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Two new subspecies of the genus *Anophthalmus* (Coleoptera: Carabidae: Trechini) from Slovenia

Dva nové poddruhy rodu *Anophthalmus* (Coleoptera: Carabidae: Trechini) ze Slovinska

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Taxonomy, description, new subspecies, Coleoptera, Carabidae, Trechini, *Anophthalmus*, Slovenia

Abstract. *Anophthalmus ajdovskanus naraglavi* ssp. n. from the Snežna jama (Snow Cave) and *A. erebus bozoi* ssp. n. from the Kamniška jama (Kamnik Cave), both in the Kamnik- and Savinja Alps in northern Slovenia are described. Differential diagnoses in comparison with nominotypical and other subspecies of *A. ajdovskanus* (Ganglbauer in J. Müller, 1913) and *A. erebus* (Krauss, 1906) are given. The male genitalia and other diagnostic features are illustrated.

INTRODUCTION

The genus *Anophthalmus* Sturm, 1844 comprises about 27 endogean and cavernicolous species distributed in Italy (Veneto, Friuli - Venezia Giulia), Austria (Carinthia: Karawanken Mts), Slovenia, Croatia (Kapela Mts., Istria, Cres Is., Krk Is.), and has the following characteristics: Body extended (3.1 - 7.5 mm long), rather convex; antennal segment 3 almost as long as segment 4; pronotum mostly cordiform, laterobasal pronotal impressions relatively wide; protarsomeres I and II dilated in males; aedeagus distinctly incurved dorsoventrally; apical portion dorsally with wholly sclerotized structure called "ligula" (see Müller 1913); inner sac oblong in basal part, with drop-shaped copulatory piece; parameres triangular apically, each paramere with 3 and 4 setae, respectively.

The taxonomic position of the *Anophthalmus* species was performed by Casale & Laneyrie (1982) and by Sciaky (1987), though the latter need further revision (Daffner 1992). Slovenian cave fauna (including also a troglobiontic Coleoptera) was recently compiled by Bole et al. (1993).

During the expedition "Savinia 1992" of the Primary Organization of the Czech Speleological Society, 5-07 Antroherpon, Pardubice to Slovenia we found specimens of two new members of the genus *Anophthalmus*: *A. ajdovskanus naraglavi* ssp. n. and *A. erebus bozoi* ssp. n., which are described below.

The following abbreviations are used in the text: IBL - Institute of Biology, coll. E. Pretner & B. Drovenik, Ljubljana; JJC - coll. J. Janák, Rtyně nad Bílinou; JMC - coll. J. Moravec, Vrdy; PMC - coll. P. Moravec, Litoměřice; RMC - coll. R. Mlejnek, Pardubice. Morphological terminology mostly follows Jeannel (1928).

Anophthalmus ajdovskanus naraglavi **ssp. n.**
(Figs 1-5)

Description. Unicolorous yellowish brown, semilustrous, head and pronotum with feebly shining; body surface with short and thin yellow pubescence (Fig. 1).

Length (from apex of mandibles to apex of elytra) in males 5.35 - 5.93 mm (average of four specimens 5.72 mm) (holotype 5.83 mm), in females 5.76 to 6.18 mm (aver. of four specimens 5.98 mm).

Head relatively large, with distinct microsculpture; eyes totally reduced. Width : length ratio (measured from anterior margin of clypeus to posterior margin of tempora) = 0.77 - 0.89 (aver. 0.83) in males (holotype 0.77), 0.76 - 0.79 (aver. 0.77) in females. Width of head : width of pronotum ratio = 0.85 - 0.92 (aver. 0.89) in males (holotype 0.86), 0.88 - 0.91 (aver. 0.90) in fema-

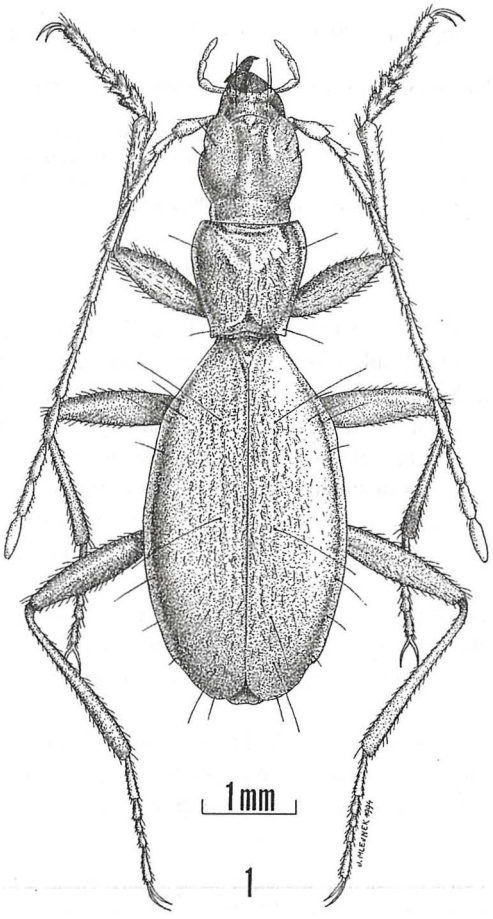


Fig. 1. *Anophthalmus ajdovskanus naraglavi* ssp. n., holotype, habitus dorsally.
Obr. 1. *Anophthalmus ajdovskanus naraglavi* ssp. n., holotypus, habitus svrchu.

les. Frontal torus indistinctly convex; tempora and orbitae widely rounded, each orbita with 2 setiferous pores. Antennae rather long (length of elytra : length of antennae ratio = 0.74 - 0.76, aver. 0.75) in males (holotype 0.75), 0.76 - 0.78 (aver. 0.77) in females. Average lenghts of individual antennal segments (in mm, five specimens measured) = 0.33 : 0.24 : 0.48 : 0.49 : 0.49 : 0.46 : 0.43 : 0.40 : 0,40 : 0.36 : 0.42.

Pronotum (Fig. 2) subcordiform; width : length ratio = 1.03 - 1.07 (aver. 1.04) in males (holotype 1.04), 1.02 - 1.06 (aver. 1.05) in females. Lateral pronotal margins regularly arcuate, moderately tapered towards to basis (width : width of basis ratio = 1.52 - 1.64, aver. 1.59) in males (holotype 1.57), 1.55 - 1.67 (aver. 1.60) in females. Shape of posterior corners short, expressive acuteangular, projecting laterally; basal pronotal impressions shallow; basis of pronotum very weakly incurved in the middle, slightly sinuous before posterior corners. Pronotal sculpture as on head.

Elytra relatively long and flat; length : width ratio = 1.82 - 1.98 (aver. 1.89) in males (holotype 1.82), 1.87 - 1.96 (aver. 1.90) in females, with the maximum width at the half or closely behind the middle. Width of elytra : width of pronotum ratio = 1.55 - 1.70 (aver. 1.66) in males (holotype 1.70), 1.58 - 1.65 (aver. 1.60) in females. Humeral region strongly oblique; lateral margins slightly depressed at the level of posthumeral pore 4, gradually narrowed apically; tip of elytron regularly rounded. Inner striae 1 to 3 deeply impressed than stria 4, striae 5 and 6 indistinct; stria 3 with 4 setiferous pores (3 discal, 1 apical), first pore placed at the level of posthumeral pore 2 or between second and third posthumeral pores; apical striolae in proximity but isolated from striae 5. Elytral microsculpture fine, however more denser than on pronotum.

Metatarsi rather long (length of elytron : length of metatarsus ratio = 2.21 - 2.33, aver. 2.28) in males (holotype 2.21); 2.31 - 2.50 (aver. 2.40) in females.

Aedeagus (Figs 3, 4) 1.65 - 1.74 mm (aver. 1.70 mm) long, (holotype 1.74 mm), gently S-shaped; length of elytron : length of aedeagus ratio = 1.82 - 1.92 (aver. 1.88) (holotype 1.91). Apical portion of aedeagus xiphoid, moderately bent dorsally (in lateral view). Inner sac (Fig. 4) oblong; endophallic structures consisting of plate-shaped copulatory piece (Fig. 5) and ligula, which is strongly developed, laminar and broadly extended laterally. Parameres subtriangular, apical edge with 4 setae, usually.

Type material. Holotype, male: "SLOVENIJA, Kamniške in Savin [jske] Alpe, Raduha Mts, Arto planina, Snežna jama /Snow Cave/, 1556 m, 1. 9. - 7. 11. 1992, traps, R. Mlejnek lgt." (IBL). Paratypes: 3 males, 4 females the same data as in holotype, only "2. 5. - 30. 8. 1992" (JMC, RMC).

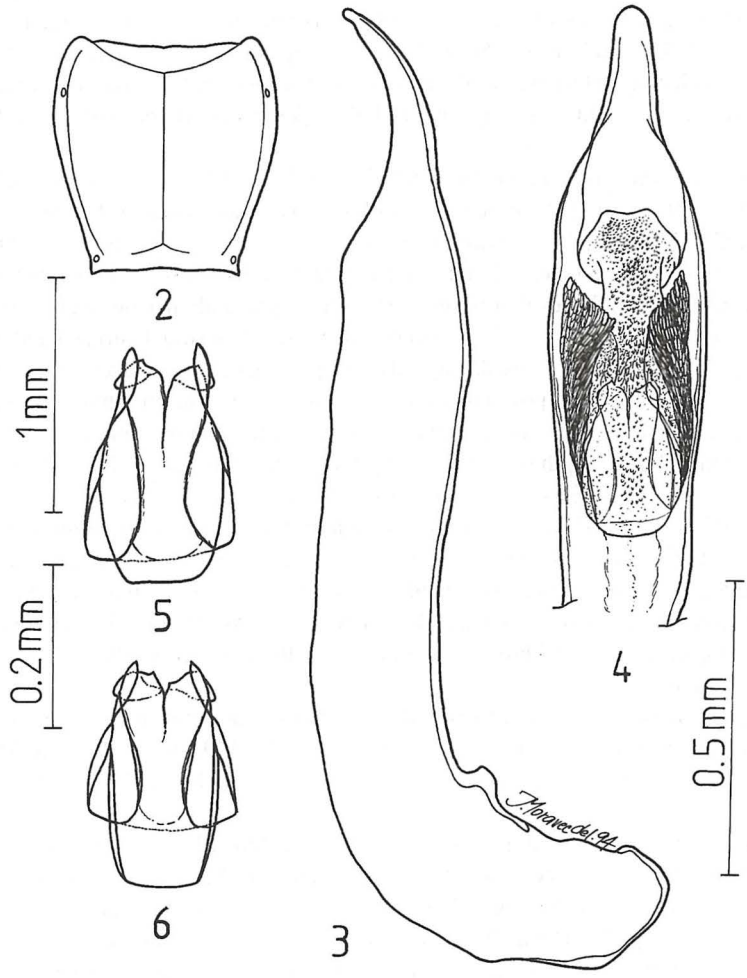
Type locality. Northern Slovenia, Kamniške in Savinjske Alpe (the Kamnik- and Savinja Alps), Raduha Mts, southwestern slope of the Arto plateau, the cave Snežna jama (Snow Cave), 1,556 m a.s.l. (Cave Register No 1254, Speleological Association of Slovenia, Ljubljana) about 1.5 km SW of Koča na Loki lodge. The high-alpine cave for tourist visits (Naraglav & Ramšak 1990).

All specimens were collected by pitfall traps located in the Velika podorna dvorana (Great Hall of Breakdown blocks).

Name derivation. The new subspecies is named in honour of Mr Darko Naraglav (Caving Club „Črni galeb" Prebold, Slovenia) who enabled us an exploration in the Snežna jama cave.

Differential diagnosis. *Anophthalmus ajdovskanus naraglavi* ssp. n. is very similar to *A. a. ajdovskanus* (Ganglbauer in J. Müller, 1913) and next three subspecies [*A. a. pretneri* (J. Müller, 1913), *A. a. fodinae* Mandl, 1940 and *A. a. mixanigi* Daffner, 1985] by its external habitus and by

the shape of aedeagus (incl. overall form of copulatory piece). These subspecies create itself a characteristic group, which can be distinguished [from i.e. *A. a. ravasinii* (G. Müller, 1922), *A. a. muelleri* Jeannel, 1926, *A. a. concubinus* G. Müller, 1931 and *A. a. haraldianus* Daffner, 1922] by the apical portion of aedeagus. The latter is more or less curved in lateral view, with long and



Figs 2-6. 2-5 - *Anophthalmus ajdovskanus naraglavi* ssp. n., holotype: 2 - pronotum, dorsally; 3 - aedeagus, laterally; 4 - apical portion of aedeagus with endophallic plates, dorsally; 5 - copulatory piece, dorsally; 6 - *A. ajdovskanus mixanigi* Daffner, copulatory piece, dorsally. Scale bars: 1 mm = Fig. 2; 0.5 mm = Figs 3, 4; 0.2 mm = Figs 5, 6.
Obr. 2-6. 2-5 - *Anophthalmus ajdovskanus naraglavi* ssp. n., holotypus: 2 - štít, svrchu; 3 - aedeagus, z boku; 4 - apikální část aedeagu se sklerity vnitřního vaku, svrchu; 5 - destička vnitřního vaku aedeagu, svrchu; 6 - *A. ajdovskanus mixanigi* Daffner, destička vnitřního vaku aedeagu, svrchu. Měřítka: 1 mm = obr. 2; 0,5 mm = obr. 3, 4; 0,2 mm = obr. 5, 6.

narrow apex („xiphoid", the term is used in the present paper for the first time). A new subspecies differs from the nominotypical one (from Ajdovska jama in Posavje, Slovenia) by a little wider basis of pronotum and by its wider ligula [(in *A. a. ajdovskanus* is ligula narrower, ligular sides regularly arcuate - fig. 2241 in Jeannel (1928)]. Aedeagus has not been studied. Further, it differs from *A. a. pretneri* (from the abandoned mines of the Mt. Stol, Austria) by its longer prehumeral portion of elytra, shoulders less angulate, ligula as in *A. a. ajdovskanus* (see above). The apex of aedeagus of the new subspecies resemble those of *A. a. fodinae* (from the Karawanken Mts, Austria) than *A. a. mixanigi* (from the Mt. Grintovec, Austria) although it is geographically the nearer [(cf. Figs. 3, 4 presented here and Daffner (1985, figs 6, 7 „spiniform" and 9, 10 „beak-shaped")]. However, the acute posterior corners of pronotum distinguishes the new subspecies (see Fig. 2), but also *A. a. mixanigi* from *A. a. fodinae* [conspicuously rectangular - cf. Daffner (1985: 367, figs 3, 4)]. The general shape of inner sac and endophallic plates are identical [Fig. 4; cf. Daffner (1985, figs 7, 10)].

Note. Casale & Laneyrie (1982: 213) classified *A. a. fodinae* as a subspecies of *A. micklitzi* (Ganglbauer in J. Müller, 1913). Later Sciaky (1987: 67) transferred it to the species *A. ajdovskanus*, belongs to the *A. micklitzi* species group.

Anophthalmus erebus bozoi ssp. n.

(Figs 7-8, 11-12)

Description. Colour uniformly yellowish brown, head and pronotum somewhat darker, semilustrous; pubescence extremely short, pronotum almost hairless (Fig. 7).

Lenght (including mandibles) in males 5.86 - 6.75 mm (aver. of five specimens 6.39 mm) (holotype 6.41 mm), in females 6.17 - 6.82 mm (aver. of five specimens 6.44 mm).

Head rather large and broad, with distinct microsculpture; width : length ratio (measured from anterior margin of clypeus to posterior margin of tempora) = 0.73 - 0.81 (aver. 0.80) in males (holotype 0.79), 0.68 - 0.82 (aver. 0.77) in females. Eyes totally reduced. Width of head : width of pronotum ratio = 0.81 - 0.87 (aver. 0.84) in males (holotype 0.82), 0.82 - 0.89 (aver. 0.86) in females. Frontal torus moderately convex, slightly flattened on medial epicranial portion; tempora regularly rounded. Two supraorbital setiferous pores placed on each orbita. Antennae rather long (length of elytra : length of antennae ratio = 0.73 - 0.77, aver. 0.76) in males (holotype 0.77), 0.77 - 0.82 (aver. 0.81) in females. Average lenghts of antennal segments (in mm, five specimens measured) = 0.32 : 0.29 : 0.48 : 0.50 : 0.53 : 0.51 : 0.44 : 0.42 : 0.39 : 0.35 : 0.44.

Pronotum (Fig. 8) cordate (width : length ratio = 1.05 - 1.16, aver. 1.09) in males (holotype 1.16), 1.06 - 1.13 (aver. 1.09) in females. Anterior margins of pronotum arcuate, markedly broader than basis (width : width of basis ratio = 1.60 - 1.80, aver. 1.70) in males (holotype 1.80), 1.64 - 1.77 (aver. 1.73) in females. Posterior corners of pronotum obtuse; basal pronotal impressions broad and shallow. Microsculpture, like on the head, denser and coarser on lateral pronotal margins.

Elytra rather long, flat; length : width ratio = 1.65 - 1.81 (aver. 1.70) in males (holotype 1.67), 1.68 - 1.83 (aver. 1.73) in females, the widest in its posterior half. Width of elytra : width of pronotum ratio = 1.77 - 1.89 (aver. 1.82) in males (holotype 1.77), 1.70 - 1.87 (aver. 1.81) in females. Shoulders angulate, moderately oblique; tip of elytron widely rounded. Inner striae 1 to 6 markedly impressed, stria 7 superficial; stria 3 with 3 discal and 1 apical setiferous pores, with

the tendency for asymmetric dislocation (see Fig. 7), pore 1 situated between second and third posthumeral pores habitually, sometimes at the level of the second posthumeral pore. Sculpture is fine, on the lateral elytral margins becoming denser and rougher.

Metatarsi long [lenght of elytron : lenght of metatarsus ratio = 2.07 - 2.29 (aver. 2.16)] in males (holotype 2.07), 2.19 - 2.26 (aver. 2.23) in females.

Aedeagus (Figs 11, 12) 1.43 - 1.55 mm (aver. 1.48 mm) long (holotype 1.43 mm), strongly arcuate in lateral view, to apex tapered gradually. Length of elytron : length of aedeagus ratio = 2.28 - 2.52 (aver. 2.37) (holotype 2.46). Apical portion of aedeagus elongated, narrow and moderately incurved (in lateral view). Inner sac relatively slender, bilobate endophallic plate with conspicuous lobular carunculae (Fig. 12). Parameres triangular, with 3 and 4 setae, respectively.

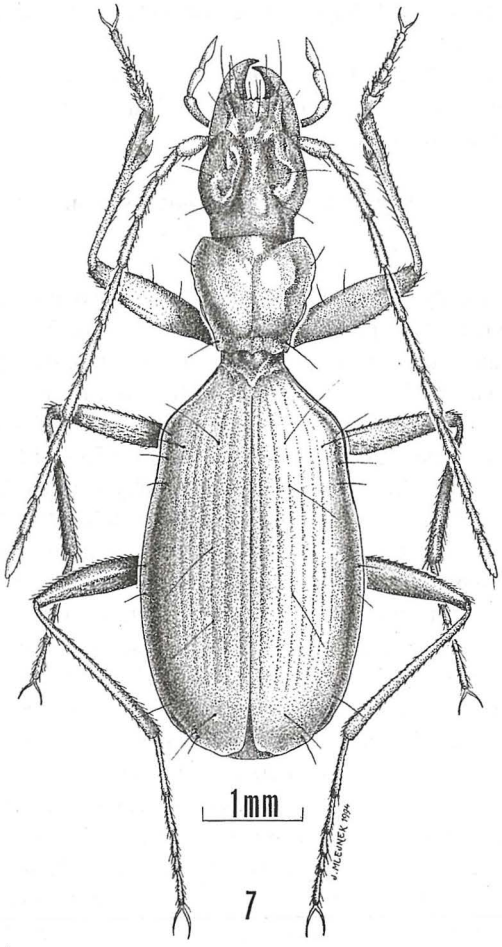
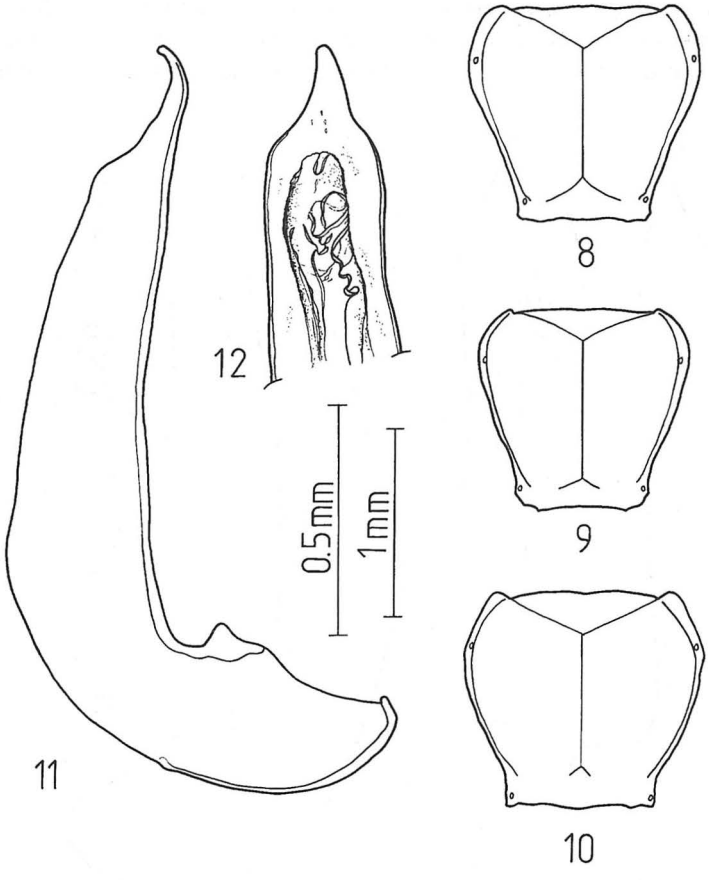


Fig. 7. *Anophthalmus erebus bozoi* ssp. n., holotype, habitus dorsally.
Obr. 7. *Anophthalmus erebus bozoi* ssp. n., holotypus, habitus svrchu

Type material. Holotype, male: "SLOVENIJA, Kamniške in Savin [jske] Alpe, Planjava Mts, Zeleniške špice ridge, Kamniška jama /cave/, 1400 m, 9. 5. - 29. 8. 1992, traps, R. Mlejnek lgt." (RMC). Paratypes: 11 males, 12 females, therefrom 1 female the same data as in holotype (RMC); 4 males and 3 females the same data, only "3. 6. 1990, G. Dunay, J. Janák, R. Mlejnek, P. Moravec lgt." (JJC, JMC, PMC); 7 males and 8 females, therefrom 2 males and 2 females, "Jugoslavija, Slovenija, 1400 m, Kamniška jama /cave/, 8. 1982, Savinjske Alpe, leg. DROVENIK" (IBL); 1 male and 3 females, ditto, only "4. 1983" (IBL); 4 males and 3 females were collected by Kamnik's cavers from May 1985 to August 1986, without other data (IBL).



Figs 8-12. 8-10 - Pronotum, dorsally. 8 - *Anophthalmus erebus bozoi* ssp. n., holotype; 9 - *A. erebus erebus* (Krauss); 10 - *A. erebus kraussi* (A. Winkler). 11-12 - *A. erebus bozoi* ssp. n., holotype. 11 - aedeagus, laterally; 12 - apical portion of aedeagus with endophallic plates, dorsally. Scale bars: 1 mm = Figs 8-10; 0.5 mm = Figs 11, 12.

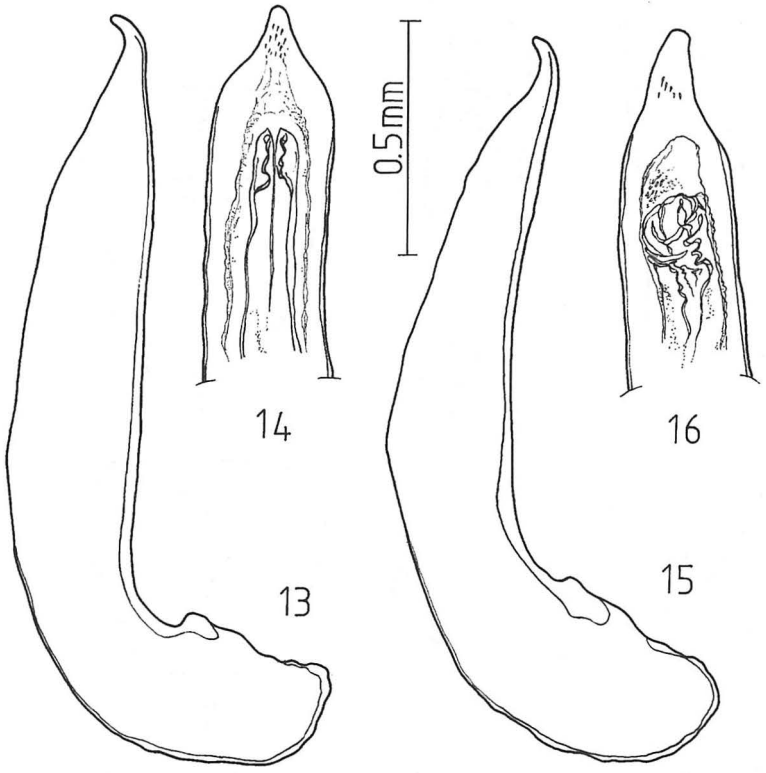
Obr. 8-12. 8-10 - Štít, svrchu. 8 - *Anophthalmus erebus bozoi* ssp. n., holotypus; 9 - *A. erebus erebus* (Krauss); 10 - *A. erebus kraussi* (A. Winkler). 11-12 - *A. erebus bozoi* ssp. n., holotypus. 11 - aedeagus, z boku; 12 - apikální část aedeagu se sklerity vnitřního vaku, svrchu. Měřítka: 1 mm = obr. 8-10; 0,5 mm = obr. 11, 12.

Type locality. Northern Slovenia, Kamniške in Savinjske Alpe (the Kamnik- and Savinja Alps), Planjava Mts, the rugged ridge Zeleniške špice, 1.2 km E of Mt. Kamniški Dedec, 1,663 m a.s.l., the cave Kamniška jama (Kamnik Cave), 1,400 m a.s.l. (Cave Register No 0209, Speleological Association of Slovenia, Ljubljana). Touristically undeveloped high-alpine cave which can be visited by individual cavers or groups [for details see Urbanc (1982) and Kregar et al. (1988)].

All specimens were collected by pitfall traps, together with *Aphaenopidius kamnikensis* Drovenik, 1987, except the ones collected during individual visit in June 1990 (G. Dunay, J. Janák, R. Mlejnek & P. Moravec lgt.). Installation of the traps was executed in a cave sections "Aragonitna dvorana" (Aragonite Hall) and "Velika dvorana" (Great Hall) (Mlejnek 1992).

Name derivation. This new subspecies is named after Dr Božo Drovenik (Kamnik), a specialist in the family Carabidae.

Differential diagnosis. *Anophthalmus erebus bozoi* ssp. n. belongs to the *A. erebus* (Krauss, 1906) by fundamental structure of its bilobate endophallic plates (Fig. 12; cf. Figs 14, 16) and identical chaetotaxy. It differs from *A. e. erebus* [from the Vračka zijalka cave (type locality),



Figs 13-16. 13-14 - *Anophthalmus erebus erebus* (Krauss); 15-16 - *A. erebus kraussi* (A. Winkler). Figs 13, 15 - aedeagus, laterally; 14, 16 - apical portion of aedeagus with endophallic plates, dorsally. Scale bar: 0.5 mm.

Obr. 13-16. 13-14 - *Anophthalmus erebus erebus* (Krauss); 15-16 - *A. erebus kraussi* (A. Winkler). Obr. 13, 15 - aedeagus, z boku; 14, 16 - apikální část aedeagu se sklerity vnitřního vaku, svrchu. Měřítko: 0,5 mm.

Slovenia] by its tiny, obtuse posterior corners of pronotum and by the apical portion of aedeagus, which is tapered gradually to its apex in dorsal view (Fig. 12; short, regularly rounded in *A. e. erebus* - Fig. 14). Also by the shape of endophallic plate "vesicular form" ("lobular form" in *A. e. erebus*) differ from it. The shape of pronotum and clearly different form of the aedeagal complex, especially the proportions of apical parts distinguish a new subspecies from *A. e. kraussi* (A. Winkler, 1923) [from the "Höhle Zelenjak" (= ? Jerekov brlog) (type locality), Slovenia]. In *A. e. kraussi* is pronotum broadly cordiform, with rectangular posterior corners (Fig. 10) and apical portion of aedeagus wider than in *A. e. bozoi* ssp. n. (see Fig. 15) in lateral view.

Note. *A. e. bozoi* ssp. n. was already mentioned by Drovenik (1987: 32, 34) and Kregar et al. (1988: 16, Fig. 17). *A. erebus* is known from the Dobrovlje Mts, Savinja Alps (Raduha Mts, surroundings of Luče ob Savinji village) and Menina plateau only (Bole et al. 1993). The record is a confirmed occurrence of this species at altitudes over 1,200 m a.s.l. in the high-alpine karst and the first record of *A. erebus* from the Kamnik Alps.

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SOUHRN

Předkládáme popisy dvou nových poddruhů rodu *Anophthalmus* Sturm, 1844 ze Slovinska: *Anophthalmus ajdovskanus naraglavi* ssp. n. (Snežna jama) a *A. erebus bozoi* ssp. n. (Kamniška jama).

A. ajdovskanus naraglavi ssp. n. je velmi podobný nominotypickému poddruhu *A. a. ajdovskanus* (Ganglbauer in J. Müller, 1913) a dalším třem poddruhům: *A. a. pretneri* (J. Müller, 1913), *A. a. fodinae* Mandl, 1940 a *A. a. mixanigi* Daffner, 1985 svým vnějším habitem a tvarem aedeagu, včetně celkového tvaru destiček vnitřního vaku. *A. a. naraglavi* ssp. n. se liší od nominotypického poddruhu širší bází štítu a širší ligulou [viz. Jeannel (1928, obr. 2241)]. Od *A. a. pretneri* se odlišuje delší prehumerální částí krovek, ramena méně vystupují, ligula je totožná s *A. a. ajdovskanus*. Špice aedeagu je u nového poddruhu více podobná *A. a. fodinae* než *A. a. mixanigi*, který je geograficky bližší. Od *A. a. fodinae* se však oba poddruhy liší ostrými zadními rohy štítu. Celkový tvar vnitřního vaku a skleritu aedeagu je identický s *A. a. mixanigi* [obr. 4; srov. Daffner (1985, obr. 7, 10)].

Nová ssp. je pojmenována na počest pana Darko Naraglava (JK „Črni galeb", Prebold), který nám umožnil výzkum v jeskyni Snežna jama.

A. erebus bozoi ssp. n. náleží k druhu *A. erebus* (Krauss, 1906) základní strukturou skleritu aedeagu (obr. 12; srov. obr. 14, 16) a totožnou chetotaxií štítu a krovek. Liší se však od *A. e. erebus* drobnými tupými zadními rohy štítu a apikální částí aedeagu, která je ponenáhlu zúžená ke špici (v dorzálním pohledu). Tvarem štítu a zřetelně rozdílným tvarem aedeagu, zejména proporcemi jeho apikální části, se odlišuje nový poddruh od *A. e. kraussi* (A. Winkler, 1923).

Nový poddruh je pojmenován po Dr. Božovi Drovenikovi (Kamnik) známém odborníku na čeleď Carabidae.