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SHORT COMMUNICATION

First evidence on the epiphytic macroalga *Pylaiella littoralis* on the prawn *Palaemon adspersus*

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Abstract. In this paper we describe for the first time the presence of the epiphytic *Pylaiella littoralis* on the phytophilous prawn *Palaemon adspersus*. The female prawn was caught in an eutrophicated brackish-water coastal habitat (Kopli Bay, eastern Baltic Sea). The epiphyte covered various parts of the shrimp's cuticle, including antennules and limb segments. This phenomenon was not related to the damaged appendages that hindered the prawn from cleaning herself. However, such a camouflage may actually offer the prawn a unique defence against predators.

Key words: epiphytes, *Palaemon adspersus*, fouling.

INTRODUCTION

When epibionts are found on some organism, it obviously raises the question if this has to do with the epibionts' tolerance for the conditions of basibiont surfaces or, alternatively, the basibiont actively attracts beneficial epibionts in order to reduce drag, deter predation, or inhibit further fouling (e.g. Bernadsky et al., 1993; Cerrano et al., 2001; Dobretsov & Qian, 2004; Lee et al., 2006; Wahl, 2009).

Crustaceans have one of the highest numbers of species that are commonly colonized by other organisms or epibionts as the surface of crustacean cuticle represents a suitable substrate for the settlement of benthic organisms (Wahl, 2009). Owing to complex interactions between biota and the environment, the presence of epibionts may affect either directly or indirectly the adaptation of hosts to their environment (e.g. Wahl, 2008). Multicellular organisms attached to crustaceans may represent a wide range of animal and plant species. However, with every successive moult the old carapace is removed and therefore this temporary surface is suitable only for organisms with a short life cycle and/or a rapid growth phase (Gili et al., 1993).

As expected from their fast formation and growth, crustacean epibionts are relatively common in tropical seas. For example, pond-reared adult Malaysian prawns (*Macrobrachium rosenbergii*) were noted to carry several epibiotic organisms: green algae *Oedogonium crassiusculum* and Cyanobacteria, where infested specimens composed 58% of the male population (Smith et al., 1979). The tropical marine isopod *Dynamenella perforata* was also reported to have epiphytic algae in exposed conditions whereas those that were provided shelter carried no such algae (Glynn, 1970).

Green, red, and brown algae are common epiphytes on crabs. Approximately 25% of all the crabs surveyed by McGaw (2006) had one or several seaweeds growing on the antennae and anterior margins of the cephalothorax, probably used as camouflage. As for the spider crabs, seaweed attachment can be used not only as camouflage (Wicksten, 1993) but may also serve as a food store (Woods & McLay, 1994).

Epibionts can also bring about negative repercussions for their crustacean hosts. As a consequence of the fouling of antennules, olfactory setae (responsible for chemically mediated perception of food and mates) can be damaged, possibly leading to the interruption of distance hemoreception (Bauer, 1989). Crustacean decapods may reduce epibionts by mechanically removing the settlers during grooming or moulting. Such grooming is highly valuable in terms of species adaptation (Bauer, 1989) with caridean shrimps having even special appendages for this procedure (Bauer, 1978).

MATERIAL AND METHODS

The prawn specimens were caught with a small trap located at a depth of 1 m in Kopli Bay, the Gulf of Finland (59.45007°N, 24.60393°E) in June 2013. Sea surface salinity and temperature were estimated at 5.8 ppt and 18.2 °C, respectively. In this catch the following caridean shrimps were caught: *Palaemon adspersus*, *Palaemon elegans*, and *Crangon crangon* (number of specimens 15, 14, and 1, respectively). The substrate of the sampling site represented a mixture of hard and soft sediments with stones composing approximately 40%, and sand, clay, and gravel 60% of the total coverage. The green filamentous algae *Cladophora glomerata* dominated in the area with a total cover of 60%.

The prawn specimen covered with the macroalga *Pylaiella littoralis* was kept in captivity in an aquarium with other *Palaemon adspersus* individuals and fed with chironomid larvae for a period of 3 days. Then the fouled specimen was fixed in 70% alcohol and examined under stereomicroscope for visible damages.

RESULTS AND DISCUSSION

The prawn *Palaemon adspersus* specimen covered with the epiphytic macroalga was a 6-cm long female (Fig. 1). Examination of the epiphytes under stereomicroscope

Fig. 1. *Palaemon adspersus* covered with the epiphytic macroalga.

allowed identifying the species as the filamentous brown alga *Pylaiella littoralis*, a common macrophyte species in the shallow coastal areas of the Baltic Sea. This brown algal species dominates in the study area during spring and early summer (Kotta et al., 2006). Thus, within the critical phase of the life cycle of the macroalga, the spores had attached to and grown upon different parts of the shrimp's cuticle, including antennules.

The third pair of maxilipedes, responsible for removing fouling from carapace appendages (as described by Bauer, 1977), was present and carried brushes. In the aquarium the prawn continuously cleaned the surface of its carapace with chelipedes, but the activity did not result in a visible reduction of the amount of epiphytes.

The antennules of the specimen were densely covered with the filamentous epiphyte, which was expected to change the prawn's behaviour in terms of food and mate perception (Bauer, 1989). Nevertheless, epiphytic algae did not largely affect the ability of the prawn to feed on chironomid larvae when kept in captivity for a 3-day period. Besides, the prawn continuously removed the algal fouling from its carapace with its chelipedes and even consumed some part of the algae. Besides, some smaller individuals interacted with the fouled prawn by removing algae from its body. Still, the prawn was more cautious compared to its counterparts. This behaviour pattern may be induced by fouled antennules leading to an impoverished distance hemoreception.

The epiphytic cover of prawns seems to be relatively rare in the Baltic Sea range as despite the large catching effort no other fouled specimens were caught during this and previous sampling campaigns. Neither are we aware of similar reports from elsewhere in the Baltic Sea. Bauer (1989) showed that amputation experiments and/or an extended intermoulting period of a large specimen may increase the probability of a prawn's fouling by epiphytes. The duration of the prawn's intermoult period depends on external factors, among which the key is the feeding regime of the prawn. In laboratory conditions the intermoult period usually exceeds 10 days (Salama and Hartnoll, 1992). However, we should take into account that such an old individual as described in the current study has a very slow growth rate and therefore moulting takes place less often. On hard substrata that are constantly submerged, it takes at least a week for filamentous algae to reach the size on the observed prawn (authors' personal observations).

Such an epiphytic cover may actually be beneficial to the infested prawn. Specifically, the camouflage may reduce the predation risk of cod and sculpins on *Palaemon adspersus* (Berglund & Rosenqvist, 1986). It is also interesting to note that the site where the prawn specimen was caught represents a highly eutrophicated water body with a high cover of opportunistic filamentous algae (Martin et al., 2003). Thus, we cannot exclude the probability that such an abnormal growth of epiphytes on prawn is a consequence of human-induced eutrophication.

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