MATURITY OF THE MANGROVE CRAB *Ucides cordatus* (LINNAEUS, 1763) (CRUSTACEA, BRACHYURA, OCYPODIDAE) AT IGUAPE, SP, BRAZIL

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Resumo: A maturidade sexual de *Ufides. cordatus* foi estimada utilizando 3.787 espécimes (2.044 machos e 1.743 fêmeas) coletados nos manguezais de Iguape (SP), Brasil. A maturidade morfológica foi estimada por análises de regressão para examinar o crescimento alométrico das quelas (machos) e abdome (fêmeas). As medidas da largura da carapaça (CW), comprimento do própodo quelar dos machos (PL) e largura do quinto segmento abdominal (AW) foram registradas com um paquímetro (0,05mm). O estágio de maturação das gônadas foi verificado para estimar a maturidade fisiológica. Com base na análise das gônadas, o tamanho da maturidade fisiológica estimado foi maior nos machos (51,1mm) que das fêmeas (43mm). A maturidade morfológica foi determinada pela mudança da constante de crescimento alométrico das quelas (machos) e abdome (fêmeas). O início da maturidade sexual morfológica foi de 51,3mm e 39,1mm para machos e fêmeas respectivamente. Não foi verificado nenhuma diferença quanto ao tamanho estimados para os machos, o tamanho da maturidade fisiológica foi maior que a morfológica para fêmeas. As condições ambientais podem promover uma antecipação ou retardo na maturidade sexual. O tamanho da maturidade sexual em *Ucides cordatus* é utilizado na elaboração de leis de defeso pesqueiro e na criação de um manejo sustentável desse recurso.
Palavras chave: maturidade, gônada, morphologia, ocypodidae, *Ucides*

Abstract: The sexual maturity of *U. cordatus* was estimated using 3,787 specimens (2,044 males and 1,743 females), collected at the Iguape (SP) mangrove areas, Brazil. Morphological maturity was estimated by regression analyses to examine the allometric growth of males chelae and females abdomen. Measurements of carapace width (CW), male chelar propodus length (PL) and width of the female fifth abominal segment (AW) were recorded using a vernier caliper (0.05mm). The stage of gonad maturity of the individuals obtained was also noted to estimate physiological maturity. By using the analyses of gonads, size at physiological maturity was found to occur at a higher size in males (51.1mm) than females (43mm). Morphologic maturity was determined by assessing the size at which the allometric growth constant of chelae (males) and abdomen (females) change. Size at the onset of morphologic sexual maturity was found to be 51.3 and 39.1mm, for males and females, respectively. While no difference was found between such size estimates in males, size at physiologic maturity was higher than size at morphologic maturity in females. Environmental conditions may either hasten or delay sexual maturity. Size at sexual maturity in *U. cordatus* is used in the elaboration of laws to protect its fishery and to promote a sustainable management of this resource.
Key words: maturity, gonad, morphology, ocypodidae, *Ucides*

The onset of sexual maturity in crustaceans may vary either inter or intra-specifically, around a given size (FONTELES-FILHO, 1989). Species of the genus *Ucides* have been studied by some authors, namely *U. occidentalis* by RUJEL-MENA (1996) and *U. cordatus* by VASCONCELOS *et al.* (1999) and

BOTELHO *et al.* (1999), but estimates of morphologic and physiologic maturity were not previously attempted.

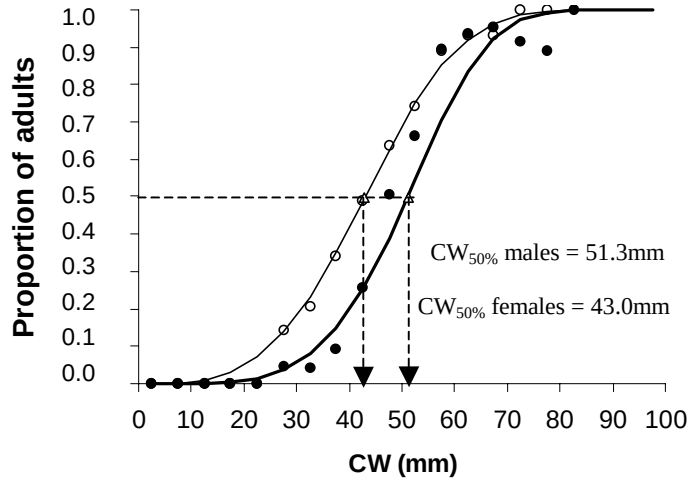

Figure 1 – *Ucides cordatus* (Linnaeus, 1763). Galton's ogives fit to physiologic maturity relationships for males (thick line) and females (thin line) from specimens collected from September/1998 to September/2000. Estimates of $CW_{50\%}$ maturity are indicated.

The assessment of size at which such activities occur may provide insight on maturity size, more recent techniques enable more precise estimates of physiologic and morphological maturity in crustaceans (PINHEIRO & FRANSOZO, 1998). The onset of sexual maturity may be evidenced by the analysis of gonad maturation (CONAN & COMEAU, 1986). On the other hand, the allometric growth of certain dimensions through ontogeny may indicate the size at morphologic maturity by defining young and adult growth phases (HARTNOLL, 1978). Computer software may aid in ascertaining morphologic maturity in crustaceans, as does the MATURE routine (SOMERTON, 1980).

The examined *U. cordatus* specimens were collected monthly from September/1998 to September/2000 in the Iguape region, SP, Brasil. The carapace width (CW), male chelar propodus length (PL) and the width of the fifth female abdominal somite (AW) were measured with the aid of a vernier caliper (0.05mm). The gonads of crabs were classified into three different categories, i.e. immature (IM), developing (DE) and mature (MA). A total of 3,787 specimens was examined, corresponding to 2,044 males ($16.7 \leq CW \leq 83.4$mm; 51.4 ± 11.2mm) and 1,743 females ($14.8 \leq CW \leq 78.1$mm; 47.3 ± 9.1mm).

The physiologic maturity estimate was drawn based on gonad analyses and corresponded to the size (CW) at which half of the individuals within the population become mature ($CW_{50\%}$). In each sex, crabs were distributed in 5-mm size classes and the Galton's ogive ($y=1-e^{-AZ}$, where $Z=x^b$) (FONTELES-FILHO, 1989) was fit to the relationship between within-class proportion of mature individuals vs size.

The curve describing the physiologic maturity relationship was $y = 1 - e^{-5.55\times10^{-9} x^{4.74}}$ for males and $y = 1 - e^{-1.49\times10^{-6} x^{3.47}}$ for females (Fig. 1). Derived values of 50% maturity are 51.1mm for males and 43mm for females.

The morphologic maturity was estimated by locating the size at which an alteration of the allometric growth level was detected in PLxCW and AWxCW relationships. A total of 714 males (18.9≤CW≤82.6mm) averaging 51.2±11.2mm, and 862 females (14.8≤CW≤71.9mm) averaging 47.0±9.3mm were used for establishing the relative growth relationships. For both sexes, the MATURE software indicated that data should be partitioned according to two growth phases thus providing a transitional size estimate. The analysis obtained for the male PLxCW relationship revealed an inflection point at 51.3mm. For females, the results obtained in the allometric relationship AWxCW indicated an inflection point at 39.1mm.

HINES (1989) consider that size and age at sexual maturity directly affect population dynamics and reproductive output in brachyurans. Size at sexual maturity may vary according to latitude, usually associated to key environmental parameters which may affect its timing. Sea currents may also promote metabolic changes affecting growth and reproduction in crustaceans, often more marked than temperature-induced alterations (SASTRY, 1983).

Increased water temperature, photoperiod and food availability often promote optimal conditions for reproduction by modulating the endocrine system thus triggering gonad development (WENNER *et al.*, 1974). Photoperiod induces oocyte maturation, favoring gonad development during the season or in geographic regions where daylength is higher (ARMSTRONG, 1988). Geographic differences of size at sexual maturity in *U. cordatus*, higher in the equatorian and lower in the circumtropical population, evidences a clear influence of temperature and photoperiod.

In August 2000, preliminary results of this study were presented at the "1ª Reunião de Avaliação da Portaria de Defeso do Caranguejo-Uçá", hosted by the CEPSUL/IBAMA when a minimum legal size of 52mm was indicated for its fishery. Although already ensuring an error safety margin by the method

itself, it was decided by consensus to establish a 60mm size for the sake of a better divulgence among officers and fishermen. Pertinent information is already included in the applicable laws (Portaria IBAMA no. 70/2000).

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