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SHORT COMMUNICATION

First field record of mangrove crab *Ucides cordatus* (Crustacea: Decapoda: Ucididae) recruits co-inhabiting burrows of conspecific crabs

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ABSTRACT. Recruits of the mangrove crab *Ucides cordatus* (Linnaeus, 1763), rarely encountered in the field were found co-inhabiting burrows of larger male and female conspecifics in the mangrove forest. They were located in the sediment of the inner walls and burrow plugs. Average carapace width (CW) of the hosting and co-inhabiting crabs was 3.8 ± 0.20 and 0.9 ± 0.03, respectively. As shown by the size-frequency distribution, while most recruits leave the conspecific burrows after reaching 1.0 cm CW, some stay until they reach a size of 2.5 cm CW. The results of this study contribute to a better understanding of recruitment patterns in this ecologically and economically important mangrove crab species. Follow-up studies are however needed to fully determine the role of conspecific burrows for juvenile habitat choice and survivorship in *U. cordatus*.

KEY WORDS. Caranguejo-uçá; juvenile; recruitment; settlement; size-frequency.

Early benthic life stages of many crab species are rarely seen due to their small size and cryptic behaviour. Hence, little is generally known about their habitat and ecology (Wolcott 1988). This also holds true for the mangrove crab *Ucides cordatus* (Linnaeus, 1763): while larger juveniles and adults are frequently encountered in the mangrove forest, where they inhabit conspicuous burrows excavated in the mud, small juveniles with a carapace width (CW) < 1 cm had hardly ever been found in former population samplings. Therefore, there is a gap in knowledge concerning the early juvenile stage in the life history of this ecologically and economically important mangrove crab. During a population sampling for larger *U. cordatus* crabs conducted between October 2003 and October 2004, we coincidently found small *U. cordatus* recruits. They were located in burrow walls or in mud plugs constructed by the owner crab to occasionally obstruct the burrow entrance. These juveniles are herein called "co-inhabitants", whereas those living in their own burrows are referred to as "owners". Owner crabs (both larger juveniles and adults) hosting co-inhabitants in their burrows are called "hosting owners". This work assesses the size-frequency of recruits co-inhabiting conspecific burrows, the number of co-inhabiting recruits per burrow and the sex and size of the hosting owner crabs.

We analysed samples taken monthly between February 2004 (when co-inhabitants were first found), and October 2004, in a mangrove of Canavieiras estuary, BA, NE-Brazil (15°41'S, 038°57'W). Stratified random sampling involved four 5 x 5 m quadrats in each of the following three zones: channel margin, forest basin and transition zone to dry land. Within quadrats, all *U. cordatus* burrow openings were measured (using the smaller diameter of the ellipsoidal opening) to obtain information on the size of the burrows co-inhabited by the recruits. The recruits were found by removing sediment from the plugs and walls of the owner burrows (until a depth of approx. 15 cm) and carefully searching through the sediment manually. Burrow owners (hosting and non-hosting crabs) were hand-captured by a professional crab gatherer whenever burrow depth and surrounding root structure permitted. Next, the width of the carapace and the sex of the crab were ascertained. Sex identification was not possible for recruits due to their small size. Data concerning the different sampling months were pooled together for analysis, as temporal fluctuations of co-inhabitants could not be investigated due to the bias resulting from the fact that, with time, crab gatherers became increasingly more skilled in locating the small crabs. All average values are given together with the standard error.

Of the 1324 *U. cordatus* burrows examined during the nine sampling months, 137 (10%) were co-inhabited by a total of 160 young recruits. One hundred and twenty-two burrows had one co-inhabitant, nine had two, four had three and two burrows had four co-inhabitants. The smallest and largest co-inhabitants measured 0.3 cm and 2.5 cm, respectively, and mean CW was 0.9 ± 0.03 cm. The recruits were found inhabiting small secondary burrows branching from the main burrow

of the hosting owner crab or inside the sediment of the plugs of these burrows. Mean diameter of the burrow openings of the hosting owners was 3.6 ± 0.08 cm (Fig. 1, minimum 1.4 cm, maximum 5.7 cm).

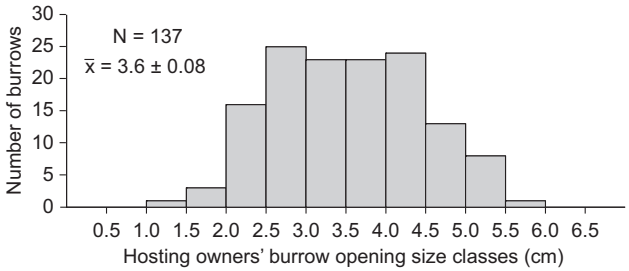


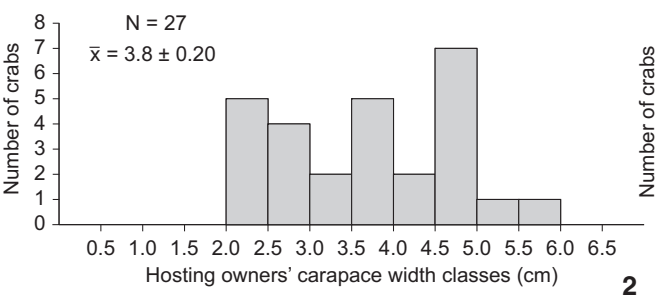
Figure 1. Size-frequency distribution of opening diameter (mean and standard error) of *U. cordatus* burrows with conspecific co-inhabitant crabs, n = 137.

All hosting burrows showed fresh tracks of larger crabs, indicating that they were inhabited. In 27 cases, the crab gatherer was successful in capturing the hosting owner crabs from these burrows. A total of 63% of the latter were males and 37% were females. The smallest and largest crabs had a CW of 2.1 cm and 5.7 cm, respectively, and average size was 3.8 ± 0.20 cm (Fig. 2). From the non-hosting burrows (without co-inhabitants, n = 1187) 414 crabs were captured. Their minimum and maximum sizes were 1.1 and 7.0 cm and average CW was 3.6 ± 1.03. Figure 3 compares the size-frequency of burrow owners (n = 441; 27 hosts and 414 non hosts) versus co-inhabiting recruits. While the mode of the former was in the class of 3.5-4.0 cm CW, the co-inhabiting crabs (N = 160) showed a mode in the 0.5-1.0 cm CW size class (Fig. 3). The distribution of the co-inhabitants overlapped with the one of owner crabs in the size classes of 1.0-1.5, 1.5-2.0 and 2.0-2.5 cm CW (Fig. 1).

The cryptic life-style and small size of the co-inhabiting *U. cordatus* recruits probably explains why they had not been encountered in the field prior to our study in Canavieiras, state of Bahia in 2004. In 2007-2008 similar observations were made for a *U. cordatus* population in Cabaraquara, state of Paraná, South-Brazil (Alexandre D. Kassuga, Universidade Federal do Paraná, pers. comm.). Juveniles associated with adults are also known from other species, e.g. *Neosarmatium meinerti* De Man, 1887 – Emmerson (2001), *Neohelice granulata* (Dana, 1851) – Luppi *et al*. (2002) and *Cardisoma carnifex* (Herbst, 1796) – Vannini *et al*. (2003). This suggests that recruits co-inhabiting burrows of larger conspecifics may be common in semi-terrestrial crabs.

The number of co-inhabiting *U. cordatus* recruits found relative to the overall number of examined burrows was relatively low. However, the true number of recruits was probably underestimated, due to the difficulties in locating them in the sediment. The ability to locate these small crabs increases with experience. Thus, future studies using this methodology should include training prior to sampling. Recruits were found inside burrows of both sexes of mostly intermediate-sized crabs. As indicated by the low frequencies in size classes larger than 0.5-1.0 cm, most co-inhabitant crabs seem to leave the conspecific burrow at a relatively small size/early age. Some, however, stay longer, a conclusion based on the fact that we still found crabs with a CW of 2.5 cm inside conspecific burrows.

Recent laboratory experiments showed that chemical cues emitted by conspecific crabs, regardless of gender, enhance the survivorship and induce the settlement of *U. cordatus* megalopae (Diele & Simith 2007, Simith & Diele 2008). As *U. cordatus* odour concentrations are likely to be higher inside conspecific burrows than outside, settlement may indeed occur more frequently (or exclusively?) inside these burrows and explain our findings in the field. However, our sampling did not include the sediment outside the burrows. Consequently, we cannot rule out the possibility that recruitment also takes place elsewhere, irrespective of the presence of conspecific burrows. We will conduct further studies in this context to fully understand habitat choice of the settlers and the significance of co-inhabiting conspecific burrows for juvenile survival.



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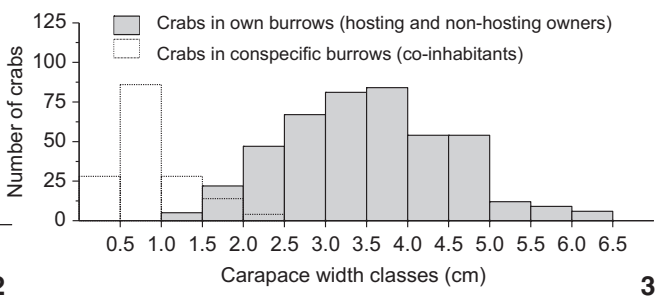

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Figures 2-3. Size-frequency distribution of *U. cordatus*: (2) burrow owners (n = 27, mean and standard error of carapace width) hosting conspecific co-inhabitants crabs; (3) co-inhabitants (n = 160) and conspecific burrow owner crabs (hosting and non-hosting owners pooled together, n = 441).

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