Epibiota associated with setae on Chinese mitten crab claws (*Eriocheir sinensis* H. Milne-Edwards, 1853): a first record*

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Abstract

Eriocheir sinensis H. Milne-Edwards, 1853 is a non-native species found in European waters. Analyses of mitten crabs caught in brackish waters (Gulf of Gdańsk, Poland) and in freshwater (Havel River, Germany) have indicated that numerous epibionts (possibly temporary) inhabit the dense setal mats that cover the chelipeds. Of the 950 associates found on 22 crabs collected from brackish water, the most abundant were *Nematoda* (82.3%), followed by *Bivalvia* (10.3%), *Crustacea* (5.6%), *Oligochaeta* (1.2%) and *Gastropoda* (0.6%). In comparison, 1280 specimens (*Chironomidae* – 67.6% and *Halacaridae* – 32.4%), were identified from 13 crabs collected in freshwater. As this crab can migrate long distances, it is capable of transporting native and non-native species via its mittened claws to new habitats.

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1. Introduction

Eriocheir sinensis Milne-Edwards, 1853, a native species of China and Korea (Leppäkoski & Olenin 2000), was first recorded in the River Aller, near Hamburg (Germany) in 1912 and has since dispersed to other European countries (Rasmussen 1987, Vincent 1996, Clark et al. 1998, Cabral & Costa 1999, Gollasch 1999, Valovirta & Eronen 2000, Paunovic et al. 2004, Panov 2006). The Chinese mitten crab is a catadromous species that lives most of its life in freshwater, but migrates downstream to reproduce and spawn in higher salinity waters (Panning 1939). This crab presents a substratum for green algae, red algae, bryozoans, tubes of polychaetes, and mussels (Panning 1952, Kobayashi & Matsuura 1994). Recent studies of mitten crabs have shown, however, that the dense setal patches on the chelipeds might offer an additional habitat for a number of small organisms. As this exotic crab is capable of migrating long distances, up to 18.1 km per day (Herborg et al. 2003), it is possible that both native and non-native species may be transported to new habitats in the setal mats of its claws. The present paper reports for the first time on the occurrence of the epibiota collected in the mittens of *E. sinensis* from the Gulf of Gdańsk (Poland) and the Havel River (Germany).

2. Material and methods

The analysis was based on 22 crabs (3 females and 19 males) collected in the Gulf of Gdańsk (Poland) during 2002–2005, and 13 specimens (7 females and 6 males) caught in the Havel River (Germany) during September 2004. The crabs were caught in flounder nets or in fyke-nets and after collection were frozen at -20°C. In the laboratory the crabs were sexed on the basis of the abdominal structure (Panning 1952), after which their carapace width and claw length were measured using a slide caliper (± 0.1 mm). Next, the setae covering the claws were removed with a scalpel and analysed under a stereomicroscope EVB-208 (ECOTONE, Poland) in order to identify the higher taxa present (Stańczykowska 1986).

Linear regression ($y = ax + b$) and determination coefficients (r^2) were used to describe the relationship between the investigated parameters at a significance level of $p < 0.05$.

3. Results

The carapace width of the Polish crabs ranged from 53.5 to 73.3 mm, the claw length from 35.9 to 59.2 mm (Table 1). The carapace width of the German crabs ranged from 64.0 to 80.7 mm, and the claw length from 35.2 to 62.7 mm. The correlation between carapace width and claw length was

Table 1. *Eriocheir sinensis*: data on the 22 individiuals from the Gulf of Gdańsk and the 13 individiuals from the Havel River (CW – carapace width, M – male, F – female, CL – claw length)

Crabs from the Gulf of Gdańsk				Crabs from the Havel River			
Sex	CW [mm]	CL [mm]	Number of epibiota	Sex	CW [mm]	CL [mm]	Number of epibiota
M	53.5	35.9	5	F	64.0	35.2	45
F	54.6	32.8	20	F	65.8	46.2	31
M	58.5	37.6	21	F	67.4	48.2	94
M	58.6	38.9	32	F	68.2	37.2	155
M	58.6	39.8	15	F	69.5	39.4	67
M	58.6	39.9	24	F	70.7	40.2	23
M	59.3	40.1	16	F	72.7	39.7	52
M	59.5	40.6	66	M	73.8	53.9	216
F	62.1	34.0	59	M	74.3	54.6	217
M	62.3	44.2	58	M	75.2	42.3	201
M	62.9	45.0	96	M	76.0	43.3	128
M	63.9	45.3	18	M	79.9	62.6	10
M	64.3	46.8	130	M	80.7	62.7	41
M	65.0	48.6	153		avg. $\pm$ SD	avg. $\pm$ SD	avg. $\pm$ SD
M	65.5	49.1	28		71.9 ± 5.1	46.6 ± 9.3	91 ± 78
M	65.6	49.1	26				
M	66.2	49.3	16				
M	66.7	51.7	16				
F	70.2	40.2	20				
M	71.4	54.2	15				
M	73.2	59.2	45				
M	73.3	59.2	71				
	avg. $\pm$ SD	avg. $\pm$ SD	avg. $\pm$ SD				
	63.4 ± 5.5	44.6 ± 7.4	43 ± 39				

statistically significant ($p < 0.05$). Males had longer claws than females of the same carapace width.

Respectively representing 82.3% and 10.3% of all recorded specimens, *Nematoda* and *Bivalvia* were the most abundant organisms recorded from the claws of crabs collected in the Gulf of Gdańsk. Less frequent were *Crustacea*, *Oligochaeta* and *Gastropoda*, which respectively made up 5.6%, 1.2%, and 0.6% of all the recorded specimens. 86.8% of the crustaceans belonged to the *Harpacticoida*, 13.2% to the *Amphipoda*. The number of specimens found in the setae of individual crabs collected in the Gulf of Gdańsk varied from 4 to 153 (av. 43 ± 39). The percentages of the various taxonomic groups on the claws of *E. sinensis* individuals differed (Fig. 1a). The numbers of *Nematoda* found on individual crabs ranged from 1 to 137, *Bivalvia* from 1 to 15, and *Crustacea* from 1 to 13. One or

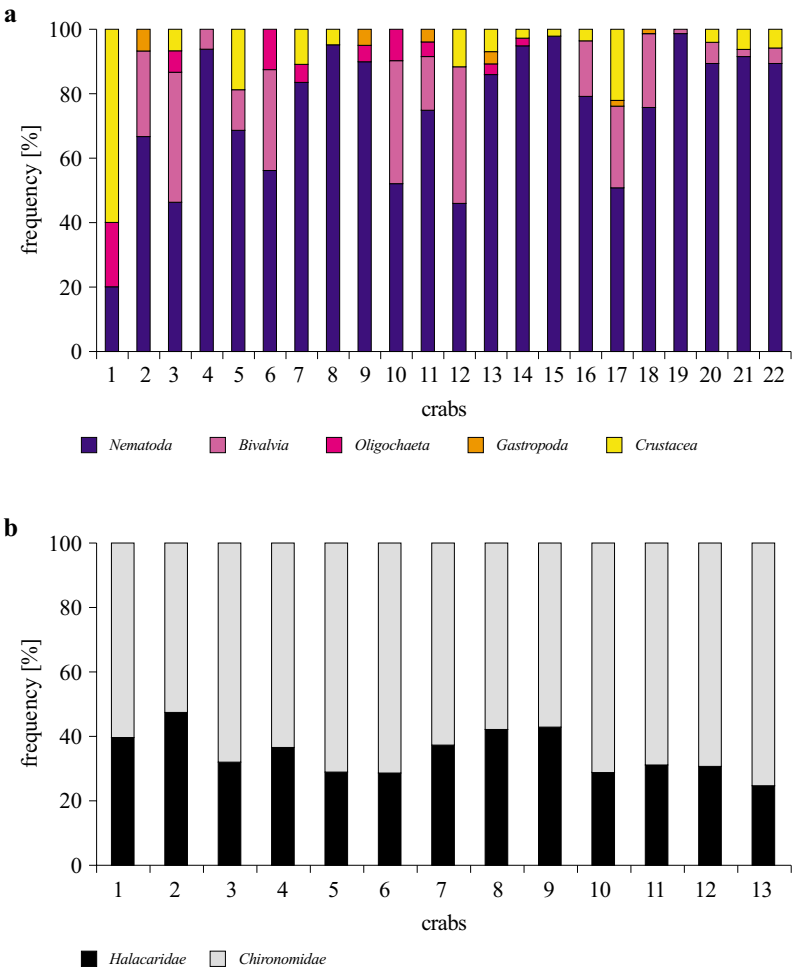

Fig. 1. Percentage of different taxa found in the setae covering the claws of *Eriocheir sinensis* individuals collected in the Gulf of Gdańsk (a) and the Havel River (b)

two oligochaetes, and just one single gastropod were noted. In comparison, a total of 1280 specimens were found in the setae of the 13 crabs from the Havel River. These specimens were all *Arthropoda* belonging to the *Chironomidae* (67.6%) and *Halacaridae* (32.4%); the numbers recorded from individual crabs ranged from 10 to 217 (av. 98 ± 76). The percentages of *Chironomidae* and *Halacaridae* on the claws of *E. sinensis* differed (Fig. 1b); their respective numbers varied from 6 to 163 and from 4 to 66. A significant increase in the number of epibionts with claw length was observed only in the German crabs ($p < 0.05$, $r^2 = 0.77$).

4. Discussion

Eriocheir sinensis was first noted in Polish waters nearly eighty years ago (Kulmatycki 1933). Since c. 1990, its numbers have increased, especially in the mouth of the River Oder and the Szczecin Lagoon (Normant et al. 2000, Czerniejewski & Wawrzyniak 2006), the Gulf of Gdańsk (Normant et al. 2002) and in the Vistula and Curonian Lagoons (Bacevicius 2004, Ojaveer et al. in press). It is possible that these crabs migrate into Polish waters through the system of rivers and canals from Germany, where they breed. Furthermore, Chinese mitten crabs are capable of migrating long distances and have even been observed in Czech and Serbian waters (Schäferna 1935, Paunovic et al. 2004).

As a result of the present research, four phyla were identified on the crabs from Polish brackish waters compared to only one on the specimens from German freshwaters. However, the density of organisms found on the latter was higher. This may have been because the chela of the crabs from German waters were larger and covered with more setae. The number of organisms inhabiting the claws of these crabs may not just depend on size, but also on sex. Females have smaller claws with fewer setae, so they can be expected to have fewer 'residents'. It appears that the majority of organisms inhabiting the setal mats of *E. sinensis* are commensal and include juvenile forms, primarily of *Bivalvia* and *Gastropoda*, but also of *Oligochaeta*, *Gammaridae*, and *Chironomidae*. Nevertheless, before any conclusions can be drawn regarding interactions between 'residents' and hosts, all of the organisms found have to be identified to species level.

Crabs can rid themselves of their individual epibionts when they shed their shells. But one has to bear in mind that the inter-moult period of large, old specimens with claws densely covered by setal mats is around one year (Panning 1939). During such a time crabs can disperse over several hundred kilometres (Herborg et al. 2003, Ojaveer et al. in press), so there is potentially a high risk of epibiotic 'residents' being transported over long distances.

The first of its kind, this study has indicated that, beside the massive carapace, the characteristic dense patches of setae covering the claws of *E. sinensis* may well offer a habitat for many different organisms. The next stage of this project will be to conduct detailed qualitative and quantitative analyses to determine precisely which species are present on the claws. This will enable us to define the role of Chinese mitten crabs in transporting small animals from one region to another.

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