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REPRODUCTIVE CYCLE AND LENGTH AT FIRST MATURITY OF *SQUILLA MANTIS* IN THE CENTRAL-WESTERN MEDITERRANEAN

*CICLO RIPRODUTTIVO E TAGLIA DI PRIMA MATURITÀ DI *SQUILLA MANTIS* NEL MEDITERRANEO CENTRO-OCCIDENTALE*

Abstract - Data of commercial landings collected during 2009-2011 in the central-southern Tyrrhenian (GSA 10), South Adriatic (GSA 18) and western Ionian (GSA 19) seas were used to estimate the length at first maturity (Carapace length, mm) for females of *Squilla mantis* (Linnaeus, 1758) (Crustacea: Stomatopoda): 19.6±0.1 (GSA 10); 21.1±0.13 (GSA 18); 20.3±0.16 (GSA 19), after tuning of the maturity scale. The analysis of the maturity cycle in the studied areas indicated that the reproduction period is wide with a peak in the winter-early spring months.

Key-words: *Squilla mantis*, reproduction, southern Adriatic, central-southern Tyrrhenian, western Ionian.

Introduction - The spot-tail mantis shrimp, *Squilla mantis* (L., 1758) is distributed in all the Mediterranean Sea and in the Atlantic Ocean from the Gulf of Cadiz to the Angolan coasts. *S. mantis* lives on fine-sand and muddy substrates of the continental shelf and it is very abundant in the proximity of river mouths (Maynou *et al.*, 2004). Along the Italian coasts the fishery of spot-tail mantis shrimp is rather important, depending on the area, and represents about 3% of the total annual landings (IREPA, 2012). The aim of this study is to elucidate the maturity cycle and estimate the size at first maturity of the species in the central-southern Tyrrhenian (GSA 10), South Adriatic (GSA 18) and western Ionian seas (GSA 19).

Materials and methods - Monthly samples (years: 2009-2011) of spot-tail mantis shrimp were obtained from commercial landings (biological sampling from Data Collection Framework, EU Reg. 199/2008) for the GSA 10, 18 and 19. Carapace length (CL) to the nearest 1 mm was measured and sex recorded. To assess the maturity stages the scale proposed by Frogliani (1996) was finely tuned and modified as reported in the Tab. 1. The length at first maturity (L_{m50}) and the maturity range ($MR=L_{m75}-L_{m25}$) were estimated for females using the following ogive model: $M(L)=e(a+bL)/1+e(a+bL)$; where $M(L)$ is the proportion of the specimens maturing or mature (stage 2c and 2d) respect to the immature virgin (stage 1); L is the length class. Binomial generalized linear models (GLMs) with logistic link has been used to model the proportion of adult individuals on the length, as independent variable.

Results - The monthly percentages of female maturity stages for the three GSA are shown in Fig. 1. Despite the lack of samples in some months, due to sampling constraints, the same pattern is observed in the three areas with a reproductive period extending from October to June with a peak during the coldest months (winter-early spring). L_{m50} (\pm s.e.), and MR (\pm s.e.) for GSA 10, 18 and 19 are respectively: 19.6 mm (\pm 0.10), 1.28 (\pm 0.17); 21.1 (\pm 0.13), 1.08 (\pm 0.14); 20.3 (\pm 0.16), 1.08 (\pm 0.21).

Conclusions - The reproduction period observed in the studied areas, with a peak in the winter-early spring, is comparable with the findings in other Mediterranean areas

(Maynou *et al.*, 2004; Mili *et al.*, 2011). The lengths at first maturity estimated in the three GSAs are slightly different each other and in the range of the values reported by Maynou *et al.* (2004) for the other Mediterranean areas. These small differences might be ascribed to different estimation methods as well to possible differences of environmental conditions in far geographic locations (Mili *et al.*, 2011).

Tab. 1 - Maturity scale utilized in this study compared with the one reported by Frogli (1996).
Scala di maturità utilizzata in questo studio comparata con quella riportata da Frogli (1996).

Present study		Frogli (1996)	
0	UNDETERMINED		
1	IMMATURE VIRGIN: ovaries filamentous and hyaline; 6 th -8 th sternites hyaline	0	IMMATURE ovaries filamentous and hyaline; 6 th -8 th sternites hyaline
2a	VIRGIN DEVELOPING: narrow yellow ovaries sometimes filamentous and with brown dots (chromatophores), 6 th -8 th sternite hyaline	2	EARLY MATURATION narrow yellow ovaries, 6 th -8 th sternites whitish
2b	RECOVERING: narrow yellow ovaries sometimes filamentous with evident brown dots (chromatophores) 6 th -8 th sternites whitish.		
2c	MATURING OR ALMOST MATURE: yellow ovaries extending up to half of abdomen width, not visible through cuticle on the ventral side of telson, 6 th -8 th sternite white	3	MATURATION yellow ovaries extending up to half of abdomen width, not visible through cuticle on the ventral side of telson, 6 th -8 th sternites white.
2d	MATURE: yellow ovaries extending over half abdomen width, visible through cuticle on the ventral side of telson, 6 th -8 th sternite milky white	4	RIPE yellow ovaries extending over half abdominal width, visible through cuticle on the ventral side of telson, 6 th -8 th sternites milky white.
2e	RESTING ADULT: filamentous hyaline ovaries with evident brown dots (chromatophores), sometime still yellow or with few yellow dots. In this case the ovaries appear flaccid and shrunken. The 6 th -8 th sternite hyaline or still white.	1	QUIESCENT filamentous ovaries with evident brown dots (chromatophores), 6 th -8 th sternites hyaline
		5	SPENT similar to quiescent ovaries, sometime with few yellow dots, but 6 th -8 th sternites still white.

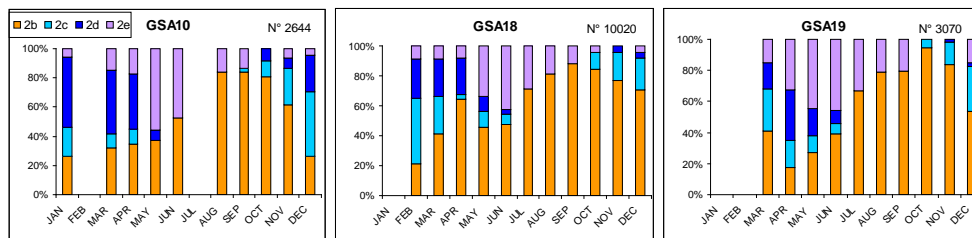


Fig. 1 - Monthly percentage of female maturity stages in the GSA 10, 18 and 19.
Percentuali mensili degli stadi di maturità femminili nella GSA 10, 18 e 19.

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