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The response to variable salinity and the colonization of rivermouth environments in the myodocopan species *Parapolycope oligohalina* (Cladocopina, Polycopidae) from the oligohaline interstitial environment

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Most of myodocopan ostracods have been reported only from marine environments and only few species (e.g., *Eusarsiella zostericola* and *Polycope seridentata*) are found in low salinity environments, such as estuaries or rivermouths. Tanaka & Tsukagoshi (2010) discovered a new polycopid species (*Parapolycope oligohalina*) from the interstitial environment in Kanogawa rivermouth (central Japan: Suruga bay). We could find this species from the type locality and some other rivermouth sites, where at low tide the salinity goes down to values from 0–2 ‰. Moreover, we observed that this species swam actively in both low salinity water (1 ‰) and fully marine water (35 ‰) in a petri dish and survived there for about one month. As a result of the occurrences from the rivermouth sites and laboratory observations, it is supposed that *Parapolycope oligohalina* is adapted to oligohaline environment.

In this study, we performed experiments on the salinity tolerance of myodocopids and the molt of *P. oligohalina*, to elucidate if this species actually adapts to the rivermouth interstitial habitat. Based on the results of these experiments, we discuss the process of invasion to low salinity environments in *P. oligohalina*. Four myodocopid species were used in the salinity tolerance experiment as following; *Vargula hilgendorfii* (Myodocopina, bottom sand of infralittoral zone: euhaline), *Euphilomedes japonica* (Myodocopina, calcareous algae of tide pool: euhaline), *P. japonica* (Cladocopina, interstitial environment of intertidal zone: euhaline), *P. oligohalina* (Cladocopina, interstitial environment of rivermouth: oligohaline).

For the salinity tolerance experiment, 40 individuals of each species were put into petri dishes filled with water adjusted to various salinities (0, 3, 10, 30, 50 and 70 ‰) and all petri dishes were kept in an incubator at 21 degrees. We checked the petri dish under the microscope hourly during the first twelve hours and then daily for six days. The appendage movement of the examined specimens was confirmed to know whether the individuals are still alive or not. Dead animals, which did not move their appendages entirely, were removed from the petri dish and living ones were counted.

The examination revealed that epifaunal taxa, *V. hilgendorfii* and *E. japonica*, can survive only in fully marine salinity (30‰) which is comparable to that of their habitat. On the other hand, two interstitial species, *P. japonica* and *P. oligohalina*, show high salinity tolerance. *P. japonica* has a high salinity tolerance, though this species is often yielded from a euhaline environment, because it is inhabiting the interstitial system of beach with its highly variable salinity. However, the survival rate of *P. oligohalina* was clearly the highest within the wide salinity range from 0–70‰ (Fig. 1).

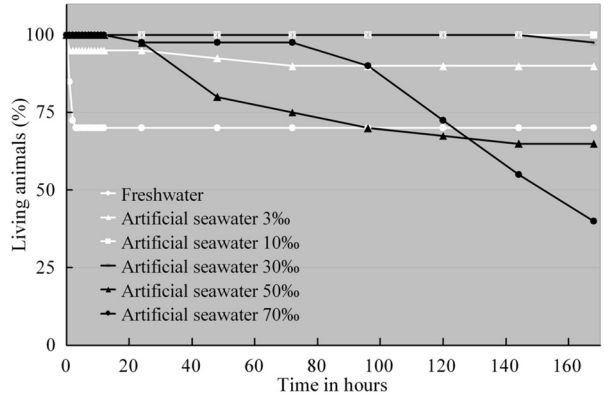

Fig. 1: Salinity tolerance of *Parapolycope oligohalina*.

For the molt experiment, the juveniles of the interstitial *P. oligohalina* from the rivermouth were used. They were put into petri dishes filled with water adjusted to various salinities (1, 5, 10, 20, 25 and 30‰) and these petri dishes were kept in an incubator at 21 degrees for one month.

As a result of this molt experiment, it is shown that only the individuals in the salinities from 5–25‰ shed their old exoskeleton (Fig. 2).

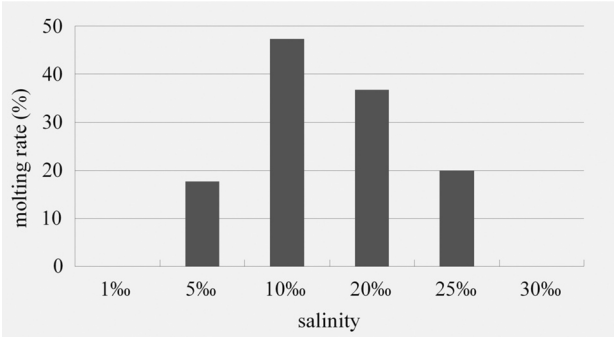

Fig. 2: Molting rate of *Parapolycope oligohalina*.

The percentage of the specimens carrying out the molt is the highest at 10‰. This fact indicates that the oligohaline (0–2‰) environment, which this species were collected from, is not a suitable condition for this species to molt. Besides, we found that the individuals in fully marine water at 30‰ never cast off the old exoskeleton.

Summing up, our experiments are showing the following facts (1) two interstitial *Parapolycope* species, *P. japonica* and *P. oligohalina*, have a high salinity tolerance (2) *P. oligohalina* can survive even in the oligohaline environment and (3) this species adapts completely to brackish condition (5–25‰) for its molt. Many *Parapolycope* species (e.g., *P. japonica*, *P. digitolabrum*, *P. spiralis*) except for *P. oligohalina* live in the interstitial environment of the intertidal zone, where the salinity often considerably changes because of the tide and rain. Thus, we hypothesize that the ancestor of *P. oligohalina* also had the salinity tolerance as *P. japonica* and then this ancestor species gradually migrated to the rivermouth where salinity varies drastically. In consequence, *P. oligohalina* has developed a higher salinity tolerance than that of the other myodocopans.

References

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