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To MICHAEL HUBBARD,
WITH BEST REGARDS
Martin Schletterer

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First record of *Prosopistoma pennigerum* from the Russian Federation (Ephemeroptera: Prosopistomatidae)

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Larvae of *Prosopistoma pennigerum* (Müller, 1785) are collected from the Volga River at Rzhev, Tver Prov. This is the first record of the species from Russia. A brief description of nymph and notes on the distribution of the species are given.

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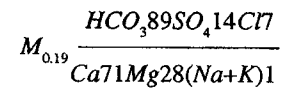
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The macrozoobenthos community of the Volga River from the source to Tver was studied in detail within the research expedition "Upper Volga 2005". Three geomorphological reaches (source region, upper Volga lakes, upper Volga River) were defined. During the summer low-flow period samples from the littoral were taken at two locations in reach 1, at four locations in reach 2 and at 33 locations in reach 3. In the Volga River, a bottom grab with a grabfield of 0.025 m² was used for sampling. At each point, three parallel samples were taken; also kick-sampling was applied to get an overview on the whole community. The macro-invertebrates were washed through a 500 µm net and sorted to higher taxa. Afterwards, the invertebrates were stored in ethyl-alcohol (70%), labelled and analysed after the expedition. Different European and Russian keys were used for determination; for mayflies, Tshernova (1964), Müller-Liebenau (1969), Kluge (1997) and Bauernfeind & Humpesch (2001) were relevant. A preliminary checklist (Schletterer, 2006) already revealed that the mayflies form a taxa-rich part of the invertebrate community and during the survey it turned out that there are typical species which became already rare in Europe.

Locations at Rzhev, Staritsa and Tver were selected for a monitoring programme. Within the sampling campaigns in August 2006 and 2007 in the location at the town of Rzhev, the potamobiont species *Prosopistoma pennigerum* (syn.: *P. foliaceum*) was found. The substrate was dominated by pebble and gravel (lithal); the depth amounted

about 0.5 m. Around the location where *Prosopistoma* was found, the river is variable: there are islands and the bank depth on the right rises more than 30 meters, while it is lower on the left side. In this reach, the banks are dominated by reeds (e.g. *Phalaris arundinacea*), but poor in shrubs or trees close to the water.

At Rzhev, the temperature isotherm of the water is about 11 °C between April and November (Jablokov, 1973). The hydrochemical measurements in August 2005 (Shaporenko et al., 2006) resulted a pH value of 7.2 and a conductivity of 191 µS/cm; ammonium amounted 0.53 mg/l, total Nitrogen 2.90 mg/l and total Phosphor 0.07 mg/l. According to the reference data (Jablokov, 1973), the composition of the water of the Volga River in Rzhev during the low water period in summer is described by the formula



According to Jablokov (1973), the concentrations of biogenic components, such as nitrite (0.001 mg NO₂⁻ per liter), nitrate (0.02 mg NO₃⁻/l), phosphates (0.006 mg PO₄³⁻/l), iron (0.18 mg Fe_{total}/l) and silicon (1.8 mg Si/l) are not high in comparison with the other sites of the studied reach. The content of organic matter of the water in Rzhev is also low: chromaticity is about 30 degrees and bichromate oxidability is about 13 mg O/l.

***Prosopistoma pennigerum* (Müller, 1785)**

- = Binocle à queue en plumet: Geoffroy, 1762 (unavailable name).
- = *Binoculus foliaceus* Geoffroy in Fourcroy, 1785.
- = *Limulus pennigerus* Müller, 1785.
- = *Binoculus pisciforme* Dumeril, 1816.
- = *Prosopistoma punctifrons* Latreille, 1833.
- = *Prosopistoma foliaceum* (Geoffroy in Fourcroy, 1785).

Material examined. Russia, Tver Prov., Rzhev Distr., Volga River at Rzhev (56°15'31.89" N, 34°19'13.16" E), 15.VIII.2006 (2 larvae) and 19.VIII.2007 (3 larvae), leg. et det. M. Schletterer; one specimen is deposited at Tver State Technical University.

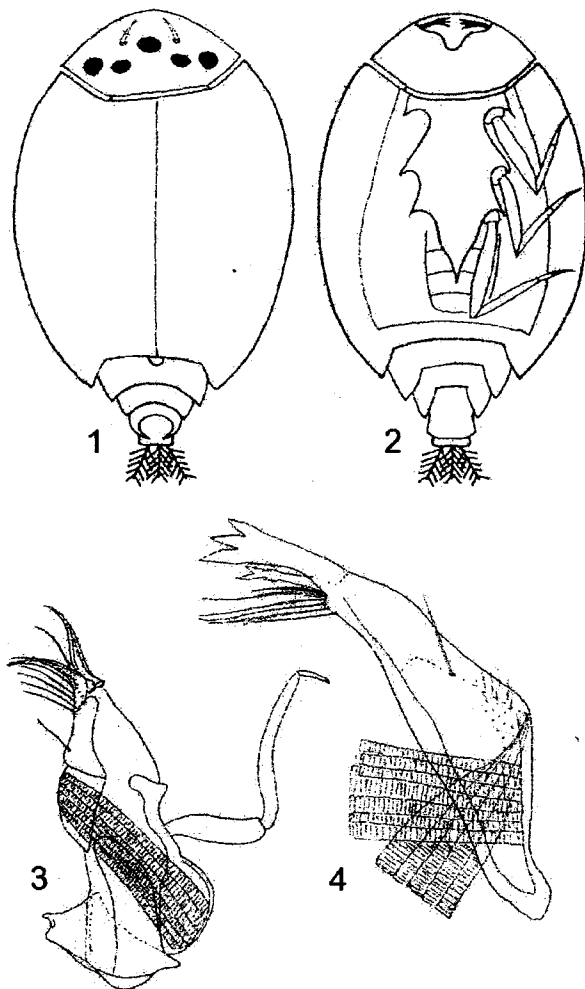
Discussion. When it was discovered in 1762 by Geoffroy, he described the larva of the species as a crustacean, due to the carapace-like mesothorax. Only 100 years later, Joly (1871) realized that this was a mayfly nymph. Up to now, only few adults

were found, because they are flying only about 30 minutes after emerge at dawn (Fontein, 1982; Kluge 1998) in September/October (Hufnagel & Gaál, 2005) and the females are known to be reproductive as subimagos (Edmunds & McCafferty, 1988). *Prosopistoma* is feeding predacious on Chironomidae and Oligochaeta (Haybach, 1998).

The head of the lens-shaped larvae is recessed into the thorax; mesonotum forms a typical shield that is extending to the sixth abdominal segment (Figs 1, 2). There are five antennal segments in *P. pennigerum*; the second one is the longest (Trägårdh, 1911). Their mouth apparatus is modified for carnivorousness (Figs 3, 4): the asymmetry of mandibles is lost and the mola as well as superlinguae are lost. The gill chamber contains five distinct pairs of tracheal gills (Lieftinck, 1932; Gillies, 1954). On some of the observed larvae, the caudal filaments were not visible; in larvae of *Prosopistoma*, the filaments can be completely retracted into the abdomen, due to the arrangement of muscles to the bases of the caudal filaments: (1) on the anterior margin of tergum X and also (2) on the apices of these apodemes (Kluge, 1998). Detailed descriptions can be found e.g. in Joly & Joly (1872), Trägårdh (1911) and Kluge (1998, 2004b).

In West Palaearctic, two species are known: *P. pennigerum* (Müller, 1785) and *P. phoenicium* Alouf, 1977; the latter occurs restricted to Israel, Lebanon and Syria (Thomas et al., 1988). *Prosopistoma pennigerum* is considered to be extinct in most parts of Europe, as Bauernfeind & Humpesch (2001) stated "Bestandsentwicklung in Zentraleuropa vermutlich negativ, in weiten Bereichen ausgestorben oder verschollen", and also the Russian literature described it as a very rare species (Kluge, 1997). It is not yet listed on the checklist of Ephemeropterans of the Eastern European Plain (Kluge, 2004a). *P. pennigerum* was not reported from the extensive studies in the Volga Basin (Behning, 1924, 1928; Butorin & Mordukhai-Boltovskoi, 1978).

In the territory of the former USSR, the species was collected in Latvia, in the Daugava River (Kachalova, 1962, 1965; Kachalova & Skrube 1971; Spuris, 1974, 1982). Spuris (1982) mentions two species of the genus *Prosopistoma* in Latvia: *P. foliaceum* (Fourcroy, 1785) = *P. pennigerum* (Müller, 1785) and *P. daugaviense* Spuris, 1974. But it is noticed that *P. daugaviense* Spuris, 1974 is a nomen nudum (Poppels & Kalniņš, 2002). After



Figs 1-4. *Prosopistoma pennigerum*, larva. 1, 2, dorsal and ventral view, $\times 10$ (orig.); 3, 4, maxilla and mandible, $\times 75$ (from Trägårdh, 1911).

the dam was built, this species disappeared from the Daugava River (N.J. Kluge, pers. comm.). *Prosopistoma* was also found in the Kura River (Georgia), within Borzhomi Nature Reserve. R.S. Kazlauskas collected larvae there and wanted to describe a new species (N.J. Kluge, pers. comm.). Also some other people collected these larvae (Sadovskiy, 1946; Kasymov, 1972). Thus, *P. pennigerum* was included in the Red Book of the USSR and due to this it is nowadays mentioned on the official red list of Smolensk Region (Kruglov, 1995) and Belarus (Republic of Belarus, 2004; Moroz, 2006).

The actual finding of *P. pennigerum* in the Volga River is the first record for the Russian Federation (N.J. Kluge, pers. comm.). For better conservation, this species has to be added to the national red list and the red list of Tver Province. The discovery of this rare and scarce mayfly, that is typical for large rivers, also indicates the upper Volga River as very valuable freshwater habitat. This record also gave us important information about the habitat requirements and ecological demands of *P. pennigerum*; this will be presented in a further scientific work (Schletterer in prep.).

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