

Perla carantana - a new species of the genus *Perla* (Plecoptera: Perlidae) from Austria and Slovenia

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Abstract. Members of the genus *Perla* are the largest, and amongst the most endangered European stonefly species. During a revisionary study of this genus, a new species was discovered at several localities in Austria and Slovenia; *Perla carantana* was named after Carantania, a 7th - 11th century political unit within the territories of Austria and Slovenia. Adults and larvae are nearly indistinguishable from the sympatric species, *Perla burmeisteriana* Claassen, but the two species can be clearly distinguished on the basis of egg chorion morphology.

Keywords: Plecoptera, *Perla*, new species, Austria, Slovenia

Izvešček. *Perla carantana* - nova vrsta iz rodu *Perla* (Plecoptera: Perlidae) iz Avstrije in Slovenije - Vrste iz rodu *Perla* sodijo med največje, a tudi najbolj ogrožene predstavnice vrbnic. Pri podrobni obdelavi rodu *Perla* smo našli novo, do sedaj še neopisano vrsto, z več lokalitet v Avstriji in Sloveniji. Vrsto smo poimenovali po Karantaciji, ki je nekoč (7-11 stoletje) obsegala tudi ozemlje današnje Avstrije in Slovenije. Odrasli osebki in tudi ličinke so zelo podobni vrsti *Perla burmeisteriana* Claassen, ki živi na istem območju. Najbolj zanesljivo se vrsti razlikujeta po obliki in strukturi površine jajc.

Ključne besede: Plecoptera, vrbnice, *Perla*, opis nove vrste, Avstrija, Slovenija

Introduction

Members of the genus *Perla* are the largest European stoneflies and the genus name is the oldest still in use for a group of stonefly species. In the Illies catalogue (1966) nearly 300 species were assigned to the genus, but Sivec et al. (1988) reduced this number to only eight species found from Britain and Ireland, through the circum-Mediterranean region of Europe and North Africa to the Caucasus and Iran. Taxonomy of the genus has never been studied in detail, but four species names proposed more than a century ago have been applied, with varying accuracy, to the complex of species found in Central Europe.

The present investigation grew out of an attempt to identify new material collected in the Balkans and Turkey and an effort to construct a reliable larval key for the genus. Earlier results (Sivec & Stark 2002) support recognition of a minimum of 12 *Perla* species, including two that had previously been undescribed, and suggest that the only consistently reliable character for species recognition in the genus is egg chorionic detail.

Surprisingly, several specimens were found among recently collected or older museum material from Austria and Slovenia, completely within the range of *P. burmeisteriana*, which have a distinct egg and are therefore recognized as a new species.

Specimens used in this study were made available from the following museums and other institutions. Abbreviations are used with specimen data to indicate the sources of material: University of Natural Resources and Applied Life Sciences (BOKU); National History Museum, Vienna (NHMV); National Museum, Prague (NMP); Slovenian Museum of Natural History, Ljubljana (PMSL).

***Perla carantana* sp. nov. (Figs. 1-11)**

Perla sp. nov. - Sivec & Stark (2002), Scopolia 49: 10 figs. 16-18.

Material: male holotype, Slovenia: river Iška, Ig, 300 m (PMSL); paratypes: Austria Carinthia: 1 male, 1 female, Wölfnitz at Wölfnitz near Klagenfurt, 454 m, 14.5.2001; 1 male, 1 female, 4.5.2001; 21 larvae, 2 exuvia, 30.3.2002; 4 females, 15.5.1999, leg. M. Konar; 2 males, 1 female, Lammeraubach at Lammerau, Lower Austria, 392 m, 8.5.1999; 2 males, 2 females, Moosgraben, Vienna, 296 m, 14.5.2002; 3 males, Halterbach, Vienna, 270 m, 19.5.1994; 1 female, 1.5. 1995; 1 male, 1 female, 2 exuviae, Kasgraben, Vienna, 254 m, 20.5.2001; 1 female, Mauerbach at Mauerbach, Lower Austria, 274 m, 19.5.2001; 1 larva, 15.4.2001; 1 larva, Grosse Tulln at Abstetten, Lower Austria, 190 m, 11.4.1961, leg. Pomeisl (NHMV); 1 female, Purbach, NE Baden, Lower Austria, 330 m, 24.5.1994, leg. O. Moog (all Austrian material, except material from NHMV, is deposited at the second author's collection); Slovenia: 1 female, Ljubljana, 300 m, 18.5.1889 (NMP); 1 female, Iška, Ig, 300 m, 2.5.1989; 4 larvae, Gabrje, 310 m, 23.4.1986; 1 female, Velike Bloke, 730 m, May 1974; 2 larvae, river Mirna, 22.4.1986; 3 female, Ljubljansko Barje, May 1967 (Slovenian material, except Prague specimen is deposited at PMSL).

Description

Midsized to larger species, uniformly dark brown coloured. Length of forewings in males 18 mm, females 25 mm. Wings normally developed, brownish coloured with dark brown venation. Occipital area of head, callosities and M-line pale, rest of head dark brown (Fig. 4). Femora and tarsi dark brown, tibiae paler except proximal and distal parts. Antennae uniformly brown, palpi paler, cerci dark brown.

Male genitalia: Abdominal segment 9 and 10 of the typical *Perla* type (Figs. 1-3). Hemiterga similar in shape to those of *P. burmeisteriana*, not as simple and straight as those of *P. pallida*, and not so strongly curved as those of *P. marginata*. Penis (Fig. 5) indistinguishable from *P. burmeisteriana*.

Female genitalia: Subgenital plate small, bilobed (Fig. 6) and indistinguishable from several *Perla* species. Vagina typical of genus.

Egg: Length 0,51-0,54 mm, width 0,28-0,30 mm (Figs. 7-8). Collar short (0,02-0,03 mm long and 0,10-0,12 mm wide). Circumference of collar with about 12 irregular thick ribs extending from rim and continuous with follicle cell impressions of egg body. Collar and chorionic surface perforations in the follicle cell impressions of the same type as in *P. burmeisteriana* but the two are clearly distinct. Chorion covered throughout with a coarse lattice of raised follicle cell impression walls surrounding a finely pitted floor. Cell impression shape irregularly hexagonal and size varies from about 0,017-0,029 mm in inner diameter. Micropyles set in follicle cell impressions about 0,17-0,24 mm from pole.

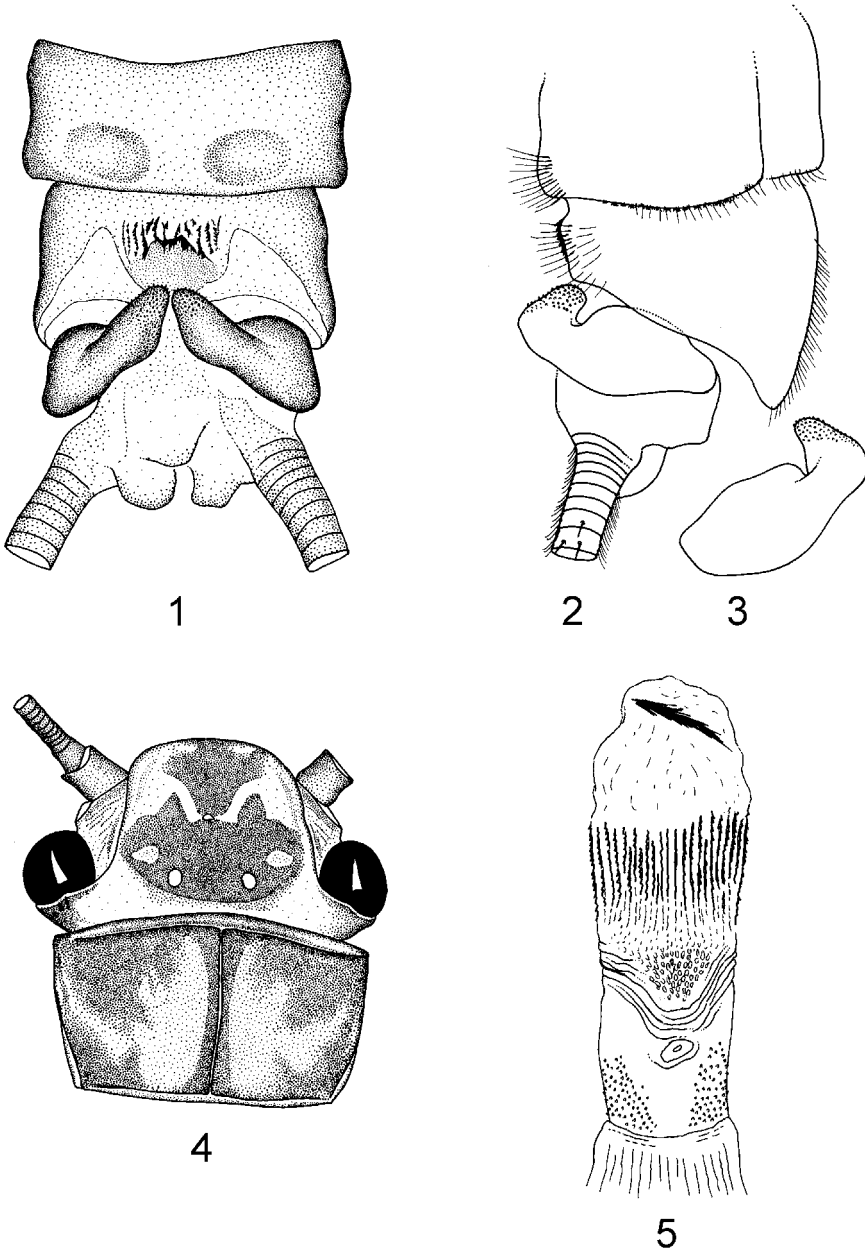
Orifices of micropyles with thin raised rims.

For detail comparison of egg structures with other species see in Sivec & Stark (2002).

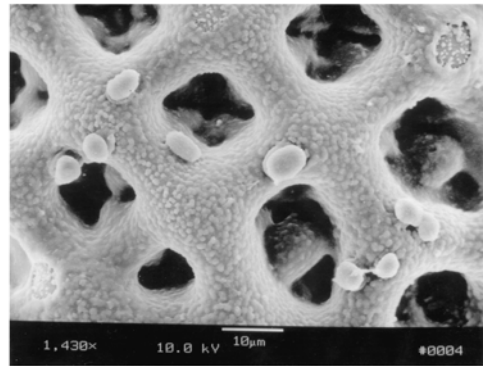
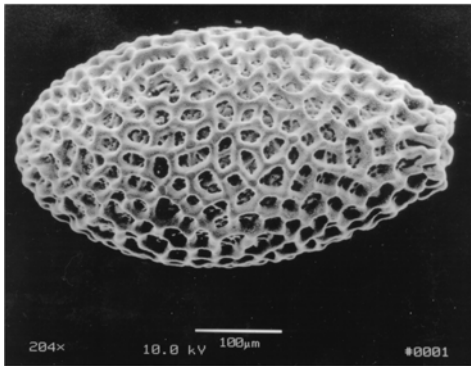
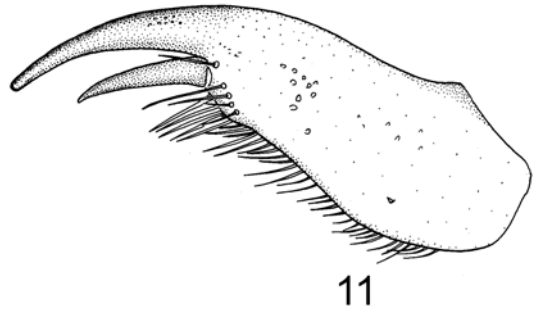
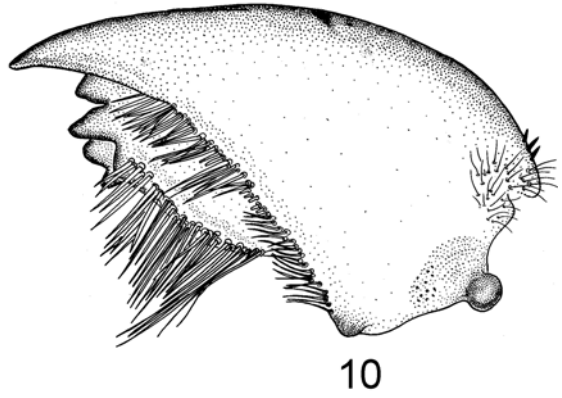
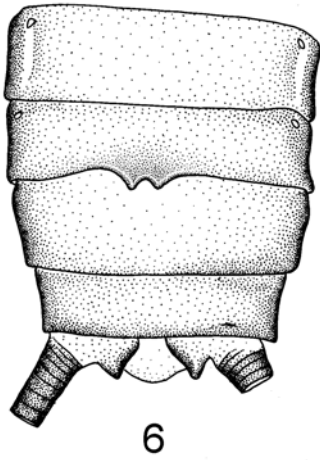
Larva: Similar in colour pattern to larva of *P. burmeisteriana* (Figs. 9-11).

Etymology

The species name is based on the historical-territorial unit of the 7th-11th centuries in the area of present day Carinthia in Austria and Slovenia, and is used as a noun in apposition.



Figures: 1. Male terminalia, dorsal; 2. Male terminalia, lateral; 3. Hemitergite; 4. Head and pronotum; 5. Penis.



Figures: 6. Female terminalia, ventral; 7.-8. SEM photomicrographs of egg: egg lateral, 204x (7); detail of chorion, 1430x (8); 10. Right mandible, ventral; 11. Right lacinia, ventral.

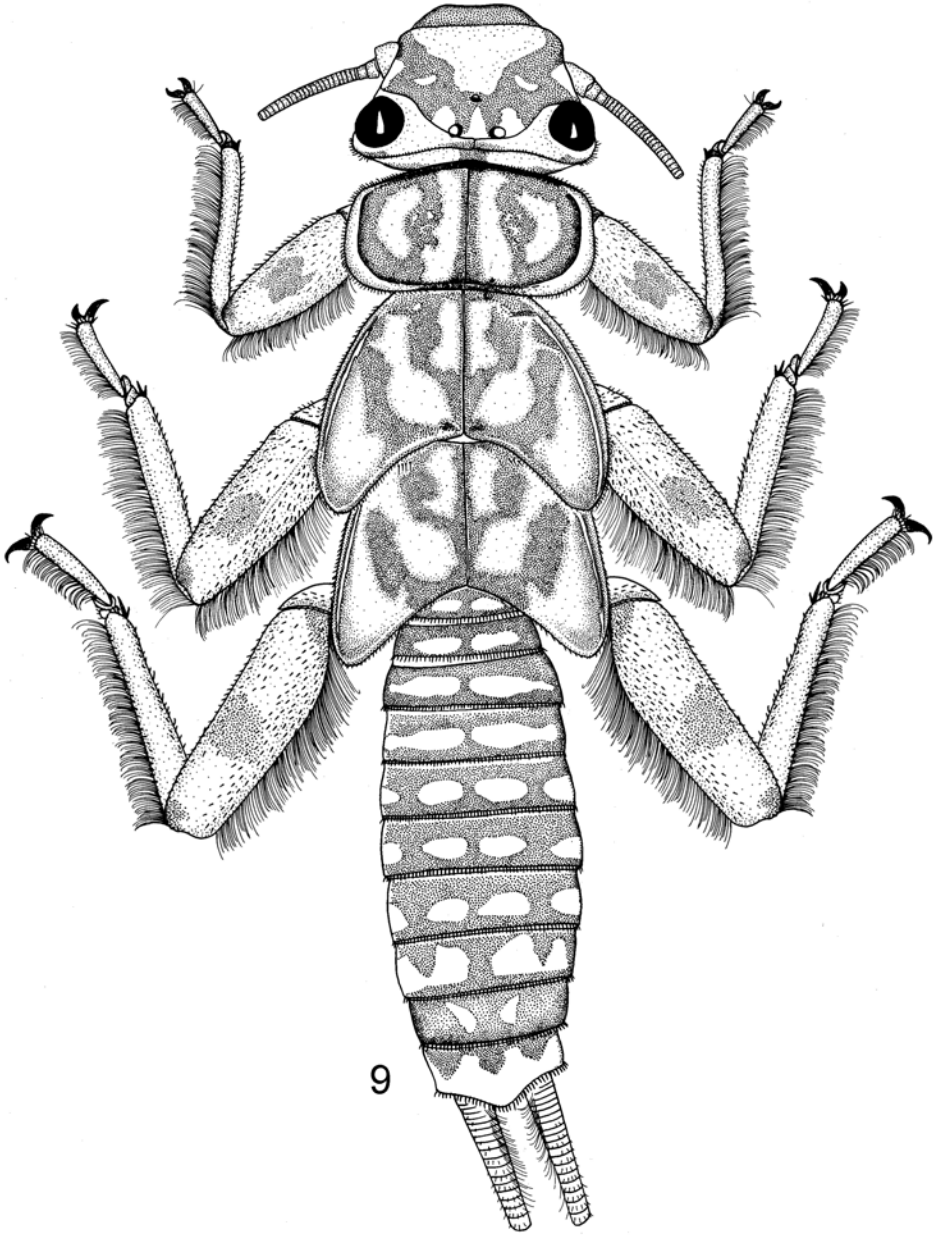


Figure: 9. Habitus of larva

Comments

A closely related species, *P. burmeisteriana*, is widely distributed in Europe and also recorded in North Africa. In Europe *P. burmeisteriana* is reported from the general area bounded by Spain, Netherlands and Luxemburg to the Carpathian Mountains, Macedonia and Montenegro. The type locality is in Germany and there is a clinal variation in egg morphology toward the southeast. Reports of this species further to the east are suspect because a different species in the complex, *P. zwicki* (Sivec & Stark 2002) is reported from Turkey.

Perla carantana is known from several localities in Austria and Slovenia within the general distribution range of *P. burmeisteriana*, but that species, now nearly extinct, inhabits larger streams and rivers and the new species occurs in smaller streams.

Despite being the largest European stoneflies, taxonomy of genus *Perla* is still insecure. General morphology of most species is very similar making identifications tenuous. Further studies, especially those utilizing techniques of behavioral and molecular investigations, are needed to bring us to a better understanding of the species relationships and boundaries in this important genus.

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Povzetek

Rod *Perla* je najstarejše rodovno ime za vrbnice, s katerim je bilo imenovanih skoraj 300 vrst vrbnic kot jih navaja katalog Illies (1966). Čeprav sodijo med največje predstavnike evropskih vrbnic, so sistematski položaj in sorodnost posameznih vrst ter njihova razširjenost še vse prej kot jasna. Študija Sivec et al. (1988) je v okviru rodu omejila število na 8 vrst, ki so razširjene od Irske in Britanije na severu ter Španije na zahodu do Kavkaza in Irana na vzhodu. Podrobnejša študija tega rodu (Sivec & Stark 2002) je pokazala, da rod obsega najmanj 12 vrst, med katerimi je več do sedaj še neopisanih vrst.

V tem delu predstavljamo podroben opis vrste iz skupine *Perla burmeisteriana*. Tipična oblika te vrste, ki je bila opisana iz Nemčije, živi tudi na območju Avstrije in Slovenije. Tukaj smo na več lokalitetah našli ozko sorodno vrsto, ki smo jo poimenovali po Karantaniji, zgodovinski kneževini, ki je od 7-11 stoletja obstajala tudi na ozemlju današnje Avstrije in Slovenije. Predstavljamo opis in ilustracije odraslih osebkov in ličinke, ki se zelo malo razlikujejo od ozko sorodne vrste *P. burmeisteriana*. Tako kot pri drugih vrstah iz rodu *Perla* sta najbolj zanesljiva znaka za ločevanje posameznih vrst oblika in struktura površine jajc. Ker pri predstavnikih iz rodu *Perla* dobimo povsem razvita jajca že pri popolnoma odraslih ličinkah to lahko precej olajša identifikacijo posameznih vrst. Ličinke najdemo mnogo lažje kakor odrasle osebkke.

To je zelo pomembno, saj so predstavniki iz rodu *Perla* kot ene najbolj ogroženih vodnih žuželk, pomembni kot indikatorski organizmi pri ocenjevanju onesnaženosti in kvalitete tekočih voda.

Literatura

- Aubert J. (1959): Plecoptera. *Insecta Helvetica*, Fauna 1: 1-140.
- Burmeister H.C.C. (1839): *Handbuch der Entomologie, Plecoptera*. Berlin, 2(2): 863-881.
- Illies J. (1955): Steinfliegen oder Plecoptera. In: Dahl (Ed.), *Tierwelt Deutschlands*, 43: 1-150.
- Klapálek F. (1907a): Die europäischen Arten der Gattung *Perla* Geoffr. *Bull. internat. Acad. Sci. Bohême (Sci. math.-nat.)*, Praha 12: 117-138.
- Klapálek F. (1907b): Evropské druhy rodu *Perla* Geoffr. *Rozpravi České Akad., Praha* (2) 16(16): 1-25.
- Illies J. (1966): Katalog der rezenten Plecoptera. *Das Tierreich* 82: I-XXX, 1-632.
- Sivec I., Stark B.P., Uchida S. (1988): Synopsis of the world genera of Perlinae (Plecoptera: Perlidae). *Scopolia* 16: 1-66.
- Sivec I., Stark B.P. (2002): The Species of *Perla* (Plecoptera: Perlidae): Evidence from Egg Morphology. *Scopolia* 49: 1-33.
- Zwick P. (1971a): Die Plecopteren Pictets und Burmeisters, mit Angaben über weitere Arten (Insecta). *Revue Suisse de Zoologie* 78: 1123-1194.
- Zwick P. (1971b): Plecoptera aus Anatolien und benachbarten Gebieten. *Mitt. schweiz. ent. Ges., Lausanne* 44: 233-264.
- Zwick P. (1973): Insecta: Plecoptera, phylogenetisches System und Katalog. *Das Tierreich* 94: I-XXXII, 1-465.