

Parental care in the freshwater crab *Sylviocarcinus pictus* (Milne-Edwards, 1853)*

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ABSTRACT

Parental care is a common strategy in many animal groups, to increase survival of the offspring. Here, we report parental care in the freshwater crab *Sylviocarcinus pictus*. A female caught in the Amazon River, Brazil, bore juvenile crabs rather than eggs on her abdomen. Kept in the laboratory, the female retained the juveniles on the abdomen for 17 days, after which the juveniles left the abdomen. A total of 341 juvenile crabs measuring 3.45 ± 0.12 mm were recorded. This pattern of parental care is very important for the maintenance of local populations of *S. pictus*, because if the larvae were released, as occurs in many marine species, they would drift downstream.

Keywords: Freshwater Crab; Parental Care; Reproduction; Trichodactylidae

1. INTRODUCTION

In many animal species, parental care is a common reproductive strategy [1-3]. The many patterns of parental care include biparental, or uniparental by either males or females [1]; that may show manipulation of sex differences in parental care [4] and is energetically costly [5]. Many groups of invertebrates show some form of parental care. For instance, in insects the most rudimentary form of maternal care is provided by females that incorporate toxins into their eggs, oviposit them in protected places, or cover their eggs with a hard wax-like shell before abandoning them [3]. In arachnids, females of *Bourguyia albiornata* Mello-Leitão 1923 oviposit almost exclusively inside the tube formed by the curled leaves

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of the bromeliad *Aechmea nudicaulis* (Linnaeus) Grisebach, 1864 [6]. Jawed Hirudinidae deposit desiccation-resistant cocoons on land and many species brood the eggs and young [7].

In decapod crustaceans, parental care is usually restricted to females that carry the eggs in the brood compartment, and care is terminated when the larvae are released into the plankton [8,9]. However, among other examples in crustaceans, [10] presented evidence of a direct link between active brood care and provision of oxygen to the young. For amphipods, [11,12] studied active maternal brooding and juvenile care. The preparation of a nest structure to defend and feed its young in the crab *Metopaulias depressus* Rathbun, 1918 was recorded [9,13].

For freshwater crustaceans, available information about parental care is sparse in comparison with marine species. The species that has been most studied is the crab *M. depressus*, in several aspects, *i.e.*, parental care in an unusual environment [13], protection of larvae from predation by damselfly nymphs [9], maintaining oxygen, pH and calcium levels optimal for the larvae [14] and evolution theory [15]. In freshwater crabs, 15 species have been reported to bear juvenile crabs attached to the female abdomen [16]. The extended brood care was reported in species of all five families of primary freshwater crabs [17]. Here, we record a female of the freshwater crab *Sylviocarcinus pictus* (Milne-Edwards, 1853) with juvenile crabs attached on the abdomen, indicating the existence of parental care in this species.

2. MATERIAL AND METHODS

The female of *S. pictus* was collected by hand, on a bank of the Amazon River (03°08'13.7"S; 58°27'46.8"W) in October 2011 (**Figure 1**). The specimen was placed in a plastic box with aerated water and transported to the laboratory. In the laboratory, the carapace width was

measured with a caliper (0.05 mm), and the crab was maintained in an aquarium for 17 days.

3. RESULTS AND DISCUSSIONS

This female had a carapace width of 41.5 mm, with 341 juvenile crabs attached to the abdomen (**Figure 2**). The mean size of the juveniles was 3.45 ± 0.12 mm, ranging from 3.10 to 3.66 mm. The juveniles remained on the female's abdomen for 17 days; during this period, they would occasionally leave the female's abdomen for

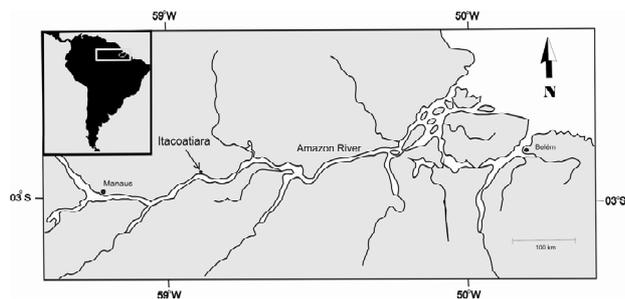


Figure 1. Location of the study area, Itacoatiara (arrow) on the Amazon River, Brazil.

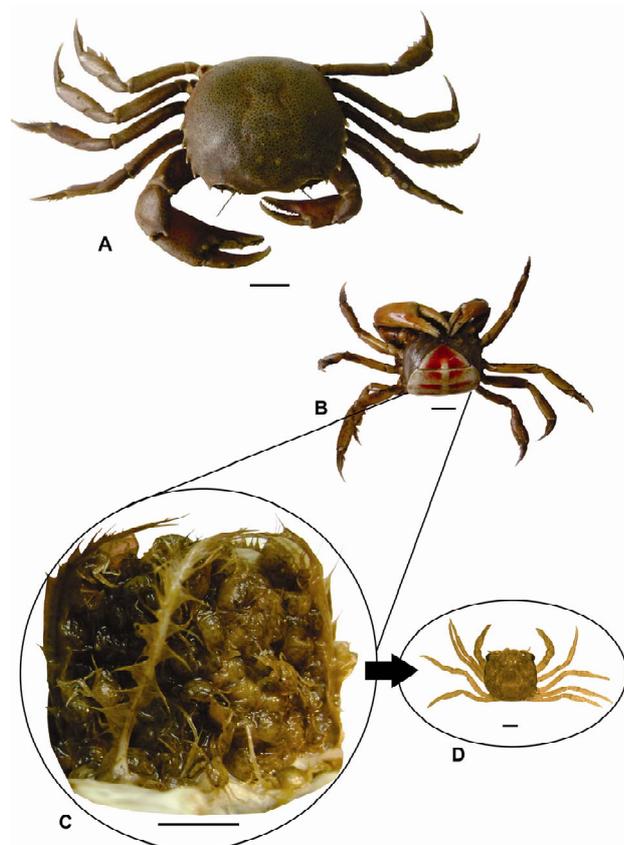


Figure 2. Dorsal view of *Sylvioecarcinus pictus* (A), ventral view of *S. pictus* (B), detail of juvenile crabs attached to the female abdomen (C) and juvenile crab (D). Scale bar of the figures A, B and C = 10 mm, and of figure D = 1 mm.

several minutes. After 17 days, all the juveniles permanently left the female's abdomen. *Sylvioecarcinus pictus* shows gregarious behavior, and the juveniles can cling to their mother, as also observed in the freshwater crab *Potamon edulis* (*P. fluviatile*) (Latreille, 1818) by [18], this kind of behavior is common for freshwater crabs. According to [20], the juveniles of the potamid crab *Candidiopotamon rathbunae* (de Man, 1914) are essentially independent after their first day of life, but often return to the mother for shelter during the following 2 weeks. The same pattern was observed for the juveniles of *S. pictus*.

In a recent study [16] observed two size groups of juvenile crabs with different carapace morphology, attached on the abdomen of females of the crab *Kingsleya ytupora* Magalhães, 1986, suggesting that the juveniles are attached to females for a prolonged period. In the present study, all juveniles had the same morphology and similar size, and remained on the female's abdomen for 17 days in the laboratory. However, as recorded by [16], we did not observe the hatching process and cannot accurately report the full period of juvenile incubation by females.

According to [11], brood care is called "active" if specific parental activities are directed toward the brood, and "passive" if such specific behavior is lacking. Females of *S. pictus* could be considered "active" in parental activities, since in this freshwater crab the embryonic and larval periods are completed entirely in the egg stage, resulting in hatching of miniature adults [20]; these are considered juveniles, and remain on the abdomen.

Abbreviated larval development is often accompanied by increased parental care. According to [21], in its broadest sense, parental care includes preparation of nests and burrows, production of heavily yoked eggs, care of the eggs, provisioning of the young, and care of the offspring after they reach nutritional independence. Parental care significantly affects the ecological success and evolutionary potential of species by enhancing the survival and fitness of the offspring. In the freshwater caridean shrimp *Dugastella valentina*, [22] observed both the abbreviated development and parental safeguarding until the decapodid stage obviously reduce the risk of being washed away or of being predated upon. Simultaneously, this type of parental care could mean a limited gene flow and hence a high degree of genetic divergence between populations, because of the low dispersal ability of the larvae [22]. In populations of *S. pictus*, the epimorphic development and parental care could produce a similar situation.

This pattern is common in primary freshwater crabs, because in freshwater habitats there are strong selective pressures toward reduction in egg number and increase in egg size, abolishment of free larvae, and extension of

brood care until the juvenile stage, resulting in a marked reduction in dispersal and gene flow, and leading to the high degree of endemism and speciation seen in these crustaceans [17]. However, under conditions of rapid habitat destruction, environmental pollution and global warming, slow dispersal of direct developers may become a severe disadvantage, impairing replacement of lost populations and placing the directly developing taxa at a greater risk of extinction than the indirectly developing taxa [17].

4. CONCLUSIONS

The present study records extended parental care in the crab *S. pictus*, contributing to knowledge of the reproduction of freshwater crabs. This pattern of parental care is very important for the maintenance of local populations of *S. pictus*, because if the larvae were released, as occurs in many marine species, they would drift downstream.

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