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Short communication

Marine midge *Telmatogeton japonicus* Tokunaga (Diptera: Chironomidae) exploiting brackish water in Finland

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Abstract

Pupal exuviae of marine intertidal midge *Telmatogeton japonicus* Tokunaga (Diptera: Chironomidae) were found in September 2008 from the Gulf of Finland, Baltic Sea. Previous records of the species in the Baltic Sea were from Sweden, Denmark, Germany and Poland. *Telmatogeton japonicus* is an alien species introduced to Europe from the Pacific Ocean. It probably uses shipping as the vector, since in north-western Europe it has first been detected near large seaports. This was also the case in the Gulf of Finland. Our findings suggests that the species' distribution extends further northeast in the Baltic Sea than understood before, and that the species is able to establish viable populations into fresh-brackish (salinity < 4 ‰) coastal habitats.

Key words: *Telmatogeton japonicus*, Chironomidae, pupal exuviae, Gulf of Finland

Benthic macroinvertabrate communities in the littoral and sub-littoral zones in the Gulf of Finland (Baltic Sea) are rather poorly known, as most biomonitoring and assessment programs focus on sampling soft-bottom macrofauna in profundal areas (e.g. Ashan 1990; Laine 2003). Although invasive species are a major concern in the Baltic Sea region, benthic macroinvertebrates colonising and inhabiting shallow water habitats may go easily undetected. The insect family Chironomidae (Diptera: Nematocera) is an example of an abundant and species rich taxon, which is commonly neglected in benthos studies. The majority of the chironomid species complete their aquatic life stage in lotic and lentic freshwaters, but more than 160 species have been recorded from the northern Baltic Sea coastal and archipelago areas (Paasivirta 2000). The list does so far not contain any predominately marine chironomid species.

In this study, we used the Chironomid Pupal Exuvial Technique (CPET, Wilson and Ruse 2005; Raunio 2008) to assess chironomid community composition in three areas in the Gulf of Finland (Figure 1). Pupal exuvial samples allow in most cases straightforward identification of species (Langton and Visser 2003) and insight into community composition at various microhabitats and depths at or some distance of the sampling site (Wilson and Ruse 2005; Raunio 2008). A more complete picture of the chironomid communities can be achieved and probability of encountering rare species is higher than when sampling larvae or adults. Although rarely applied for coastal waters, the method is equally applicable for monitoring ecological status and determining species composition in brackish and marine environments.

We collected chironomid pupal exuviae from four sites at each of the three areas (Annex 1). The samples were collected in spring (May) and autumn (September). Thus, species emerging during different seasons were detected. Sampling was conducted by scooping foam and floating

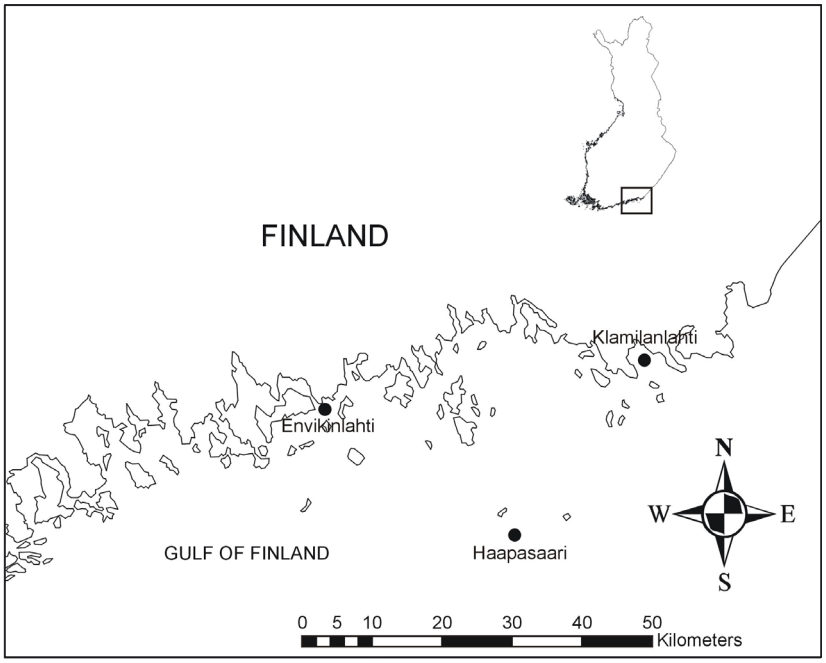

Figure 1. Location of the sampling areas in the Gulf of Finland

debris along the water margins (about 25-50 m of the shoreline) with a hand net (mesh size 250µm) (see e.g. Wilson and Ruse 2005). Pupal exuviae of the marine intertidal midge *Telmatogeton japonicus* Tokunaga were found in autumn samples from a shallow coastal bay Envikinlahti (mean salinity in epilimnion during 2006-2008: 2.9 psu), as well as from the northern coasts of Haapasaari island (mean salinity: 4.1 psu), located some 25 km south of the Finnish coastal line (Figure 1).

This was, to our knowledge, the first record of the species (as well as of the whole sub-family) from the Gulf of Finland, and in fact in the northern half of the Baltic Sea.

Morphological characteristics of the pupal exuviae of T. japonicus

Subfamily Telmatogetoninae is a species poor with only three species described from the Palaearctic region (Langton and Visser 2003). All three species live in marine environments. Pupal exuviae of species in the subfamily Telmetogetoninae can be separated from the other subfamilies by having eight apparent abdominal segments (Figure 2A) whereas other subfamilies having nine segments. Species of Telmatogetoninae have caudal ends developed as a subcircular flattened disc (Figure 2B), which is unique among chironomids. In addition, the thoracic horn (respiratory organ of the pupa) of the genus is unusual, with the horn having an open lumen. In contrast to the congeneric species *T. pectinata* (Deby), *T. japonicus* has an opening of the thoracic horn lumen in the proximal half of the horn (Figure 2C). The abdomen of the pupal exuviae of *T. japonicus* is mainly hyaline, whereas thorax and the terminal disc are golden to golden-brown. Pupal exuviae are normally about 7 mm long.

Ecological considerations and distribution potential

Larvae of *T. japonicus* typically inhabit marine intertidal splash zones (Brodin and Andersson 2008). The larvae live in tubes attached on hard substrates, such as rocks, but they have also been found attached to ship hulls and offshore windmills (Brodin and Andersson 2008). Adult emergence of the species appear to have no particular season, and thus adults and pupal exuviae of the species can be found throughout the year or open water season. In our data, however, the species was only detected during autumn (September). Previous records of the species have also indicated that adult emergence

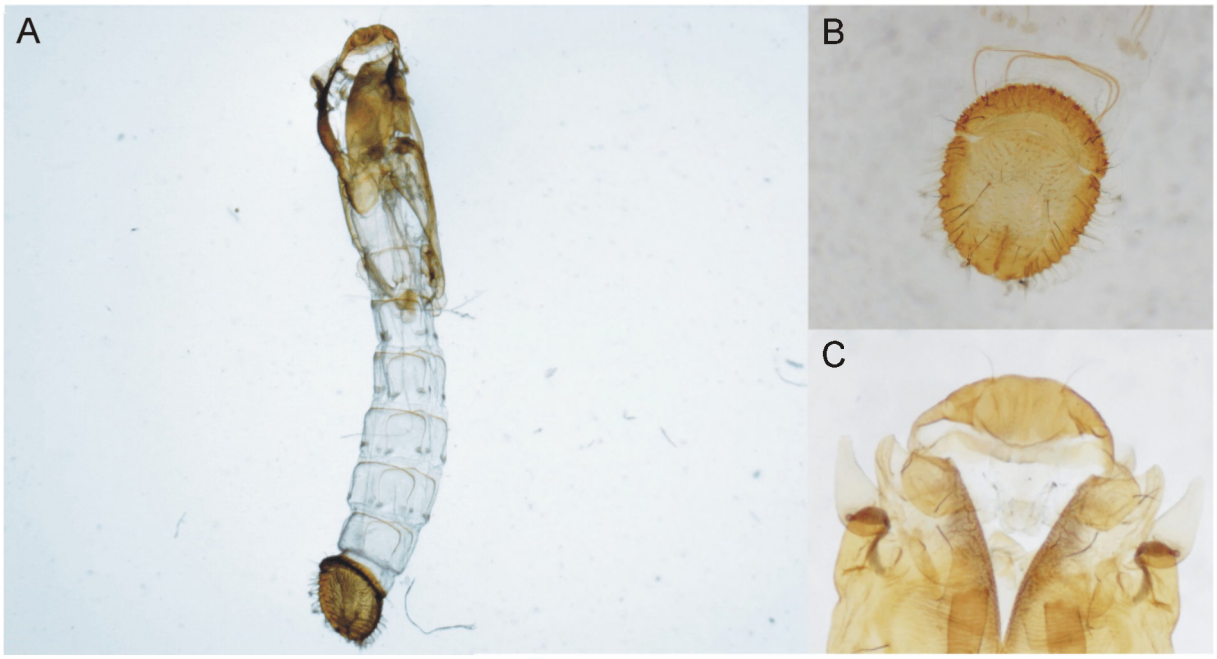

Figure 2. Pupal exuviae (A), terminal disc (B) and thorax and thoracic horns (C) of *Telmatogeton japonicus* (Photograph by Janne Raunio)

is more pronounced during autumn or winter, which may help to avoid predation (Brodin and Andersson 2008). Interestingly, author LP has collected adult chironomids from coastal areas in the Gulf of Finland during the recent years and in different seasons, with no record of the species. Mating of adult *T. japonicus* takes place on the ground (Cranston 1989), which may explain its absence in the sweep-net samples. However, adult emergence is from exuviae that is retained within the larval/pupal tube (see also Robles 1984), and the exuviae often remains within the tube. Therefore, *T. japonicus* may be more abundant than indicated by the number of their pupal exuviae in the CPET samples. Although *T. japonicus* live mainly in marine environments (first described by Tokunaga (1933) from Japan), the species seems to be able to establish viable population into brackish water environments such as the Kiel canal. *T. japonicus* was first discovered from the Baltic Sea during 1960s'. Previous records of the species from the Baltic Sea were from Sweden, Denmark, Germany and Poland (Brodin and Andersson 2008). The species has however not been caught before in such low salinity conditions as in the present study.

Our observations show that *T. japonicus* is distributed further northeast in the Baltic Sea than has been realised before. The fact that the species is usually found in shallow water habitats, which are rarely sampled in biomonitoring studies of coastal habitats, may explain its absence in previous surveys, but on the other hand it may be a species extending its distribution northwards into almost freshwater conditions. Genetic studies of *T. japonicus* in Hawaii have resulted in a suggestion that it once invaded freshwater habitats and evolved into separate species (Newman 1988). Rapid micro-evolution by an invasive species have also been documented by Lee (1999).

We found exuviae of the species in two of the three areas studied, which indicated that *T. japonicus* may not be a rare species in the Gulf of Finland. We thus anticipate that the species can be found from other coastal habitats in the Gulf of Finland, particularly near large seaports. Future studies are required to determine species' tolerance towards freshwater and its

possible distribution in large river deltas, such as that of R. Kymi in SE Finland.

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