Hermit crabs in evidence: unusual gastropod shell occupation.

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Abstract

Empty gastropod shells have been shown to be a limiting resource to the hermit crab population. Here we report findings based on field collections of the occupancy of shells containing soft parts of snail by the hermit crab species *Dardanus insignis* and *Pagurus exilis* and the unique occupancy of a land gastropod shell by *D. insignis*. This is the first account of unusual shell occupation by hermit crabs in the Brazilian coast.

Key-Words: Paguridae, Diogenidae, hermit crabs, shells, unusual resources

Introduction

Hermit crabs are commonly found occupying empty marine gastropod shells. The strong association between these crustaceans and their occupied shelters has greatly influenced almost all aspects of their biology (Hazlett, 1981). When gastropod shells are not available, some hermits may utilize a variety of alternative shelters such as tusk shells, serpulid tubes, cavities of stones, sponges, dead corals, pieces of bamboo, bivalve shells. In this sense, Imafuku and Ando (1999) presented a good review about shelters occupation by hermit crabs.

Hermit crabs may obtain shells of many ways, such as: by the natural mortality of gastropod shells, finding empty shells, changing shells with other specimens, mainly. Some authors have described the active predation of gastropod shells by hermit crabs (Rutherford, 1977; Imafuku and Nakamura, 1995). However, according to Scully (1983) the predation of gastropods by the hermit crabs in laboratory conditions may not be considered as a natural event.

Only few reports to date have registered hermit crabs occupying shells with some remnants of the soft parts of the snail still in the shell (see Imafuku and Nakamura, 1995). In the Brazilian coast, there is a single and recent paper by Garcia et al. (in press), who reported the occupancy of unusual shelters by *Dardanus venosus* (H. Milne Edwards, 1848), *D. insignis* (Saussure, 1858), and *Paguristes erythrops* Holthuis, 1959.

During the last ten years an extensive effort has been made to identify and characterize the biology of decapods crustaceans occurring in the Ubatuba region (Hebling et al., 1994; Negreiros-Fransozo et al., 1997; Fransozo et al., 1998; Mantelatto and Garcia, 2002). In this sense, an impressive number of systematized samples were carried out during the last three consecutive years (2001 to 2003) on soft bottom substrate of shallow water areas (from 5 to 35 m deep) focusing on decapod species composition along the northern coast of São Paulo.

The occupancy of shells containing soft parts of snail by the hermit crabs *D. insignis* and *Pagurus exilis* (Benedict, 1892) and the unique occupancy of a land gastropod shell by *D. insignis* are presented here based on specimens collected in their natural habitat.

Material and Methods

In January and February 2003, hermit crabs occupying unusual shells were collected in one of the sampled area - Caraguatatuba Bay (23° 57′S, 45° 28′W). In June 2003, hermit crabs were also collected in another northern area - Ubatuba Bay (23° 26′ S, 45° 02′ W) of São Paulo State coast. Specimens were collected by a shrimp boat equipped with a double rig trawl net. All collections were made over transects of about 1 km² long.
The physical and chemical conditions of studied site have been described by Mantelatto and Fransozo (1999).

Hermit crabs obtained in the samplings were immediately frozen and transported to the laboratory where they were thawed at environment temperature and then removed from their shells. Sex of each crustacean was achieved from the gonopore position. Measurement of shield length (SL) of each hermit crab was made with a caliper (0.1 mm).

The shell species were identified according to Rios (1994) and confirmed by Dr. Wagner Avelar (from the same institution of the authors). All found shells were measured for their aperture width (SAW).

Voucher specimens collected are deposited in the Crustacean Collection of the Biology Department of FFCLRP, University of São Paulo, Brazil (DB/FFCLRP/USP 1111 to 1114).

Results

From the 93 animals captured in January and February, two males of Dardanus insignis (11.2 and 11.9 mm of SL, respectively) (table I and figure 1) inhabited Tonna galea (Linnaeus, 1758) shells (18.0 and 18.8 mm of SAW, respectively) with remnants of the soft parts of mollusks and/or the whole mollusk. From the 52 specimens of Pagurus exilis captured, one male (6.0 mm of SL), inhabited a Buconanops gradatum Deshayes, 1844 shell (18.7 mm of SAW) with soft parts of the snail too (table I and figure 1).

In June 2003, one female (14.9 mm of SL) of Dardanus insignis from a total of 10, was collected inhabiting a land gastropod shell Achatina fulica Bowdich, 1822 (SAW = 22.4 mm) (table I and figure 1).

Discussion

This is the first account on hermit crabs occupying shells with soft parts of snails to the Brazilian coast. It is important to note that during the last years working in the studied areas on biology and ecology of hermit crabs, almost all hermit species reported for the São Paulo coast region were found occupying only gastropod shells without soft parts of the mollusks in the natural population (Negreiros-Fransozo et al., 1991; Negreiros-Fransozo and Fransozo, 1992; Martinelli and Mantelatto, 1999; Bertini and Fransozo, 2000; Mantelatto and Garcia, 2000; Mantelatto and Dominicano, 2002; Mantelatto and Meireles, in press). This situation is uncommon and inspires caution since the cause of this occupation remains unknown. However, this condition may sign for an important aspect that affect directly the life cycle of hermit crabs – the resource availability.

The fact noticed here may indicate low availability of the resources for the natural populations of hermit crabs inhabiting the soft bottom region of these bays. This assertion can be considered once from our experience working on hermit’s community, this is the first occurrence of occupation of shell with parts of the snail. It is known that from the 8 species found in both bays (Biagi et al., unpub.), D. insignis is the dominant one with a large number of specimens, and with a great variety of hermit crabs in different size classes (Meireles pers. com.). We cannot discharge the hypothesis of the predation of live gastropods by D. insignis in function of high abundance in the area (Meireles, pers. obs.). The competition among hermit crabs in the area as well as the low number of available resources for occupation to larger specimens of D. insignis can also be other stressing elements.

The gastropod A. fulica was introduced in Brazil in 1988 from Africa for human consumption as “scargot”. As they have a high reproductive potential and the current market was not prepared to receive the great production, A. fulica has became an agricultural pest. The specimens have escaped from its artificial breeding sites dispersing to different regions and, thus colonizing them successfully (Teles et al., 1997; Vasconcellos and Pile, 2001). The occupation of A. fulica shell in Ubatuba could be supposed a discharge by people as a sewage, taking in to account that such biological material have been reared in areas close to the Ubatuba Bay (Vasconcellos and...
Our hypothesis is based on the fact the A. fulica is a land snail gastropod that is not reported in the marine region to date.

The present study reported isolated cases of uncommon hermit crab shell occupation in the São Paulo coast. Furthermore, intra and interspecific encounters, shell fights and low shell availability may have contributed to the occurrence of the situation described here. The most important aspect of this report is to make available this unusual information for the carcinologists’ community and focus on for this condition that can affect in some way the hermit crab community.

Table I: Records of hermit crabs from the São Paulo coast inhabiting gastropod shells containing soft parts of snail and occupying the land snail A. fulica.

<table>
<thead>
<tr>
<th>Species</th>
<th>Collection Site</th>
<th>Month (2003)</th>
<th>Total number of hermit crabs</th>
<th>% of soft parts occurrence</th>
<th>SL (mm)</th>
<th>Gastropod Shell species</th>
<th>SAW (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. insignis</td>
<td>Caraguatatuba</td>
<td>January</td>
<td>56</td>
<td>2%</td>
<td>11.2</td>
<td>T. galea</td>
<td>18.0</td>
</tr>
<tr>
<td>D. insignis</td>
<td>Caraguatatuba</td>
<td>February</td>
<td>37</td>
<td>3%</td>
<td>11.9</td>
<td>T. galea</td>
<td>18.8</td>
</tr>
<tr>
<td>D. insignis</td>
<td>Ubatuba</td>
<td>June</td>
<td>10</td>
<td>10%</td>
<td>14.9</td>
<td>A. fulica</td>
<td>22.4</td>
</tr>
<tr>
<td>P. exilis</td>
<td>Caraguatatuba</td>
<td>February</td>
<td>52</td>
<td>2%</td>
<td>6.0</td>
<td>B. gradatum</td>
<td>18.7</td>
</tr>
</tbody>
</table>

Figure 1. Hermit crabs inhabiting different shells: A) D. insignis occupying the land snail Achatina fulica; B) P. exilis occupying B. gradatum shell with remnants of the mollusk; C) D. insignis and the whole mollusk that were inside the T. galea shell. The arrows indicate parts of the mollusks.

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