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Three new species of the genus *Loxoconcha* (Crustacea, Ostracoda, Podocopida) from the Okinawa Islands, southern Japan

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Abstract

Three new species of Ostracoda, *Loxoconcha noharai* sp. nov., *L. santosi* sp. nov. and *L. sesokoensis* sp. nov., are described from the Okinawa Islands, southern Japan. The two species *Loxoconcha noharai* sp. nov. and *L. santosi* sp. nov. live in estuaries, whereas the species *L. sesokoensis* sp. nov. lives in coral reefs. These species can be easily distinguished from other previously described *Loxoconcha* species by their morphological differences, mainly in the male copulatory organ, and distribution pattern of their pore systems. In addition, *L. sesokoensis* sp. nov. is suggested to be phylogenetically apart from any other *Loxoconcha* species which have been reported so far from Japan and the adjacent seas.

Key words: taxonomy, soft parts morphology, brackish-water, estuary, coral reef

Introduction

The genus *Loxoconcha* Sars, 1866 is one of the most diverse Recent ostracod taxa. Species of this genus are distributed in low to middle latitude areas of marine and brackish waters, and up to more than 150 living and 350 fossil species have been identified in the world (Kempf 1986a, 1986b). Since a part of these species was later assigned to other genera, e.g. *Palmoconcha*, *Sagmatocythere* and *Loxocorniculum*, the effective species number of *Loxoconcha* must be smaller. More than twenty living and four fossil species have been described so far from Japan (Ishii *et al.* 2005; Ozawa & Ishii 2008).

As for the phylogenetical view of this genus, there are four remarkable papers. Firstly, Kamiya (1988) described two main modes of life in *Loxoconcha* species, i.e., phytal and bottom-dwelling, and suggested that these modes reflect the differences of adaption to each microhabitat. He showed the distinct differences in carapace morphologies between species of the two life modes. The phytal species were round in lateral view and rugby-ball shaped in posterior view, whereas the sand bottom species were elongate rectangular in lateral view and triangular in posterior view. Secondly, Kamiya (1989) interpreted the difference in the distributional patterns of pore-systems in the adults of the phytal species *L. japonica* and the bottom-dwelling species *L. uranouchiensis*, especially in the ventral area as the result of adaptation to their respective microhabitats. Thirdly, on the basis of carapace morphology, Tanaka & Ikeya (2002) divided the genus *Loxoconcha* from East Asia into five species groups. The migration and speciation patterns of four species of the *L. japonica* species group were presented. Fourthly, Ishii *et al.* (2005) studied 17 species of *Loxoconcha* around Japan, and concluded that they were divided into two groups according to the distribution pattern of the pore systems located below the eye tubercle. The Group A is more diverse, but has fewer pore systems in the ventral area than Group B, and tends to inhabit normal marine environments, while the Group B inhabits brackish water. They also showed that the density of pore-systems on the ventral area of *Loxoconcha* species was not determined by the adaptation to habitat, but by phylogeny.

Since the 1970s, various studies on Recent ostracod assemblages from brackish waters and coral reefs of Okinawa Islands have been published (Nohara 1976, 1981a, 1981b; Nohara & Tomoyose 1977; Nohara & Yabu, 1983). Nohara & Tsukishima (1980) investigated the ostracod distribution in coral reefs of Komesu and southeast

When comparing *L. sesokoensis* **sp. nov.**, with Ishii *et al.*'s (2005) results, the distributional pattern of the pore system below the eye tubercle in this new species is unique (Fig. 14C, D), i.e. neither belonging to Group A (fully marine; phytal, or bottom-dwellers) nor to Group B (brackish, bottom-dweller). Since Ishii *et al.* (loc. cit.) do not cover any coral reef *Loxococoncha* species, their grouping obviously cannot be applied to *L. sesokoensis* **sp. nov.**, which inhabits the sediment surface in coral reefs. The present paper thus expands of the knowledge of possible correlations between pore system pattern and habitat in *Loxococoncha* species around Japan.

In previous descriptions of *Loxococoncha* species, Okubo (1980) defined the genus by the following features (Table 2): mandible with exopodite of 4 setae, third podomere distally with 2 claws and 2 setae; in the maxillula, each of 3 masticatory lobes distally consisting of 6 stout setae. Recently, Nakao & Tsukagoshi (2002) studied two *Loxococoncha* species from the Obitsu River Estuary, central Japan, and described them as follows (Table 2): basis bearing exopodite in the mandible of *Loxococoncha kosugii* being composed of 4 plumose setae and 1 short, simple seta; third podomere of endopodite bearing 4 simple setae and 1 short, plumose seta; in *L. pulchra*, third podomere of endopodite of the mandible bearing 2 stout setae and 1 plumose seta; 3 endites of the maxillula bearing 6, 7, and 4 setae, respectively; most ventral seta of 3rd endite with long hairs arranged in 2 rows and terminating in spatula-like head. In the present study, the exopodite of the mandible bearing 4 setae for *L. noharai* **sp. nov.**, *L. santosi* **sp. nov.** and *L. sesokoensis* **sp. nov.**; 3 endites of the maxillula consist of 6, 6 and 4 setae, respectively for *L. noharai* **sp. nov.**; 6, 5, and 5 setae, respectively for *L. santosi* **sp. nov.** and 5, 6 and 5 setae, respectively for *L. sesokoensis* **sp. nov.**; in the maxillula, the most ventral seta of 3rd endite in all three species bear long setules, forming a cluster and terminating in a club-like process. The plumose seta on the posterior margin of first podomere consisting of several long setulae is found at the fifth and sixth limbs in *L. santosi* **sp. nov.**, *L. sesokoensis* **sp. nov.**, and *L. noharai* **sp. nov.**, but also at the seventh limb in *L. noharai* **sp. nov.**

In the past, chaetotaxy of *Loxococoncha* species has not been given enough attention to, although it bears many potentially species specific characters. Especially the chaetotaxy of maxillulae should be included to the descriptions of species of the genus.

With the aim of confirming the new species, we compared their carapace morphology in external lateral view of with *Loxococoncha* species not only from around Japan but also from the western Pacific, e.g., Australia (Yassini & Jones 1995), Indonesia-Malaysia (Whatley & Zhao 1987, 1988), China (Brady 1869, 1880; Hou *et al.* 1981; Gou *et al.* 1983; Wang & Zhao 1985; Zhao 1985; Zhao *et al.* 1985), Korea (Cheong *et al.* 1986; Paik & Lee 1988; Huh & Paik 1992) and Taiwan (Hu & Tao, 2008). The here described three new species are morphologically different from other *Loxococoncha* species described from Japan and the Western Pacific.

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