The mud crab Scylla serrata (Forskål) in Maputo Bay, Mozambique.

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The mud crab *Scylla serrata* (Forskål) in Maputo Bay, Mozambique

Adriano Macia, Paula Santana Afonso, José Paula and Rui Paula e Silva

The mud crab in Mozambique

The mud crab Scylla serrata is a portunid brachyuran crab with a complex life cycle. It inhabits Indo-Pacific shores and recruits to mangrove forests where it resides during the juvenile phase, making burrows in the muddier parts of the forest, among the roots of *Rhizophora mucronata*. When it matures the crabs move offshore where reproduction takes place (Robertson and Kruger, 1994). No ovigerous females are usually seen within the mangrove, and the largest crabs are collected in the subtidal zone and mostly outside the estuarine environment.

Exploitation of the mud crab in Mozambique is a traditional artisanal activity involving local fishermen. Due to the relatively small investment required for this fishery and to its demand as a delicacy for the tourism industry and local consumers, mud crab harvesting has great potential for expansion (Piatek, 1981). The total annual catch of mud crabs in Mozambique in general is not known, and Piatek (1981) estimated the annual production potential of this crab to be around 5,700 t yr^{-1} taking into account a total mangrove forest area of 850 km^2 throughout Mozambique. In Maputo Bay, the mud crab is locally known as "Hala". The Bay is one of the most important economic areas in Mozambique for commercial harvesting of this species due to their relative abundance and easy access (Piatek, 1981).

Basic biological information on *S. serrata* in Mozambique is scarce. Existing information is known from a few studies and restricted to catch estimates and size distribution (see Morais, 1972; Piatek, 1981) and the assessment of catches within mangrove forests, generally referred to as the nurseries for this species (Peatek, 1981; Hill, 1994; Robertson and Piper, 1991; Barnes *et al.*, 2002). Halare (1999) estimated catch per unit effort by means of baited traps at Inhaca Island, while Barnes *et al.* (2002) estimated density and biomass based on the mangrove forest area at the Quirimbas Archipelago. These studies represent modest contributions to the knowledge on *Scylla serrata* in Mozambique. Population data such as size structure, sex balance and reproductive parameters, are vital information in that they create a foundation for the study of population dynamics (Robertson and Kruger, 1994), providing the basis for managing the sustainable utilization of this resource.

Figure 1. (A) The mud crab *Scylla serrata*, **(B)** woman digging for mud crabs in Ponta Rasa mangrove at Inhaca Island. Photographs by José Paula.

Mud crab biological data from the Incomati Estuary, Maputo Bay

This report presents some aspects of the biology of *Scylla serrata* (body size, sex ratio, size at maturity as well as gonad development), obtained from bi-monthly sampling of artisanal catches using baited traps from the Incomati Estuary during spring tides, over a period of 23 months (February 1997 to July 1999).

Results reveal that mud crab carapace width (CW) varies from 70-200 mm, with the majority of male and female crabs (74%) exhibiting a width of 90-120 mm. High percentages of juveniles (CW<80 mm) were recorded from catches in May, July and November (Figure 2) indicating a major recruitment peak during the cold season (May to July) with a smaller peak around the start of the warm season.

Male and female carapace width to wet weight (W) relationships were analysed using least square regression. The relationships suggest that males increase in weight faster than females ($W=0.0013.L^{2.561}$ for females and $W=0.0001.L^{3.060}$ for males) as seen in Figure 3. Male crabs attain a larger size than females, which suggest a longer growth period or a higher growth rate. The sex ratio was 53% to 47% (males to females) for the entire period of study, with ratios alternating slightly (Figure 4). During the hot season males outnumbered females, suggesting that offshore migration of mature females for spawning occurs during this season.

There was a strong relationship between mating season and the moult stages over the study period. For both sexes, soft-shelled individuals were most common from July to November, suggesting that mating occurs more frequently during this period of the year (Figure 5). In December at Inhaca Island, Paula *et al.* (2003) collected recruiting megalopae larvae of *Scylla serrata* settling in the creek of Ponta Rasa mangrove; this indicates that fertilization was active a few weeks before. During the study, no ovigerous female crabs were encountered in the sampled catches. Fishermen from Inhaca Island reported the occurrence of large crabs, including ovigerous females, in the shallow subtidal vegetated banks in the eastern part of Maputo Bay and seldom caught them with gillnets (J. Paula, pers. obs.).

The analysis of gonad developmental stages (based on three colour stages) revealed that a higher percentage of mature females were present in the mud crab population of the Incomati Estuary around January (Figure 6), but mature females were always present in the samples which indicates a potential continuous reproductive capacity. The intermediate stages were found dominant throughout the year

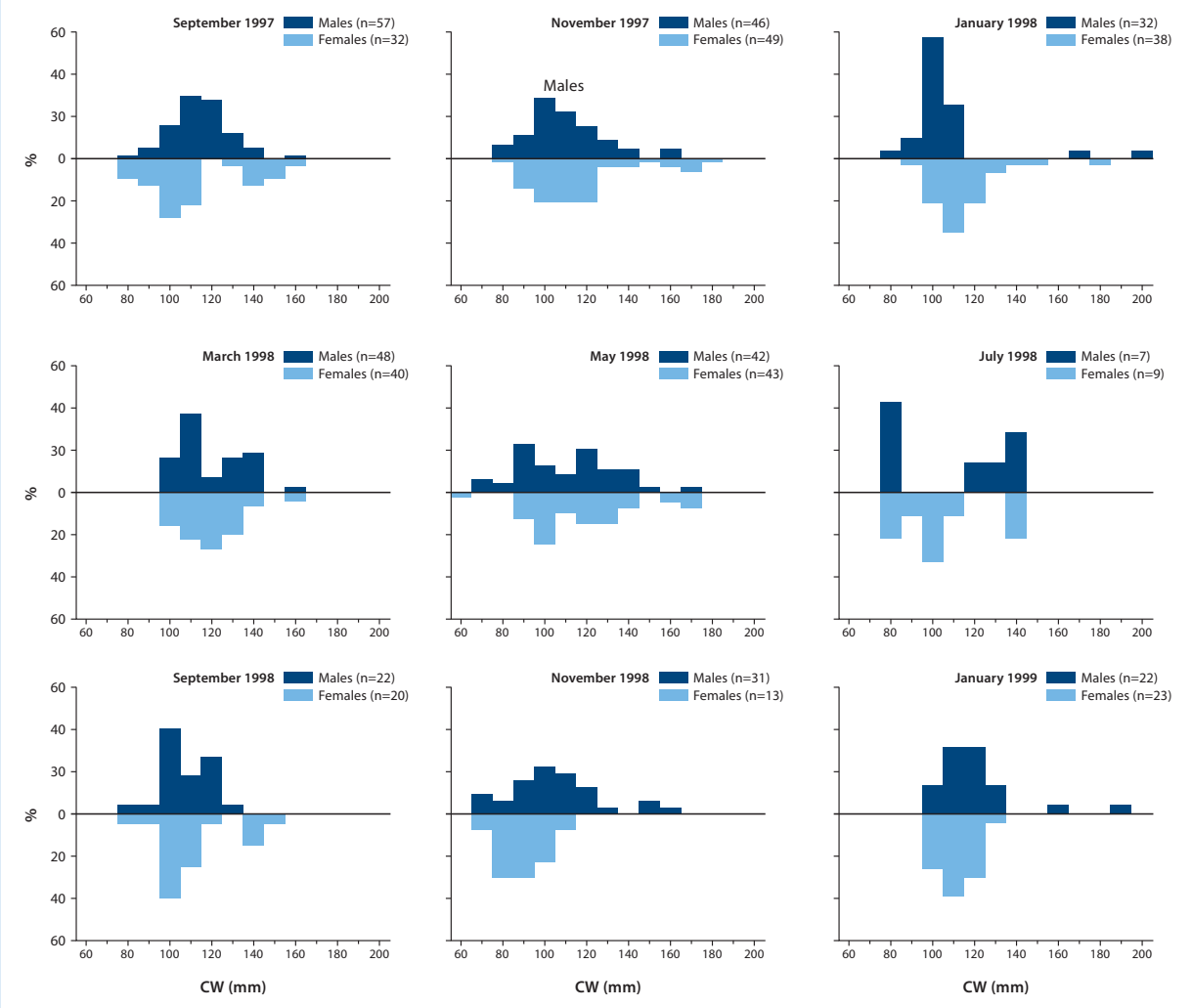

Figure 2. Monthly size frequency distribution for both sexes of *Scylla serrata* from the Incomati Estuary over the study period.

except during the maturation January peaks. However, few females with immature gonads (first gonad development stage) were encountered throughout the study period, indicating that probably the selectivity of the gear used is excluding the smaller and immature female crabs.

Quin and Kojis (1987) noted that enlargement and maturation of female oocytes are associated with a colour change from yellow to orange. In our study, gonads of yellow coloration were not considered "fully" mature and were classified separately from "mature" orange gonads. A more detailed microscopic analysis is needed to establish greater accuracy in determining gonad development stages and seasonality. Nevertheless, the findings are encouraging and suggest that gonad colour analysis can be utilised for a quick appraisal of the sexual maturity of mud crabs from Maputo Bay waters.

Size at first [?] maturity (CW_{50}) was estimated to be around 100 mm for females and 110 mm for males, showing that females attain maturity size at smaller sizes (Figure 7). In Natal, South Africa (approximately 300 km south of Maputo Bay) mud crabs attain maturity when they are only 90 mm CW (Rob-

ertson and Kruger, 1994), at slightly smaller sizes that those from the Incomati Estuary. Some authors have reported that *S. serrata* becomes sexually mature at smaller sizes in the tropics than in the subtropics especially in African and Australian shores (Quinn and Rojis, 1987). These comparisons, however, do not apply to all geographic locations (Robertson and Kruger, 1994).

Summary

Mindful of the limited data obtained thus far, it is evident that the biological parameters examined for the mud crabs at the Incomati Estuary (Muntanhana) reflect important trends that could form the basis for a further, more detailed fisheries assessment. The reproduction pattern for Incomati Estuary mud crabs appears to include mating inside the mangrove environment, with embryonic development taking place in deeper waters, usually in the estuarine environment, with females eventually moving offshore to spawn. These findings and the study methods utilised should be considered in further mud crab investigations, especially in view of the growing exploitation of this species in Mozambique and the need for a sound management programme for this valuable resource.

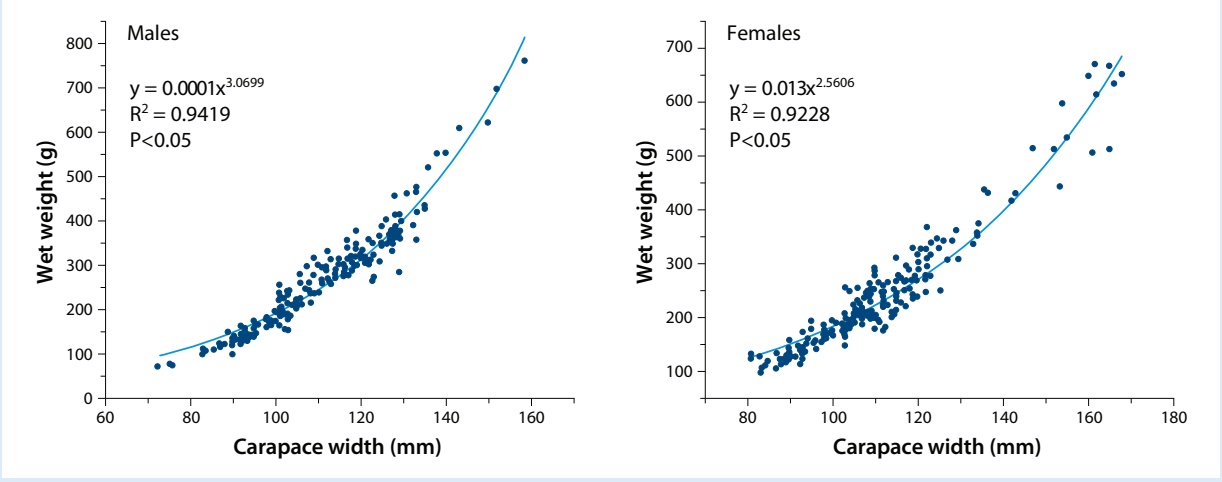

Figure 3. Relationship between carapace width and wet weight for both sexes of *Scylla serrata* from the Incomati Estuary (males=180, females=193).

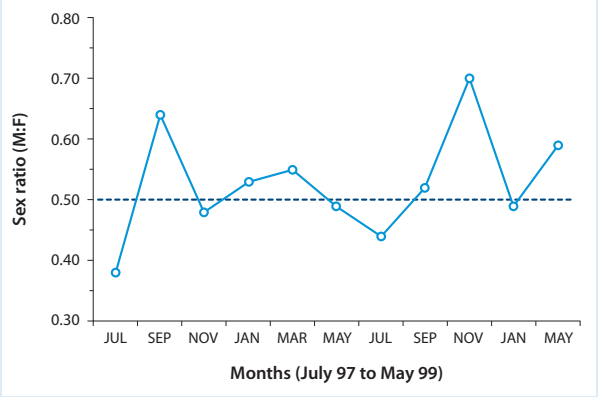

Figure 4. Sex ratios (male to female) for *Scylla serrata* from the Incomati Estuary over the study period (July 1997 to May 1999).

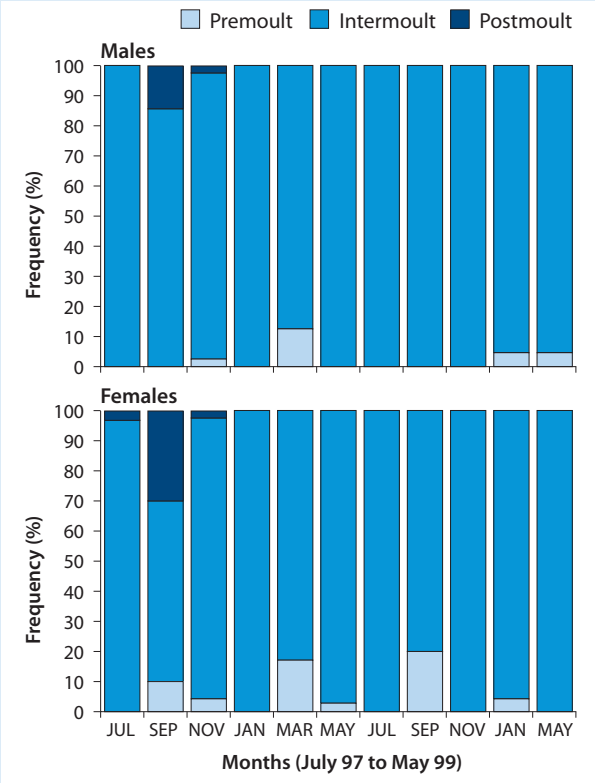

Figure 5. Moulting stage for both sexes of *Scylla serrata* from the Incomati Estuary over the study period.

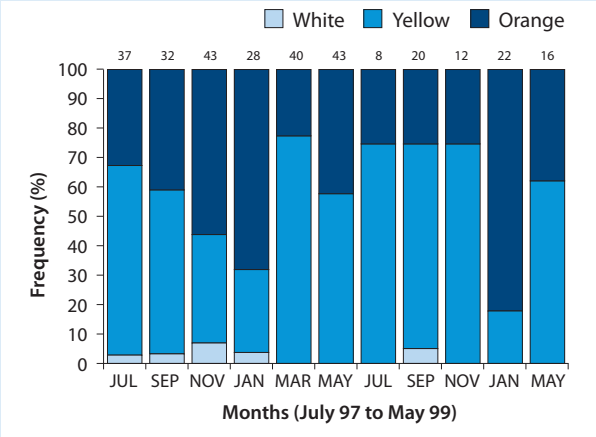

Figure 6. Temporal variation of gonad condition, colour and size for female mud crabs caught from the Incomati Estuary over the study period (numbers above bars = n).

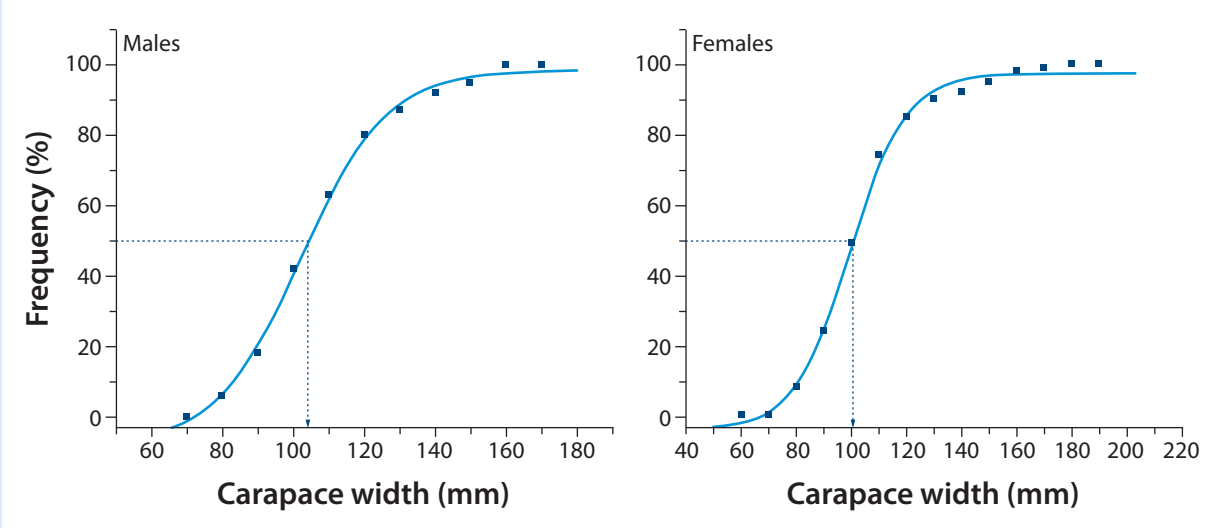

Figure 7. Overall carapace size at first maturity for both sexes of *Scylla serrata* from the Incomati Estuary.

Bibliography

Barnes, D., Dulvy, N., Priestley, S., Darwall,W., Choisel, M.,Whittington, M., 2002. Fishery characteristics and abundance estimates of the mangrove crab *Scylla serrata* in Southern Tanzania and Northern Mozambique. *South African Journal of Marine Science* 24, 19-25.

Halare, A., 1999. Abundância de *Scylla serrata* no Saco da Inhaca. Licentiate Thesis, Universidade Eduardo Mondlane, Maputo.

Hill, B.J., 1994. Offshore spawning by the portunid crab *Scylla serrata* (Crustacea: Decapoda). *Marine Biology* 120, 379-384.

Morais, O., 1972. Estudo preliminar das capturas de caranguejo na região de Lingamo. Relatório Científico (1969). Missão de Estudos Biocean-ológicos e de Pescas de Moçambique (MEBPM), Lourenço Marques.

Paula, J., Dornelas, M., Flores, A., 2003. Stratified settlement and moulting competency of brachyuran megalopae in Ponta Rasa mangrove swamp, Inhaca Island (Mozambique). *Estuarine, Coastal and Shelf Science* 56, 325-337.

Piatek, M.A., 1981. Mangrove crab, *Scylla serrata*, and its utilisation with particular reference to Mozambique. A Report prepared for the Research and Development of Inland Fisheries Project. FAO, Rome, GCP/MOZ/006(SWE), No. 3, 53pp.

Quinn, N.J., Kojis, B.L., 1987. Reproduction biology of *Scylla* spp. (Crustacea: Portunidae) in the Labu estuary in Papua New Guinea. *Bulletin of Marine Science* 42, 234-241.

Robertson, W.D., Kruger, A., 1994. Size at maturity, mating and spawning in the portunid crab *Scylla serrata* (Forskål) in Natal, South Africa. *Estuarine, Coastal and Shelf Science* 39, 185-200.

Robertson, W.D, Piper, S.E., 1991. Population estimates of crabs *Scylla serrata* (Forskål, 1755) (Decapoda: Portunidae) in two closed estuaries in Natal, South Africa, from mark-recapture methods. *South African Journal of Marine Science* 11, 193-202.