

Microhabitat distribution and behaviour of Branchiobdellidan *Holtodrilus truncatus* found on the freshwater shrimp *Neocaridina* spp. from the Sugo River, Japan

Research Article

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Abstract: A study was performed on the microhabitat distribution and some aspects of behaviour of the ectosymbiotic branchiobdellidan *Holtodrilus truncatus* (Annelida, Clitellata) found on the freshwater shrimp that inhabit the Sugo River, Hyogo Prefecture, western Japan. Observations on shrimp that were collected from the Sugo River (2003 to 2011) confirmed that the host shrimp is *Neocaridina* spp. (Atyidae). The attachment location on the host shrimp was predominately between the 1st pleopod and the 5th pereopod (55.3%). The reproductive method of *H. truncatus* is hemaphroditism. The cocoon was found only inside the carapace of the host shrimp. The cocoon was transparent and contained a maximum of 14 juvenile worms (developing embryos). When hatching approached, *H. truncatus*'s worms became elongated and slender, and only one worm hatched out at a time. When *Holtodrilus truncatus* was removed from its host and was maintained in river water without any food, it survived for a maximum of 46 days. In a host exchange experiment, where we provided several other freshwater shrimp species, Palaemonidae fed on *H. truncatus*. Moreover, *Palaemon paucidens* and *Macrobrachium nipponense* from Lake Biwa also preyed upon *H. truncatus*. The possible symbiotic relationship between *H. truncatus* and *Neocaridina* spp. (family Atyidae) is further discussed.

Keywords: Branchiobdellidan • *Holtodrilus truncatus* • Behaviour • *Neocaridina* spp. • Survival time • Host exchange experiment

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1. Introduction

In 2003, Niwa *et al.* [1-4] discovered that the ectosymbiont annelid, *Holtodrilus truncatus* (ZIHU3066, Hokkaido University, Japan), which had previously been reported present only in China (Henan and Guangdong Provinces), was attached to the freshwater shrimp *Neocaridina* spp. in the Sugo River (Figure 1), Hyogo Prefecture, western Japan. The Japanese endemic species *Neocaridina denticulata denticulata* is a freshwater shrimp that is distributed mainly in western Japan [5]. However, many live *Neocaridina* spp. were imported from China and South Korea to be used as live bait for sport fishing in Japan [6,7]. *H. truncatus* has not been previously reported in Japan [2]. *H. truncatus* may have been imported unintentionally into Japan together

with bait shrimp, and later dispersed and settled after being discarded by sport fishers in the freshwater environment of the Sugo River [7,8]. Branchiobdellidans (Annelida) and temnocephalidans (Platyhelminthes) are both known to be ectosymbionts of decapod crustaceans. Their original geographical distributions are separate; the former is found in the northern hemisphere and the latter in the southern hemisphere [4,9]. However, the Sugo River in western Japan is an exceptional area, as both the branchiobdellid *H. truncatus* and the temnocephalid *Scutariella japonica* (Matjašič, 1990) can be found here together [1,3,4]. These species attach to the same host, *Neocaridina* spp., but their behaviour is not entirely clear. There are many unknown factors that affect the symbiotic relationship between *H. truncatus* on the host shrimp. We forcibly separated *H. truncatus*

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