

NOTE

Estimating the size of *Uca tangeri* (Crustacea: Ocypodidae) without massive crab capture*RITA LOURENÇO¹, JOSÉ PAULA² and MIGUEL HENRIQUES³¹Unidade de Investigação em Eco-etologia, Instituto Superior de Psicologia Aplicada, Rua Jardim do Tabaco 34, 1149-041 Lisboa, Portugal. E-mail: rital@ispa.pt²Laboratório Marítimo da Guia, Faculdade de Ciências de Lisboa, Estrada do Guincho, 2750 Cascais, Portugal.³Instituto da Conservação da Natureza, Praça da República, 2900 Setúbal, Portugal.

SUMMARY: *Uca tangeri* (Eydoux, 1835) is the only species of fiddler crab that occurs in Portugal, where it mainly inhabits salt marshes in the south and southwest coasts. Individuals spend most of their time on and around their galleries, burrowing structures which they typically create and maintain in muddy substrate. Capturing fiddler crabs in nature is extremely difficult and can be destructive for their habitat. Once disturbed, *U. tangeri* tend to hide in their burrow, and their capture usually involves the destruction of the upper part of the burrow. In the present study, a method for estimating the carapace length of the fiddler indirectly, using the diameter of the burrow opening, is proposed. Significant sex-specific relationships between the diameter of the burrow opening and the occupant's length were found. Although the mean length of the carapace was not significantly different between sexes, males were found to be associated with smaller galleries, probably in order to prevent larger males entering their galleries.

Key words: *Uca tangeri*, fiddler crab, galleries, biometry, nature conservation.

INTRODUCTION

The fiddler crab *U. tangeri* is an intertidal species that inhabits muddy areas on the south (Nobre, 1935) and south-west (Paula and Cartaxana, 1986) coasts of Portugal (Ria Formosa and Mira estuary, respectively). Like other *Uca* species, *U. tangeri* presents pronounced sexual dimorphism. The males have a very developed chella that has lost its feeding function and is used in sexual and agonistic interactions (Christy and Salmon, 1984). Fiddler crabs show site-fidelity,

living in galleries that they create and actively maintain by digging the substrate. The galleries are used for protection from predators, for copulation and as a water reservoir during low tide. Fiddlers use their burrow as a hiding place during high tide, only emerging when the galleries are exposed at low tide (Altevogt, 1959; Montague, 1980). When fiddlers sense danger, they immediately retreat to their burrows, making their capture for biometrical studies extremely difficult.

In this study, we explore the possibility of using the burrow's diameter to estimate the fiddlers' dimension indirectly. *U. tangeri* always enter their burrow sideways, and the length of their carapace

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adjusts well to the diameter of the burrow opening. Since each specimen defends and maintains its own burrow (Wolfrath, 1992), a strong relationship between the dimensions of the crab and the diameter of the burrow is plausible as noticed by Takeda and Kurihara (1987) for other Brachyura. Finding such a correlation could prevent the capture of crabs in nature and would therefore avoid disturbing natural populations and their habitat.

MATERIAL AND METHODS

Twenty three males and twenty five females of different sizes were captured from Cacela Velha salt marsh in Ria Formosa (Algarve), during the breeding season, June 1995. For each individual the maximum carapace length (CL) and the internal diameter of its burrow opening (burrow diameter - BD) were measured, at a level of one centimetre below surface, using a calliper (error 0.005 cm).

A t-Test was used to evaluate inter-sexual differences in the length of the carapace (Sokal and Rolph, 1981). The relationship between the carapace length of the crab and the burrow opening diameter was explored using a linear regression model separately for each sex. The regression lines for males and females were compared with an analysis of covariance (ANCOVA - Sokal and Rolph, 1981). All statistical analysis was undertaken using the STATISTICA software version 4.5 (StatSoft. Inc., 1993).

RESULTS

Mean values of the maximum carapace length are shown in Table 1 for both sexes. Significant sex differences were not found for this parameter ($t = 0.95$, $df = 46$, $p > 0.34$, t-Test). The carapace length (CL) of the crabs was found to be significantly correlated to burrow diameter (BD), both in males and females (see figures captions). Although the correlation coefficient in the two models was similar ($p > 0.05$, test to correlations coefficients), analysis of covariance showed that the relationship between carapace length and burrow opening diameter is significantly different between males and females (adjusted means: DF (1, 45), $F = 10.290$; slope: DF(1, 44), $F = 4.668$, ANCOVA) (Figs. 1 and 2):

$$\begin{aligned} \text{males: } CL &= 0.43892 + 0.58610 \cdot BD; \\ \text{females: } CL &= 0.21067 + 0.74281 \cdot BD \end{aligned}$$

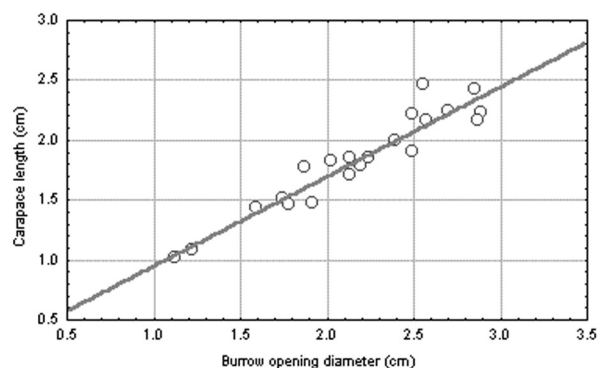


FIG. 1. – Carapace length vs. Burrow opening diameter in females ($r = 0.946$, $n = 25$, $p < 0.01$)

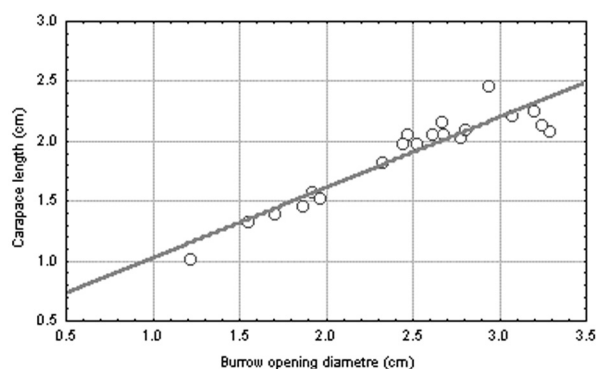


FIG. 2. – Carapace length vs. Burrow opening diameter in males ($r = 0.933$, $n = 23$, $p < 0.01$)

TABLE 1. – Carapace length (CL) in both sexes (centimetres): N- total specimens; Max – maximum value; Min – minimum value; SD- standard deviation.

	N	Mean	Max	Min	SD
Males CL	23	1.900	2.455	1.005	0.355
Females CL	25	1.798	2.470	1.020	0.388

DISCUSSION

Our results confirm that there is a significant correlation between the size of fiddler crabs and the diameter of their galleries, while the relationship differs between sexes. Although sex differences in the carapace length of the fiddler crab *U. tangeri* were not found to be significant, the fitted regression parameters indicate that, as crabs grows up, males became associated with larger openings than females. This is probably due the presence of the hypertrophied chelae in bigger males, which require some extra space.

The sexual dimorphism and behaviour differences in fiddler crabs does not permit the use of a single model to estimate the size of the burrow's occupant from the diameter of its opening. Howev-

er, the occupant's sex can be easily observed without capturing the crab, in which case the appropriate regression model can be used to estimate the fiddler's size indirectly. This merely involves measuring the diameter of the burrow opening and using this observation in the sex-specific model. Identifying and measuring the diameter of burrow openings is a much easier task than having to capture the crabs themselves. Furthermore, mapping and measuring the burrows in a particular area, and sexing their occupants, involves minimal observer interference, which minimises the risk of physical damage both for the crabs and their habitat. Habitat interference is particularly unwanted in natural parks, location of the main *Uca* populations in Portugal.

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