

Freshwater and Brackish-water Macroinvertebrates in the Ogasawara Islands

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Abstract

During the past twenty years several surveys have been conducted on the freshwater and brackish-water macroinvertebrates of the Ogasawara Islands. As a result, several species of macroinvertebrates have been described as new species endemic to these islands. Subsequent investigation has shown that some of these endemic species are on the verge of extinction. Consequently, the species are treated as threatened or endangered species in the Red List by the Ministry of the Environment, Japan.

Key words : brackish-water, endemic species, freshwater, macroinvertebrates, oceanic islands

1. Introduction

The Ogasawara Islands are known as oceanic islands that consist of small islands such as Chichi-Jima and Haha-Jima. During the past twenty years several surveys were conducted on the freshwater and brackish-water macroinvertebrates of the Ogasawara Islands by several research groups. As a result, macroinvertebrates species such as a caridean shrimp, mitten crab, isopod and caddisflies were described as new species endemic to these islands (Komai *et al.*, 2006; Ito *et al.*, 2011; Nunomura & Satake, 2006; Satake & Cai, 2005; Satake *et al.*, 2005). Subsequent investigation showed that some of these endemic species were on the verge of extinction. At present, some of these species are treated as threatened or endangered species in the Red List of the Ministry of the Environment, Japan.

2. Fauna Identified

2.1 Aquatic Insects

The distribution of EPT (typical aquatic insect fauna of the three orders Ephemeroptera, Plecoptera and Trichoptera) among oceanic islands is extremely rare anywhere in the world. In the Ogasawara Islands, aquatic insects of the orders Ephemeroptera and Plecoptera seem to be absent. However, it has been confirmed that two species of Trichoptera or caddisflies inhabit streams of the Ogasawara Islands. One species of the genus *Goera* that inhabits only the headwaters of Chichi-Jima was described as a new species, *Goera ogasawaraensis*,

endemic to the Ogasawara Islands (Satake *et al.*, 2005). Another caddisfly species of the genus *Hydroptila* was confirmed in the rivers of Chichi-Jima and Haha-Jima, and was also described as a new species, *Hydroptila ogasawaraensis*, endemic to these islands (Ito *et al.*, 2011).

Regarding the other aquatic insect orders, several studies were also conducted on the freshwaters of the Ogasawara Islands.

Recently, a new species of aquatic coleoptera of the genus *Ochthebius* was described as a new species. This record is the first from the family Hydraenidae in the Ogasawara Islands. This coleopteran species usually found in sheeting freshwaters, but after a drought in 2018–2019 the area of sheeting freshwater was markedly reduced (Yoshitomi *et al.*, 2019).

As for dipterans, chironomid fauna have been studied on Chichi-Jima and Haha-Jima during the last twenty years. A total of 17 species have been recorded, among which *Dicrotendipes yaeyamanus*, *Glyptotendipes tokunagai* and *Tanytarsus magnihamatus* were new to those islands. The chironomid fauna of these islands differ markedly from those of the Japanese mainland, and some species seem to be endemic to the islands, but as other species also occupy the Northern Marianas, further studies are needed to clarify the endemism of this group of insects (Ueno & Satake, 2009).

2.2 Crustaceans

Decapod crustaceans are typical fauna of the freshwater and brackish-water habitats of the Ogasawara

Islands.

As for freshwater and brackish-water shrimps, nine species from three families have been confirmed, of which there are three species of the family Palaemonidae, and five species of the family Atyidae. In addition, one species of the genus *Metabetaeus* has been discovered in an anchialine pool, but its taxonomic position is still uncertain. At present, two species of shrimps are regarded as endemic species to the Ogasawara Islands: *Palaemon ogasawaraensis*, which lives only in the brackish waters of Chichi-Jima (Kato & Takeda, 1981), and one species of the genus *Paratya* inhabiting the upstream stretches of some streams on Chichi-Jima and Haha-Jima, which has been described as *Paratya boninensis* (Satake & Cai, 2005). As for this species, compared with its congener shrimps living in Japan and neighboring countries, the body size is smaller, and the egg size is larger. At present, these two endemic shrimp species are regarded as endangered or threatened species by the Ministry of the Environment, Japan and are at risk of extinction due to habitat degradation, drought, etc. in their remaining habitat.

One species of mitten crab has been described as a new species endemic to the Ogasawara Islands (Komai *et al.*, 2006). Distribution patterns and life cycles of this mitten crab were revealed by Kobayashi and Satake (2009). Kobayashi and Satake (2017) compared morphological differences and growth patterns between this mitten crab and its congener, *Eriocheir japonica*, and concluded that the mean carapace width of this island species is 1.6 times larger than that of mainland species. In addition to this mitten crab, a sesamid crab and a fiddler crab have also been described as new species endemic to the Ogasawara Islands (Komai & Ng, 2013; Shi *et al.*, 2013). These three endemic crab species are regarded as endangered, threatened or vulnerable species by the Ministry of the Environment, Japan.

An endemic species has also been found from the Isopoda. One species of the genus *Gnorimosphaeroma*, which was collected from the upper reaches of a stream on Haha-Jima, was described as a new species (Nunomura & Satake, 2006). A new species of the genus *Ligia* was collected from steep streams on Chichi-Jima and Ani-Jima (Nunomura *et al.*, 2011). These two isopod species are regarded as species endemic to the Ogasawara Islands. As the habitat of these species is extremely unstable, these species seem to be at risk of extinction.

2.3 Gastropods

Although *Stenomelania boninensis* is known as a thiarid snail endemic to the Ogasawara Islands, an alien thiarid snail, *Melanoides tuberculata* was recorded from Chichi-Jima in 2005. *Melanoides tuberculata* was originally widely distributed from tropical to subtropical regions, such as East to South Asia, the Middle East and Northeast Africa, but has become an invasive alien



Fig. 1 An ovigerous female of the freshwater shrimp, *Paratya boninensis*, endemic to the Bonin Islands.

species in North America, South America, New Zealand, Europe and elsewhere, undergoing parthenogenetic reproduction. It is causing problems such as replacement of native gastropods. In the case of the Ogasawara Islands, there is a possibility of it replacing the endemic species *Stenomelania boninensis* through competition, so measures to reduce its effects are being sought (Sasaki *et al.*, 2009; Satake *et al.*, 2006).

3. Conclusions

In recent years, the extinction of various species and local populations has been reported occurring in the terrestrial habitats of the Ogasawara Islands. Freshwater and brackish-water endemic species are also at the risk of extinction possibly due to stream renovations, droughts and invasions of alien species (Sasaki *et al.*, 2009; Satake & Ueno, 2012). Protective measures and management plans are needed to conserve these species in the Ogasawara Islands, otherwise these endemic species may go extinct one after another.

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