (in dorsal view) with more or less prominent tip on the left side (Figs 4–6), suppose that the new species together with *Z. bishoffi* and *Z. boldori* Schatzmayr, 1943 form a distinct subgroup in the subgenus *Pelor*. As well, the presence of well-differentiated structures of endophallus, e.g., prolonged DA and protuberant VA, as well both the close resemblance of the external morphology of the median lobes of aedeagus (lateral and dorsal aspects) and the relative width of the apical third of right parameres, demonstrates that *Z. hiekei* sp. n. and *Z. incrassatus* are adelphotaxa.

Zabrus* (*Pelor*) *bischoffi J. Müller, 1936 (Figs 3, 6, 9, 12, 17, 18)

Diagnosis. This species can be easily differentiated from both *Z. hiekei* sp. n. and *Z. incrassatus* by the specific apex of the median lobe of the aedeagus, the shape of the right paramere, and the inner sac structure (Figs 3, 6, 9, 12, 17, 18). The female of *Z. bischoffi* may be distinguished by the sides of the pronotum posteriorly straight to slightly narrow towards base (in the other two species the sides of pronotum posteriorly slightly to well-narrowed towards base).

Description of male genitalia. Only very schematic illustrations of the aedeagus of *Z. bischoffi* have been represented by Schatzmayr (1943: 109). Here, we give a description and more detailed figures of the male genitalia.

Median lobe of aedeagus in lateral view short and corpulent, basal part large, massive, apical part relatively short and slightly bent downwards (Fig. 3); apical part in dorsal view short, apex round and asymmetrical at tip – forming small, scarcely visible protuberance on left side (Fig. 6). Right paramere falcate, apically bent inward, becoming sharply thinner, tip without trace of hook (Figs 9, 12). Endophallus perpendicularly orientated with respect to median lobe, BLR well-developed, VA and DA poorly differentiated (Figs 17, 18).

Material studied. Albania: 19 s from "Mal i Dajtit, Ing. Meschnigg", different dates (MNHUB); 5 s from "Mal i Krues" (MNHUB); 3 s from "Mal i Shenjit" (MNHUB); 37 s from "Llogora" (MNHUB); "Albania, Llogora Pass, 1025 m a.s.l., 6.6.1995, G. Blagoev", 1 m (NMNHS).

Distribution. Albania, Bosnia Herzegovina, Croatia, Macedonia, Montenegro. Hieke (1981), Hieke & Wrase (1988) and Hristovski et al. (2003: 56) have cited *Z. bischoffi* from Macedonia, and Drovenik & Peks (1999: 111) from Bosnia Herzegovina, Croatia, Macedonia and Montenegro. We consider all records outside Albania need confirmation since no specimen from a sufficiency of material from the "*incrassatus*" group was proven to belong to Z. *bischoffi*.

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