

Natural Diet of *Callinectes ornatus* Ordway, 1863 (Decapoda, Portunidae) in the Itapocoroy Inlet, Penha, SC, Brazil

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ABSTRACT

From January to December 1995, 332 individuals of the *Callinectes ornatus* species were collected from the Itapocoroy inlet in Penha, Sta. Catarina, Brazil to study its natural diet and the seasonal variations of diet. Results showed a diversified trophic spectrum with a generalized dietary strategy comprising the algae, macrophyta, foraminiferida, mollusca, polychaeta, crustacea, echinodermata, Osteichthyes and NIOM (Nonidentified Organic Matter) groups.

Key words: *C. ornatus*, Portunidae, natural diet, dietary habits, dietary ecology

INTRODUCTION

Callinectes ornatus Ordway, 1863, which is present in the west Atlantic from North Carolina, USA to Rio Grande do Sul, Brazil can be found at depths of up to 75 meters in sand and mud bottoms, as well as in waters with lower salt content (Melo, 1996). In addition to being a saprophagous species, it is also a predator that digs into the substrate in search of food and participates in the diet of other aquatic organisms (Haefner, 1990; Nonato *et al.*, 1990). The available literature on the species covers the aspects of distribution, occurrence, reproduction, morphology (Gore, 1977; Norse, 1978; Paul, 1982; Branco & Lunardon-Branco, 1993 a, b; Melo, 1996) And Diet (Williams, 1981; Haefner, 1990; Nonato *et al.*, 1990; Moncada & Gomes, 1980; Stoner & Buchanan, 1990). The purpose of this work was to study the natural diet of *C. ornatus* and the seasonal variations of the diet of the population of

the Itapocoroy inlet in the municipality of Penha, SC, Brazil.

MATERIALS AND METHODS

The samples were collected monthly, from January through December 1995, in the Itapocoroy inlet at a depth varying from 5 to 10 meters using a over-trawl net with doors. The average sampling time was 30 minutes and speed was two knots. The samples were placed in a styrofoam container on ice and were laboratory processed immediately after disembarkation. Identification and recognition of sex was done according to Williams (1974), and determination of the state of maturity (young/adult) according to the shape and adherence of the abdomen to the thoracic sternum by Taissoum method (1969), using a stereoscopic microscope whenever necessary. The width of the

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carapace (between the ends of the side spikes) and the total weight (in grams) of each sample were measured.

Identification of dietary items was done according to Rios, 1975; Nonato & Amaral, 1979; Amaral & Nonato, 1981; 1982; Barnes, 1984; Elnor *et al.*, 1985; And Nonato *et al.*, 1990. Items that were unidentifiable due to their advanced state of digestion were considered Nonidentified Organic Matter (NIOM). The dietary items were divided into nine groups: 1) Algae, 2) Macrophyta, 3) Foraminiferida, 4) Mollusca, 5) Polychaeta, 6) Crustacea, 7) Echinodermata, 8) Osteichthyes, and 9) NIOM. Sand was not considered a trophic category since it does not provide information about the nature of the diet (Williams, 1982). The trophic categories were analysed qualitatively and quantitatively using Hynes (1950) and Williams (1981) methods of frequency of occurrence (FO), of points (MP). For comparison and a better comprehension of the importance of each trophic category, the feeding index (IAi) was used as proposed by Kawakami & Vazzoler (1980) that combines both methods.

RESULTS AND DISCUSSION

Three hundred and thirty-two specimens were collected from the Itapocoroy inlet (209 males and 123 females) from January through December 1995 (Table 1). The total body length of these varied from 2.2 to 10.5 cm. Stomachs with contents were more frequent in the case of both males (53.1%) and females (63.4%) (Table 1). Results of Table 2 reveal that the Osteichthyes (22.41%) contributed with the highest relative volume in points, followed by the non-identified Brachyura (15.19%), Penaeidae (14.75%) and Bivalvia (8.36%). However, in terms of frequency of occurrence, small variations were observed among the specimens investigated: Osteichthyes (13.28%), Bivalvia (11.11%), non-identified Brachyura (10.84%) and Penaeidae (9.21%). *C. ornatus* presented a diversified trophic spectrum at several levels. Crustacea represented the highest diversity of their prey, the non-identified Brachyura, followed by Penaeidae and species of the *Callinectes*. Among the Mollusca, the most representative item was Bivalvia, while among the

Annelida, non-identified Polychaeta were the most frequent and among the Echinodermata, it was the Ophiuroidea that most contributed in terms of relative volume and frequency of occurrence. Haefner's (1990) findings from Mullet Bay (Bermudas) were similar for *C. ornatus*, however, the most important item was Mollusca, which could be justified by its abundance in that region. The lack of inventories of the marine fauna in the Itapocoroy inlet precluded us from reporting on the abundance of these groups in the region. Nonetheless, our findings indicated that among the invertebrates found in the diet of *C. ornatus*, Bivalvia were the most frequent, although non-identified Brachyura were the most abundant. Moncada & Gómez (1980), characterized *C. ornatus* as a predator of the species of the *Penaeus*. This was related to the pattern of distribution of the species of the *Callinectes* and the *Penaeus* (Williams, 1974 *apud* Moncada & Gómez, 1980). The main items in the diet were vegetable and crustacean remains. It has proved difficult to identify the Mollusca, as well as other dietary items of *C. ornatus* (Moncada & Gómez, 1980; Haefner, 1990), owing to the species' strategy of fragmenting the larger individuals it captures in order to ingest them. On the other hand, the small individuals are ingested practically intact, which allows for their identification. Although sand occupied 9.08% of the stomach volume and was found in 26.02% of the stomachs, it was not considered an trophic item or category. These percentages could be justified by the behavior of the species which, when manipulating its diet, ingested a certain amount of sand with it. Branco (1996) stated that the large amount of sand ingested by the *C. danae* species was probably related to the ingestion of its prey. Haefner (1990) considered it difficult to correctly evaluate the value of the nonidentified organic matter, sand and sediment, believing it will not continue posing a problem in studies of natural diets. Indeed, in Mullet Bay, he observed *C. ornatus* taking sediment into its mouth together with the chelipeds, stomach volume and was present in 3.28% of the stomachs analyzed. Branco (1996) found NIOM to be the item most consumed by adult individuals of *C. danae* in the Lagoa da Conceição, state of Santa Catarina, Brazil.

Table 1 - *Callinectes ornatus*. Frequency of occurrence distribution of males and females with contents and empty stomachs, in the period from January to December/95.

Sex	Stomachs				Total
	Empty		With Contents		
	N	%	N	%	
Males	98	26.9	111	53.1	209
Females	45	36.6	78	63.4	123
Total	143	43.07	189	56.93	332

Table 2 - *Callinectes ornatus*. Frequency of occurrence (FO) and points (MP) of the feeding items in stomachs contents, for grouped sexes, during the study period.

Itens	MP	%	FO	%
Algae	396	3.96	12	3.28
Macrophyta	30	0.30	1	0.27
PROTOZOA				
Foraminiferida	2	0.02	1	0.27
MOLLUSCA				
Bivalvia	835	8.36	41	11.20
Gastropoda	137	1.37	5	1.37
Cephalopoda/Loligonidae	185	1.85	3	0.82
ANNELIDA/POLYCHAETA				
Polynoidae	2	0.02	1	0.27
Polychaeta not identified	433	4.33	14	3.82
CRUSTACEA				
Mysidacea	152	1.52	3	0.82
General Amphipoda	18	0.18	5	1.37
Gammaridae	97	0.97	5	1.37
Isopoda	12	0.12	2	0.55
Decapoda not identified	190	1.90	5	1.37
Penaeidae	1473	14.75	34	9.29
<i>Farfantepenaeus paulensis</i>	50	0.50	1	0.27
<i>Penaeus spp.</i>	75	0.75	1	0.27
Sergestidae				
<i>Acetes americanus</i>	25	0.25	1	0.27
Portunidae				
<i>Callinectes spp.</i>	524	5.25	14	3.82
Xanthidae	25	0.25	1	0.27
Brachyura not identified	1517	15.19	40	10.93
Anomura/Diogenidae				
<i>Dardanus insignis</i>	75	0.75	1	0.27
Crustacea eggs	4	0.04	2	0.55
ECHINODERMATA				
Ophiuroidea	255	2.55	15	4.10
Echinodermata not identified	2	0.02	1	0.27
Osteichthyes	2239	22.41	49	13.40
Organic material (NION)	330	3.31	12	3.28
Sand	908	9.09	96	26.23
TOTAL	9991	100	366	100

The dietary category Crustacea was most representative, both in points (MP) and in occurrence (FO), followed by Osteichthyes and Mollusca, while the less representative categories were Macrophyta and Foraminiferida, with the

remaining categories participating only moderately in the species' trophic spectrum (Table 2). In other species of the *Callinectes* genus, Crustacea also represented an important dietary source (Moncada & Gómez, 1980; Haefner, 1990; Stoner &

Buchanan, 1990; Branco, 1996). Analyzing the dietary composition from a seasonal standpoint, variations were observed throughout the year. In spring, the most significant prey in terms of IAI were Crustacea (0.695) and Osteichthyes (0.229), followed by Mollusca (0.030) and Polychaeta (0.029) in second place and the remaining prey classified as occasional (Figure 1). The Polychaeta contributed to the diet of the Crustacea Decapoda Brachyura, constituting a dominating group in unconsolidated substrates. Nonato *et al.* (1990), working with six species of Brachyura, found that Polychaeta was present in 25.3% of the analyzed stomachs of *C. ornatus*, represented by the Eunicea and Pectinariidae families. In the Itapocoroy inlet, the Polychaeta which was identified in stomachs belonged to the Polynoide family. According to Nonato *et al.* (1990), this group predominated on the diet of juvenile *C. ornatus*. In his study of the natural diet of *C. danae* in the Lagoa da Conceição, state of Santa Catarina, Brazil, Branco (1996) reported that the juveniles of this species caught prey which were little or with no mobility (the Polychaeta).

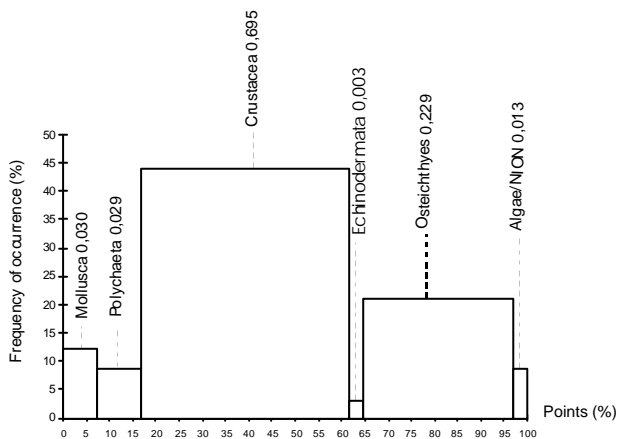


Figure 1 - *C. ornatus*. Frequency of occurrence (%) and of points (%) of the dietary groups and their respective IAI in spring.

Similar findings were reported for the summer season, with Crustacea and Osteichthyes also representing the most important prey; however, Mollusca were also occasional prey (Figure 2).

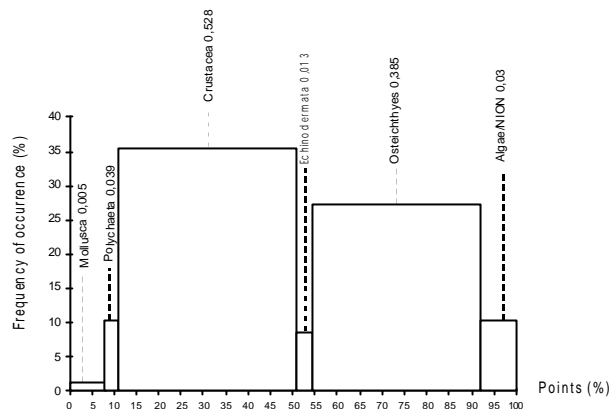


Figure 2 - *C. ornatus*. Frequency of occurrence (%), and points (%), of the feeding groups and their respective IAI in summer.

Crustacea continued representing the most important diet in autumn (0.4224), although Mollusca, which were occasional in summer, took secondary place in the fall (0.2878). This change was ascribed to the availability of this group in the environment (Figure 3). Autumn presented the greatest diversity of prey, represented by Mollusca Bivalve, Gastropoda and Loligonidae; Polychaeta, Bracyura, *Callinectes* genus, species of the Penaeidae family, *Farfantepenaeus paulensis*, Ophiuroide, Osteichthyes, algae and organic material; while the Penaeidae were the most representative prey among the Crustacea.

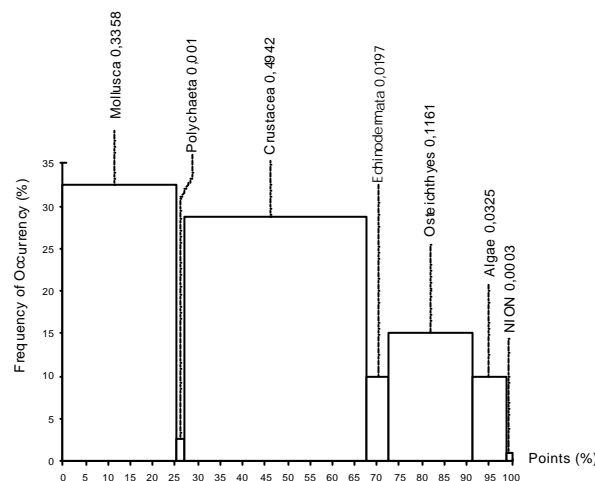


Figure 3 - *C. ornatus*. Frequency of occurrence (%), and points (%), of the feeding groups and their respective IAI in fall.

The diversity of prey was found to diminish in winter in comparison to autumn, with Crustacea representing the chief diet, followed by Mollusca and Osteichthyes (Figure 4). The dietary category of algae, though present in every season except winter, was found to be of secondary importance. Generally speaking, one can consider that the most preyed on categories were Crustacea, Osteichthyes and Mollusca. Crustacea, therefore, were present throughout the four seasons and represented the basis of the natural diet of *C. ornatus*, which was composed of Amphipods, Decapoda Penaeidae/Sergestidae, together with the species *Farfantepenaeus paulensis* and other species of the *Penaeus* genus that were not properly identified to the high degree of digestion, *Acetes americanus*, Portunidae in general and species of the *Callinectes* genus; Xanthidae, Brachyura, Anomura, Diogenidae with the species *Dardanus insignis* and Crustacea eggs (Figure 5; Table 2).

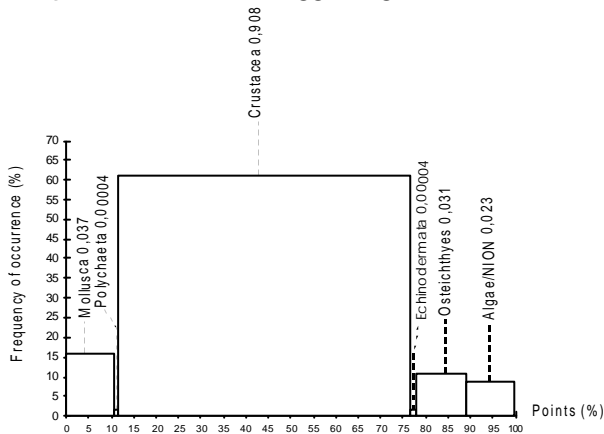


Figure 4 - *C. ornatus*. Frequency of occurrence (%), and points (%), of the feeding groups and their respective IAI in winter.

Callinectes ornatus presented a diversified trophic spectrum with a generalized feeding strategy and, therefore, a large niche, which was represented by its successful ingestion of animals of inferior trophic levels. Similar to *C. danae* (Branco, 1990), *C. ornatus* plays an important role in the transfer of energy of the ecosystem. *C. ornatus* can be considered an opportunistic predator of slow-moving macroinvertebrates. The presence or absence of any given trophic group in the diet of this species depends on the most recently visited; microhabitat as well as the availability of prey in the environment (Haefner, 1990; Branco, 1996). This predatory behavior was confirmed by Lipcius & Hines (1986) for Decapoda, whose behavior

was a possible delimiting factor of the abundance and distribution of prey in unconsolidated substrates.

RESUMO

Alimentação natural de *Callinectes ornatus* Ordway, 1863 (Decapoda, Portunidae) na Armação do Itapocoroy, Penha, SC - Brasil. No período de janeiro a dezembro de 1995, foram coletados 332 indivíduos de *Callinectes ornatus*, procedentes da Armação do Itapocoroy (Penha, SC). Foi estudada a alimentação natural da espécie e as variações sazonais da dieta.

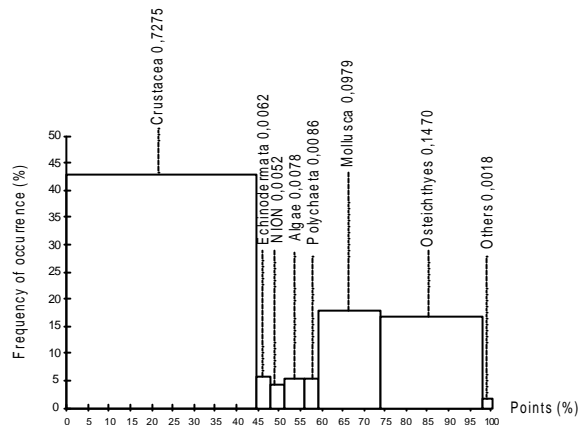


Figure 5 - *C. ornatus*. Frequency of occurrence (%), and points (%), of the feeding groups and their respective IAI in general.

Os resultados mostram um espectro trófico diversificado, com estratégia alimentar generalista, sendo Algas, Macrófitas, Foraminiferida, Mollusca, Polychaeta, Crustacea, Echinodermata, Osteichthyes e matéria orgânica não identificada, os grupos que compõem sua dieta.

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