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Complete morphological re-description of mud-dwelling axiid *Leonardsaxius amurensis* (Kobjakova, 1937) with remarks on Axiidae (Crustacea: Decapoda: Axiidea) from the Russian coast of the Sea of Japan

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Abstract

The first complete re-description of mud-dwelling axiid *Leonardsaxius amurensis* (Kobjakova, 1937) (Crustacea: Decapoda: Axiidea) is presented based on the holotype and freshly collected specimens from Vostok Bay, Russia coast of the Sea of Japan. The species is mostly morphologically similar to *Leonardsaxius spinulicauda* (Rathbun, 1902) known from Pacific coasts of North America from Vancouver to California but can be morphologically separated mainly by morphology of carapace and coloration of cornea of eyes. Remarks on distribution of *Leonardsaxius amurensis* (Kobjakova, 1937) and the second axiid species, *Boasaxius princeps* (Boas, 1880), known along Russian coastline of the Sea of Japan are given.

Key words: Crustacea, Decapoda, Axiidae, *Leonardsaxius amurensis*, *Boasaxius princeps*, Vostok Bay, the Peter the Great Bay, the Sea of Japan, Russia, northern Pacific, new records

Introduction

Infraorder Axiidea (Crustacea: Decapoda) presently includes 6 families and about 420 species worldwide (Sakai, 2011). These marine crustaceans inhabit all Oceans, from littoral to bathyal depths; freshwater or brackish forms are still unknown (Dworschak et al, 2012; Kornienko, 2013). Study of the diversity of axiids from Russian far-Eastern seas started at the first half of the 20th century. The first descriptions were presented by Kobjakova (1937): *Calastacus quinqueseriatus* Rathbun, 1902 [= *Calocarides quinqueseriatus* (Rathbun, 1902)] was described from the Sea of Okhotsk at the depths of 1150 meters and new subspecies *Axius spinulicauda amurensis* Kobjakova, 1937 was described from Amur Bay of the Sea of Japan at the depths 31 meters (Kobjakova, 1937); and later from Vostok Bay of the Sea of Japan (color photo in Marin, 2013b; Marin & Kornienko, 2014). The presence of *Calastacus quinqueseriatus* in the Sea of Okhotsk and Bering Sea at the depths of 1040–1240 and 2220 meters, respectively, were briefly confirmed by Birstein & Vinogradov (1951, 1953). Makarov (1938) presented a brief description of morphology of shallow water axiid *Axiopsis princeps* (Boas, 1880) from the Sea of Japan. Later, the species has been referred to the newly described genera *Axiopsis* Borradaile, 1903 (Borradaile, 1903), *Allaxius* Sakai & de Saint Laurent, 1989 (Sakai & de Saint Laurent, 1989) and recently reported as *Boasaxius princeps* (Boas, 1880) placing into recently suggested monotypic genus *Boasaxius* Sakai, 2011 (Sakai, 2011). The first larval stage of the species was described from Vostok Bay of the Sea of Japan (as *Allaxius princeps*) (Kornienko & Korn, 2012; Kornienko et al, 2014); color photos of *Leonardsaxius amurensis* (as *Calocarides amurensis*) and *Boasaxius princeps* (as *Axiopsis princeps* or *Allaxius princeps*) (Miyake, 1982; Sliskin, 2010; Marin, 2013b) are presented in the respective atlases of decapod crustaceans. Thus, according to literature and own data, three species of axiids have been noted for fauna of the Russian far-Eastern seas, two of which, *Leonardsaxius amurensis* and *Boasaxius princeps*, occur along the Russian coastline of the Sea of Japan.

Axius spinulicauda amurensis Kobjakova, 1937 described from the Sea of Japan was transferred later to the genera *Axiopsis* Borradaile, 1903 (Vinogradov, 1950), *Calocarides* Wollebaek, 1908 (Sakai & de Saint Laurent,

Conclusion

According to literature and own data, the axiid fauna of the Russian far-Eastern seas includes 3 species of axiids, *Calocarides quinqueseriatus* (Rathbun, 1902) (Kobjakova, 1937; Birstein & Vinogradov, 1951, 1953; Marin, 2013b), *Leonardsaxius amurensis* Kobjakova, 1937; Marin, 2013b; the present paper) and *Boaxius princeps* (Sliskin, 2010; Kornienko & Korn, 2012; Marin, 2013b; the present paper), the two latter species occur along the Russian coastline of the Sea of Japan. The list of Decapoda species known from Vostok Bay of the Sea of Japan includes 62 species belonging to 22 families (Marin, Kornienko, Tyurin, in prep.) including only 2 axiid species mentioned above. It is interesting that 3 species of relatively large and common shallow water cryptofaunal decapods, viz. burrowing axiid *Leonardsaxius amurensis* (Kobjakova, 1937; the present paper), burrowing callianassid ghost shrimp *Nihonotrypaea makarovi* Marin, 2013 (Marin, 2013c) and *Upogebia*-associated alpheid shrimp *Betaeus levifrons* Vinogradov, 1950 (Vinogradov, 1950; Marin, 2010), are presently known exclusively from Vostok Bay and some other parts of the Peter the Great Bay within the Sea of Japan, showing the rather high level (about 5%) of local endemism among all local Decapoda species richness of this area.

However, some authors (Kensley & Komai, 1992; Kensley, 1996) according to the figures presented by Kobjakova (1937) suggested an incorrect identification of *Calocarides quinqueseriatus* from the Sea of Okhotsk and Bering Sea as the true species usually found along the Pacific coast of North America, supposing that the species of the Sea of Okhotsk and the Bering Sea is close to *Calocarides soyoi* (Yokoya, 1933) but possesses smooth chela of first pereopods (cheliped) opposite to the latter species having chelipeds covered with fine spinules and serrated palm along its dorsal and ventral edges (Kensley & Komai, 1992). During last careful search in the collections of the Zoological Institute and Zoological Museum of MSU the specimens of *Calocarides quinqueseriatus* described by Kobjakova (1937) and Birstein & Vinogradov (1951, 1953) from the Sea of Okhotsk and Bering Sea were not found and the their exact identification remains questionable.

Burrowing decapods crustaceans are rather common in the studied area (for example, Selin, 2013; Marin & Kornienko, 2014) but rarely collecting by usual sampling methods such as dredging or hand sampling with the help of SCUBA. But they can be collected with the help of special suction pump (or yabby-pump) allowing to pull out of them from substratum or burrows as well as other mud or sand-dwelling decapods (for example, see Dworschak et al, 2006; Anker, & Marin, 2009; Anker et al, 2014; Marin, 2008, 2014); but this method of sampling rarely used in the region, especially for sampling of deep-water burrowing decapods (living deeper than 20 meters). For example, *Calocaris granulosa* Grebenjuk, 1975 is known from both Alaska and Sagami Bay, at the depth of 250–280 meters (according to Sakai, 1987), but still unrecorded from the Sea of Japan.

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