DO EARTHEN STRUCTURES MORE OFTEN DETER BARRICADE BUILDING SPECIES THAN NON-BUILDING SPECIES IN CRABS OF THE FAMILY DOTILLIDAE (BRACHYURA, OCYPODOIDEA)?

BY

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ABSTRACT

The small ocypodoid crab, *Ilyoplax pusilla* exhibits a subtle territorial behaviour termed barricade building. The barricades are made of mud. To better understand the evolution of this behaviour, the responses to artificial earthen structures built near the crabs’ burrows were compared between *I. pusilla* and two other species, *Ilyoplax deschampsi* and *Scopimera globosa*, of the same family, that do not build barricades. *Ilyoplax pusilla* broke the structure less frequently than did *S. globosa* and more frequently avoided it than did *I. deschampsi*. These results suggest that *I. pusilla* is more disposed to avoid the earthen structure, which would favour the evolution of barricade building.

RÉSUMÉ

Le petit crabe Ocypodidae, *Ilyoplax pusilla* montre un comportement territorial subtil nommé construction de barricades. Les barricades sont faites de boue. Afin de mieux comprendre l’évolution de ce comportement, les réponses à des structures artificielles de terre construites près des terriers de crabe ont été comparées entre *I. pusilla* et deux autres espèces, *Ilyoplax deschampsi* et *Scopimera globosa*, de la même famille, qui ne construisent pas de barricades. *Ilyoplax pusilla* a détruit la structure moins fréquemment que *S. globosa* et l’évitait plus fréquemment que *I. deschampsi*. Ces résultats suggèrent que *I. pusilla* est plus disposé à éviter la structure de terre, ce qui favoriserait l’évolution de la construction de barricade.

INTRODUCTION

Some species of ocypodoid crabs inhabiting intertidal flats build earthen structures near their own burrow, such as a pyramid (Linsenmair, 1967), a hood (Zucker, 1974, 1981; Clayton, 1988; Christy et al., 2001), a pillar (Christy, 1988a, 1988b).
1988b), a mound (Wada et al., 1994), a mudball (Oliveira et al., 1998), a chimney (Wada & Murata, 2000; Shih et al., 2005), or a semidome (Kim et al., 2004), or near their neighbour’s burrow, such as a barricade (Wada, 1984) or a fence (Wada, 1994). These structures have been suggested to function as a kind of territorial defence (Zucker, 1974, 1981; Wada, 1984, 1994; Oliveira et al., 1998; Wada & Murata, 2000) or as some form of mate attraction (Christy, 1988a, 1988b; Christy et al., 2002; Kim et al., 2004). Notwithstanding the knowledge on these structures, it has not been explored why some species use such a structure as a signal for deterring or attracting, while others do not.

Barricade building, in which a crab builds a mud wall beside its neighbour’s burrow as a territorial defence (Wada, 1984), is unique to the genus Ilyoplax in the family Dotillidae, occurring in only four species (Kitaura et al., 1998). For this behaviour to evolve, neighbours must avoid barricades. However, it is not known if barricade avoidance is unique to barricade building species or if other species also avoid these structures but have not evolved building behaviour. To explore these possibilities, we compared the responses to artificial barricades between Ilyoplax pusilla (De Haan, 1835), a barricade builder, and two other species of the same family, Ilyoplax deschampsi (Rathbun, 1913) and Scopimera globosa (De Haan, 1835) that burrow intertidal flats as do I. pusilla, but that do not build barricades (Kitaura et al., 1998). The three species are nearly of the same size, live in similar habitats, and show surface activity during daytime low tide.

MATERIALS AND METHODS

Field experiments on Ilyoplax pusilla, Ilyoplax deschampsi, and Scopimera globosa were conducted during the daytime low tides of spring tides in the breeding periods of 2002 to 2004. Study locations and dates include Uchinoura, Wakayama Prefecture, Japan (33°41′N 135°23′E) from 25 June to 29 July 2002 for I. pusilla, the Chikugo River Estuary, Fukuoka Prefecture, Japan (33°11′N 130°21′E) during 6-9 August and 7-9 September 2003 for I. deschampsi, and the Waka River Estuary, Wakayama Prefecture, Japan (34°10′N 135°10′E) during 7-10 August 2002, 25-31 August 2003, and 17-19 July 2004 for S. globosa.

To examine how crabs respond to artificial barricades, an artificial barricade made of sediments collected from the substrate of the study site was placed at the burrow entrance of a resident crab. The burrow holder was observed for 10 minutes after it emerged. During this time, a trace of the crab’s movements was made and it was noted whether the crab broke the barricade. Artificial barricades were 16.5 mm in length, 8.5 mm in width, 9.5 mm in height, i.e., the average size of barricades by I. pusilla (n = 49). After observation, the crab was captured by digging, measured