

Population structure of *Goniopsis cruentata* (Latreille, 1803) in the Paripe estuary, Brazil.

Moura ¹, N. F. O.; Coelho-Filho ¹, P. A. and Coelho ¹, P. A.

¹Departamento de Oceanografia - UFPE. Av. Arquitetura, s/n - Cidade Universitária CEP 50790-540. Recife, Pernambuco / Brasil. E-mail: oceano@hotmail.com.br

Abstract

The grapsid *Goniopsis cruentata* (Latreille, 1803) is a common and abundant crab in the intertidal zone of many estuaries in Pernambuco State, northeastern Brazil, where this species supports local fishery. Crabs were sampled monthly from August 1997 to July 1998, in the Paripe River Estuary – Pernambuco State – Brazil, through of fishing gear, with 1 hour effort per sampling period. A total of 1014 specimens were sampled, being 594 males (582 adults; 12 juveniles) and 420 females (222 adults no ovigerous; 182 ovigerous; 16 juveniles). The population was constituted mainly of adult crabs, which is probably due to the selectivity action of the fishing gear. Males (Carapace Width: 43.5 ± 5.9 mm) were significantly ($p < 0.05$) larger than females (CW: 41.01 ± 4.73 mm). Size frequency distribution was unimodal for both sexes, and ranged from 25 to 58 mm CW. Reproductive activity was recorded during almost all the year, except in June and July. A high incidence of ovigerous females from December 1997 to April 1989 was observed. Through Pearson's correlation, air temperature showed to be significantly correlated ($r = 0.73$; $p < 0.05$) with ovigerous females frequency, suggesting that species presented a high reproductive activity during the warmest months of the year.

Key words: Population structure, Grapsidae, *Goniopsis cruentata*, estuary

Introduction

The grapsid crab *Goniopsis cruentata* (Latreille, 1803) is commonly found in the intertidal zone of estuarine areas of Pernambuco State, northeastern Brazil. It is distributed on the Western Atlantic from Florida to southern Brazil (Melo 1996). Like most Grapsidae, it can run very fast and hence hides when it is disturbed by human activity. According to Wiedemeyer (1997), this species feeds on plants, organic detritus and other crabs such as *Uca* spp. and *Aratus pisonii*.

Research on *G. cruentata* in Brazil has been restricted to some species list (Abreu 1980, Coelho 1965, Coelho and Coelho-Filho 1993; Coelho and Ramos-Porto 1995, Oshiro *et al.* 1998) and some studies about population biology and reproduction (Cobo, 1995; Cobo and Fransozo, 1998; Cobo 1999; Guerrero-Ocampo and Negreiros-Fransozo, 2000). Therefore, it is necessary to obtain more information on this species, mainly in the northeastern region, where it is abundant in estuarine areas and supports a specific fishery. The present study provides some information better on aspects of the population structure of *G. cruentata* captured by the artisanal fishery in the Paripe River estuary, with emphasis on structural aspects, sex-ratio, individual size and reproductive season.

Materials and Methods

The study area is located in the Paripe River Estuary (7° 48' S and 34° 51' W), in the southern part of Itamaracá Island in Pernambuco State, northeastern Brazil. With 1.6 km in length and 0.55 km in the widest part, it sustains by 29.4 Km² of mangrove forests, dominated by *Rhizophora mangle* L., *Avicennia schaueriana* Stapf and Leechman and *Laguncularia racemosa* Gaertn. The salinity

ranges from 3.2 to 37.1‰ being the largest part of the estuary dominated by waters of high salinity due to strong marine influence (Lacerda, 1994).

Monthly collections were accomplished from August 1997 to July 1998, always during low tide. The collections were performed by professional fishermen during 1h, employing a fishing gear. This is the most common technique used by fishermen. After sampling, the individuals were counted, sexed and taken to the laboratory. All specimens were measured regarding width (CW) and length carapace (CL). Specimens were distributed in 11 size classes and ranged between 25 and 58 mm CW.

Also abiotics data were obtained monthly as average precipitation and air temperature given by the III Distrito do Instituto Nacional de Meteorologia, and water temperature was measured during the sampling.

Pairs of samples (e.g. size mean of males and females) were evaluated by student t-tests at $\alpha=0.05$. χ^2 test were applied for comparison between pairs of sample. The relationship between ovigerous females frequency, and salinity, water temperature and rainfall was tested by Pearson correlation analysis.

Results

The precipitation ranged from 1.4 mm in September 1997 to 210 mm in July 1998. Air temperature varied from 24° C in August to 28.5° C in February and March 1998. Water temperature ranged from 24.5° C in August to 34° C in October and February 1998 (Table I).

Table I: Monthly values of abiotics factors sampled in the Paripe River estuary, Brazil.

Year	Months	Rainfall (mm)	Air Temperature (°C)	Water Temperature (°C)
	August	130	24	24.5
1	September	20	25	29
9	October	10	26.5	34
9	November	45	27	30.5
7	December	90	27.3	31
	January	70	27.7	30
	February	45	28.5	34
1	March	75	28.5	33
9	April	110	27.7	33
9	May	190	26.5	28
8	June	150	25.3	27
	July	170	24.7	28
Mean and sd		92 ± 59	26.5 ± 1.5	30 ± 3

Throughout this study 1,014 specimens were obtained 594 being males (582 adult and 12 juveniles) and 420 females (222 non-ovigerous, 182 ovigerous and 16 juveniles). The highest individuals frequency was recorded in April and the lowest in July (Table II). Sex ratio was approximately 1:1 in August, September, October 1997, February, May, June and July 1998. In November, December 1997, January, March and April 1998, the number of males was significantly higher than that of females (Table II).

The range of the carapace width was from 25.4 to 57.7 mm in males with mean and standard deviations of 43.5 + 5.9 mm. For females, the CW range was from 26.8 to 53 mm with mean and standard deviations of 41.0 + 4.7 mm. There was difference in size between males and females, males being significantly larger ($p < 0.05$) than females.

Table II: Monthly frequency of *G. cruentata* sampled in Paripe River Estuary, Brazil.

Year	Months	Rainfall (mm)	Air Temperature (°C)	Water Temperature (°C)
	August	130	24	24.5
1	September	20	25	29
9	October	10	26.5	34
9	November	45	27	30.5
7	December	90	27.3	31
	January	70	27.7	30
	February	45	28.5	34
1	March	75	28.5	33
9	April	110	27.7	33
9	May	190	26.5	28
8	June	150	25.3	27
	July	170	24.7	28
Mean and sd		92 ± 59	26.5 ± 1.5	30 ± 3

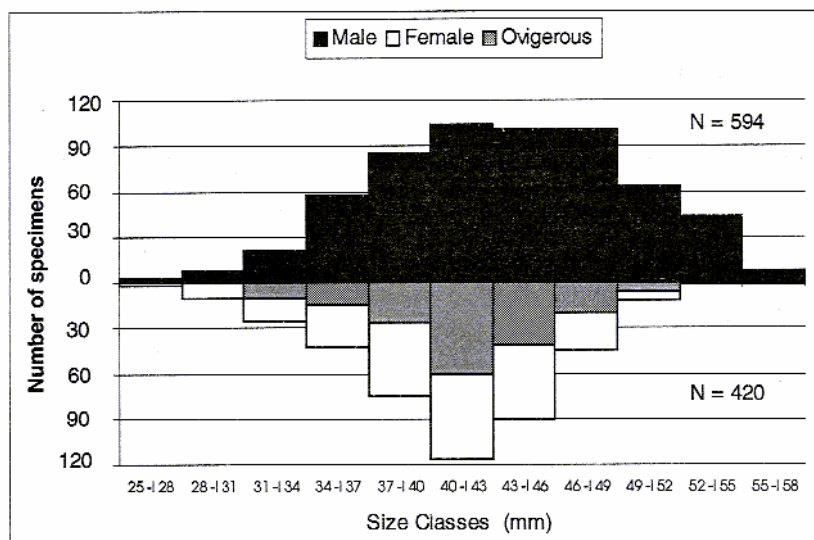


Figure 1: Size class frequency distribution of *G. cruentata* collected from August 1997 to July 1998 in the Paripe River Estuary, Brazil.

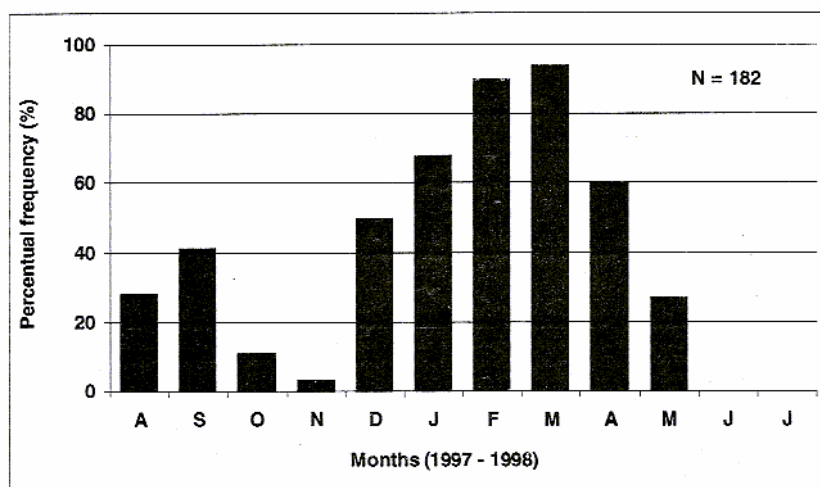


Figure 2: Percentual frequency of ovigerous females of *G. cruentata* collected from August 1997 to July 1998 in the Paripe River Estuary, Brazil.

Size distribution of females showed smaller range and it was more symmetrical than for males. Carapace width distribution was unimodal for females (40 –| 43 mm). There was no modal class for males but a modal interval (40 –| 43, 43 –| 46, 46 –| 49mm) (Fig. 1).

Ovigerous females were collected during almost the whole studied period, except in June and July. The peak of ovigerous females was observed during the months of February and March 1998 (Fig. 2). Taking into account the size distribution, the highest number of ovigerous females was found in the 40 –| 43 mm size class (Fig. 1). The smallest and largest ovigerous female found had a CW of 31.9 mm and 53 mm, respectively.

Ovigerous females frequency was correlated with abiotic values. Air temperature showed to be significant through Pearson's correlation, $r = 0.73$ ($p < 0,05$) (Table III).

Table III: Pearson's correlation coefficient (r) for ovigerous females frequency of *G. cruentata* and the abiotic factors sampled in the Paraíba River estuary - Brazil.

	Rainfall (mm)	Air temperature (°C)	Water temperature (°C)
Ovigerous females	-0.3	0.73*	0.5

Discussion

Literature on the population biology of *G. cruentata* in Brazil is scarce. Cobo (1995) and Cobo and Fransozo (1998) studied this species in São Paulo State, southeastern Brazil, emphasizing the population structure, breeding period and relative growth. Average carapace width obtained for this species in São Paulo State (males 28.7 ± 7.3 mm and females 29.8 ± 6.1 mm) was smaller than those observed in the present study. The differences observed between data of the present study and the results obtained by Cobo (1995) can be reflecting the employ of distinct catch methods, while we used a specific commercial fishing gear, he performed the sampling by hand. The gear used in this research probably does not sample the juveniles, excluding individuals smaller than 25mm

Besides the catch methods, factors like food availability, pollution and environmental conditions could be associated with these differences regarding the animal's mean size.

A unimodal frequency distribution was also found by Cobo (1995) for the same species, that according to Díaz and Conde (1989) suggests a stable population. The unimodality usually reflects the balance between the larval release, recruitment, migration and mortality rates.

Reproductive activity of *G. cruentata* indicated by the presence of ovigerous females, can be considered as continuous reproduction (Sastry 1983). This was also observed in São Paulo State Coast for this species (Cobo 1999). In the present study, the reproductive peak was recorded in the warmest months of the year in February and March, but with many ovigerous females from December to April, summer in the study area. This was confirmed by the significant correlation between ovigerous females and air temperature. This higher incidence in summer was observed also for other grapsids such as *Aratus pisonii* H. Milne Edwards, 1837 by Díaz and Conde (1989), Leme and Negreiros-Fransozo (1998); *Cyrtograpsus angulatus* Dana, 1851 by Cracco and Fontoura (1996); *Pachygrapsus tranversus* (Gibbes, 1850) by Flores and Negreiros-Fransozo (1999). Temperature has been considered the main decisive factor for reproductive events (Thorson, 1950; Sastry, 1983). According to Negreiros-Fransozo *et al.* (1992), some anomurans and brachyurans concentrate their reproductive phase in the warmest months. Cobo (1999) assumed that spawning period may be influenced also by photoperiod and temperature. However, further investigations are necessary, concerning mainly reproductive aspects of this species, considering that at the moment there is no data on *G. cruentata* in northeastern Brazil.

Acknowledgements

To the "PET - CAPES" (Programa Especial de Treinamento - Coordenação de Aperfeiçoamento de Pessoal de Nível Superior) that provided a fellowship for the first author. We thank also to Dr. Ralf Schwamborn for valuable suggestions and for revising the manuscript.

References

- Abreu, J. de. 1980. Distribuição e ecologia dos Decapoda numa área estuarina de Ubatuba (SP). Boletim do Instituto Oceanográfico, 29(1): 1-3.
- Cobo, V. J. 1995. Biologia populacional e crescimento relativo de *Goniopsis cruentata* (Latreille, 1803) (Crustacea, Decapoda, Grapsidae) na região de Ubatuba, SP. 79p. Master Science dissertation, Universidade Estadual Paulista, Botucatu, São Paulo.
- Cobo, V. J. 1999. Estrategia reprodutiva do caranguejo do manguezal *Goniopsis cruentata* (Latreille, 1803) (Brachyura, Grapsidae), na região de Ubatuba, litoral norte do Estado de São Paulo. 90p. Doctoral thesis, Universidade Estadual Paulista, Botucatu, São Paulo.
- Cobo, V. J. and Fransozo, A. 1998. Relative Growth of *Goniopsis cruentata* (Crustacea, Brachyura, Grapsidae), on the Ubatuba Region, São Paulo, Brazil. Iheringia, Ser. Zool., Porto Alegre. 84: 21-28.
- Coelho, P. A. 1965. Os crustáceos decápodos de alguns manguezais pernambucanos. Trabalhos do Instituto Oceanográfico, Universidade Federal de Pernambuco, 7/8: 71-90.
- Coelho, P. A. and Coelho-Filho, P. A. 1993. Chave para identificação dos crustáceos Decapodos Braquiuros encontrados nos biótopos de água salobra do litoral oriental do Nordeste do Brasil. Boletim Técnico Científico CEPENE. 1(1): 29-56.
- Coelho, P. A. and Ramos-Porto, M. 1995. Crustáceos da região de Tamandaré, estado de Pernambuco, Brasil. Boletim Técnico Científico CEPENE. 3(1): 57-80.
- Cracco, E. B. and Fontoura, N. F. 1996. Dinâmica populacional de *Cyrtograpsus angulatus* Dana, 1851 no estuário do Rio Tramandaí, Imbé, Rio Grande do Sul, Brasil (Crustacea, Decapoda, Grapsidae). Revista Brasileira de Biologia, 56(3): 513-528.
- Díaz, H. and Conde, J. E. 1989. Population dynamics and life history of the mangrove crab *Aratus pisonii* (Brachyura, Grapsidae) in a marine environment. Bulletin of Marine Science, 45(1): 148-163.
- Flores, A. A. V. and Negreiros-Fransozo, M. L. 1999. On the population biology of the shore crab *Pachygrapsus transversus* (Gibbes, 1850) (Crustacea, Brachyura, Grapsidae). Bulletin of Marine Science, 65(1): 59-74.
- Guerrero-Ocampo, C. M. and Negreiros-Fransozo, M. L. 2000. Determinação da maturação sexual morfológica por meio do estudo do crescimento relativo em *Goniopsis cruentata* (Brachyura, Grapsidae). In: Proceedings of the Mangrove 2000, Recife, Pernambuco, Brasil.
- Lacerda, S. R. 1994. Variação diurna e sazonal do fitoplâncton no estuário do rio Paripe (Itamaracá/ Pernambuco/Brasil). 146p. Master Science Dissertation, Universidade Federal Rural de Pernambuco.
- Leme, M. H. A. and Negreiros-Fransozo, M. L. 1998. Reproductive patterns of *Aratus pisonii* (Decapoda: Grapsidae) from an estuarine area of São Paulo Northern Coast, Brazil. Revista de Biologia Tropical, 46(3): 673-678.
- Melo, G. A. S. 1996. Manual de identificação dos Brachyura (caranguejos e siris) do litoral brasileiro. Plêiade / FAPESP, São Paulo, 604pp.
- Negreiros-Fransozo, M. L.; Fransozo, A.; Mantelatto, F. L. M.; Nakagaki, J. M. and Spilborghs, M. C. F. 1992. Fecundity of *Paguristes tortugae* Schmitt, 1933 (Crustacea, Decapoda, Anomura) in Ubatuba, São Paulo, Brasil. Revista Brasileira de Biologia, 52: 547-553.
- Oshiro, L. M.Y.; Silva, R. and Silva, Z. S. 1998. Composição da fauna de braquiúros (Crustacea, Decapoda) dos manguezais da Baía de Sepetiba – RJ. Nauplius, 6: 31-40.

- Thorson, G. 1950. Reproductive and larval ecology of marine bottom invertebrates. *Biological Reviews of the Cambridge Philosophical Society*, Cambridge, 25: 1-45.
- Sastry, A. N. 1983. Ecological aspects of reproduction. *In: Waterman, T. H. (Org.) The Biology of Crustacea. VII. Environmental adaptations.* Academic Press Inc., 179-270.
- Wiedemeyer, W. 1997. Analysis of the benthic food web of a mangrove ecosystem at northeastern Brazil. 155p. PhD. Thesis. Kiel University, Germany.

Received: 15th / 12 / 2000

Approved: 15th / 12 / 2001