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Nota Científica

Utilization of shells of the snail *Achatina fulica* Bowdich, 1822 (Mollusca, Gastropoda) by the hermit crab *Clibanarius vittatus* (Bosc, 1802) (Decapoda, Anomura) in the São Vicente Estuary, São Paulo, Brazil

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ABSTRACT. Hermit crabs depend on mollusc shells for housing. In this study, an unusual resource is reported for a hermit crab that usually inhabits marine gastropod shells. During a field study conducted from May 2001 to April 2003 in an estuarine area in São Vicente, state of São Paulo, Brazil, 21 individuals of *Clibanarius vittatus* (Bosc, 1802) were found inhabiting the shells of the terrestrial gastropod *Achatina fulica* Bowdich, 1822. *A. fulica* occurs in nearshore grass patches, where occasional contact with sea water kills them, and their shells then become available to the hermit crabs.

Key words: *Clibanarius*, Gastropoda, Anomura, hermit crab, Brazil.

Utilización de conchas de caracoles terrestres *Achatina fulica* Bowdich, 1822 (Mollusca, Gastropoda) por el cangrejo ermitaño *Clibanarius vittatus* (Bosc, 1802) (Decapoda, Anomura) en el estuario de São Vicente, São Paulo, Brasil

RESUMEN. El cangrejo ermitaño depende de conchas de moluscos para hacer de ella su casa. Este estudio ha descubierto una manera inusual de como vive este cangrejo, que generalmente habita la concha de gastrópodos marinos. El estudio fue realizado en la estación marítima de São Vicente, provincia de São Paulo, de mayo de 2001 hasta abril de 2003. Durante ese periodo, un total de 21 cangrejos *Clibanarius vittatus* (Bosc, 1802) fueron encontrados viviendo en las conchas del caracol terrestre *Achatina fulica* Bowdich, 1822. *A. fulica* ocurre en áreas de césped cercanos a la costa, donde el contacto ocasional con el agua de mar provoca su muerte y sus conchas quedan disponibles para el cangrejo ermitaño.

Palabras clave: *Clibanarius*, Gastropoda, Anomura, cangrejo ermitaño, Brasil.

The occupation pattern of gastropod shells by hermit crabs is complex (Fernandes-Góes, 1997), but accessibility to empty shells is considered a key factor (Negreiros-Fransozo *et al.*, 1991; Pinheiro *et al.*, 1993; Turra & Leite, 2001). Shell availability may be provided by a high mortality of gastropods residing nearby (Fernandes-Góes, 2000).

Achatina fulica Bowdich, 1822 is a pulmonate terrestrial gastropod, first introduced into Brazil for farming (Teles *et al.*, 1997), but later found breeding in the wild. In other countries, the introduction of *A. fulica* has led to the devastation of several crops (Vasconcellos & Pile, 2001). Besides its effect as a plague, *A. fulica* is also the intermediate host of

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Angiostrongylus cantonensis, (Chen, 1935), a nematode that causes meningitis. In this study, the utilization of shells of *A. fulica* by the hermit crab *Clibanarius vittatus* (Bosc, 1822) is reported.

Hermit crabs were collected by hand, from May 2001 to April 2003, in an estuarine region in São Vicente (23°58'21"S; 46°23'35"W), São Paulo State, Brazil, during low tide when the crabs are exposed on the sediment. All hermit crabs and their shells were identified according to Melo (1999) and Rios (1994), and sexed from the gonopore position: in males the gonopores are open in coxae of the fifth pereopods, and in females in the third pereopods. The intersex has both male and female gonopores open, as observed by Turra (2004). When necessary, gastropod shells were sent to specialists for identification.

The 2,344 hermit crabs captured during the study period were using 13 gastropod species. Of this total, 21 used shells of *A. fulica*: these were 19 males and 2 intersexes, ranging from 7.,0 to 13.1 mm shield length. We note that shells of *A. fulica* were the largest resource of shell utilized for *C. vittatus* (41.5 to 88.3 mm shield length) in this environment.

C. vittatus has been recorded using different shell types of marine gastropods, such as *Melongena corona* (Gmelin, 1791) (Lowery & Nelson, 1988) and *Thais* (*Stramonita*) *haemastoma* (Linnaeus, 1767) (Negreiros-Fransozo *et al.*, 1991; Reigada & Santos, 1997).

Sexual dimorphism in hermit crabs is very common. In *C. vittatus*, males reach a larger size than females (Reigada & Santos, 1997; Turra & Leite, 2000). Size-related sexual dimorphism is also observed in other hermit species, such as *Paguristes tortugae* Stimpson, 1759 (Negreiros-Fransozo & Fransozo, 1992) and *Clibanarius antillensis* Stimpson, 1759 (Turra & Leite, 1999). In most crustaceans, this difference in size is associated with the reproductive functions, where females have a larger energetic cost in the production of eggs and in the care of the young, whereas males direct their energy toward growth.

Large females of the terrestrial hermit crabs *Coenobita cavipes* Stimpson, 1858 and *Coenobita purpureus* Stimpson, 1858 were also found occupying shells of *A. fulica* in Okinawa, Japan (Nakasone, 2001). The author suggested that energetic expenditure in adult individuals using these large light shells would be low compared to conspecifics housed in marine shells. However, according to Meireles *et al.* (2003), the competition among hermit crabs in the area as well as the few resources for occupation available to larger specimens of *Dardanus insignis* (Saussure, 1858) may be other stressing elements.

In the present study, all shells of *A. fulica* were used by males and a few intersexes, probably because they reach a larger size. By using these shells, energetic expenditure for locomotion would decrease and resources may be directed for intra and interspecific competition. The use of shells of *A. fulica* is due to its presence in grass patches along the shore, where contact with sea water kills them, making their shells available for *C. vittatus*.

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