



Cave shrimps *Troglocaris* s. str. (Dormitzer, 1853), taxonomic revision and description of new taxa after phylogenetic and morphometric studies

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Abstract

Within the Dinaric genus *Troglocaris* cave shrimps from the subgenus *Troglocaris* s. str. (Dormitzer, 1853) (Crustacea: Decapoda: Atyidae), have the widest distribution area. The recent molecular analyses have revealed significant, cryptic diversity in the subgenus. The aim of the subsequent detailed morphometric analyses was the provision of the appropriate diagnosable characters for the discovered lineages, i.e. taking care of their taxonomical visibility. We herein designate a neotype and provide a detailed description for the polytypic type species of the genus *T. (T.) anophthalmus* (Kollar, 1848), to enable its morphological distinction from the erroneously described *T. (T.) planinensis* Birštejn, 1948. Considering a combination of morphological, geographical and molecular data, we describe four new subspecies: *T. (T.) a. ocellata* ssp. nov., *T. (T.) a. periadriatica* ssp. nov., *T. (T.) a. legovici* ssp. nov. and *T. (T.) a. sontica* ssp. nov., apart from the extant *T. (T.) a. intermedia* Babić, 1922. Due to a considerable morphological variability and no easily observable diagnostic morphological characters, the GenBank accession numbers for the COI gene are added in all mentioned taxa.

Key words: Atyidae, phylogeny, subterranean, morphology, taxonomy

Introduction

Although only an integration of all biological disciplines can promote biological research at the tempo set by biodiversity crisis (Whitfield 2007), the morphology-based alpha taxonomy (MOBAT) remains the most important discipline, providing the accessible data-set for assigning taxonomically valid names on the basis of name-bearing specimens. Many “cryptic” species or species with an “overlooked diversity” remain taxonomically invisible, as badly under-resourced MOBAT cannot keep pace with their discovery. The MOBAT is essential and should be promoted if the promise of the profound implications for the evolutionary theory, biogeography and conservation planning is to be realised (Schlick-Steiner *et al.* 2007).

The freshwater cave dwelling shrimp *Troglocaris anophthalmus* (Kollar 1848) is among Dinaric largest and most distinctive cave invertebrates. Despite of intensive research of its taxonomy (e.g. Kollar 1848; Dormitzer 1853; Babić 1922; Holthuis 1956), reproduction, ontogeny (Matjašič 1958, Juberthie Jupeau 1974, 1975), as well as ecology (Gottstein-Matočec 2003), the taxonomy of the genus has remained unresolved for a century or longer.

An initial molecular analysis of numerous European cave shrimp populations to solve a biogeographical enigma of *Troglocaris*, was conducted by Zakšek *et al.* (2007). In 54 specimens from three known disjunct centres of the genus distribution, three genetic markers were used for a reconstruction of its phylogeny: mitochondrial cytochrome oxidase subunit I mtDNA (COI, 610 base pairs), 16S rDNA (472 bp) and nuclear ITS2 rDNA (836 bp). The genus was found to be polyphyletic. The results promoted an *a posteriori* redefinition of taxa at different levels (Sket & Zakšek 2009). The novel genus *Gallocaris* Sket *et* Zakšek, 2009, was erected for the French taxon *Troglocaris schmidtii inermis* Fage, 1937, related to the genus *Dugastella* Bouvier. Additionally, four new Dinaric

species were recognized, three of them belonging to the subgenus *Spelaecaris* Matjašič, 1956: *T. (S.) prasence*, *T. (S.) kapelana* and *T. (S.) neglecta* all Sket et Zakšek, 2009. Within the subgenus *Troglocaris* (= *Troglocaris* s. str.) only *T. (T.) bosnica* Sket et Zakšek, 2009, was morphologically and molecularly distinct enough to be described. All other populations of *Troglocaris* s. str. were assigned to *Troglocaris* aggr. *anophthalmus*. Further phylogenetic analyses (Zakšek et al. 2009) tested *T.* aggr. *anophthalmus* for a possible cryptic diversity and/or unrecognized evolutionary processes. The phylogeographical procedures showed that this aggregate is composed of four major monophyletic, geographically defined phylogroups: W-Slovenian, E-Slovenian, Adriatic, and Soča phylogroups. Authors argued that phylogroups could be treated as species as they are in agreement with all four aspects of genealogical concordance species concepts (*sensu* Avise 2000). Syntopy of the W-Slovenian and the putative fifth, i. e. Istra, phylogroups confirmed the status of biological species (*sensu* Mayr 1970) of the former phylogroup. It also indicated the same possibility for the putative phylogroup in spite of its much lower COI genetic distance (Zakšek et al. 2009). However, it has remained unresolved whether the Istra putative phylogroup represents a biological species *per se* or as a part of the rest of *T.* aggr. *anophthalmus*, excluding W-Slovenian phylogroup. In the same study, a detailed sampling also recovered a further split of the E-Slo phylogroup into E-Slo1 and E-Slo2 subgroups, which were geographically associated.

The phylogenetic framework published by Zakšek et al. (2007, 2009) provided a solid basis for the detailed morphometric studies (Jugovic et al., 2010a, 2011). Only the adult animals were included in the analyses to exclude main sources of ontogenetic variation. Beside 71 metric also 17 meristic characters were recorded (all listed in Jugovic et al., 2011), describing body proportions and elaboration of cuticular structures. Additionally, eye pigmentation, presence of supraorbital, antennal and pterygostomial spine, as well as presence of exopodites on pereopod V were considered. The descriptions, as well as the taxonomic decisions presented herein follow the results of discriminant function analysis (Jugovic et al. 2011) conducted in accordance with Zakšek et al. (2009: p. 933–934, Table 1; see also Appendix C) molecular analysis.

In this paper we are trying to imply the biological species concept (Mayr 1970) to delimit some taxa within *T.* aggr. *anophthalmus*. Presently, the inappropriate morphological characters used for the recognition of three taxa within the aggregate: *T. (T.) a. anophthalmus* (Kollar, 1848), *T. (T.) a. intermedia* Babič, 1922, and *T. (T.) planinensis* Birštejn, 1948 prevent their proper identification (Sket & Zakšek 2009). Apart from *T. (T.) planinensis* (= W-Slo phylogroup), the aggregate consists of (Sket & Zakšek 2009; Zakšek et al. 2009, Figure 1): (1) *T. (T.) anophthalmus anophthalmus* (= E-Slo1 subgroup and geographical group), (2) *T. (T.) anophthalmus intermedia* (= a subspecies that is molecularly nested within E-Slo phylogroup), (3) *T. (T.) anophthalmus* – Bela Krajina (= E-Slo2 subgroup and geographical group), (4) *T. (T.) anophthalmus* – Adriatic (= Adriatic phylogroup and geographical group), and (5) *T. (T.) anophthalmus* – Soča (= Soča phylogroup and geographical group), and (6) *T. (T.) anophthalmus* – Istra (= Istra putative phylogroup, according to ITS2 marker).

Since (except for *T. (T.) planinensis* = W-Slo phylogroup) the recognition of the above listed groups of populations as separate biological species would require information on their mating potential (reproductive isolation), we are designating them as subspecies of *T. (T.) anophthalmus*. We are considering multiple samples for each subspecies designation, thus trying to avoid the negligence of morphological variability present in Birštejn (1948) and Kollar (1848). Although the consistency of *T. (T.) anophthalmus* group from Istra (= Istra putative phylogroup) was not clearly supported by the mtDNA genetic marker, we believe a description of a subspecies is legitimate: the group is morphologically and genetically variable, its consistency is supported by a nuclear marker (we use it as a diagnostic character).

Materials and methods

Based on (1) the molecular analyses which indicated genetic isolation of several populations within *T.* aggr. *anophthalmus* (see the list of references in the Introduction section), (2) the subsequent detailed morphometric analyses were conducted, confirming the morphological distinctiveness of the identified phylogroups (see chapter »Morphometric analysis«); and (3) the description of several taxa (species and subspecies) were enabled. Although the morphological differences are minute, identification of taxa is possible when all descriptives (i.e. morphological, genetic and ecological evidence) are considered simultaneously (see chapters »Abbreviations and organisation of the text« and »Taxonomic descriptions«).

Morphometric analysis

The majority of specimens are deposited in the Zoological collection of the Oddelek za biologijo, Biotehniška fakulteta, Univerza v Ljubljani, Ljubljana (OBBFUL), Slovenia. Specimens deposited elsewhere are specified in the Results section (see also Appendix C). Altogether, 80 samples comprising over 580 specimens of *T. aggr. anophthalmus* from all known molecular phylogroups recognized by Zakšek *et al.* (2009; phylogroups/subgroups listed in the Introduction section) were surveyed, each specimen acquiring a unique voucher number (Appendix C). Besides morphometric data from Jugovic *et al.* (2011), the newly studied samples mainly collected in Istra and from the type localities were used for the herein descriptions (see Appendix C), following the same methodology as indicated in Jugovic *et al.* (2011). As some sexually dimorphic characters were disclosed lately, separate discriminant function analyses for adult males and females were conducted (Appendix A). Such analyses enabled the inclusion of both, sexually non-dimorphic (as in Jugovic *et al.* 2011), as well as of sexually dimorphic characters.

Abbreviations and organisation of the text

The abbreviation "CL" is consistently used for a carapace length in the descriptions while all other abbreviations are only provided to warrant consistency with the Figure 5 and Appendix B (this paper) and Appendices from Jugovic *et al.* (2011). They are defined by their first appearance in the text. The rostral dentition formula '(X+Y)/Z' denotes number of teeth dorsally on rostrum and carapace by the number of teeth ventrally on rostrum.

The anterior spine-like projections on the carapace are called spines (supra-, suborbital spines; see Figure 2B), following a traditional nomenclature. The spiniform setae on the telson are denominated in accordance with Sket & Zakšek (2009); three pairs of dorsal spiniform setae are present throughout this group of taxa, but the distal pair has been considered as a part of the spiniform setae row and has been placed on the distolateral corners of the telson (see Figure 2Tel). Pereopod III–VII length is given as the sum of articles 3–7 lengths (articles 3–6 in pereopods I–II), due to the prevalent loss (damaging) of basal articles during section. Roman numerals are used to denote successive body metameres and appendages, whilst the Arabic numerals denote articles within the appendages. The term 'comb-like' in connection with the pereopod dactyl (article 7) refers to a dense row of spiniform setae along its inner margin (as in Figure 4PpV – see the enlarged part).

Since the morphological differences among taxa are minute, the full description of all investigated characters is provided only for *T. (T.) anophthalmus anophthalmus* (= E-Slo1 subgroup). A single reported value is given for the male neotype while a range of values [in parentheses] refers to all other males from the subspecies' collection. The descriptions for other taxa (denoted as »differential descriptions« in the text), however, comprise exclusively specifications for the most discriminative characters. The comparison of these characters for six phylogroups of *Troglocaris* s. str is shown in Figure 5. A differential description of *T. (T.) anophthalmus anophthalmus* is added for practical reasons (see Appendix D). In the differential descriptions of males and females the arithmetic mean, standard deviation, minimum and maximum [in parentheses] are given for each character, considering all specimens of the taxon/phylogroup. In the description of *T. (T.) anophthalmus anophthalmus* females, the same values as for differential descriptions are used. In the Istra phylogroup females, only some morphometric characters are presented (see Appendix B) owing to small sample size and rather damaged animals. For the comparison of the most discriminative characters, see Appendix B. One should be aware that *T. (T.) anophthalmus anophthalmus*, *T. (T.) anophthalmus intermedia* and *T. (T.) anophthalmus ocellata* ssp. nov., were all comprised within the E-Slo phylogroup (see Sket & Zakšek 2009), since the lack of the molecular data prevented their further recognition.

Results

Taxonomic descriptions

Family Atyidae De Haan

Subfamily Paratyinae Holthuis

Genus *Troglocaris* Dormitzer, 1853

Subgenus *Troglocaris* (*Troglocaris*) Dormitzer, 1853
***Troglocaris* (*Troglocaris*) *anophthalmus anophthalmus* (Kollar, 1848)**

Synonymy: *Palaemon anophthalmus* Kollar, 1848; *Troglocaris schmidtii* Dormitzer, 1853; see also Holthuis (1956); *Troglocaris* (*Troglocaris*) – the E-Slo1 subgroup Zakšek *et al.*, 2009

Type locality: Slovenia, Dobrepolje, cave Kompoljska jama.

Material examined: Neotype: adult male (TA965), CL 7.6 mm, Kompoljska jama, Kompolje, Videm-Dobrepolje, Slovenia, 45°47'58.23" N, 14°43'51.39" E, 3rd September 2009, collected by J. Jugovic, specimen partly dissected, preserved in 70 % ethanol.

Other specimens from the neotype locality: Males: adult male (TA966; preserved in 96 % ethanol at -20°C), 7.5 mm; adult male (TA977; preserved in 96 % ethanol at -20°C), 6.5 mm; same data as neotype. Females: 8 adult females, TA975 (CL 8.4 mm); TA976 (CL 7.4 mm); TA978 (CL 8.5 mm); TA979 (CL 7.1 mm); TA980 (CL 7.8 mm); TA981 (CL 7.3 mm); TA982 (6.9 mm) (all preserved in 70 % ethanol); TA989 (CL 7.3 mm) (preserved in 96 % ethanol at -20°C); same data as neotype.

Other specimens examined: over 60 specimens from 11 samples (Figure 1, Appendix C1). Males, CL 4.7–8.3 mm. Females, CL 5.8–9.0 mm. Voucher numbers and GenBank identification numbers for COI gene are in Appendix C1.

Diagnosis: Subspecies of *T. (T.) anophthalmus* with completely reduced eye and body pigmentation. Rostrum length variable, when rostrum longer than 45 % of CL, dorsal margin usually curved upwards, ventral margin with 7 teeth or less. Antenna I article 3 length usually more than ½ of article 2 length. Pereopod III article 4 usually with three or less spiniform setae along inferior margin and at inferodistal angle, article 6 weakly or strongly curved in adult males. Pereopod V only exceptionally with exopodite. Fully mature males with no or with a single retinacular hook on *appendix interna* of pleopod I endopodite. Medial margin of pleopod I endopodite with short spiniform setae.

Description of male neotype and other [values in parentheses, if different] male material (partly after Fabjan 2001): Body and eye pigmentation completely reduced. CL 7.6 mm [5.3–7.6 mm]. Carapace (Figure 2B) surface smooth, with supraorbital and suborbital spines only. Anterolateral carapace angle rounded, without pterygostomial angle. Transversal crest posteriorly on the carapace. Rostrum length 59 % [32–78 %] of CL, shape sigmoidal [various], with 25+7/2 teeth [12–31+4–11/0–7]. Teeth on carapace along 17 % [14–25 %] of CL. Abdominal somites smooth. Pleonite V length 56 % [45–60 %] of pleonite VI length. Telson (Figure 1Tel) length 47 % [40–64 %] of CL and 87 % [85–109 %] of pleonite VI length. Telson elongated rectangular, distal margin width 66 % [48–80 %] of proximal margin width, the former 13 % [10–16 %] of CL. Dorsal surface with 3 pairs of dorsolateral spiniform setae [exceptionally 4 setae on one margin], at 0.60, 0.74 and 0.94 of telson length. Rather rounded distal border with 11 [9–14] strong spiniform setae; both distolateral setae approximately 3 times longer, all other 2 times longer than dorsolateral spiniform setae.

Antenna I (Figure 2AI) peduncle length 52 % [46–61 %] of CL. Peduncular article 1 about 1.5 [1.3–1.7] times as long as article 2, the latter 1.6 [1.5–2.0] times as long as article 3. Article 1 with nearly straight mesial margin with setose distal part; lateral stylocerite with broad base and slender, acute tip, its length 42 % [37–45 %] of peduncle length and approximately 80 % of article 1 length; distolateral lobe sharply pointed, its length 13 % [13–18 %] of peduncle length. Article 2 length approximately 83 % of article 1 length, mesial and lateral margins setose. Article 3 length approximately 41 % of article 1 length. Upper flagellum uniramous, lower flagellum slender, lengths of both flagella rather exceeding 200 % of CL.

Antenna II (Figure 2AII) with robust basicerite. Peduncle length 34 % [32–43 %] of CL. Scaphocerite 2.7 [2.6–3.2] times as long as wide, approximately 1.7 times [1.4–1.7] as long as peduncle, its length 55 % [51–63 %] of CL, distally broad, ovally produced, lateral margin nearly straight with stout distolateral tooth. Tooth length 10 % [9–13 %] of scaphocerite length. Scaphocerite mesial, distal and distolateral margins fringed with dense row of plumose setae. Flagella length rather exceeding 200 % of CL.

Mandibula with rather robust corpus, with small group of plumose setae on lateral margin. Without palp. Mandibular *pars incisiva* (incisor process; Figure 3Md) stout, tapering distally, distal margin of 3 [3–6] teeth of different size. Teeth number on left and right mandible often different. *Pars molaris* stout, U-shaped with triturative surface and numerous short simple marginal setae. Spine row of scarce serrate setae traversing to dense pappose setae.

Left maxilla I (Figure 3MxI(l)) palp truncated, with one long plumose seta at interodistal angle and one [1–2] stout spiniform subdistal seta. Right maxilla I palp (Figure 3MxI(r)) without plumose seta. Rectilinear outer margin

of upper *lacinia* (basipodial endite) with numerous short strong cuspidate setae, curvilinear inner margin and ventral surface with plumose setation. Lower *lacinia* (coxal endite) well developed, semicircular; outer margin with dense plumose and serrate setation, submedial line with five rows of shorter pappose and some simple setae. Outer part with sparse group of pappose setae.

Maxilla II (Figure 3MxII) with slender, simple, tapering palp with one simple seta distally. Basipodial endite bilobed; upper lobe subrhomboidal, margins with dense plumose and serrate setation, ventral surface with group of sparse plumose setae. Lower lobe with almost rectilinear outer margin, fringed with densely packed plumose and serrate setae; sparse simple setae are present all over its surface. Coxal endite fan-like, with dense plumose setae along distal margin and scarce plumose setae subdistally. Scaphognatite well developed, broad, margin fringed with plumose setae, anterior lobe large, posterior lobe narrower, subtriangular, with group of plumose setae on lower distal part.

Maxilliped I (Figure 3MxpI) palp clubby, flat distal margin with several plumose setae. Epipodite poorly developed, bilobed. Basipodial endite approximately 2.5 times longer than coxal endite, distal margin and mesial surface with dense rows of long plumose setae, almost rectilinear outer margin with row of shorter papulose setae with scale-like setules. Coxal endite poorly developed, with short serrate and longer plumose setae along outer margin. Exopodite with large caridean lobe approximately 2 times longer than flagellum. Lobe and flagellar margins and lobe ventral surface with plumose setation.

Maxilliped II (Figure 3MxpII) with well developed endopodite. Dactylopropodus broad, with long plumose setae on upper superior margin, densely packed longer pappose and shorter serrate setae along almost rectilinear lower superior margin and some long submarginal plumose setae. Exopodite with well developed flagellum, with plumose distal setae and serrate proximal setae. Well developed comb-like podobranchium with approximately 8 branches.

Maxilliped III (Figure 3MxpIII) with slender endopod, its length 89 % [84–105 %] of CL. Ischiomerus well separated from basis, rather curved, about 5.5 times as long as wide, with sparse pappose setae proximally on superior margin. Penultimate article slender, about 8.2 times as long as wide and 1.1 times ischiomerus length, with spiniform submarginal setae on mesial surface and few long pappose setae at distosuperior angle. Terminal article (dactylopropodus) about 11.5 times as long as wide and 1.3 times ischiomerus length, tapering distally, with strong apical dactylopropodal spine (claw). Distal $\frac{1}{3}$ of inferior margin with approximately 9 subequal spiniform setae, proximal $\frac{2}{3}$ of mesial surface and superior submarginal surface with transverse series of serrate setae. Exopodite tip reaching beyond ischiomerus distal tip, robust flagellum with serrate proximal setae and long plumose distal setae. Coxa with larger, well developed arthrobranchium upper and smaller, weakly developed (frequently damaged by section) lower arthrobranchium.

Pereopod I (Figure 4PpI) length from base of article 3 (ischium) to apex of article 6 (propodus, unmovable finger of chela) 57 % [53–67 %] of CL. Length relations of above articles (in percentages of pereopod I length): 15 % [11–16 %]: 22 % [22–27 %]: 33 % [27–33 %]: 30 % [29–36 %]. Chela with palm subcylindrical, slightly compressed, fingers with dense tuft of longer pappose and shorter serrate setae apically. Within tufts also shorter setae rounded distally (Figure 4PpI_{fin}). Article 6 maximal length 22 % [21–26 %] of CL, its length 2.2 [1.9–3.1] times its width. Chela palm well developed, its basal bulge length approximately 23 % [13–26 %] of article 6 maximal length. Article 7 (dactylus, movable finger) length 49 % [49–66 %] of article 6 maximal length. Exopodite with serrate basal setae and plumose distal setae, little overreaching distal end of article 4 (merus).

Pereopod II (Figure 4PpII) longer and thinner than pereopod I, its length (given as in pereopod I) 75 % [69–88 %] of CL. Length relations of above articles (given as in pereopod I): 17 % [14–19 %]: 24 % [23–28 %]: 34 % [31–35 %]: 25 % [24–29 %]. Chela with palm subcylindrical, slightly compressed, fingers with dense tuft of longer pappose and shorter serrate setae apically. Within tufts also shorter, distally rounded setae (as shown for pereopod I on Figure 2PpI_{fin}). Article 6 maximal length 23 % [21–27 %] of CL, its length 2.4 [2.0–3.6] times its width. Chela palm well developed, its basal bulge length approximately 21 % [11–22 %] of article 6 maximal length. Article 7 (dactylus, movable finger) length 60 % [48–66 %] article 6 maximal length. Exopodite with serrate basal setae and plumose distal setae, reaching distal end of article 4 (merus).

Pereopod III (Figure 4PpIII) length from base of article 3 (ischium) to apex of article 7 (dactylus) 153 % [148–205 %] of CL. Length relations of above articles (in percentages of pereopod III length): 9 % [7–10 %]: 34 % [31–36 %]: 18 % [17–20 %]: 31 % [28–33 %]: 8 % [5–12 %]. In fully mature males article 7 inferior margin with

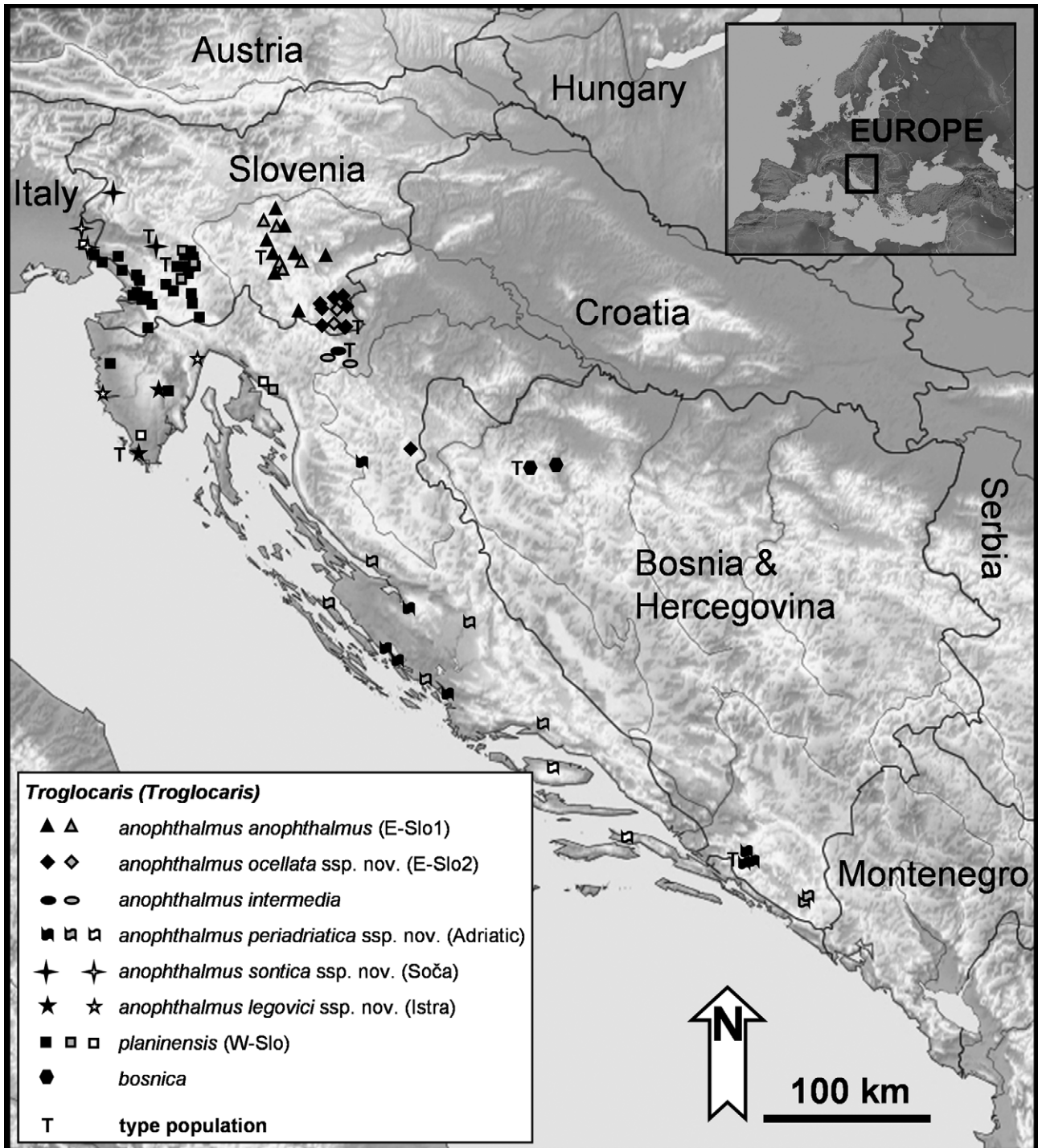


FIGURE 1. Distribution map of eight taxa of the subgenus *Troglucaris* s. str., with phylogroup/subgroup designation (in brackets, as in Zakšek *et al.* 2009). Different symbols denote taxa, their coloration denotes method of the analysis: black – molecular and morphometric analysis; grey – morphometric analysis; white – molecular analysis.

17 [8–40] spiniform setae in two, proximally densely and distally rarely set groups. Article 6 of mature males slightly curved, 13 % [12–20 %] of article 6 length differentiated (i.e. article distally widened, with a group of numerous spiniform setae). Articles 5 and 4 bear 1 and 3 [1–4] large spiniform setae on mesial surfaces, respectively. Article 3 bears 1 smaller [0–1] spiniform seta on mesial surface. Exopodite well developed, with basal serrate setae and plumose distal setae, reaching approximately second half of article 4 (merus). Pereopod IV similar to pereopod III.

Pereopod V (Figure 4PpV) length 157 % [142–171 %] of CL. Length relations of its articles (in percentages of pereopod V length): 8.5 % [8–9 %]: 30 % [28–30 %]: 18 % [16–19 %]: 36 % [35–38 %]: 7.5 % [7–9 %], the latter with 43 [37–54] equally long spiniform setae, formatting a comb-like article 7. Articles 5 and 4 bear 1 and 2 [1–3] large spiniform setae on mesial surfaces, respectively. Article 3 bears no [0 (exceptionally)–1] spiniform setae on mesial surface.

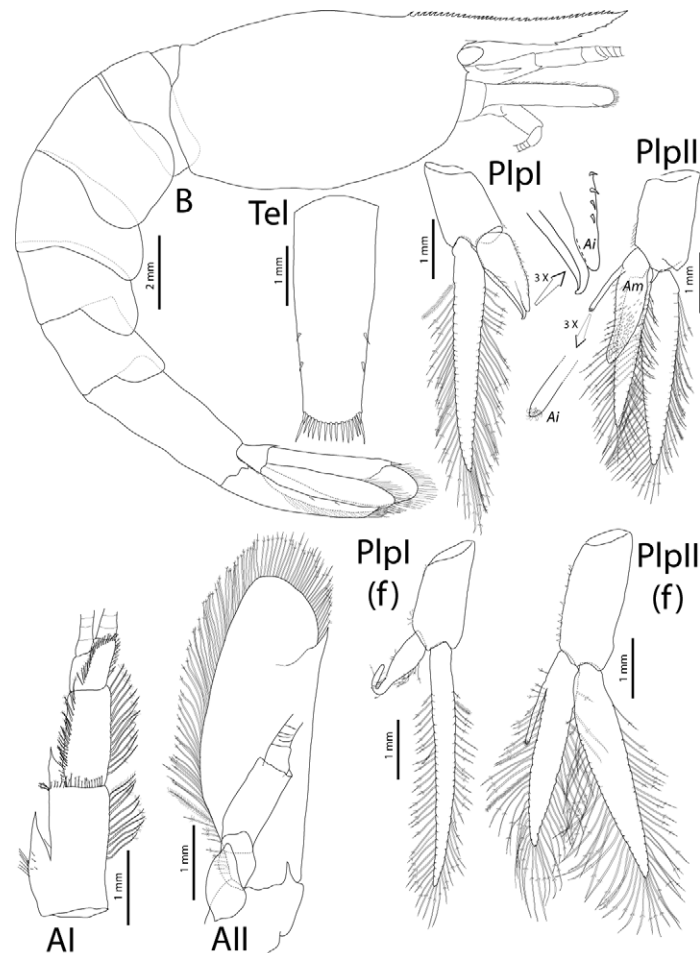


FIGURE 2. *Troglocaris (Troglocaris) anophthalmus*, Kompoljska jama, Kompolje, Videm–Dobrepolje, male (TA966), CL 7.5 mm: B, body, appendages (except antennae I–II and uropods) omitted, lateral view; Tel, telson, dorsal view; PlpI, left pleopod I; PlpII, left pleopod II; AI, left antenna I; AII, left antenna II. Female (TA975), CL 8.4 mm: PlpI(f), left pleopod I, PlpII(f), left pleopod II. *Ai*, appendix interna; *Am*, appendix masculina. Enlarged parts of the structures are indicated by arrows and their magnifications.

Pereopods I–IV with pleurobranchia, epipodites and exopodites. Pereopod V with pleurobranchium, without epipodite, exceptionally with exopodite – if developed, exopodite short, not/barely exceeding pereopod article 2 (basis) in length. All pereopods with setobranchia.

Pleopod I (Figure 2PlpI) endopodite well developed, with wide basis, tapering apex and slightly bent shallow groove on outer subdistal part. Endopodite length 19 % [17–25 %] of CL and 38 % [34–46 %] of exopodite length. Outer margin with 17 [17–33] spiniform setae. *Appendix interna* with no [0–1] retinacular hooks distally, not exceeding lamina in length. Exopodite with plumose setae along margins.

Pleopod II (Figure 2PlpII) with well developed shield-like *appendix masculina*, with numerous spiniform setae on medial and subdistal surface; its length 24 % [24–35 %] of CL and 63 % [62–73 %] of endopodite length. *Appendix masculina* 2.1 [2.1–3.3] times longer than *appendix interna*, the latter with 15 [3–23] retinacular hooks apically. Exopodite 1.2 [1.1–1.3] times longer than endopodite. Endopodite and exopodite lengths 39 % [37–51 %] and 44 % [43–60 %] of CL, respectively; their inner and outer margins fringed with plumose setae.

Uropod (Figure 4U) exopodite overreaching tip of endopodite, its width 33 % [29–34 %] of length, its length 60 % [50–71 %] of CL. Exopodite lateral margin almost rectilinear and without setae proximal to distolateral tooth,

other margins fringed with plumose setae, sparse setae also subterminally on surface. Diaeresis with 1 [exceptionally 2] movable stout spiniform seta. Endopodite length about 0.9 exopodite length, with plumose setae along margins.

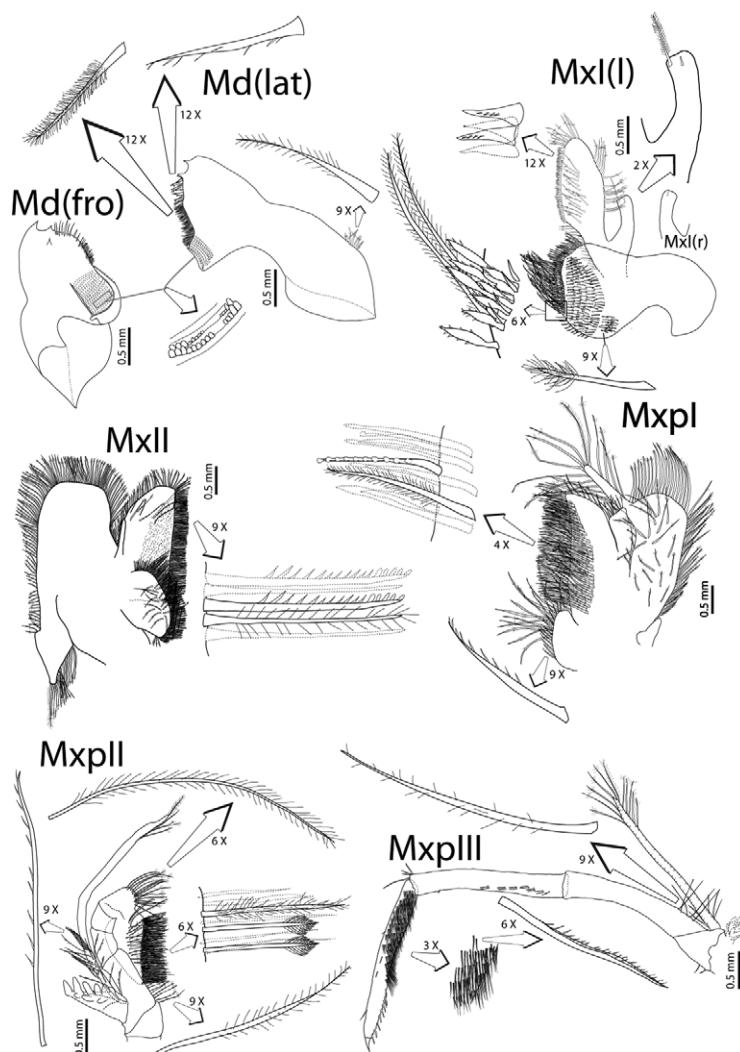


FIGURE 3. *Troglocaris (Troglocaris) anophthalmus*, Kompoljska jama, Kompolje, Videm–Dobrepolje, neoparatype male (TA966), CL 7.5 mm: MxpII, left maxilliped II; MxpIII, left maxilliped III. Neoallotype female (TA975), CL 8.4 mm: Md, left mandible: fro – frontal view, lat – lateral view; MxI(l), left maxilla I, MxI(r), palp of right maxilla I, MxII, left maxilla II, MxpI, left maxilliped I. Enlarged parts of the structures are indicated by arrows and their magnifications.

Description of females (partly after Fabjan 2001; average values presented): CL 7.4 ± 0.8 mm [5.8–9.0 mm], significantly longer than in males (t-test, $p < 0.05$).

Pereopods III–IV subsimilar, not differentiated. Pereopod III (Figure 4PpIII(f)) length from base of article 3 (ischium) to apex of article 7 (dactylus): 143 ± 10 % [119–172 %] of CL. Length relations of above articles (in percentages of pereopod III length): 10 ± 1 % [7–12 %], 34 ± 1 % [31–36 %], 18 ± 1 % [16–20 %], 31 ± 1 % [28–34 %] and 7 ± 1 % [5–8 %]. Article 7 with 6.5 ± 1.4 [4–10] spiniform setae. Article 6 with 5.9 ± 1.5 [4–10] groups of spiniform setae.

Pleopod I (Figure 2PlpI(f)) endopodite length 17 ± 3 % [10–23 %] of CL and 38 ± 7 % [24–51 %] of exopodite length. Endopodite basis wide, remarkably tapering distally. Distal endopodite extension possibly representing *appendix interna* (according to its location), but without retinacular hooks.

Pleopod II (Figure 2PlpII(f)) without *appendix masculina*.

Distribution. The subspecies is distributed in SE Slovenia, in NW parts of its Dolenjska region, mainly covering the Suha Krajina: from Stična 27 km SE of Ljubljana, along the upper course of the Krka River to Novo mesto and further in the SE direction to the Kolpa/Kupa River near Kostel at the border with Croatia (Figure 1).

Remarks. According to Kollar (1848), the type sample (not explicitly designated as such) was brought to the ‘k. k. Hof-Naturalien-Cabinet’. The collection is now in possession of the Naturhistorisches Museum Wien (Vienna, Austria), but the sample couldn’t be found (P. Dworschak, pers. comm.). Both, Kollar and Dormitzer (1853; for its *T. schmidtii*) mention Kompoljska jama (Kollar also mentioned the nearby cave Potiskavc [‘Portiskavcz’]) as the locality of their samples. Since Kompoljska jama is easily accessible, with regularly available shrimps, it was selected as the (neo)type locality (Sket & Zakšek 2009).

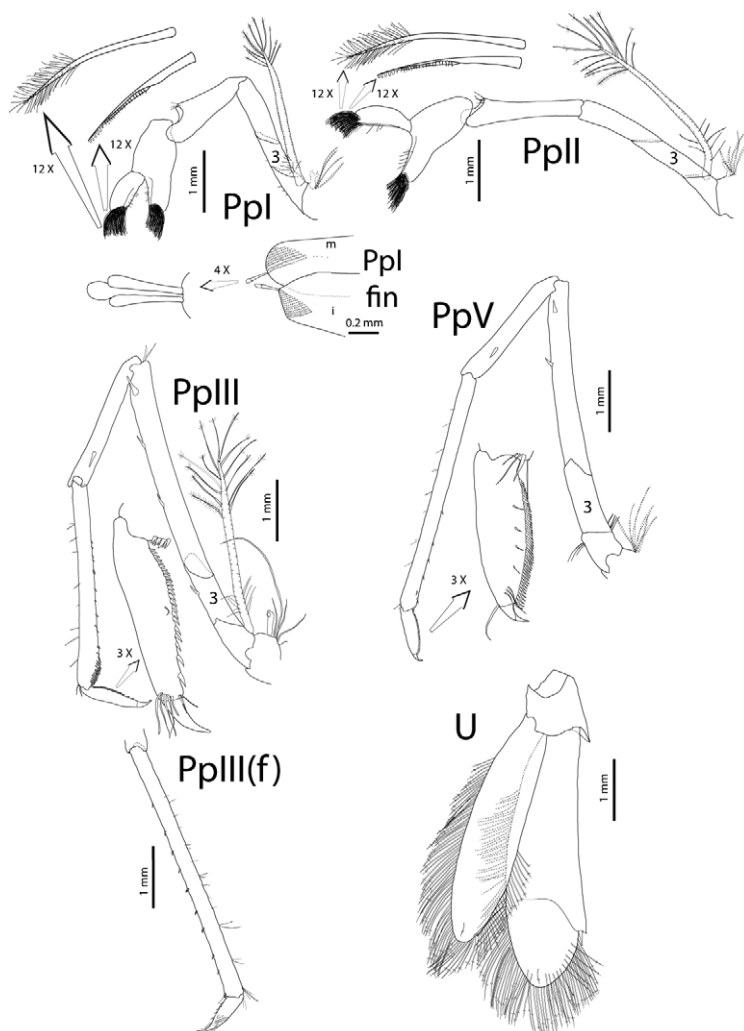


FIGURE 4. *Troglolaris (Troglolaris) anophthalmus*, Kompoljska jama, Kompolje, Videm–Dobrepolje, neoparatype male (TA966), CL 7.5 mm: PpI, left pereopod I; PpII, left pereopod II; PpIII, left pereopod III; PpV, left pereopod V; U, left pleopod VI (uropod). Neoallotype female (TA975), CL 8.4 mm: Pp III (f), distal part (articles 6 and 7) of the left pereopod III; PpI fin, placing of the setae on the movable (m) and immovable (i) fingers (equal on left and right side of the pereopods I–II). 3 – pereopod article 3. Enlarged parts of the structures are indicated by arrows and their magnifications.

***Troglolaris (Troglolaris) anophthalmus ocellata* ssp. nov.**

Synonymy: *Troglolaris (Troglolaris)* – the E-Slo2 subgroup Zakšek *et al.*, 2009; *Troglolaris anophthalmus intermedia* Gottstein Matočec, 2003 and Franjević, 2006, p.p. (from Kukuruzovića špilja, Croatia).

Type locality: Slovenia, Vinica, cave Jama v kamnolomu.

Type sample: **Males:** adult male (TB046, holotype), CL 7.8 mm, Vinica, cave Jama v kamnolomu, Slovenia, 45°27'15.14" N, 15°14'39.17" E, June 1977, collected by M. Štangelj, specimen partly dissected, preserved in 70 % ethanol. Other males: adult male (TB045; preserved in 70 % ethanol), 7.5 mm; adult male (TB047; preserved in 70 % ethanol), 8.2 mm; same data as holotype. **Females:** 2 adult females, TB049 (CL 8.8 mm); TB050 (CL 8.4 mm, collected 27th May 1974) (all preserved in 70 % ethanol); same data as holotype.

Other specimens examined: over 50 specimens from 8 samples (Figure 1, Appendix C2). Males, CL 4.7–8.3 mm. Females, CL 5.0–9.0 mm. Voucher numbers and GenBank identification numbers for COI gene are in Appendix C2.

Diagnosis: Subspecies of *T. (T.) anophthalmus* comprising populations with mostly pigmented eye rudiments (in more than 90 % of analysed specimens; see Appendix C2 for exact localities). In mature males, *appendix interna* with no retinacular hooks distally, not exceeding lamina in length.

Etimology: *Ocellata* - adjective from Latin *ocellus* – with a small eye (rudiment in this case).

Remarks: In samples from Dolenjske Toplice (cave Sušica, 1 specimen) and Črnomelj (cave Stobe, 4 specimens) no specimen had pigmented eye rudiments, despite their placement in the E-Slo2 subgroup in the ITS2 and COI based phylogenetic trees (Zakšek *et al.*, 2009). It should be noted, however, that the discriminant function analysis was run on *T. (T.) a. ocellata* together with *T. (T.) a. anophthalmus* and *T. (T.) a. intermedia*, as a monophylum. Therefore the appropriate differential description for *T. (T.) anophthalmus ocellata* is missing and only the eye specifics and data on retinacular hooks on male pleopod I are given (see also Material and methods).

Distribution: Bela Krajina (extreme SE Slovenia), contiguous to the area of *T. (T.) a. anophthalmus* (located north westerly). Considering only the existence of pigmented eye rudiment also the population of the geographically remote Kukuruzovića špilja near Rakovica (Croatia, at the NW Bosnian border) should be assigned to *T. (T.) a. ocellata* (Figure 1).

***Troglocaris (Troglocaris) anophthalmus intermedia* Babić, 1922**

Synonymy: *Troglocaris schmidti* var. *intermedia* Babić, 1922; *Troglocaris intermedia* d'Udekem d'Acoz, 1999; nec *Troglocaris anophthalmus intermedia* Gottstein Matočec, 2003 and Franjević, 2006, from Kukuruzovića špilja (Croatia).

Type locality: Croatia, Ogulin, Slunj-Tounj, Mikašinići, Mikašinića pećina (= pećina Zala).

Specimens examined: 29 specimens from Mikašinića pećina (Figure 1, Appendix C3). Only specimens collected from Mikašinića pećina have been attributed to this subspecies. Voucher numbers and GenBank identification numbers for COI gene are in Appendix C3.

Preliminary (see remarks) diagnosis: Specimens from the type locality without pigmented eye rudiments and with rostrum length less than 35 % of CL. In mature males, *appendix interna* with no retinacular hooks distally, not exceeding lamina in length.

Remarks and distribution: Presently certified only from Mikašinića pećina, but morphologically similar populations are known from the vicinity (they were too old to be analysed molecularly): wider Ogulin area, e. g. cave Privis and cave Rudnica (see Figure 1, Appendix C3). The appropriate morphological characterisation of the subspecies will be possible when fresh samples for the molecular analysis will be obtained from the mentioned area. Since the rostral length in *Troglocaris* s. str. seems to be dependent on the presence of the predatory *Proteus anguinus* Laurenti (see Jugovic *et al.*, 2010b), we can not admit the identification of the subspecies only on the basis of this character (rostral length was used as a key character in original description). The lack of pigment in the eye rudiments distinguishes this population from the geographically closest *T. (T.) a. ocellata*. In the COI based phylogenetic tree, the population from Mikašinića pećina is separated from *T. (T.) a. anophthalmus* and *T. (T.) a. ocellata*, but splits are weakly supported.

***Troglocaris (Troglocaris) anophthalmus periadriatica* ssp. nov.**

Synonymy: *Troglocaris (Troglocaris)* – the Adriatic phylogroup Zakšek *et al.*, 2009 incl. *Troglocaris schmidti* auct. from Vjetrenica, p.p.; incl. *Troglocaris schmidti schmidti* forma *typica* Fage, 1937 p.p.; incl. *Troglocaris anophthalmus* Matjašič, 1960.

Type locality: Bosnia and Hercegovina, Popovo polje, Zavala, cave Vjetrenica.

Type sample: **Male:** adult male (TA063, holotype), CL 6.0 mm, lake at the end of Blatni rov, Gornji Absolonov kanal, cave Vjetrenica, Popovo polje, Bosnia and Hercegovina, 42°50'43.21" N, 17°59'09.26" E, 18th August 2005, collected by M. Zgamajster, specimen partly dissected, preserved in 70 % ethanol. **Females:** 7 adult females, TA794 (CL 6.9 mm); TA795 (CL 6.0 mm); TA796 (CL 6.2 mm), Donja Vjetrenica, 26th September 1962, collected by J. Matjašič, other data as in holotype; TA798 (CL 6.0 mm); TA799 (CL 5.2 mm), TA800 (CL 7.0 mm), data as in holotype; TA801 (CL 6.6 mm), lake Duguljasto jezero, Gornji Absolonov kanal, other data as for TA798–TA800; one juvenile female, TA797 (CL 6.0 mm),

data as for holotype (all specimens preserved in 70 % ethanol).

Other specimens examined: 29 adult males, CL 4.8–7.3 mm and 53 adult females, CL 5.2–8.7 mm, from 15 samples from the entire distribution area of *T. (T.) a. periadriatica* (Figure 1, Appendix C4). Voucher numbers and GenBank identification numbers for COI gene are in Appendix C4.

Diagnosis: Subspecies of *T. (T.) anophthalmus* with completely reduced eye and body pigmentation. Rostrum length variable, but even when rostrum longer than 45 % of CL, dorsal margin usually straight, ventral margin with 9 or less teeth, but mostly with less than 7 teeth. Antenna I article 3 length usually more than ½ of article 2 length. Pereopod III article 4 usually with three spiniform setae along inferior margin and at inferodistal angle, article 6 weakly or strongly curved in adult males. Pereopod V article 7 length usually more than 21 % (in males) and more than 17 % (in females) of article 6 length. Pereopod V only exceptionally with exopodite. Uropod exopodite width usually more than 32 % of its length. Telson usually strongly narrowed distally. Fully mature males with 2–7 retinacular hooks on pleopod I *appendix interna*, sometimes with a single retinacular hook or without them. Medial margin of pleopod I endopodite with short spiniform setae.

Differential description of material examined: **Males** (average values \pm SD and [min, max values] presented from Figure 5; see also Appendix B1): Small bulky specimens, CL: 6.0 mm \pm 0.6 mm [4.8, 7.3 mm]. Rostrum length and dentition variable, only exceptionally rostrum curved. Article 3 of antenna I long (a13a12), its length 58 \pm 6 % [46, 73 %] of article 2 length. Antenna II scaphocerite wide (a2s2s1), its width 38 \pm 2 % [33, 42 %] of scaphocerite length. Pereopod I article 7 long (pr1da), its length 21 \pm 1 % [18, 23 %] of pereopod I length; and pereopod III article 7 of medium length (pr3da), its length 10 \pm 1 % [8, 12 %] of pereopod III length. Pereopod I article 6 long (pr1che), its length 25 \pm 2 % [22, 27 %] of CL. Uropod exopodite wide (u21, u2cl), its width 35 \pm 2 % [32, 39 %] of uropod exopodite length, and 20 \pm 2 % [17, 24 %] of CL. Pereopod V article 7 long (p5dp), its length 25 \pm 2 % [21, 28 %] of pereopod V article 6 length. Telson short (te1s6), its length only 89 \pm 6 % [76, 103 %] of pleonite VI length. Adult males generally with at least one (up to 7) retinacular hooks on *appendix interna* of pleopod I endopodite. **Females** (average values \pm SD and [min, max values] presented from Figure 5; see also Appendix B2): Small bulky specimens, CL: 6.9 \pm 0.7 mm [5.2, 8.7 mm]. Rostrum length and dentition variable, rostrum curved only exceptionally. Article 3 of antenna I long (a13a12), its length 55 \pm 6 % [44, 69 %] of article 2 length. Antenna II scaphocerite wide (a2s2s1, a2s2cl), its width 39 \pm 3 % [32, 47 %], of scaphocerite length, and 21 \pm 2 % [17, 24 %] of CL. Distal articles (article 7) of chelate pereopods I and II long (pr1da, pr2da), its length 21 \pm 1 % [19, 23 %] of pereopod I length, and 17 \pm 1 % [15, 19 %] of pereopod II length; chelae of pereopod II relatively long (pr2che), their length 23 \pm 2 % [19, 28 %] of CL. Proximal articles of chelate pereopods of medium length; length of article 4 of pereopod I (pr1ma) 24 \pm 2 % [20, 26 %] of pereopod I length, and length of article 5 of pereopod II (pr2ccl) 27 \pm 2 % [20, 31 %] of CL. Pereopod V article 7 long (p5dp), its length 25 \pm 2 % [17, 29 %] of article 6 length. Pleonites V–VI long (s56cl), their length 85 \pm 5 % [73, 97 %] of CL. Uropod exopodite wide (u21, u2cl), its width 37 \pm 2 % [32, 43 %] of uropod exopodite length, and 20 \pm 2 % [16, 24 %] of CL. Uropod exopodite of medium length (u1te1), its length 108 \pm 6 % [98, 121 %] of telson length; telson short (te1cl, te1s56), its length 49 \pm 3 % [43, 55 %] of CL, and 59 \pm 3 % [54, 63 %] of pleonites V+VI length. Telson clearly narrowed distally (tes2tes1): its distal width 56 \pm 7 % [43, 70 %] of proximal width. **Males and females** (see also Table 1): article 3 of pereopod III with 3 or less spiniform setae along its inferior margin and at inferodistal angle in over 80 % of specimens, otherwise with up to 5 spiniform setae.

Etymology: Peri- in a composite word comes from a Greek word meaning “near, around”. Accentuating its distribution area along and within the Adriatic coast and resembling the designation ‘Adriatic’ in the phylogenetic studies (Zakšek *et al.* 2007, 2009).

Remarks: Vjetrenica is chosen as the type locality, because the population of *Troglocaris* s. str. living in Vjetrenica has been so often mentioned in literature. It was often regarded as belonging to the ‘typical’ *T. anophthalmus* (e.g. Matjašič, 1960) or even explicitly as being *T. a. anophthalmus* (Fage 1937, as *T. s. schmidtii*; Franjević 2006).

Distribution: The subspecies inhabits a contiguous wide area along the Adriatic coast, approximately from Otočac in Lika (Croatia) in NW to SE of Trebinje (Bosnia and Hercegovina) in SE. It seems to be absent from the central Velebit mountains (Croatia), but it is present in the detached peninsula Pelješac and the islands of Brač and Ugljan. The populations W and NW of Otočac were not available for study (Figure 1).

Troglocaris (Troglocaris) anophthalmus sontica ssp. nov.

Synonymy: *Troglocaris (Troglocaris)* – the Soča phylogroup Zakšek *et al.*, 2009

Type locality: Slovenia, Vipava, cave Vipavska jama.

Type sample: **Males:** adult male (TA985, holotype), CL 7.4 mm, Vipavska jama, Vipava, Slovenia, 45°50'40.91" N, 13°57'52.55" E, 6th September 2009, collected by J. Jugovic and M. Kolesnikova, specimen preserved in 70 % ethanol. Other males from the type sample: adult male (TA983), CL 6.1 mm; adult male (TA984), CL 6.3 mm; adult male (TA986), CL 6.6 mm; adult male (TA987), CL 6.2 mm; adult male (TA988), CL 5.6 mm; same data as neotype. **Females:** 5 adult females, TA990 (CL 7.1 mm); TA991 (CL 6.1 mm); TA992 (CL 6.4 mm); TA993 (CL 6.1 mm); TA994 (CL 6.2 mm); same data as neotype.

Other specimens examined: 9 specimens collected from one other known locality of *T. (T.) anophthalmus sontica* (Figure 1, Appendix C5). Males, CL 5.0–6.8 mm. Females, CL 5.9–7.0 mm. Molecular analysis only: 6 specimens from two additional localities (Figure 1, Appendix C5). Voucher numbers and GenBank identification numbers for COI gene are in Appendix C5.

Diagnosis: Subspecies of *T. (T.) anophthalmus* with completely reduced eye and body pigmentation. Rostrum length variable, rostrum always straight and narrow, with 7 or less ventral teeth. Antenna I article 3 length less than ½ of article 2 length. Antenna II scaphocerite's distal point weak, usually its length less than 28 % of scaphocerite width. Pereopod III article 4 usually with four spiniform setae along inferior margin and at inferodistal angle, article 6 not or only weakly curved in adult males. Pereopod V exopodite absent. Uropod exopodite width usually less than 32 % of its length. Fully mature males without retinacular hooks on pleopod I endopodite *appendix interna*. Pleopod I endopodite inner margin with short spiniform setae. Medial margin of pleopod I endopodite with short spiniform setae.

Differential description of material examined: **Males** (average values ± SD and [min, max values] presented, Figure 5; see also Appendix B1): Small specimens, CL: 5.8 ± 0.5 mm [5.0, 6.8 mm]. Rostrum length and dentition variable, when rostrum longer than 45 % of CL, narrow and never curved upwards. Article 3 of antenna I short (a13a12), its length 39 ± 4 % [33, 46 %] of article 2 length. Antenna II scaphocerite narrow (a2s2s1), its width 34 ± 2 % [31, 38 %] of scaphocerite length; distal point of scaphocerite weak and short (a2s3s1), its length 7 ± 1 % [5, 10 %] of scaphocerite length. Pereopod I article 7 long (pr1da), its length 21 ± 2 % [19, 24 %] of pereopod I length; and pereopod III article 7 short (pr3da), its length only 9 ± 1 % [7, 12 %] of pereopod III length. Pereopod I article 6 long (pr1che), its length 26 ± 2 % [22, 29 %] of CL. Pereopod III article 3 long (pr3ia), its length 9 ± 1 % [8, 11 %] of pereopod III length. The comb on pereopod V article 7 with small number of setae (*P5D*): 36.8 ± 4.3 [32, 47]. Pereopod V article 7 short (p5dp), its length only 21 ± 2 % [17, 24 %] of pereopod V article 6 length. Uropod exopodite narrow (u21, u2cl), its width only 29 ± 2 % [27, 32 %] of uropod exopodite length, and 16 ± 1 % [14, 18 %] of CL. Telson long (te1s6), its length 97 ± 5 % [89, 103 %] of pleonite VI length. Adult males generally without a single retinacular hook on *appendix interna* of pleopod I endopodite. Number of setae on pleopod I endopodite inner margin small (*PPIENS*): 18.9 ± 2.8 [15, 24]. **Females** (average values ± SD and [min, max values], Figure 5; see also Appendix B2): Small specimens, CL: 6.5 ± 0.4 mm [5.9, 7.0 mm]. Rostrum length and dentition variable, when longer than 45 % of CL, narrow and never curved upwards. Article 3 of antenna I short (a13a12), its length only 38 ± 7 % [31, 50 %] of article 2 length. Antenna II scaphocerite narrow (a2s2s1, a2s2cl), its width 36 ± 2 % [30, 38 %] of scaphocerite length, and 17 ± 1 % [16, 19 %] of CL; distal point of scaphocerite weak and short (a2s3s1), its length only 8 ± 1 % [6, 9 %] of scaphocerite length. Distal articles of chelate pereopods long; length of article 7 of pereopod I (pr1da) 21 ± 1 % [20, 22 %] of pereopod I length, and length of article 7 of pereopod II (pr2da) 18 ± 1 % [17, 19 %] of pereopod II length. Pereopod II chelae long (pr2che), their length 24 ± 1 % [23, 26 %] of CL. Proximal articles of chelate pereopods long, length of pereopod I article 4 (pr1ma) 23 ± 1 % [22, 25 %] of pereopod I length, and length of pereopod II article 5 (pr2ccl) 26 ± 2 % [23, 28 %] of CL. Pereopod V article 7 short (p5dp), its length only 19 ± 2 % [16, 22 %] of pereopod V article 6. The comb on pereopod V article 7 with small number of setae (*P5D*): 35.9 ± 3.0 [31, 40]. Pleonites V–VI long in relation to CL (s56cl), its length 78 ± 3 % [71, 80 %], and short in relation to uropod exopodite length (u1s56), its length 64 ± 3 % [61, 71 %] of uropod exopodite length. Uropod exopodite narrow (u21, u2cl), its width only 31 ± 1 % [29, 33 %] of uropod exopodite length, and only 16 ± 1 % [14, 16 %] of CL. Pleopod II *appendix interna* short (pl2aicl), its length 10 ± 1 % [9, 12 %] of CL. Telson of medium length (te1cl, te1s56), its length 50 ± 3 % [47, 55 %] of CL, and 64 ± 3 % [62, 71 %] of pleonites V+VI length. Telson weakly narrowed distally (tes2tes1), its distal width 79 ± 7 % [69, 89 %] of proximal width. **Males and females** (see also Table 1): pereopod III article 3 with 4–5 spiniform setae along its inferior margin and at inferodistal angle in over 70 % of specimens, otherwise with 3 spiniform setae.

Etymology: *Sontica* is an adjective from *Sontius* (or *Aesontius*) which was the Roman name for the river Soča/Isonzo.

Distribution: despite the thorough examination of the area (Jugovic and Zakšek, 2008; Prevorčnik, Fišer, Zagmajster, Trontelj, 2009) the subspecies is known only from four localities (Figure 1, Appendix C5) in the Soča–Vipava rivers system, NW from *T. (T.) planinensis*. Both taxa seem to be sympatric in the Italian Carso/Kras.

***Troglocaris (Troglocaris) anophthalmus legovici* ssp. nov.**

Synonymy: *Troglocaris (Troglocaris)* – the Istra putative phylogroup Zakšek *et al.*, 2009

Type locality: Croatia, Pula, Nimfej izvor (spring).

Type material: **Male:** adult male (inv. number 1770, holotype), CL 5.7 mm, Nimfej izvor, Pula, Croatia, 25th January 2011, collected by B. Jalžić, specimen partly dissected and stored in 96 % ethanol. **Females from the type locality:** 2 juvenile females: TB082 (CL 5.6 mm), TB084 (CL 5.7 mm). Type material stored in Hrvatski prirodoslovni muzej in Zagreb (Croatia).

Other specimens examined: Kršan (female, CL 6.2 mm). Molecular analysis only: Opatija, Medveja (juvenile male); Vrsar, Klariča jama (female, only tissue available). Voucher numbers and GenBank identification numbers for COI and ITS2 genes are in Appendix C6, where available.

Description of the holotype (only characters that are used for differential descriptions of other herein described taxa are included, see also Table 1 and Appendix B1): Small specimen, CL: 5.7 mm. Rostrum straight and narrow, with 4 ventral teeth. Article 3 of antenna I length (a13a12) 50 % of article 2 length. Antenna II scaphocerite narrow (a2s2s1), its width 34 % of scaphocerite length; distal point of scaphocerite 9.5 % of scaphocerite length (a2s3s1). Pereopod I article 7 length (pr1da) 17 % of pereopod I length; pereopod III article 7 length (pr3da) 11.5 % of pereopod III length. Pereopod I article 6 length (pr1che) 22 % of CL. Pereopod III article 3 long (pr3ia), its length 10.5 % of pereopod III length. The comb on pereopod V article 7 with small number of setae (*P5D*), only 30. Pereopod V article 7 rather short (p5dp), its length 18 % of pereopod V article 6 length. Uropod exopodite narrow (u21, u2cl), its width 29 % of uropod exopodite length and 18.5 % of CL. Telson long (te1s6), its length 97 % of pleonite VI length. Pleopod I endopodite without retinacular hooks on *appendix interna*. Number of setae on pleopod I endopodite inner margin (*PPIENS*) small, only 21. Article 3 of pereopod III with 4 spiniform setae along its inferior margin and at inferodistal angle. **Females:** no adult females from the type locality were available, but see Appendix B2 for scarce morphometric data.

Etymology: named after the well known Istrian caver and our friend Silvije Legović.

Remarks and distribution: Only populations from W and E coast of the central Istra peninsula (Croatia), S from rivers Mirna and Raša, together with a sample from the southern tip of peninsula (near Pula) could be molecularly identified as belonging to the Istra putative phylogroup (Figure 1). In Kršan (in a spring in the tunnel draining the former lake of Čepić), it was found in syntopy with *T. (T.) planinensis*, where the latter was more numerous. Near Pula, *T. (T.) planinensis* was also found (but not in the same locality). So these populations might represent separate biological species either on their own or as a member of herein described *T. (T.) anophthalmus*.

***Troglocaris (Troglocaris) planinensis* Birštejn, 1948**

Synonymy: *Troglocaris schmidti planinensis* Birštejn, 1948; *Troglocaris planinensis* d'Udekem d'Acoz, 1999; *T. anophthalmus* – the W-Slovenian phylogroup Zakšek *et al.*, 2007; incl. *Troglocaris anophthalmus anophthalmus*, Gottstein Matočec, 2003, p.p. (from Jama pod Krogom); incl. *Troglocaris* 'forma A2' (Plomin) Franjević, 2006; incl. *Troglocaris* 'forma AN' (Krog) Franjević, 2006; incl. *Troglocaris hercegovinensis* Sket, 1992 from Slovenia (Osp); see also Holthuis (1956).

Type locality: Slovenia, Postojna, Planina, cave Planinska jama.

Type material: Birštejn's sample is supposed to be in his collection in the Zoologičeskij institut, Moskovskij Gosudarstvennyj Universitet in Moskva (Moscow, Russia). The author of the subspecies did not declare the holotype. Since his only male is evidently juvenile, choosing a lectotype would be of little practical value. Therefore we decided to choose a neotype from a new sample from the topotype population.

Neotype: adult male (TA972), CL 6.3 mm, Planinska jama, Planina, Postojna, Slovenia, 45°49'11.64" N, 14°14'44.4" E, 15th October 2009, collected by J. Jugovic and M. Vittori, specimen partly dissected and stored in 70 % ethanol. **Other specimens from the neotype locality:** **Males:** adult male (TA973), 6.6 mm; adult male (TA974), CL 7.0 mm; same data as neotype. **Females:** 3 adult females, TA969 (CL 7.7 mm); TA970 (CL 7.4 mm); TA971 (CL 7.4 mm); same data as neotype.

Other specimens examined: over 200 specimens from 32 samples (Figure 1, Appendix C7). Males, CL 5.1–8.2 mm. Females, CL 4.0–9.9 mm. Voucher numbers and GenBank identification numbers for COI gene are in Appendix C7.

TABLE 1. Most discriminative numerical counted, descriptive and dichotomous morphological characters and ratios for the separation of five molecularly identified phylogroups of *T. aggr. anophthalmus* and *T. bosnica*. Symbols: “+”: present; “-”: absent; “*”: data for males only; M: males; F: females. Number after the colon indicate the sample number for that particular count, interval or character state. Explanation for values, used in ratios (R): upper row, average value \pm standard deviation (number of specimens); lower row, [minimum, 12th percentile, 88th percentile, maximum].

Morphological character	<i>T. planinensis</i> (‘W-Slo’)	<i>T. a. anophthalmus</i> + <i>T. a. intermedia</i> + <i>T. a. ocellata</i> (‘E-Slo’)	<i>T. a. peria Adriatica</i> (‘Adriatic’)	<i>T. a. somtica</i> (‘Soča’)	<i>T. a. legovici</i> (‘Istra’)	<i>T. bosnica</i>	
eye pigment ^d							
rostral shape ^d	variable in length, when frequently the tip protruding upwards (i.e. dorsal margin concave)	variable in length, when frequently the tip protruding upwards (i.e. dorsal margin concave)	variable in length, when long \pm straight, only exceptionally the tip protruding upwards	variable in length, when long, always straight and narrow	rather short, straight and narrow	long, the tip always protruding upwards (i.e. dorsal margin concave)	
number of teeth on rostrum ventrally (ROT3)	0-7: 171 8: 10 9: 4 10: 4 11: 1 12: 0 13: 1 14-17: 0 0.43 \pm 0.05 (205) [0.31, 0.38, 0.49, 0.58] 0.30 \pm 0.05 (201) [0.18, 0.24, 0.36, 0.45]	0-7: 163 8: 1 9: 2 10: 0 11: 0 12: 1 13: 0 14-17: 0 0.54 \pm 0.06 (178) [0.41, 0.46, 0.62, 0.70] 0.28 \pm 0.05 (177) [0.16, 0.22, 0.34, 0.41]	0-7: 88 8: 1 9: 1 10: 0 11: 0 12: 0 13: 0 14-17: 0 0.55 \pm 0.06 (95) [0.44, 0.48, 0.64, 0.73] 0.28 \pm 0.04 (94) [0.20, 0.23, 0.34, 0.38]	0-7: 27 8: 0 9: 0 10: 0 11: 0 12: 0 13: 0 14-17: 0 0.38 \pm 0.05 (28) [0.30, 0.33, 0.46, 0.50] 0.22 \pm 0.05 (28) [0.14, 0.15, 0.28, 0.31]	0-7: 2 ^{e1, e2} 8: 0 9: 0 10: 0 11: 0 12: 0 13: 0 14-17: 0 0.50 (1) ^{e1}	0-7: 0 8: 0 9: 0 10: 1 11: 0 12: 1 13: 2 14-17: 10 ^a 0.50 \pm 0.07 (19) [0.39, 0.41, 0.59, 0.61] 0.32 \pm 0.09 (19) [0.24, 0.26, 0.36, 0.41]	
antenna I article 3 length vs. antenna I article 2 length (R)							
scaphocerite point length vs. scaphocerite width (R)							
number of spiniform setae on pereopod III article 3 (P3M) ^d	2: 1 3: 16 4: 63 5: 10 -: 189 +: 11 0.22 \pm 0.02 (188) [0.16, 0.20, 0.24, 0.36]	2: 4 3: 45 4: 9 5: 6 -: 157 +: 8 0.21 \pm 0.02 (165) [0.14, 0.18, 0.24, 0.27] 37-56: 43 23-61: 86	2: 4 3: 40 4: 6 5: 2 -: 87 +: 5 0.25 \pm 0.02 (87) [0.17, 0.22, 0.27, 0.29] 31-56: 28 39-62: 52	2: 0 3: 6 4: 14 5: 3 -: 28 +: 0 0.20 \pm 0.02 (26) [0.16, 0.17, 0.23, 0.25]	2: 0 3: 0 4: 1 5: 0 -: 0 +: 0 0.18 (1) ^{e1}	2: 11 3: 3 4: 2 5: 0 -: 0 +: 16 ^a 0.22 \pm 0.02 (18) [0.18, 0.19, 0.25, 0.25] approx. 50: 1 ^a 40-53: 11	
pereopod V exopodite ^{c, d}	weakly or strongly curved	weakly or strongly curved	weakly or strongly curved	not or only weakly curved	strongly curved	weakly or strongly curved	
number of retinacular hooks on pleopod I endopodite <i>appendix interna</i> (PPIAIN) ^{*, d}	0: 12 1: 6 2-6: 48 7: 0 16-40: 62 (short setae)	0: 45 ^y 1: 13 ^y 2-6: 0 7: 0 12-33: 48 (short setae)	0: 8 1: 4 2-6: 15 7: 1 14-38: 29 (short setae)	0: 14 1: 0 2-6: 0 7: 0 15-24: 14 (short setae)	0: 1 ^{e1} 1: 0 2-6: 0 7: 0 21: 1 ^{e1} (short setae)	no data available > 30 ^b (moderately long setae)	
number of inner marginal setae on pleopod I endopodite (description of length) (PPIENS) [*]	0.33 \pm 0.02 (197)	0.32 \pm 0.02 (169)	0.36 \pm 0.02 (92)	0.30 \pm 0.02 (27)	0.29 (1) ^{e1}	0.34 \pm 0.02 (19)	
uropod exopodite length vs. uropod exopodite length (R)	[0.26, 0.31, 0.36, 0.40]	[0.28, 0.30, 0.34, 0.37]	[0.31, 0.33, 0.39, 0.43]	[0.27, 0.28, 0.32, 0.33]	0.29 (1) ^{e1}	[0.30, 0.31, 0.36, 0.36]	
telson length vs. pleonite VI length (R)	0.91 \pm 0.08 (174)	0.98 \pm 0.06 (151)	0.88 \pm 0.05 (84)	0.97 \pm 0.06 (24)	0.97 (1) ^{e1}	0.99 \pm 0.12 (17)	
telson distal vs. proximal width (R)	[0.59, 0.82, 1.00, 1.12] 0.63 \pm 0.10 (173)	[0.83, 0.90, 1.04, 1.17] 0.68 \pm 0.10 (152)	[0.76, 0.82, 0.94, 1.03] 0.56 \pm 0.07 (84)	[0.89, 0.91, 1.04, 1.15] 0.74 \pm 0.09 (23)	0.59 (1) ^{e1}	[0.77, 0.85, 1.18, 1.20] 0.63 \pm 0.10 (18) [0.49, 0.52, 0.77, 0.87]	

^a incl. holotype specimen: see Sket and Zakšek (2009)

^b after Sket and Zakšek (2009)

^c data for juveniles and adults combined; in *T. (T.) bosnica*, the character present regardless to age, while in *T. aggr. anophthalmus* present exceptionally and only in adult, completely grown up specimens

^d character, excluded from discriminant function analysis

^e holotype male (^{e1}) and juvenile female (^{e2})

^x eye pigment present only in *T. ocellata*

^y *T. a. ocellata* and *T. a. intermedia*: PPIAIN = 0; *T. a. anophthalmus*: PPIAIN = 0-1

Diagnosis: Species of *Troglocaris* sg. *Troglocaris* with completely reduced eye and body pigmentation. Rostrum length and dentition variable, when rostrum longer than 45 % of CL, dorsal margin usually curved upwards, ventral margin with less than 13, mostly with less than 7 teeth. Antenna I article 3 length usually less than ½ of article 2 length. Pereopod III article 4 usually with 4–5 spiniform setae along inferior margin and at inferodistal angle, article 6 weakly or strongly curved in adult males. Pereopod V only exceptionally with exopodite. Fully mature males with 1–6 retinacular hooks on *appendix interna* of pleopod I endopodite, only exceptionally without them. Medial margin of pleopod I endopodite with short spiniform setae.

Differential description of material examined: **Males** (average values \pm SD and [min, max values] presented, Figure 5; see also Appendix B1): Large specimens, CL: 6.6 ± 0.8 mm [5.1, 8.2 mm]. Rostrum length and dentition variable, when rostrum longer than 45 % of CL, usually curved upwards. Article 3 of antenna I of medium length (a13a12), its length 44 ± 5 % [33, 57 %] of article 2 length. Antenna II scaphocerite of medium width (a2s2s1), its width 35 ± 3 % [28, 41 %] of scaphocerite length. Pereopod I article 7 short (pr1da), its length only 20 ± 2 % [16–24 %] of pereopod I length. Pereopod III article 7 of medium length (pr3da), its length 11 ± 2 % [6, 14 %] of pereopod III length. Pereopod I article 6 length short (pr1che), its length only 23 ± 2 % [19, 28 %] of CL. Uropod exopodite of medium width (u21, u2cl), its width 32 ± 2 % [28, 36 %] of uropod exopodite length, and 18 ± 2 % [15, 23 %] of CL. Pereopod V article 7 of medium length (p5dp), its length 22 ± 2 % [18, 26 %] of pereopod V article 6 length. Telson short (tel56), its length only 91 ± 7 % [75, 106 %] of pleonite VI length. Adult males generally with at least one (up to 6) retinacular hook on *appendix interna* of pleopod I endopodite. **Females** (average values \pm SD and [min, max values] presented, Figure 5; see also Appendix B2): Large specimens, CL: 7.8 ± 0.9 mm [5.5, 9.9 mm]. Rostrum length and dentition variable, when rostrum longer than 45 % of CL, dorsal margin usually curved upwards. Article 3 of antenna I short to medium long (a13a12), its length 43 ± 5 % [31, 58 %] of article 2 length. Antenna II scaphocerite of medium width (a2s2s1, a2s2cl), its width 37 ± 3 % [30, 42 %] of scaphocerite length, and 19 ± 2 % [14, 24 %] of CL. Distal articles of chelate pereopods of medium length: length of article 7 of pereopod I (pr1da) 19 ± 2 % [14, 25 %] of pereopod I length, and length of article 7 of pereopod II (pr2da) 15 ± 2 % [12, 19 %] of pereopod II length. Chelae (article 6) of pereopod II short (pr2che), their length only 22 ± 2 % [17, 28 %] of CL. Proximal articles of chelate pereopods rather long: article 4 of pereopod I length (pr1ma) 25 ± 2 % [21, 29 %] of pereopod I length, article 5 of pereopod II length (pr2ccl) 28 ± 4 % [21, 38 %] of CL. Pereopod V article 7 of medium length (p5dp), its length 22 ± 2 % [16, 29 %] of pereopod V article 6 length. Pleonites V–VI short (s56cl), their length only 79 ± 5 % [67, 95 %] of CL. Uropod exopodite long (u1te1), its length 110 ± 7 % [97, 130 %] of telson length. Telson short to medium long (telcl, tel56), its length 48 ± 3 % [40, 57 %] of CL, and 62 ± 4 % [51, 72 %] of pleonites V+VI length. Telson distally narrowed (tes2tes1), its distal width 65 ± 9 % [47, 90 %] of proximal width. **Males and females** (see also Table 1): Article 3 of pereopod III with 4–5 spiniform setae along its inferior margin and at inferodistal in over 80 % specimens, otherwise 2–3.

Distribution: This species inhabits the Planina-Postojna Cave System, its close surroundings, the areas W and SW from the type locality (SW Slovenia), Kras/Carso (SW Slovenia and extreme NE Italy) and the northern part of the Istra peninsula in Slovenia and Croatia. It was also molecularly identified from the southern tip of the Istra peninsula (near Pula/Polja; Zakšek and Moškrič, unpublished) (Figure 1).

***Troglocaris (Troglocaris) bosnica* Sket et Zakšek, 2009**

Synonymy: *Troglocaris* sp. nov. 2 of the Bosnian clade, Zakšek *et al.*, 2007

Specimens examined: Suvaja pećina cave, Sanski Most, Bosnia and Hercegovina: 1 juvenile male, CL 6.2 mm; 13 mature females, CL 5.8–7.4 mm; 4 juvenile females, CL 5.0–5.5 mm. Dabarska pećina cave, Sanski Most, Bosnia and Hercegovina: 1 adult female, CL 8.8 mm (voucher numbers are in Appendix C8; for GenBank identification numbers for COI gene see Sket & Zakšek 2009).

Emended diagnosis: Species of *Troglocaris* sg. *Troglocaris* with completely reduced eye and body pigmentation. As for the subgenus, rostrum length 55 % of CL or longer, usually with 13 or more ventral teeth (exceptionally 12–10 teeth); palp of maxilla I with more than three, moderately long setae; male pleopod I endopodite with more than 30 partially grouped, and long, inner marginal setae. Pereopod V exopodite well developed.

Remarks:**Males:** the holotype was the only adult male available. Except for the age dependent characters (pereopod III–IV article 6 differentiation), no other differences from the species diagnosis (Sket & Zakšek 2009) are present in the only juvenile male. **Females:** no differences from the species diagnosis (Sket & Zakšek 2009) present.

It should be stressed that not only all adult males and females (in contrast to the vast majority of *T. aggr. anophthalmus* specimens), but also all juveniles have well developed exopodites on pereopod V.

Distribution: The subspecies is known only from two caves in Bosanska Krajina (westernmost Bosnia and Hercegovina, Figure 1). The populations from the Bihać region between Lušci polje (Bosnia and Hercegovina) and Kukuruzovića pećina (Croatia) were available neither for molecular nor for the morphometric study; they could belong to this or to any of the neighbouring taxa.

Discussion

A recognition and formalization of cryptic species is nowadays declared to be a major challenge to modern taxonomy (Heinrichs *et al.* 2011, Hekkala *et al.* 2011). This is also reflected in an exponential growth of publications on cryptic species observed during the past two decades (Pfenninger & Schwenk 2007). The term was circumscribed as “populations which are phylogenetically distinct, but which are distinguished by molecular or other features that are either not evident macroscopically or generally overlooked” (Hawksworth 2010). Cryptic species occur when daughter taxa accumulate genetic differences without apparent morphological divergence (Bickford *et al.* 2006, Mathews *et al.* 2002), the term “apparent” usually referring to the use of the traditional taxonomic techniques (Schutze *et al.* 2012) in search for morphological distinction.

After the reconstruction of its phylogeny, an overall morphological investigation of the subgenus *Troglocaris* s. str. was necessary to improve the existent knowledge on its intra- and interspecies morphological diversification. Yet, providing the basis for the morphological distinction of the taxa described herein in order to achieve their taxonomical visibility has proven to be anything but simple. Although a huge set of morphometric data was gathered and processed, the results of a non-biased multivariate primary component analysis (Jugovic, unpubl.) did not correspond to the molecular results. Only after using the established phylogenetic framework for delimiting taxa a subsequent Discriminant Function Analysis (DFA) revealed minimal morphological differences (Figure 5). These differences, however, are manifested as complex combinations of morphological characters, demanding the employment of the PC supported Multivariate statistical tools. Additionally, gender and age of specimens turned out to have a significant impact on the identification capability. Due to the negligible convenience and applicability of the given descriptions, we believe that one can still reasonably consider the herein described taxa of *Troglocaris* s. str. as cryptic, despite the provided morphological descriptions/diagnoses and quite loose (arbitrary) definitions of cryptic taxa (i.e. with features that are not evident macroscopically; taxa are very morphologically similar).

Some characters (listed and explained further in the text) were excluded from the DFA owing to deviations from the required DFA's assumptions (i.e. normal distribution, low correlation coefficients, a few missing data). Nevertheless, they somewhat support the separation of herein described taxa and with their simultaneous consideration, the reliability of taxonomic separation increases. The most discriminative of the characters excluded from the multivariate statistical analysis (Table 1, characters marked as “^{db}”), is the presence of pigment in the eyes. It has been found only in *T. (T.) a. ocellata* ssp. nov., in the majority of specimens. This is the only case of a common pigmented eye rudiment presence in the Dinaric *Troglocaris* (Sket 1985). Müller (1931) mentioned individual specimens with pigmented eye rudiments (‘singoli individui con traccie di pigmento oculare’) in the otherwise blind population from San Giovanni/Štivan in the Italian Carso/Kras, i.e. within the *T. (T.) planinensis* distribution area. In our large samples from the same and from the nearby localities, we did not find a single specimen with the eye pigmentation. Such specimens were present exclusively within the distribution area of *T. (T.) a. ocellata* ssp. nov. Another informative morphological character is the number of retinacular hooks on the *appendix interna* of the adult male pleopod I (*PPIAIN*, see Table 1), which has not been used in the taxonomy of *Troglocaris* s. str. before. However, it is an age- and gender-dependent character, i.e. the hooks are absent in immature males and females. Only the adult males can therefore be used for the identification purposes (Thorpe 1983, see also Jugovic *et al.* 2010a). The most discriminative meristic character in both genders turned out to be the

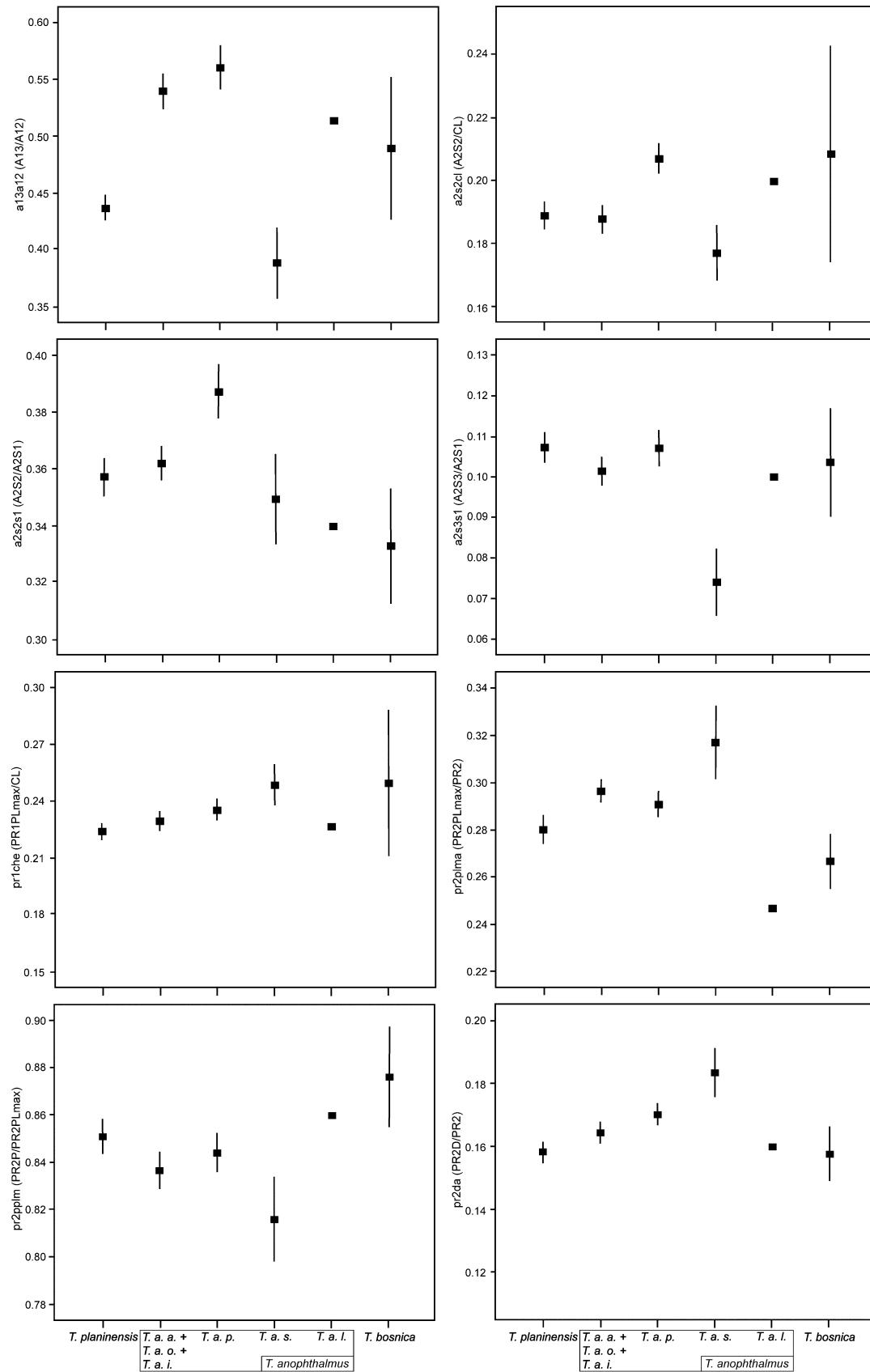


FIGURE 5a. The arithmetic mean and 99 % confidence interval (where $N > 10$) of the most discriminating morphological characters (MC) for six phylogroups of *Troglolaris* s. str. For explanation of MCs' symbols, see taxonomic descriptions in the text. Note that *T. (T.) a.* – E-Slo contains *T. (T.) a. anophthalmus* (*T. a. a.*), *T. (T.) a. intermedia* (*T. a. i.*) and *T. (T.) a. ocellata* (*T. a. o.*); *T. a. p.* – *T. (T.) a. periadriatica*; *T. a. s.* – *T. (T.) a. sontica*, *T. a. l.* – *T. (T.) a. legovici*.

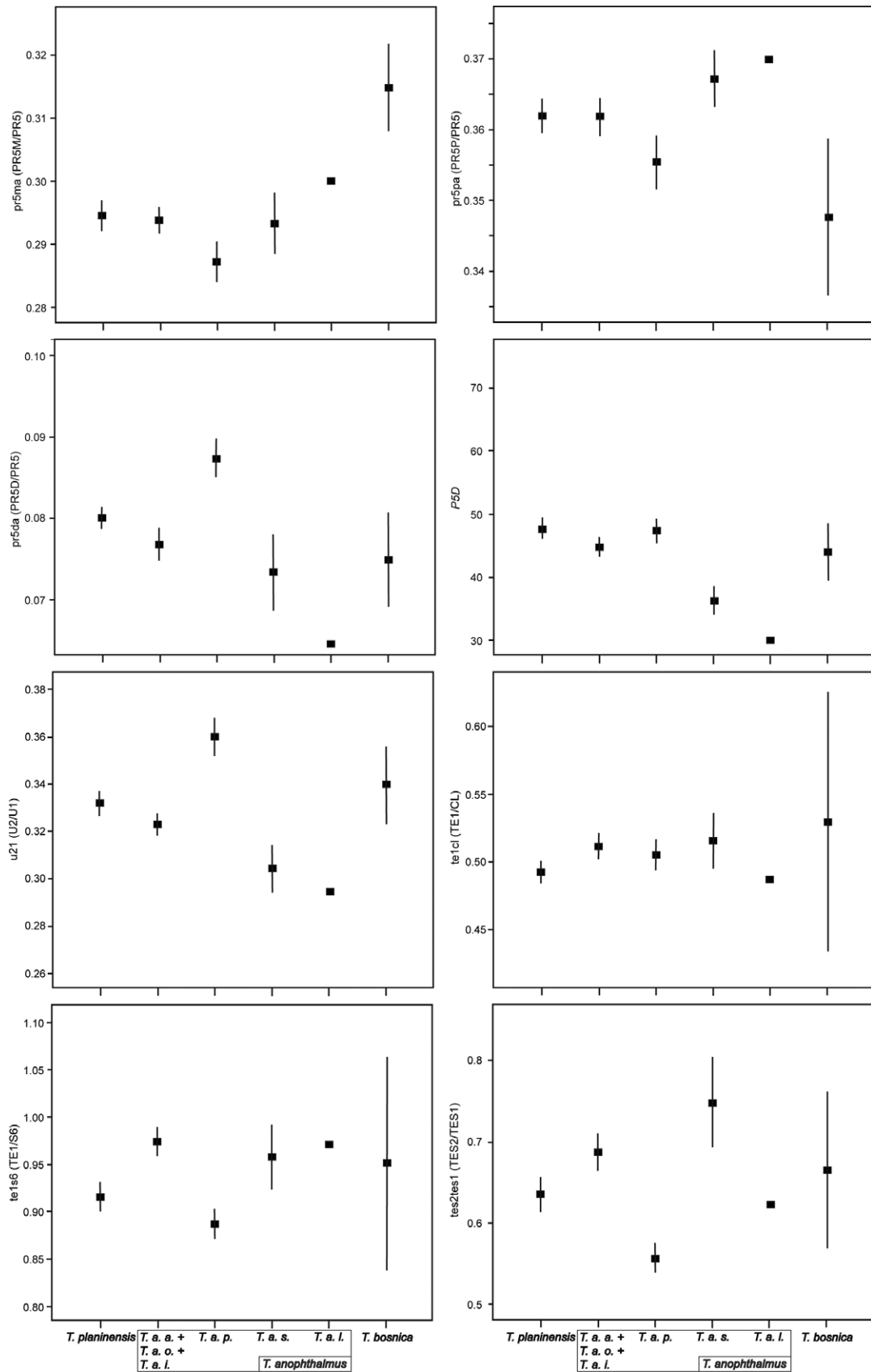


FIGURE 5b. The arithmetic mean and 99 % confidence interval (where $N > 10$) of the most discriminating morphological characters (MC) for six phylogroups of *Trogloniscus* s. str. For explanation of MCs' symbols, see taxonomic descriptions in the text. Note that *T. (T.) a.* – E-Slo contains *T. (T.) a. anophthalmus* (*T. a. a.*), *T. (T.) a. intermedia* (*T. a. i.*) and *T. (T.) a. ocellata* (*T. a. o.*); *T. a. p.* – *T. (T.) a. periadriatica*; *T. a. s.* – *T. (T.) a. sontica*, *T. a. l.* – *T. (T.) a. legovici*.

number of spiniform setae on the article 4 (merus) of pereopod III (*P3M*, see Table 1). The character has already been used in a morphological study of three populations of *T. aggr. anophthalmus* from Slovenia (comprising also samples of *T. (T.) planinensis* and *T. (T.) a. anophthalmus* type populations; see Fabjan 2001), but its importance wasn't stressed. As this character is age-dependent, it can only be of use in identification of fully mature males and females. Previously, the described species of the genus *Troglocaris* s. l. (i.e. of three Dinaric subgenera, *Spelaeocaris*, *Troglocaridella*, and (in part) also *Troglocaris* s. str.) were mainly diagnosed by characters acquired from sexually dimorphic structures (Sket & Zakšek 2009). The use of such characters is frequent since sexual differentiation usually represents one of the most rapid and obvious taxon-specific events during speciation in many animal groups (invertebrates in particular, e.g. see Mayr & Ashlock 1991).

There are cases in which a detailed morphological analysis revealed distinct and easily diagnosable characters in separate phylogenetic lineages within cryptic species (e.g. Sket & Zakšek 2009, Trape *et al.* 2009, De Oliveira *et al.* 2012). Despite our seemingly unsuccessful quest to provide such easily observable diagnostic traits, we do not consider our efforts as unreasonable. Moreover, a confirmation of the negligible morphological differences will serve as a unique starting point for further investigations. Namely, lineages exhibiting so little morphological change over time can most efficiently highlight whether non-adaptive or adaptive processes explain the conservation of morphology over evolutionary time scales (Smith *et al.* 2011, Schluter 2000, Milinkovitch 1995).

Due to all limitations of morphological identification stated above, we highly recommend the investigation of large samples, presumably providing a suitable number of adult males and females. The geographic origin of the investigated samples should be prevalent in identification (see data on distribution of taxa), except for the westernmost parts of the *Troglocaris* s. str. area (Istra and Kras/Carso, see Cobolli Sbordoni *et al.* 1990). There, some species do or might occur in syntopy. Molecular analysis alone (probably also the simplified DNA barcoding), however, can ensure an unambiguous identification of the taxa within *Troglocaris* s. str.

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Appendix A. The results of Discriminant Function Analyses (DFAs) run on *Troglocaris* s. str. (a) males and (b) females.

(a) MALES: The principal result of DFA 1 (Figure A1) run on 156 males from four phylogroups of *Troglocaris* s. str. (adult males of *T. (T.) bosnica* were not available for the study), using 26 morphometric characters (Table A1), is the separation of all phylogroups. The classification error rate of the DFA 1 is only 3.2 % (6.4 % for cross validation procedure). Each of three DFs separates at least one pair of phylogroups (Wilks' lambda, $p < 0.001$). DF 1–DF 3 account for 42.9 %, 36.8 % and 20.3 % of the total variance, respectively. In the stepwise repetition with only 13 morphometric characters, the misclassification rate is 4.5 % (for cross validation procedure 7.7 %). The explained parts of total variance along DF 1–DF 3 are 43.7 %, 38.3 % and 17.9 %, respectively.

TABLE A1. Morphometric characters (MC) showing standardized discriminant function coefficients for all three discriminant functions (DFs), separately for non-stepwise and stepwise DFA 1, run on 156 males of *T. (Troglocaris)* from four phylogroups, using 26 and 13 characters, respectively. Meristic characters are written in *italics>. Largest absolute correlation between each MC and any DF is denoted with asterisk (*). For explanation of MCs' symbols, see taxonomic descriptions in the text.*

MC	Non-stepwise DFA				Stepwise DFA			
	DF 1		DF 2	DF 3	DF 1		DF 2	DF 3
a13a12	0.558	*	-0.412	-0.243	0.555	*	0.525	-0.272
u21	0.440	*	0.159	-0.027	0.499	*	-0.098	0.011
p5dp	0.371	*	0.031	0.063				
u2cl	0.317	*	0.036	-0.139				
a2s2s1	0.267	*	-0.167	-0.047	0.267	*	0.221	-0.046
pr5pa	-0.237	*	0.020	-0.066				
pr5ia	0.211	*	-0.125	0.209	0.203		0.175	0.252
tes1te1	0.198	*	0.099	-0.078				
te1s6	-0.132		-0.351	*	-0.145		0.350	*
pr1da	0.082		-0.306	*	0.083			
pr2pa	-0.032		-0.269	*	0.197		0.288	*
<i>ROT3</i>	-0.048		0.244	*	-0.011		-0.269	*
pr3da	-0.005		0.222	*	-0.078			
pl1enex	0.079		0.212	*	0.001		-0.214	*
a1s3an	0.079		0.202	*	-0.113		-0.206	*
pr2pwcl	-0.021		-0.193	*	-0.037			
pr5ma	-0.151		0.151	*	-0.147			
pr3ia	0.161		-0.061		0.405	*		
a2s3s1	0.160		0.176		-0.386	*	0.212	
pr2da	-0.002		-0.213		-0.363	*	-0.173	
<i>P5D</i>	0.057		0.129		-0.322	*	0.238	
<i>PPIENS</i>	0.018		0.150		-0.303	*	-0.167	
pr1im	0.044		0.069		0.282	*	-0.344	*
pr1che	0.055		-0.194		0.243	*	0.339	*
pr1ma	0.014		0.176		-0.220	*		
s6cl	0.134		0.156		0.183	*		

(b) FEMALES: The principal result of DFA 2 (Figure A2) run on 289 females from five phylogroups of *Troglocaris* s. str., using 36 morphometric characters (Table A2), is in accordance with the result of DFA run on males. The classification error rate of the DFA is 7.6 % (14.9 % for cross validation procedure). Each of all five DFs separate at least one pair of phylogroups (Wilks' lambda, $p < 0.001$). DF 1–DF 4 account for 47.6 %, 23.0 %, 19.8 % and 9.6 % of the total variance, respectively. In the stepwise repetition with only 14 morphometric characters, the misclassification rate is 11.1 % (for cross validation procedure 14.9 %) (Appendix B). The explained parts of total variance along DF 1–DF 4 are 49.8 %, 24.6 %, 19.0 % and 6.5 %, respectively.

In an attempt to eliminate the impact of 14 *T. (T.) bosnica* females on the other four phylogroups, DFA 3 (Figure A3) without *T. (T.) bosnica*, using 28 characters (Table A3) was run. The classification error rate is 7.3 % (14.1 % for cross validation procedure). Each of four DFs separate at least one pair of phylogroups (Wilks' lambda, $p < 0.001$). DF 1–DF 3 account for 61.1 %, 29.1 % and 9.8 % of the total variance, respectively. In the stepwise repetition with only 10 morphometric characters, the misclassification rate is 9.8 % (for cross validation procedure 14.5 %). Percentages of the explained total variance along the DF 1–DF 3 are 60.5 %, 32.0 % and 7.5 %, respectively.

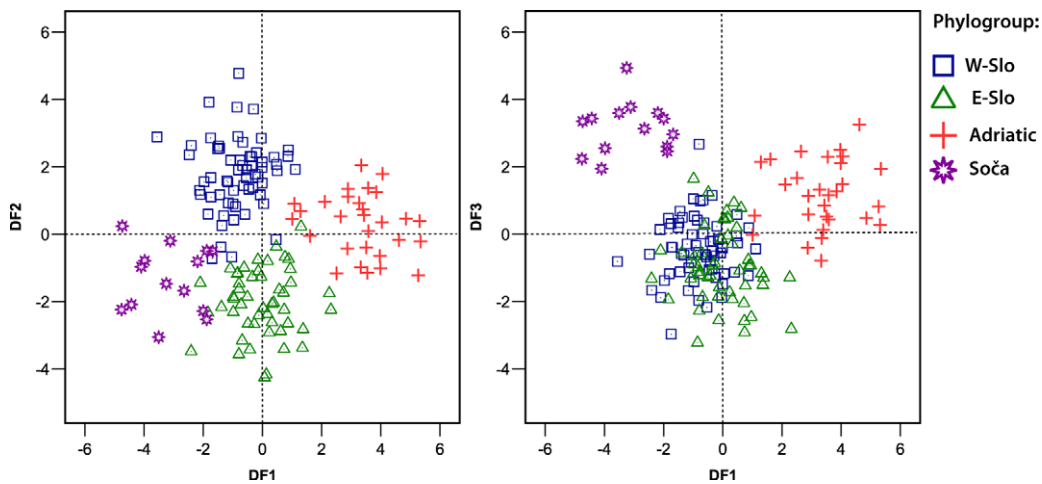


FIGURE A1. Plot of the DFA 1 scores of four phylogroups of 156 *T. sg. Trogllocaris* males on the all three discriminant functions (DF 1–DF 3), using 26 morphometric characters. W-Slo: *T. (T.) planinensis*; E-Slo: *T. (T.) anophthalmus anophthalmus* + *T. (T.) a. ocellata* ssp. nov. + *T. (T.) a. intermedia*; Adriatic: *T. (T.) a. periadriatica* ssp. nov.; Soča: *T. (T.) a. sontica* ssp. nov.

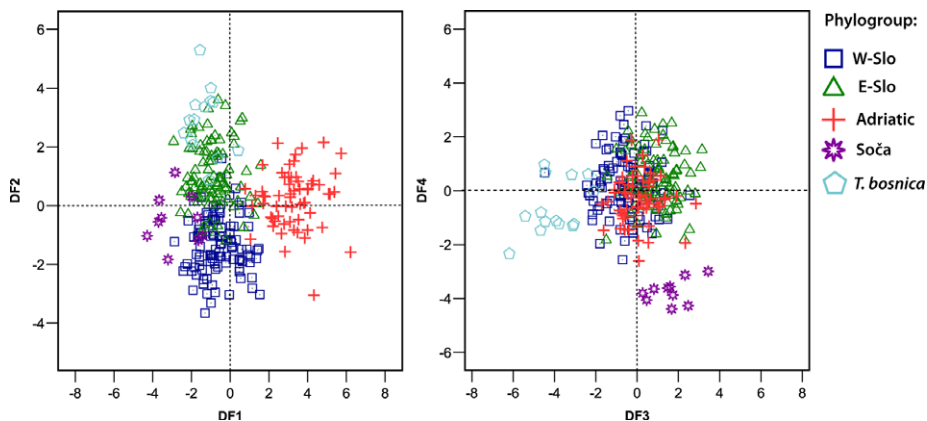


FIGURE A2. Plot of the DFA 2 scores of five phylogroups of 289 *T. sg. Trogllocaris* females on the all four discriminant functions (DF 1–DF 4), using 36 morphometric characters. W-Slo: *T. (T.) planinensis*; E-Slo: *T. (T.) anophthalmus anophthalmus* + *T. (T.) a. ocellata* ssp. nov. + *T. (T.) a. intermedia*; Adriatic: *T. (T.) a. periadriatica* ssp. nov.; Soča: *T. (T.) a. sontica* ssp. nov.

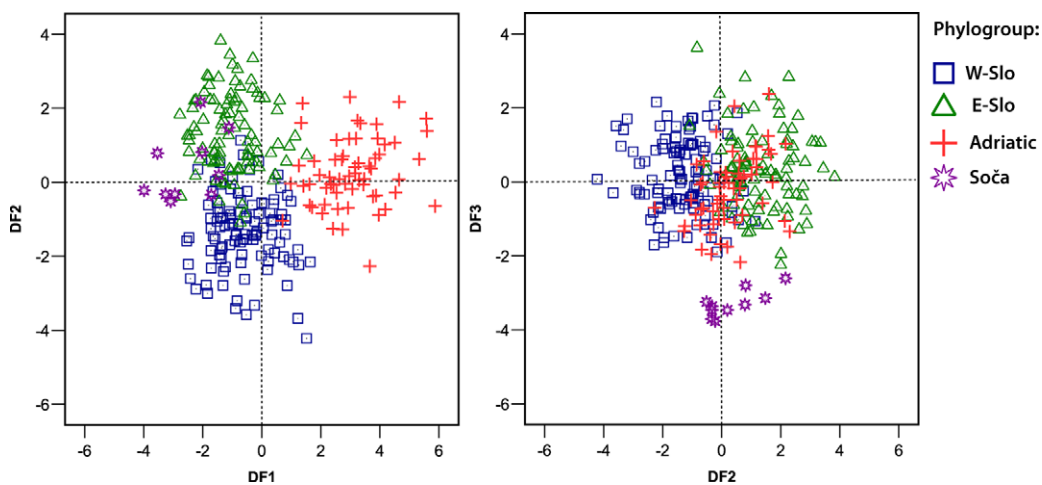


FIGURE A3. Plot of the DFA 3 scores of four phylogroups of 275 *Trogllocaris* s. str. females (excluding *T. (T.) bosnica*) on the all three discriminant functions (DF 1–DF 3), using 28 morphometric characters. W-Slo: *T. (T.) planinensis*; E-Slo: *T. (T.) anophthalmus anophthalmus* + *T. (T.) a. ocellata* ssp. nov. + *T. (T.) a. intermedia*; Adriatic: *T. (T.) a. periadriatica* ssp. nov.; Soča: *T. (T.) a. sontica* ssp. nov.

TABLE A2. Morphometric characters (MC) showing standardized discriminant function coefficients for all four discriminant functions (DFs), separately for non-stepwise and stepwise DFA 2, run on 289 females of *T. (Troglocaris)* from five phylogroups, using 36 and 14 characters, respectively. Meristic characters are written in *italics*. Largest absolute correlation between each MC and any DF is denoted with asterisk (»*«). For explanation of MCs' symbols, see taxonomic descriptions in the text.

MC	Non-stepwise DFA				Stepwise DFA			
	DF 1	DF 2	DF 3	DF 4	DF 1	DF 2	DF 3	DF 4
tes2tes1	-0.370 *	0.117	0.233	-0.057	-0.408 *	0.056	0.326	-0.162
u21	0.364 *	-0.048	-0.174	-0.043	0.404 *	0.006	-0.246	0.013
pr5da	0.334 *	-0.130	-0.092	0.048				
pr3da	0.305 *	-0.068	0.054	0.000	0.346 *	-0.067	0.019	0.039
te1s56	-0.258 *	0.154	0.100	0.072				
a2s2s1	0.252 *	-0.131	0.165	-0.015	0.293 *	-0.162	0.133	-0.001
s56cl	0.250 *	0.120	-0.173	-0.142	0.274 *	0.183	-0.195	-0.145
a1s1an	0.188 *	-0.104	0.068	-0.018				
a13a12	0.278	0.597 *	0.219	0.321	0.302	0.622 *	0.400	0.445
te1cl	-0.018	0.241 *	-0.061	-0.108				
pr5imcpd	-0.090	0.236 *	-0.117	0.015				
tes2cl	-0.126	-0.222 *	-0.074	-0.017	-0.149	0.250 *	-0.017	-0.039
pr1ma	-0.059	-0.187 *	-0.168	0.134				
an1cl	0.115	0.332	-0.404 *	-0.182	0.110	0.454 *	-0.396	-0.199
pr1iccl	-0.022	0.011	-0.386 *	-0.129				
<i>ROTI</i>	0.018	0.108	-0.332 *	-0.009				
pr2pplm	0.036	-0.053	-0.316 *	-0.034				
u2cl	0.257	0.095	-0.315 *	-0.049				
pr5ma	-0.194	0.298	-0.312 *	0.009	-0.237	0.379 *	-0.264	0.013
pr1plma	0.038	0.198	0.312 *	-0.168	0.055	0.153	0.397 *	-0.270
rcl	-0.011	0.125	-0.293 *	-0.114				
u1te1	0.040	-0.115	-0.269 *	0.255	0.031	-0.067	-0.329	0.395 *
a11an	-0.142	-0.089	0.240 *	-0.065				
pl1enex	0.055	-0.204	0.228 *	0.180	0.072	-0.267 *	0.213	0.237
pr2pa	0.013	0.201	0.219 *	-0.150				
pr5ia	0.121	-0.066	0.217 *	0.002				
a1s3an	0.107	-0.045	-0.198 *	0.117				
pr5pa	-0.122	-0.170	0.172 *	0.036				
pr2da	0.114	0.221	0.172	-0.353 *				
a2s3s1	0.107	-0.059	-0.116	0.314 *				
<i>P5D</i>	0.130	-0.177	-0.159	0.303 *				
pr1da	0.156	0.261	0.221	-0.301 *	0.186	0.248	0.293	-0.430 *
pr1che	0.030	0.225	-0.062	-0.279 *				
u1s56	-0.209	0.057	-0.098	0.272 *	-0.246	0.069	-0.066	0.359 *
pl2aicl	-0.021	0.145	-0.137	0.230 *				
pr2dplm	0.110	0.023	-0.144	-0.214 *				

TABLE A3. Morphological characters (MC) showing standardized discriminant function coefficients for all three discriminant functions (DFs), separately for non-stepwise and stepwise DFA 3, run on 275 females of the subgenus *Troglocaris* from four phylogroups, using 28 and 10 characters, respectively. Meristic characters are written in *italics*. Largest absolute correlation between each MC and any DF is denoted with asterisk (»*«). For explanation of MCs' symbols, see taxonomic descriptions in the text.

MC	Non-stepwise DFA			Stepwise DFA		
	DF 1	DF 2	DF 3	DF 1	DF 2	DF 3
tes2tes1	0.409 *	0.222	-0.146	-0.467 *	0.249	-0.134
u2l	0.392 *	-0.128	0.022	0.445 *	-0.151	-0.035
pr5da	0.346 *	-0.152	0.087	0.394 *	-0.173	0.061
u2cl	0.325 *	-0.080	0.195			
pr3da	0.305 *	-0.020	-0.002			
s56cl	0.292 *	0.027	-0.079	0.331 *	0.016	-0.164
te1s56	-0.289 *	0.196	0.063			
a2s2s1	0.237 *	-0.019	-0.066			
an1cl	0.204 *	0.089	-0.036			
a1s1an	0.182 *	-0.042	-0.045			
a1lan	-0.174 *	0.046	-0.170			
pr5pa	-0.158 *	-0.063	-0.046			
pr5ma	-0.152 *	0.086	0.134	-0.168	0.103	0.194 *
a13a12	0.295	0.676 *	0.437	0.358	0.735 *	0.425
pr1da	0.162	0.358 *	-0.354	0.180	0.369	-0.535 *
pr1plma	0.023	0.341 *	-0.246			
pr2pa	0.006	0.292 *	-0.201	0.006	0.309 *	-0.296
pr1ma	-0.058	-0.255 *	0.168			
pr2pplm	0.067	-0.218 *	0.045			
tes2cl	-0.115	0.163 *	0.029	-0.128	0.181 *	0.041
pr2da	0.123	0.287	-0.411 *			
a2s3s1	0.111	-0.103	0.395 *			
<i>P5D</i>	0.131	-0.233	0.375 *			
u1te1	0.054	-0.245	0.356 *	0.068	-0.255	0.481 *
u1s56	-0.221	-0.009	0.351 *			
pr1che	0.063	0.178	-0.285 *			
pr2dplm	0.135	-0.056	-0.193 *			
a1s3an	0.124	-0.140	0.193 *			

Appendix B. Tables of descriptive statistics (mean, standard deviation, minimum, maximum) of the phylogroups, separately for males and females.

Appendix B1. Morphometric comparison of five phylogroups of *T. sg. Troglocaris* adult males. MC – morphometric character; number of specimens measured for each MC in superscript. Carapace length (CL) and MCs used in DFA 1, are listed (MCs, used in the stepwise repetition of DFA 1, are denoted with asterisk; scarce samples of the Istra phylogroup were excluded from DFA). Upper line: arithmetic mean \pm 1 SD; lower line [minimum, maximum]. Abbreviations of MCs as in Appendix A; for explanation of MCs' symbols, see taxonomic descriptions in the text. Istra - data for holotype male only.

MC	W- Slo (<i>T. planinensis</i>)	E-Slo (<i>T. a. anophthalmus</i> + <i>T. a. ocellata</i> + <i>T. a. intermedia</i>)	Adriatic (<i>T. a. periadriatica</i>)	Soča (<i>T. a. sontica</i>)	Istra (<i>T. a. legovici</i>)
CL	6.61 ± 0.75 ⁶² [5.12, 8.18]	6.3 ± 0.75 ⁵⁰ [4.73, 8.33]	5.96 ± 0.6 ²⁹ [4.75, 7.26]	5.77 ± 0.47 ¹⁴ [5, 6.83]	5.70
ROT3	4.97 ± 2.49 ⁵⁸ [0, 11]	2.76 ± 2.46 ⁴⁵ [0, 12]	3.71 ± 1.76 ²⁴ [0, 9]	3.36 ± 2.24 ¹⁴ [0, 7]	4
a1s3an	0.15 ± 0.02 ⁶⁰ [0.12, 0.2]	0.14 ± 0.02 ⁴⁹ [0.09, 0.18]	0.15 ± 0.02 ²⁹ [0.12, 0.19]	0.13 ± 0.02 ¹⁴ [0.1, 0.17]	0.14
a13a12	0.44 ± 0.05 ⁶² [0.33, 0.57]	0.56 ± 0.06 ⁵⁰ [0.44, 0.7]	0.58 ± 0.06 ²⁹ [0.46, 0.73]	0.39 ± 0.04 ¹⁴ [0.33, 0.46]	0.50
a2s3s1	0.11 ± 0.02 ⁶⁰ [0.07, 0.14]	0.1 ± 0.02 ⁴⁹ [0.07, 0.13]	0.1 ± 0.01 ²⁸ [0.08, 0.13]	0.07 ± 0.01 ¹⁴ [0.05, 0.1]	0.10
a2s2s1	0.35 ± 0.03 ⁶² [0.28, 0.41]	0.37 ± 0.02 ⁴⁹ [0.31, 0.41]	0.38 ± 0.02 ²⁹ [0.33, 0.42]	0.34 ± 0.02 ¹⁴ [0.31, 0.38]	0.34
pr1ma	0.24 ± 0.01 ⁶² [0.22, 0.28]	0.24 ± 0.01 ⁵⁰ [0.2, 0.27]	0.24 ± 0.02 ²⁹ [0.2, 0.26]	0.23 ± 0.02 ¹⁴ [0.2, 0.25]	0.26
pr1da	0.2 ± 0.02 ⁶² [0.16, 0.24]	0.22 ± 0.02 ⁵⁰ [0.18, 0.25]	0.21 ± 0.01 ²⁹ [0.18, 0.23]	0.21 ± 0.02 ¹⁴ [0.19, 0.24]	0.17
pr1che	0.23 ± 0.02 ⁶² [0.19, 0.28]	0.24 ± 0.02 ⁵⁰ [0.19, 0.3]	0.25 ± 0.02 ²⁹ [0.22, 0.27]	0.26 ± 0.02 ¹⁴ [0.22, 0.29]	0.22
pr1im	0.88 ± 0.07 ⁶² [0.73, 1.03]	0.86 ± 0.06 ⁵⁰ [0.69, 0.98]	0.92 ± 0.05 ²⁸ [0.81, 0.99]	0.93 ± 0.05 ¹⁴ [0.81, 1]	0.96
pr2pa	0.24 ± 0.02 ⁶¹ [0.21, 0.29]	0.25 ± 0.01 ⁵⁰ [0.22, 0.29]	0.25 ± 0.01 ²⁸ [0.22, 0.27]	0.26 ± 0.02 ¹³ [0.24, 0.3]	0.20
pr2da	0.16 ± 0.01 ⁶¹ [0.14, 0.2]	0.17 ± 0.01 ⁵⁰ [0.15, 0.21]	0.17 ± 0.01 ²⁸ [0.15, 0.2]	0.19 ± 0.01 ¹³ [0.17, 0.21]	0.16
pr2pwcl	0.08 ± 0.02 ⁶² [0.05, 0.13]	0.1 ± 0.02 ⁵⁰ [0.06, 0.14]	0.09 ± 0.01 ²⁸ [0.07, 0.12]	0.09 ± 0.02 ¹³ [0.07, 0.13]	0.08
pr3ia	0.08 ± 0.01 ⁶² [0.07, 0.1]	0.08 ± 0.01 ⁴⁴ [0.07, 0.1]	0.1 ± 0.01 ²⁸ [0.08, 0.11]	0.09 ± 0.01 ¹⁴ [0.08, 0.11]	0.10
pr3da	0.11 ± 0.02 ⁶² [0.06, 0.14]	0.1 ± 0.02 ⁴⁴ [0.05, 0.13]	0.1 ± 0.01 ²⁸ [0.08, 0.12]	0.09 ± 0.01 ¹⁴ [0.07, 0.12]	0.10
pr5ia	0.09 ± 0.01 ⁵⁸ [0.07, 0.1]	0.09 ± 0.01 ⁴⁴ [0.08, 0.1]	0.09 ± 0.01 ²⁸ [0.08, 0.11]	0.09 ± 0.01 ¹² [0.08, 0.1]	0.10
pr5ma	0.3 ± 0.01 ⁵⁸ [0.28, 0.32]	0.3 ± 0.01 ⁴⁴ [0.28, 0.32]	0.29 ± 0.01 ²⁸ [0.28, 0.31]	0.3 ± 0.01 ¹² [0.28, 0.3]	0.30
pr5pa	0.36 ± 0.01 ⁵⁸ [0.34, 0.38]	0.36 ± 0.01 ⁴⁴ [0.34, 0.38]	0.35 ± 0.01 ²⁸ [0.33, 0.37]	0.36 ± 0.01 ¹² [0.34, 0.38]	0.37
p5dp	0.22 ± 0.02 ⁵⁸ [0.18, 0.26]	0.23 ± 0.02 ⁴⁴ [0.19, 0.26]	0.25 ± 0.02 ²⁸ [0.21, 0.28]	0.21 ± 0.02 ¹² [0.17, 0.25]	0.18
P5D	46.64 ± 7.04 ⁵⁶ [34, 60]	45.54 ± 5.12 ⁴³ [37, 56]	44.07 ± 5.4 ²⁸ [31, 56]	36.83 ± 4.28 ¹² [32, 47]	30
pl1enex	0.41 ± 0.04 ⁶¹ [0.32, 0.52]	0.38 ± 0.03 ⁴⁷ [0.33, 0.48]	0.41 ± 0.03 ²⁸ [0.37, 0.46]	0.38 ± 0.02 ¹³ [0.34, 0.41]	0.42
PPIENS	25.97 ± 4.97 ⁶² [16, 40]	24.1 ± 3.63 ⁴⁸ [12, 33]	23.1 ± 4.98 ²⁹ [14, 38]	18.86 ± 2.83 ¹⁴ [15, 24]	21
s6cl	0.56 ± 0.04 ⁶² [0.46, 0.64]	0.54 ± 0.04 ⁵⁰ [0.44, 0.61]	0.59 ± 0.03 ²⁹ [0.52, 0.67]	0.55 ± 0.02 ¹⁴ [0.53, 0.58]	0.50
te1s6	0.91 ± 0.07 ⁵⁶ [0.75, 1.06]	0.99 ± 0.06 ⁴⁴ [0.84, 1.11]	0.89 ± 0.06 ²⁵ [0.76, 1.03]	0.97 ± 0.05 ¹² [0.89, 1.03]	0.97
tes1te1	0.43 ± 0.06 ⁵⁶ [0.3, 0.53]	0.42 ± 0.05 ⁴⁴ [0.32, 0.5]	0.45 ± 0.05 ²⁵ [0.37, 0.6]	0.37 ± 0.05 ¹¹ [0.3, 0.4]	0.37
u2cl	0.18 ± 0.02 ⁶⁰ [0.15, 0.23]	0.19 ± 0.02 ⁴⁶ [0.15, 0.22]	0.2 ± 0.02 ²⁷ [0.17, 0.24]	0.16 ± 0.01 ¹³ [0.14, 0.18]	0.19
u21	0.32 ± 0.02 ⁵⁹ [0.28, 0.36]	0.32 ± 0.01 ⁴⁶ [0.28, 0.35]	0.35 ± 0.02 ²⁷ [0.32, 0.39]	0.29 ± 0.02 ¹³ [0.27, 0.32]	0.29

Appendix B2. Morphometric comparison of six (DFA 2) and five (DFA 3) phylogroups of *T. sg. Troglolaris* adult females. MC – morphometric character; number of specimens measured for each MC in superscript. Carapace length (CL) and MCs used in DFA 2 and DFA 3, are listed (MCs, used in the stepwise repetition of DFA 1 and DFA 2 are denoted with asterisks; scarce samples of the Istra phylogroup were excluded from DFAs). Upper line: arithmetic mean \pm 1 SD; lower line [minimum, maximum]. Abbreviations of MCs as in Appendix A; for explanation of MCs' symbols, see taxonomic descriptions in the text.

MC	W- Slo (<i>T. planinensis</i>)	E-Slo (<i>T. a. anophthalmus</i> + <i>T. a. ocellata</i> + <i>T. a. intermedia</i>)	Adriatic (<i>T. a. periadri- atica</i>)	Soča (<i>T. a. sontica</i>)	Istra (<i>T. a. legovici</i>)	<i>T. bosnica</i>	DFA 2	DFA 3
CL	7.79 \pm 0.91 ¹⁰⁶ [5.51, 9.93]	7.31 \pm 0.84 ⁹⁵ [5.83, 8.99]	6.91 \pm 0.73 ⁶¹ [5.2, 8.65]	6.49 \pm 0.38 ¹⁰ [5.9, 7.02]	6.2 ¹	6.71 \pm 1.08 ¹⁴ [5.1, 8.8]		
rcl	0.5 \pm 0.14 ⁹⁴ [0.23, 0.86]	0.49 \pm 0.14 ⁹⁰ [0.16, 0.8]	0.51 \pm 0.07 ⁵⁸ [0.28, 0.66]	0.49 \pm 0.08 ¹⁰ [0.35, 0.59]	0.34 ¹	0.71 \pm 0.15 ⁸ [0.56, 0.96]	+	
ROT1	19.62 \pm 3.67 ⁹² [11, 29]	18.77 \pm 5.73 ⁹⁰ [5, 30]	19.97 \pm 3.77 ⁵⁸ [13, 37]	16.8 \pm 8.18 ¹⁰ [0, 22]	17 ¹	27.25 \pm 2.38 ⁸ [25, 32]	+	
an1cl	0.45 \pm 0.04 ¹⁰⁵ [0.36, 0.55]	0.46 \pm 0.03 ⁹⁵ [0.39, 0.57]	0.49 \pm 0.03 ⁶¹ [0.4, 0.54]	0.45 \pm 0.02 ¹⁰ [0.43, 0.48]	0.46 ¹	0.56 \pm 0.08 ¹⁴ [0.45, 0.74]	+/*	+
allan	0.5 \pm 0.02 ¹⁰⁵ [0.45, 0.54]	0.5 \pm 0.02 ⁹⁵ [0.46, 0.53]	0.49 \pm 0.02 ⁶¹ [0.45, 0.54]	0.52 \pm 0.01 ¹⁰ [0.49, 0.54]	0.47 ¹	0.48 \pm 0.01 ¹⁴ [0.45, 0.5]	+	+
als1an	0.44 \pm 0.03 ¹⁰⁴ [0.37, 0.5]	0.44 \pm 0.03 ⁹⁵ [0.37, 0.52]	0.46 \pm 0.03 ⁶¹ [0.4, 0.56]	0.43 \pm 0.03 ¹⁰ [0.4, 0.48]	0.43 ¹	0.42 \pm 0.02 ¹⁴ [0.38, 0.45]	+	+
als3an	0.15 \pm 0.02 ¹⁰⁵ [0.1, 0.19]	0.15 \pm 0.02 ⁹⁵ [0.1, 0.21]	0.16 \pm 0.02 ⁶¹ [0.11, 0.21]	0.13 \pm 0.03 ¹⁰ [0.08, 0.18]	0.13 ¹	0.16 \pm 0.01 ¹⁴ [0.13, 0.19]	+	+
a13a12	0.43 \pm 0.05 ¹⁰⁶ [0.31, 0.58]	0.53 \pm 0.06 ⁹⁵ [0.41, 0.68]	0.55 \pm 0.06 ⁶¹ [0.44, 0.69]	0.38 \pm 0.07 ¹⁰ [0.31, 0.5]	0.53 ¹	0.51 \pm 0.07 ¹⁴ [0.39, 0.61]	+/*	+/*
a2s3s1	0.11 \pm 0.02 ¹⁰⁵ [0.07, 0.15]	0.1 \pm 0.01 ⁹⁵ [0.07, 0.13]	0.11 \pm 0.02 ⁶¹ [0.07, 0.14]	0.08 \pm 0.01 ¹⁰ [0.06, 0.09]	0.10 ¹	0.10 \pm 0.02 ¹⁴ [0.08, 0.13]	+	+
a2s2s1	0.37 \pm 0.03 ¹⁰⁵ [0.3, 0.42]	0.36 \pm 0.02 ⁹⁵ [0.29, 0.44]	0.39 \pm 0.03 ⁶¹ [0.32, 0.47]	0.36 \pm 0.02 ¹⁰ [0.3, 0.38]	0.35 ¹	0.33 \pm 0.02 ¹⁴ [0.29, 0.37]	+/*	+
pr1iccl	0.43 \pm 0.04 ¹⁰⁵ [0.35, 0.56]	0.41 \pm 0.04 ⁹⁵ [0.34, 0.49]	0.42 \pm 0.03 ⁶¹ [0.37, 0.51]	0.42 \pm 0.02 ¹⁰ [0.38, 0.45]	-	0.49 \pm 0.07 ¹⁴ [0.42, 0.66]	+	+
pr1ma	0.25 \pm 0.02 ¹⁰⁵ [0.21, 0.29]	0.24 \pm 0.01 ⁹⁵ [0.21, 0.28]	0.24 \pm 0.02 ⁶¹ [0.2, 0.26]	0.23 \pm 0.01 ¹⁰ [0.22, 0.25]	-	0.24 \pm 0.02 ¹⁴ [0.22, 0.27]	+	+
pr1plma	0.36 \pm 0.04 ¹⁰⁵ [0.31, 0.45]	0.38 \pm 0.02 ⁹⁵ [0.34, 0.43]	0.38 \pm 0.02 ⁶¹ [0.34, 0.43]	0.4 \pm 0.02 ¹⁰ [0.37, 0.43]	-	0.36 \pm 0.02 ¹⁴ [0.33, 0.38]	+/*	+
pr1da	0.19 \pm 0.02 ¹⁰⁵ [0.14, 0.25]	0.2 \pm 0.02 ⁹⁵ [0.17, 0.24]	0.21 \pm 0.01 ⁶⁰ [0.19, 0.23]	0.21 \pm 0.01 ¹⁰ [0.2, 0.22]	-	0.2 \pm 0.01 ¹⁴ [0.18, 0.21]	+/*	+/*
pr1che	0.22 \pm 0.02 ¹⁰⁵ [0.17, 0.28]	0.23 \pm 0.02 ⁹⁵ [0.18, 0.28]	0.23 \pm 0.02 ⁶¹ [0.21, 0.27]	0.24 \pm 0.01 ¹⁰ [0.23, 0.26]	0.22 ¹	0.25 \pm 0.04 ¹⁴ [0.21, 0.33]	+	+
pr2pa	0.23 \pm 0.02 ¹⁰⁴ [0.19, 0.31]	0.25 \pm 0.02 ⁹² [0.2, 0.29]	0.24 \pm 0.01 ⁵⁹ [0.21, 0.29]	0.26 \pm 0.01 ¹⁰ [0.23, 0.28]	0.21 ¹	0.24 \pm 0.01 ¹⁴ [0.21, 0.26]	+	+/*
pr2da	0.15 \pm 0.02 ¹⁰⁴ [0.12, 0.19]	0.16 \pm 0.02 ⁹² [0.13, 0.19]	0.17 \pm 0.01 ⁵⁹ [0.15, 0.19]	0.18 \pm 0.01 ¹⁰ [0.17, 0.19]	0.15 ¹	0.16 \pm 0.01 ¹⁴ [0.14, 0.18]	+	+
pr2dplm	0.56 \pm 0.06 ¹⁰⁴ [0.42, 0.69]	0.55 \pm 0.05 ⁹³ [0.44, 0.67]	0.59 \pm 0.04 ⁵⁹ [0.49, 0.67]	0.58 \pm 0.05 ¹⁰ [0.49, 0.64]	0.65 ¹	0.59 \pm 0.02 ¹⁴ [0.55, 0.63]	+	+

Continued on next page...

Appendix B2. Continued.

MC	W- Slo (<i>T. planinensis</i>)	E-Slo (<i>T. a. anophthalmus</i> + <i>T. a. ocellata</i> + <i>T. a. intermedia</i>)	Adriatic (<i>T. a. periadri- atica</i>)	Soča (<i>T. a. sontica</i>)	Istra (<i>T. a. legovici</i>)	<i>T. bosnica</i>	DFA 2	DFA 3
pr2pplm	0.85 ± 0.03 ¹⁰⁴ [0.75, 0.92]	0.83 ± 0.03 ⁹³ [0.76, 0.9]	0.85 ± 0.03 ⁵⁹ [0.79, 0.9]	0.83 ± 0.03 ¹⁰ [0.79, 0.87]	0.90 ¹	0.88 ± 0.02 ¹⁴ [0.83, 0.9]	+	+
pr3da	0.07 ± 0.01 ⁹⁹ [0.06, 0.09]	0.07 ± 0.01 ⁹¹ [0.05, 0.09]	0.08 ± 0.01 ⁵⁸ [0.07, 0.09]	0.07 ± 0.01 ¹⁰ [0.06, 0.08]	0.08 ¹	0.07 ± 0.01 ¹¹ [0.06, 0.08]	+/*	+
pr5ia	0.09 ± 0.01 ⁹⁷ [0.06, 0.11]	0.09 ± 0.01 ⁹³ [0.08, 0.11]	0.1 ± 0.01 ⁵⁵ [0.07, 0.12]	0.09 ± 0.01 ¹⁰ [0.08, 0.11]	-	0.08 ± 0.01 ¹³ [0.07, 0.1]	+	
pr5ma	0.29 ± 0.01 ⁹⁷ [0.27, 0.35]	0.29 ± 0.01 ⁹³ [0.27, 0.32]	0.29 ± 0.01 ⁵⁵ [0.27, 0.31]	0.29 ± 0.01 ¹⁰ [0.27, 0.3]	-	0.31 ± 0.01 ¹³ [0.3, 0.33]	+/*	+/*
pr5pa	0.37 ± 0.01 ⁹⁷ [0.31, 0.4]	0.37 ± 0.01 ⁹³ [0.33, 0.39]	0.36 ± 0.01 ⁵⁵ [0.32, 0.38]	0.37 ± 0.004 ¹⁰ [0.36, 0.38]	-	0.35 ± 0.01 ¹³ [0.32, 0.37]	+	+
pr5da	0.08 ± 0.01 ⁹⁷ [0.06, 0.1]	0.08 ± 0.01 ⁹³ [0.05, 0.1]	0.09 ± 0.01 ⁵⁵ [0.07, 0.1]	0.07 ± 0.01 ¹⁰ [0.06, 0.08]	-	0.08 ± 0.01 ¹³ [0.07, 0.09]	+	+/*
p5dp	0.22 ± 0.02 ⁹⁷ [0.16, 0.29]	0.21 ± 0.03 ⁹³ [0.14, 0.28]	0.25 ± 0.02 ⁵⁵ [0.17, 0.29]	0.19 ± 0.02 ¹⁰ [0.16, 0.22]	-	-		
pr5imcpd	0.62 ± 0.03 ⁹⁷ [0.53, 0.8]	0.63 ± 0.02 ⁹³ [0.56, 0.73]	0.62 ± 0.02 ⁵⁵ [0.57, 0.67]	0.62 ± 0.02 ¹⁰ [0.6, 0.66]	-	0.66 ± 0.04 ¹³ [0.58, 0.72]	+	
P5D	48.74 ± 8.31 ⁹⁷ [25, 74]	45.37 ± 6.25 ⁸⁶ [23, 61]	49.21 ± 5.99 ⁵² [39, 62]	35.9 ± 2.96 ¹⁰ [31, 40]	-	45.55 ± 4.44 ¹¹ [40, 53]	+	+
pl1enex	0.4 ± 0.06 ¹⁰³ [0.24, 0.54]	0.39 ± 0.07 ⁹³ [0.24, 0.56]	0.39 ± 0.08 ⁶⁰ [0.21, 0.53]	0.36 ± 0.07 ⁹ [0.26, 0.45]	0.38 ¹	0.28 ± 0.06 ¹³ [0.21, 0.44]	+/*	
pl2aicl	0.12 ± 0.01 ¹⁰⁴ [0.09, 0.16]	0.12 ± 0.02 ⁹³ [0.1, 0.17]	0.12 ± 0.01 ⁶⁰ [0.09, 0.15]	0.1 ± 0.01 ¹⁰ [0.09, 0.12]	-	0.13 ± 0.02 ¹⁴ [0.1, 0.16]	+	+
s56cl	0.79 ± 0.05 ¹⁰⁶ [0.67, 0.95]	0.78 ± 0.05 ⁹⁴ [0.65, 0.91]	0.85 ± 0.05 ⁶¹ [0.73, 0.97]	0.78 ± 0.03 ¹⁰ [0.71, 0.8]	-	0.84 ± 0.06 ¹⁴ [0.76, 0.98]	+/*	+/*
te1s56	0.62 ± 0.04 ⁹¹ [0.51, 0.72]	0.64 ± 0.04 ⁸⁴ [0.53, 0.78]	0.59 ± 0.03 ⁵⁵ [0.54, 0.63]	0.64 ± 0.03 ⁹ [0.62, 0.71]	-	0.64 ± 0.08 ¹² [0.51, 0.74]	+	+
te1cl	0.48 ± 0.03 ⁹¹ [0.4, 0.57]	0.5 ± 0.03 ⁸⁵ [0.41, 0.6]	0.49 ± 0.03 ⁵⁵ [0.43, 0.55]	0.5 ± 0.03 ⁹ [0.47, 0.55]	0.48 ¹	0.54 ± 0.1 ¹² [0.4, 0.72]	+	+/*
tes2cl	0.13 ± 0.02 ⁹² [0.09, 0.18]	0.14 ± 0.02 ⁸⁶ [0.09, 0.18]	0.12 ± 0.01 ⁵⁵ [0.09, 0.16]	0.13 ± 0.01 ⁹ [0.12, 0.14]	0.12 ¹	0.15 ± 0.03 ¹³ [0.11, 0.2]	+/*	+/*
tes2tes1	0.65 ± 0.09 ⁹⁰ [0.47, 0.9]	0.71 ± 0.09 ⁸⁶ [0.47, 0.94]	0.56 ± 0.07 ⁵⁵ [0.43, 0.7]	0.79 ± 0.07 ⁹ [0.69, 0.89]	0.68 ¹	0.65 ± 0.11 ¹³ [0.49, 0.87]	+/*	+/*
u2cl	0.18 ± 0.02 ¹⁰¹ [0.13, 0.24]	0.17 ± 0.02 ⁹² [0.14, 0.22]	0.2 ± 0.02 ⁶¹ [0.16, 0.24]	0.16 ± 0.01 ¹⁰ [0.14, 0.16]	0.18 ¹	0.2 ± 0.03 ¹⁴ [0.16, 0.26]	+	+
u21	0.34 ± 0.03 ¹⁰¹ [0.26, 0.4]	0.33 ± 0.02 ⁹² [0.28, 0.37]	0.37 ± 0.02 ⁶¹ [0.32, 0.43]	0.31 ± 0.01 ¹⁰ [0.29, 0.33]	0.30 ¹	0.34 ± 0.02 ¹⁴ [0.31, 0.36]	+/*	+/*
u1s56	0.68 ± 0.05 ¹⁰¹ [0.56, 0.79]	0.68 ± 0.05 ⁹¹ [0.57, 0.8]	0.64 ± 0.03 ⁶¹ [0.56, 0.73]	0.64 ± 0.03 ¹⁰ [0.61, 0.71]	-	0.7 ± 0.07 ¹⁴ [0.6, 0.84]	+/*	+
ultel	1.1 ± 0.07 ⁸⁷ [0.97, 1.3]	1.07 ± 0.06 ⁸³ [0.93, 1.22]	1.08 ± 0.06 ⁵⁵ [0.98, 1.21]	1 ± 0.05 ⁹ [0.91, 1.07]	1.17 ¹	1.12 ± 0.05 ¹² [1.06, 1.19]	+/*	+/*

Appendix C. A list of cave shrimps *Troglocaris* s. str. examined.

A list of cave shrimps *Troglocaris* s. str., with morphometric and molecular examination, or morphometric examination only.

Each sample is denoted by the brief description of the locality, followed by sample designation, composed of a two letters denoting country (SI: Slovenia; HR: Croatia; IT: Italy; BA: Bosnia and Hercegovina), dash, and two additional letters, denoting sample/locality name, and a serial number of a specimen (as on the original labels). In the same running order, those designations are followed by voucher numbers, composed of letters »TA« or »TB« plus three digit number (a voucher number of the holotype male of *T. (T.) a. legovici* ssp. nov., that is stored in Hrvatski prirodoslovni muzej, Croatia, is 1770). All specimens, analyzed molecularly, can be found at GenBank database (Zakšek *et al.* 2007; Sket and Zakšek 2009; Zakšek *et al.* 2009). All localities where molecularly analyzed (COI, ITS2 and/or 16S RNA sequences) specimens are from (not necessarily included in the present study), are denoted with asterisk (*). After each voucher number, GenBank accession numbers for COI gene are added in parentheses (*in italics*), where analyzed. Type and neotype material is added to the type localities, which are denoted with »T«. If not noted otherwise, all specimens are preserved in 70 % ethanol. Male specimens are denoted with bold printing, specimens of unknown gender denoted in the text. In toponymes, »grotta«, »cavernetta«, »jama«, »pećina«, »špilja« mean »cave«, and »brezno« means »abyss«. Samples including specimens with eye pigment are denoted with plus (+).

Appendix C1. *Troglocaris (Troglocaris) anophthalmus anophthalmus* (E-Slo1 subgroup):

- Grosuplje, Luče, Luška jama: SI-LČ 1: TA615.
 - *Stična, Šimenkovo brezno: SI-ŠI 1–7: **TA296** (*FJ426022*), TA297, TA298 (*FJ426023*), TA616, TA617, TA618, TA619.
 - Krka, Krška jama: SI-KK 1–12: **TA620, TA621, TA622, TA623, TA624**, TA625, TA626, TA627, TA628, TA629, TA630, TA631.
 - *Krka, jama Poltarica: SI-PL 1: TA744.
 - *Videm-Dobropolje, Podpeč, Podpeška jama: SI-PO 1–6: TA274 (*FJ426016*), TA275, TA276, TA632, TA633, TA634.
 - *Videm-Dobropolje, Kompolje, Kompoljska jama (T): SI-KO 1–6: TA277 (*FJ425967*), TA375, TA376, TA377 (*FJ425968*), TA635, TA636. Neotype sample: Neotype, **TA965**. Two paratypes (96 % ethanol, -20°C): **TA966, TA977**. Eight females, TA975, TA976, TA978, TA979, TA980, TA981, TA982; TA989 (96 % ethanol, -20°C)
 - Videm-Dobropolje, Kompolje, jama Potiskavec: SI-PT 1–2: TA637, TA638.
 - *Žužemberk, Dvor, Černičkova jama: SI-ČR 1-4: TA290 (*FJ425947*), TA291, TA292 (*FJ425948*), TA293.
 - Žužemberk, Dvor, Bobnova jama: SI-BO 1: TA639.
 - *Novo mesto, Jama v Luknji: SI-LU 1–6: **TA310** (*FJ425979*), **TA378, TA379** (*FJ425980*), TA380 (*FJ425981*), TA640, **TA641**. SI-LU 10–12: TA642, TA643, TA644.
 - *Ribnica, Dolenja vas, jama Mobišaht (=Mobi brezno v Vrtačah): SI-RI 1–7: TA231, TA232, **TA233, TA234** (*FJ425997*), **TA235**, TA645, TA646.
 - *Kostel, Žaga, Jelovička jama: SI-ŽA 1–9: **TA249** (*FJ425922*), **TA250, TA251** (*FJ425923*), **TA252, TA253**, TA651, **TA652, TA653**, TA654.
- T. (T.) a. anophthalmus?*
- Kočevje, Polom, jama Ebental: SI-EB 1–2: **TA647**, TA648.
 - Kočevje, cave near river Kolpa (exact data unknown): SI-KP 1–2: **TA649, TA650**.

Appendix C2. *Troglocaris (Troglocaris) anophthalmus ocellata* (pigment in the eyes is partly corresponding to the E-Slo2 subgroup):

- *Črnomelj, Vranoviči, jama Šuline 1: SI-ŠA 1–5: TA455, TA456, **TA457**, TA742, **TA743**.
 - *Črnomelj, Pavičiči, Jelenja jama: SI-JJ 1–2: TA464, **TA465**.
 - *Črnomelj, Jelševnik, on the meadow, middle spring: SI-JE 1–3: **TA236** (*FJ425955*), **TA237** (*FJ425956*), **TA238**; spring left from Obrh: SI-ČN 1–7: **TA665**, TA666, TA667, TA668, TA669, TA670, TA671.
 - *Dragatuš, Mali Nerajec, jama Djud: SI-MN 1–10: **TA672, TA673, TA674, TA675**, TA676, TA677, TA678, TA679, **TA680**, TA681.
 - *Vinica, Jama v kamnolomu (T): Type sample: holotype, **TB046**; three other males: **TB045, TB047, TB048**; two females: TB049, TB050 (all in 70 % ethanol). Other specimens: SI-VI 1–23: **TA244** (*FJ426030*), **TA245** (*FJ426031*), **TA246, TA247, TA248, TA682, TA683**, TA684, TA685, TA686, TA687, TA688, **TA689**, TA690, TA691, TA692, **TA693**, TA694, TA695, TA696, TA697, **TA698**, TA699.
 - *Špeharji, Breg, jama Kobiljača: SI-KB 1–2: **TA700**, TA701. SI-KB 5–6: TA702, **TA703**.
 - *Rakovica, Vaganac, Kukuruzovića pećina: HR-KU 1–9: **TA278**, TA279, TA280, TA281, TA282, TA332 (*FJ425978*), **TA739, TA740, TA741**.
 - *Črnomelj, jama Stobe: SI-ST 1-4: TA300 (*FJ426025*), **TA655**, TA656, TA657.
- T. (T.) a. ocellata?*
- Črnomelj, Žopenca/Gadina jama: SI-ŽO 1–7: **TA658**, TA659, TA660, TA661, TA662, TA663, TA664 (according to Sket (1985) specimens from this locality have pigmented eyes; however not a single specimen with this character state was found in our samples).

Appendix C3. *Troglocaris (Troglocaris) anophthalmus intermedia*

- *Tounj, Mikašinovići, Mikašinovića pećina (T): HR-MI 1–29: TA294 (FJ426041), TA295 (FJ426042), **TA712, TA713, TA714, TA715, TA716, TA717, TA718, TA719**, TA720, TA721, TA722, TA723, TA724, TA725, TA726, TA727, TA728, **TA729**, TA730, TA731, TA732, TA733, **TA734**, TA735, TA736, TA737, TA738.

T. (T.) a. intermedia?

- Ogulin, Privis pećina: HR-PV 1–5: **TA704**, TA705, TA706, TA707, **TA708**.
- Slunj-Tounj, spring Rudnica (zgornja jama): HR-RU 1–3: **TA709**, TA710, **TA711**.

Appendix C4. *Troglocaris (Troglocaris) anophthalmus periadriatica* (Adriatic phylogroup)

- *Otočac, Podum, Pećina Sv. Marko: HR-OT 1–20: **TA745, TA746, TA747, TA748, TA749, TA750, TA751, TA752**, TA753, TA754, TA755, TA756, TA757, TA758, TA759, TA760, TA761, TA762, TA763, TA764.
- Seline, Markova jama: HR-SE 1–2: **TA765, TA766**.
- *Obrovac, Karin, Karišnica: HR-KA 1–6: **TA335, TA336, TA337, TA767, TA768, TA769**.
- island Ugljan, Čeprijanda, spring (since the population is distributed on the border of the *Troglocaris* s. str. distribution area, we felt obliged to emphasise that the designation was done according to morphological data only): HR-UG 1–2: TA770, **TA771**.
- *Šibenik, Pirovac, jama Bikovica: HR-BI 1–18: TA239 (FJ425918), TA240 (FJ425919), TA241, TA242, TA243 (FJ425920), **TA772, TA773**, TA774, TA775, TA776, TA777, TA778, TA779, TA780, TA781, TA782, TA783, TA784.
- *Pirovac, spring near Pirovac: HR-PI 1–3: TA311 (FJ426006), TA312 (FJ426007), TA313.
- Šibenik, under hydroelectric power station Manojlovac; spring-cave, river Krka: HR-KK 1-3: TA785, TA786, TA787.
- Šibenik, jama Rasline, river Krka: HR-RS 1–2: TA788, **TA789**.
- *Šibenik, Mandalina špilja: HR-MA 1–4: TA305 (FJ425982), TA306 (FJ425983), TA307 (FJ425984), TA308 (gender unknown). HR-MA 5–9: **TA309** (FJ425985), TA790, TA791, TA792, TA793.
- Split, Dugo polje, Đuderina pećina: HR-ĐU 1–3: TA822, TA823, TA824.
- *Island Brač, Postira, Jama na Dučacu, HR: FJ425921 (gender unknown, from Zakšek *et al.* 2009).
- *Pelješac, Špilja kod Jurjevića, cave Pelješac, HR: FJ426005 (gender unknown, from Zakšek *et al.* 2009)
- *Popovo polje, Zavala, izvir Lukavac: BA-LU 1: **TA299**.
- *Popovo polje, Čvaljina, Baba pećina: BA-BA 1–2: TA303, TA304.
- *Popovo polje, Zavala, jama Vjetrenica (T): Type sample: BA-VJ 1: TA794. BA-VJ 5–7: TA795, TA796, TA797. BA-VJ 11–14: TA798, TA799, TA800, TA801. **TA063** (= Tgc_63-Vjetrenica; Sket and Zakšek 2009).
- Mokro polje, Trebinje, Čičevo, under Velja gora mountain, Šumet pećina: BA-ŠP 1–5: TA802, TA804, TA806, **TA808**, TA809. BA-ČI 1–3: TA803, **TA805, TA807**. BA-ŠU 1–10: TA810, TA811, TA812, TA813, **TA814**, TA815, **TA816, TA817, TA818, TA819**.
- Mokro polje, Trebinje, jama Vučonica: BA-VU 1–2: TA820, TA821.

Appendix C5. *Troglocaris (Troglocaris) anophthalmus sontica* (Soča phylogroup)

- *Most na Soči, jama Vogršček: SI-VO 1–3: TA314 (FJ426035), **TA315** (FJ426036), TA316 (gender unknown). SI-VO6–11: TA825, **TA826, TA827, TA828, TA829**, TA830.
- *Vipava, Vipavska jama (T): SI-IV 1: TA831. SI-VJ 1–4: **TA381** (FJ426032), **TA382**, TA383, TA832. SI-VJ 10–24: TA833, TA834, **TA835**, TA836, **TA837, TA838**, TA839, **TA840, TA841**, TA842, TA843, **TA844, TA845**, TA846, TA847. Type sample: Six males: **TA983, TA984, TA985, TA986, TA987, TA988**. Five females (96 % ethanol, -20°C): TA990, TA991, TA992, TA993, TA994.
- *Gradisca, Pozzo dei Frari: IT-FR 1: TB061 (gender unknown)
- *Monfalcone/Tržič, Grotta Nevio: IT-NE 1-5: **TB072, TB073** (sequenced, not yet publ.), TB074 (sequenced, not yet publ.), TB075 (gender unknown), **TB076** (sequenced, not yet publ.).

Appendix C6. *Troglocaris (Troglocaris) anophthalmus legovici* (Istra putative phylogroup)

- *Labin, Kršan, springs in the tunnel Čepić: TA0033 (COI: DQ641552; ITS2: FJ426103)
- *Pula, Nimfej, spring (T): HR-NI 1–3: TB082 (sequenced, not yet publ.), **1770** (holotype, stored in Hrvatski prirodoslovni muzej, Zagreb, Croatia; sequenced, not yet publ.), TB084.
- *Opatija, rudnik, AC Medveja, HR: **TB056** (juvenile, sequenced, not yet publ.).
- *Vrsar, Klarića jama, HR: 1 specimen (COI: FJ426038; ITS2: FJ426101).

Appendix C7. *Troglocaris (Troglocaris) planinensis* (W-Slo phylogroup):

- *Iamiano/Jamlje, Comarie/Komarje, jama pri Komarjih (cavernetta Presso Comarie): IT-CO 1–8: TA220 (FJ425926), TA221 (FJ425927), TA222 (FJ425928), TA223 (FJ425929), TA224 (FJ425930), **TA461**, TA462, TA463.
- *Gorizia/Gorica, Doberdo/Doberdob, Grotta Andrea: IT-AN 1–5: TB062, TB063, TB064 (gender unknown), TB065 (gender unknown), TB066 (gender unknown) – all sequenced, not yet published.
- *Duino/Devin, brezno pri Devinu (pozzo presso S. Giovanni di Duino): IT-DU 1–8: **TA225** (FJ425936), **TA226** (FJ425937),

- TA227 (*FJ425938*), TA228, **TA229**, **TA458**, **TA459**, TA460.
- *Trieste/Trst, Trebiciano/Trebče, Grotta di Trebiciano/Labodnica: IT-LA 1–13: **TA215**, **TA216**, **TA217**, TA218, TA219, **TA505**, **TA506**, **TA507**, TA508, **TA509**, TA510, TA511, TA512.
 - *Rosandra/Glinščica, izviri pri Fonte Oppia: IT-GL 1–5: **TA283** (*FJ425950*), TA284. (*FJ425951*), TA285 (*FJ425952*), TA286 (*FJ425953*), TA287 (*FJ425954*).
 - *Rosandra/Glinščica, jama Antro delle Ninfe/Spodmol nimf: IT-SN 1–3: TA288, TA289, **TA513**.
 - *Komen, Brestovica, Dolencja jama: SI-DO 1–12: TA210, TA211, TA212 (*FJ425964*), TA213, TA214, **TA514**, **TA515**, TA516, TA517, TA518, TA519, TA520.
 - *Divača, Kačna jama, Ogabno jezero lake: SI-KA 1–11: **TA205** (*FJ425957*), **TA206** (*FJ425958*), **TA207**, **TA208**, **TA209** (*FJ425959*), TA521, TA522, TA523, TA524, TA525, TA526.
 - *Divača, Kačiče, cave Mejame: SI-ME 1–10: **TA259**, TA260 (*FJ425990*), TA261 (*FJ425991*), TA262, TA263 (*FJ425992*), TA527, **TA528**, TA529, TA530, TA531.
 - *Koper, Osp, Osapska jama: SI-OS 1–10: **TA532**, **TA533**, **TA534**, **TA535**, TA536, TA537, TA538, TA539, TA540, TA541.
 - *Kozina, Ocizla, Ocizelska jama: SI-OC 1–4: **TA466**, TA467, TA468, **TA614**.
 - *Materija, Odolina, Ponikve v Odolini (jama): SI-OD 1–5: **TA365**, TA366 (*FJ426003*), TA367, TA368, TA369.
 - *Sočerga, Jama pod Krogom: SI-KR 1–14: TA254, TA255 (*FJ426020*), TA256, **TA257**, **TA258**, TA542, **TA543**, TA544, **TA545**, TA546, TA547, **TA548**, TA549, **TA550**.
 - Logatec, jama Gradišnica: SI-GR 1: **TA551**.
 - *Planina, Planinska jama (T), river Pivka: SI-PI 1–7: TA200 (*FJ426008*), TA201 (*FJ426009*), TA202 (*FJ426010*), **TA203**, TA204 (*FJ426011*), TA552, TA553. Neotype sample: Three males: **TA972**, **TA973**, **TA974**. Three females: TA969, TA970, TA971.
 - *Planina, Planinska jama (T), river Rak: SI-RA 1–5: **TA195** (*FJ426013*), **TA196** (*FJ426014*), TA197 (*FJ426015*), TA554, TA555.
 - *Planina, jama Škratovka: SI-ŠK 1–3: **TA384**, TA385, TA386.
 - *Planina, Laze, Najdena jama: SI-NA 1–15: **TA370** (*FJ425998*), **TA371** (*FJ425999*), **TA372**, TA373 (*FJ426000*), TA374, TA556, TA557, TA558, TA559, TA560, TA561, TA562, TA563, TA564, TA565.
 - Rakek, Laze, jama Logarček: SI-LO 1–7: **TA566**, **TA567**, **TA568**, **TA569**, **TA570**, TA571, **TA572**.
 - Rakek, Laze, jama Erjavščica: SI-ER 1–3: TA573, TA574, TA575.
 - Postojna, Črna jama, river Pivka: SI-ČJ 1: TA576.
 - Postojna, Pivka jama: SI-PJ 1: TA577.
 - Postojna, Postojnska jama, Tartar: SI-TA 1–3: TA578, TA579, TA580.
 - *Postojna, Sajevče, jama Markov spodmol: SI-MA 1–11: **TA317**, **TA318** (*FJ425986*), **TA319**, **TA320** (*FJ425987*), **TA321**, TA581, TA582, TA583, TA584, TA585, TA586.
 - *Postojna, Slavina, Vodna jama v Lozi: SI-LZ 1–13: TA587, TA588, TA589, **TA590**, TA591, TA592, TA593, TA594, TA595, TA596, **TA597**, **TA598**, **TA599**.
 - *Pivka, Parje, Jama v Mlaki: SI-ML 1–5: TA322, TA323, TA324 (*FJ425996*), **TA325**, TA600.
 - *Šembije, Podtabor, Kozja luknja (jama): SI-KL 1–7: TA333 (*FJ425969*), TA334 (*FJ425970*), TA601, TA602, TA603, TA604, TA605.
 - *Ilirska Bistrica, Novokračine, Novokrajska jama: SI-NO 1–12: **TA264**, **TA265**, **TA266**, **TA267**, **TA268**, TA606, TA607, TA608, **TA609**, TA610, TA611, **TA612**.
 - *Labin, Kršan, springs in the tunnel Čepić: HR-KR 1–13: TA301 (*FJ425971*), TA302 (*FJ425972*), TA359, TA360, TA361, TA362, **TA363**, TA364, TA387 (*FJ425973*), **TA388** (*FJ425974*), TA389 (*FJ425975*), TA390, TA391 (*FJ425976*).
 - Labin, Raša, izvir pri Raši: HR-RA 1: TA613.
 - *Poreč, Pincinova pečina: HR-PO 1–4: TA0848, **TA0849**, TA0850, TA0851. A sample sequenced, not yet publ.
 - Novi Vinodolski, Sušička jama: HR-NV 1–4: TA959, **TA960**, **TA961**, **TA962**.
 - *Crikvenica, HR: TB092 (juvenile, sequenced, not yet publ.)
 - *Pula, Vodnjan, Galižana: HR-GA 1–2: TA967, TA968. Sequenced, not yet publ.
- Troglocaris (*Troglocaris*) planinensis/T. (*Troglocaris*) anophthalmus legovici?
- Poreč, Funtana, captive spring: HR-FU 1–4: **TA0852**, **TA0853**, **TA0854**, **TA0855**.

Appendix C8. *Troglocaris (Troglocaris) bosnica*

- *Sanski Most, Dabar, jama Dabarska pečina: BA-DA 1: TA869.
- *Sanski Most, Lušci Palanka, Suvaja pečina (T): BA-SU 1–18: TA269, TA270, TA271, TA272, TA273, TA856, TA857, TA858, TA859, TA860, TA861, TA862, TA863, TA864, **TA865**, TA866, TA867, TA868.

Appendix D

Differential description of discriminative characters for *Troglocaris (Troglocaris) anophthalmus anophthalmus* males and females (for comparison with the differential descriptions of other taxa). Characters included in the differential

descriptions are the same as proven to be most discriminative in DFA analyses for *T. (T.) anophthalmus* – E-Slo phylogroup as a whole (incl. *T. (T.) a. anophthalmus*, *T. (T.) a. intermedia*, *T. (T.) a. ocellata* ssp. nov.).

Males (average values \pm SD and [min, max values] presented; see also Appendix C1): Large specimens, CL: 6.6 ± 0.5 mm [5.3, 7.6 mm]. Rostrum length and dentition variable, when rostrum longer than 45 % of CL, generally curved upwards. Article 3 of antenna I rather long (a13a12): its length 56 ± 5 % [48, 65 %] of article 2 length. Antenna II scaphocerite rather wide (a2s2s1): its width 36 ± 2 % [31, 39 %] of scaphocerite length. Pereopod I article 7 long (pr1da): its length 21 ± 1 % [19, 25 %] of pereopod I length, and pereopod III article 7 short (pr3da): its length 10 ± 2 % [5, 12 %] of pereopod III length. Pereopod I article 6 of medium length (pr1che): its length 23 ± 1 % [21, 26 %] of CL. Uropod exopodite of medium width (u21, u2cl): its width 32 ± 1 % [29, 34 %] of uropod exopodite length, and 19 ± 1 % [16, 21 %] of CL (however, narrower than in *T. (T.) planinensis*). Pereopod V article 7 of medium length (p5dp): its length 22 ± 2 % [19, 25 %] of pereopod V article 6 length. Telson long (te1s6): its length 99 ± 6 % [85, 109 %] of pleonite VI length. Adult males generally without or with a single retinacular hook on *appendix interna* of pleopod I endopodite. **Females** (for E-Slo as a whole; average values \pm SD and [min, max values] presented; see also Appendix C2): Large specimens, CL: 7.4 mm \pm 0.8 mm [5.8, 9.0 mm]. Rostrum length and dentition variable, when long, generally curved upwards. Article 3 of antenna I rather long (a13a12): its length 52 ± 7 % [41, 67 %] of article 2 length. Antenna II scaphocerite of medium width (a2s2s1, a2s2cl): its width 35 ± 2 % [31, 42 %] of scaphocerite length, and 18 ± 2 % [15, 23 %] of CL. Pereopod I article 7 long (pr1da): its length 20 ± 2 % [16, 24 %] of pereopod I length, and pereopod II article 7 long (pr2da): its length 16 ± 1 % [13, 18 %] of pereopod II length; maximal length of chelae (article 6) of medium length (pr2che): its length 23 ± 2 % [19, 28 %] of CL. Proximal articles of chelate pereopods rather short, i.e. article 4 of pereopod I (pr1ma) length 24 ± 2 % [21, 28 %] of pereopod I length, and article 5 of pereopod II (pr2ccl) length 25 ± 3 % [19, 32 %] of CL. Pereopod V article 7 of medium length (p5dp): its length 20 ± 2 % [15, 24 %] of pereopod V article 6 length. Pleonites V–VI rather short (s56cl): their length 77 ± 5 % [65, 91 %] of CL. Telson of medium length (te1cl): its length 50 ± 3 % [43, 60 %] of CL; however to pleonites V–VI, telson length rather large (te1s56), i.e. 64 ± 4 % [53, 73 %] of pleonites V+VI length. Telson weakly tapered distally (tes2tes1), its distal width 67 ± 9 % [47, 92 %] of its proximal width. **Males and females** (see also Table 1): The number of spiniform setae on pereopod III article 3 along its inferior margin and at inferodistal angle 1–5, but in more than 85 % with 3 or less.