The First Record of an Entocytherid Ostracod (Crustacea: Cytheroidea) from Japan

Robin J. Smith and Takahiro Kamiya

Department of Earth Sciences, Kanazawa University, Kakuma, Kanazawa 920-1192, Japan

Abstract: The first record of an entocytherid ostracod from Japan is reported. Uncinocythere occidentalis (Kozloff and Whitman, 1954) was found living commensally on the crayfish Pacifastacus leniusculus trowbridgii in Hokkaido, Japan. This is also the first record of U. occidentalis outside the western United States and it is postulated that it is an invasive species in Japan, unwittingly imported with this North American crayfish.

Key words: commensal, Entocytheridae, Japan, Ostracoda, signal crayfish, introduced species

INTRODUCTION

The Entocytheridae are a diverse family of ostracods with 178 described species in 31 genera and 5 subfamilies. They are commensal on other crustaceans, including crayfishes, isopods, amphipods and crabs and are typically under 500 μm in length with a weakly calcified carapace. The Entocytheridae have modified thoracic appendages and some species have reduced or absent maxillules. Hart and Hart (1974) extensively reviewed the family Entocytheridae and provided a taxonomic key based primarily on the hemipenes. The reported geographical distribution of the Entocytheridae includes North America, Mexico, Cuba, Hawaii, New Zealand, Australia, Europe, New Guinea and India (Hart and Hart 1974); however, recently entocytherid ostracods have been collected in Hokkaido, Japan, and these are the subject of this paper.

MATERIALS AND METHODS

The specimens were collected from Shikaribetsu Lake, Shikaoi-cho, Hokkaido, Japan, and from Hosooka, Kushiro Shitsugen National Park, Hokkaido, Japan, by Dr. Akifumi Ohtaka and Dr. Shin-Ichi Hiruta, respectively, in September 2000. The crayfish Pacifastacus leniusculus trowbridgii (signal crayfish) were captured, and entocytherid ostracods were collected by filtering the fixative (formalin) used for the crayfish. The ostracods were then washed and placed in 70% ethanol for storage. Soft parts were dissected and mounted in glycerin on glass slides and the appendages were drawn with the aid of a camera lucida. Whole specimens were freeze-dried and photographed using a JEOL JSM-5310 scanning electron microscope. Terminology used in the description of the hemipenes follows that of Hart and Hart (1974). All figured material is in the collection of the Department of Earth Sciences, Kanazawa University (GKZ 80013 to GKZ 80020).

DESCRIPTION

Family: Entocytheridae Hoff, 1942
Subfamily: Entocytherinae Hoff, 1942
Genus: Uncinocythere Hart, 1962
Species: Uncinocythere occidentalis (Kozloff and Whitman, 1954)

Female carapace length: 430–459 μm, height: 252–267 μm (Fig. 1). Male carapace length: 370–393 μm, height: 208–230 μm (Fig. 1). The carapace is lightly calcified and translucent to transparent. The hinge is...
very simple, the carapace surface is smooth and the margins of the valves have no inner lamellae. The carapace is sexually dimorphic with females averaging 17% longer than the males, and 22% higher than males. In lateral view the carapace has a straight to slightly sinuous ventral margin, with the posterior region more inflated than the anterior margin, especially in females (Fig. 1, A). Maximum height is approximately at mid-length. In ventral view the carapace is narrow (Fig. 1, B). No muscle scars are discernible. Males are often found in a copulating position with juvenile females (Fig. 1, C).

The antennule consists of seven elongate podomeres (Fig. 2). The second podomere has a hirsute seta on the apical-ventral corner. The third podomere has a seta on the apical edge. The fourth podomere has a seta on the apical-ventral corner and another on the apical-dorsal corner. The fifth podomere has three setae on the apical-dorsal corner and three setae on the apical-ventral corner. The sixth podomere has no apical setae. The final podomere is capped with five setae, one of which is shorter than the rest and has a rounded terminal end.

The antenna consists of five podomeres (Fig. 2). The first podomere supports an unjointed exopodite (the spinneret seta), which extends to the end of the limb. The second podomere has a hirsute seta on the apical-ventral corner. The third podomere has two setae on the apical-ventral corner. The fourth podomere has one hirsute subapical-ventral seta and one smaller, smooth seta on the subapical-ventral edge. The fifth podomere is sexually dimorphic. Males; the fifth podomere supports three curved claws, the most dorsal of which protrudes from a sub-apical position and has a distinctive notch just under the serrated end, while the other two claws are both situated apically, with serrated distal ends, one claw being approximately half the length of the other. Females; the fifth podomere has one thin, curved claw on the dorsal corner, one small claw next to it, and a large, broad claw on the ventral corner, and all three claws are distally serrated.

The mandibular palp is elongate, without any discernible segmentation apart from that of the final podomere (Fig. 2). The branchial plate of the palp supports three, long, backswept setae. The inner edge of the palp has one long seta which is bent distally. The terminal end of the main part of the palp has a sub-apical seta on the outer edge, a hirsute seta on the
Fig. 2. *Uncinocythere occidentalis* (Kozloff and Whitman, 1954), Shikaribetsu Lake, Shikaoi-cho, central Hokkaido, Japan. Antennule (male) (GKZ 80015); Antenna (male) (GKZ 80015); Antenna (female) (GKZ 80013); Mandible (male) (GKZ 80015); Maxillule (female) (GKZ 80017); Branchial plate (female) (GKZ 80013); 5th, 6th & 7th limbs (female) (GKZ 80016); Hemipenes (GKZ 80014).
apical-outer corner, and a final, sub-quadrate podomere with a curved, serrated claw and two apical setae. The mandibular coxa has a well developed endite with six teeth, and a sub-apical seta on the outer edge.

The rake-shaped organs are well developed and have 11 teeth along the distal edge (Fig. 2). The roots bifurcate on the inner edge.

The maxillule consists of a palp, a masticatory lobe (endite) and a branchial plate (Fig. 2). The palp is unsegmented and elongate, terminating in a smooth seta and a stout, distally hirsute seta. The masticatory lobe is not as long as the palp and is only lightly sclerified. It terminates in two smooth setae. The branchial plate has approximately 21 setae arranged along the posterior and ventral edges.

The fifth limb has four podomeres, the first of which is elongate, with two hirsute setae on the apical-dorsal corner (Fig. 2). The second podomere is elongate and slightly broader distally than at its proximal end; it supports a small, sub-apical seta on the ventral edge. The third podomere is short, with a small hirsute seta on the apical-ventral corner. The final podomere is quadrate and supports a rounded base from the ventral edge of which five short setae protrude.

The chaetotaxy of the sixth and seventh limbs is very similar to that of the fifth limb, with the exception that the first podomeres only have one hirsute seta on the apical-ventral corner (Fig. 2). The sixth limb is more elongate than the fifth limb; the seventh limb is more elongate than the sixth limb. The fifth, sixth, and seventh limbs are all connected to a well developed chitinious framework within the body.

The peniferum of the hemipenes tapers distally with two small, opposed processes at the distal end (Fig. 2). The penis is situated approximately three quarters of the way down the length of the peniferum. The clasping apparatus is evenly curved, with a single tooth on the internal border of the horizontal ramus. The horizontal ramus terminates in four denticles. The ventral finger is long and reaches to the end of the clasping apparatus. The dorsal finger is short, with a broad first segment and a thin second segment.

**DISCUSSION**

Although the Entocytheridea are a geographically widespread group and have been found in the Americas, Europe, New Zealand, Australia and southern Asia (India and New Guinea) (Hart and Hart 1974), this is the first time that this family has been found in north eastern Asia. Not only does this record constitute the first record of the Entocytheridea in Japan but it is also the first record of the subfamily Entocytherininae outside the Americas, the Caribbean and Hawaii, and the first record of *Uncinocythere occidentalis* outside the western United States. The recorded geographical distribution of *U. occidentalis* includes California, Idaho, Nevada, Oregon, Washington and Wyoming (see Hart and Hart, 1974 for more specific locality data). This record thus represents an important increase in the knowledge of the distribution of the Entocytheridae, and in particular *U. occidentalis*.

*P. leniusculus trowbridgii* was originally imported to Hokkaido from the western United States by the Japanese Government between 1926 and 1930 (Kamita 1970). Since then this species has colonized many areas of eastern Hokkaido, especially around Kushiro Marsh and it is threatening the existence of the native species of crayfish as it expands its range (Hiruta 1999). It is therefore highly likely that the associated ostracod *U. occidentalis* is also an invasive species and not originally native to Japan. Other species that have been introduced into Japan via imported crayfish include the ectosymbiotic annelid *Cambarincola okadai* Yamaguchi, 1933 (see Gelder and Ohtaka 2000). Exotic ectosymbionts can become part of the local fauna and may adopt endemic species as new hosts (Gelder et al. 1999). It is so far unknown if exotic entocytherid ostracods are able to adopt endemic species as new hosts, and there are no reports of entocytherids on endemic Japanese crayfish.

**Acknowledgments.** The authors thank Dr. Akifumi Ohtaka (Department of Natural Sciences, Faculty of Education, Hirosaki University) and Dr. Shin-Ichi Hiruta (Department of Biology, Hokkaido University of Education at Kushiro) for the specimens of *Uncinocythere occidentalis*, and for providing the opportunity to study them. We also thank the anonymous reviewers for their useful comments. RJS thanks the Japanese Society for the Promotion of Science and the Royal Society (UK) for funding (P 99764).

**REFERENCES**


