



The larval development of the mud shrimp *Upogebia issaeffi* (Balss, 1913) (Decapoda: Gebiidea: Upogebiidae) reared under laboratory conditions

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Abstract

Larval development of the mud shrimp *Upogebia issaeffi* (Balss, 1913) (Decapoda: Gebiidea: Upogebiidae) is described and illustrated for the first time from material reared in the laboratory. The development includes four zoeal and a single megalopal stages. At 20–22°C the first megalopa was attained 12 days after hatching. *U. issaeffi* is distinguished from *U. major*, the second upogebiid species inhabiting Russian waters of the Sea of Japan, by the presence of the fourth zoeal stage and considerably more intensive larval setation.

Key words: Gebiidea, Upogebiidae, larva, zoea, megalopa, Sea of Japan

Introduction

Mud and ghost burrowing thalassinidean shrimps are widely distributed in the Russian waters of the Sea of Japan. There are six species in this region at least, which reach high population density on muddy and sandy flats. Unfortunately, they are poorly caught with the traditional fishing gears. Therefore, it has given a little attention to the biology of this group, especially to the reproduction and larval development.

Two large upogebiid species, *Upogebia major* (De Haan, 1841) and *U. issaeffi* (Balss, 1913), are found in Peter the Great Bay of the Sea of Japan (Marin *et al.* 2011). Vladivostok region (southern Russia) is a type locality of *U. issaeffi* (see Makarov 1938). This species was also collected from Honshu, islands in the Seto Inland Sea, and the Koshiki-jima Islands, west of Kyushu (Itani 2004). *U. issaeffi* is distributed in mid-intertidal boulder shores and sandy shores (Itani 2004).

The larvae of *U. major* were described in detail by Konishi (1989), but the larvae of *U. issaeffi* are unknown. The aim of this study is to give a description of the complete larval development of *U. issaeffi* based on the laboratory reared material. The present paper is the first description of the larval development of thalassinidean shrimps in the Russian waters.

Material and methods

This study was undertaken on the Vostok Marine Biological Station of the Institute of Marine Biology (Russian Academy of Sciences), Vostok Bay (inner Bay of Peter the Great Bay, Sea of Japan), in July, 2011. An ovigerous female of *Upogebia issaeffi* was collected with a pump in a boulder shore, at a depth of 1 m. The female was maintained in an aquarium with aerated seawater until hatching of the larvae. After hatching larvae were concentrated at the edge of the aquarium using a direct light source, transferred to 1 L glass vessels with filtered and UV-sterilized seawater and reared to the megalopal stage at a temperature of 20–22°C and a salinity of 32‰. The density of larvae was about 100 specimens per litre. The water in the vessels was changed daily. The zoeal stages of *U. issaeffi* were fed with newly hatched nauplii of *Artemia* sp.