| Bol. Invest. Mar. Cost. | 29 | 35 - 40 | ISSN 0122-9761 | Santa Marta, Colombia, 2000 |
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**NOTE:**

# OBSERVATIONS ON THE DIET OF *BALISTES VETULA* (PISCES: BALISTIDAE) IN THE GULF OF SALAMANCA, COLOMBIAN CARIBBEAN

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## RESUMEN

**Observaciones sobre la dieta de *Balistes vetula* (Pisces: Balistidae) en el Golfo de Salamanca, Caribe colombiano.** Se describe el contenido de los tractos digestivos de ejemplares de *Balistes vetula* capturados durante faenas de pesca científica. Los crustáceos representan la presa preferencial de esta especie en el Golfo de Salamanca y dentro de estos destaca el orden Brachyura. Estos resultados se contrastan con la dieta de la especie en otras latitudes.

*Palabras clave:* Balistes vetula, *dieta, bentos, Caribe colombiano*

As part of an investigation on the demersal fish resources of the Gulf of Salamanca (11°00'N to 11°19'N and 74°12' W to 74°50'W), the stomach contents of the fishes captured have been analyzed. Among the fishes caught in 1996 there were 11 *Balistes vetula*. This small number is not surprising as *B. vetula* has been characterized as a member of the rocky-coral reef tropical fish communities (Cervigón 1995). In fact, the stations where *B. vetula* was caught were in general of rough-mixed bottom with cobbles and positioned nearby the Animas Bank, a small coral formation. The Gulf of Salamanca bottom is otherwise made up of silt-clay to sandy sediments.

Work on the diet and feeding habits of *B. vetula* has been conducted by Randall (1967) in the West Indies, Menezes (1979) in Brasil and Reinthal *et al.* (1984) in the Gulf of Mexico. Randall (1967) provides a detailed list of dietary items many of them at species level, among which echinoids, in particular, *Diadema antillarum*, constitute the preferential prey. Menezes (1979) provides a list of 22 major diet categories including

*Contribución No. 663 del Instituto de investigaciones Marinas y Costeras "José Benito Vives De Andréis" INVEMAR.*

sand, which is a clear indication of opportunistic, benthic feeding habits. According to this author, adult *B. vetula* consumes fish, crustaceans and molluscs preferentially. Reinthal *et al.* (1984) identified *D. antillarum* as the primary prey of *B. vetula* and found that in its absence *B. vetula* exhibits prey-switching from echinoids to crustaceans and molluscs.

The purpose of this study is to provide a preliminary quantitative view on the diet of *B. vetula* in order to add to the understanding of its role in the trophic dynamics of the Gulf of Salamanca ecosystem. Quantitative information and lists of dietary items are input information for mass balanced models of ecosystems like ECOPATH (Christensen and Pauly 1993).

The fishes were measured (fork length), the complete digestive tract removed (no differentiated stomach exist in this species) and preserved in a 4 % neutral formaldehyde solution. Digestive tract contents were separated and identified to the lowest possible taxa. As relative measures of prey quantity (RMPQ) three measures were used: gravimetric (wet weight) importance (%W), frequency of occurrence in the digestive tracts (%F) and frequency of occurrence in the sample of prey items (%F'). The gravimetric importance is defined as:

$$\%W=(Wi/Wt)*100 \qquad (1)$$

where Wi represents the weight of the i-th item and Wt represents the total weight of the i items. The frequency of occurrence in the digestive tracts is defined as:

$$\%F= (Ni/Nt)*100 \qquad (2)$$

where Ni represents the number of digestive tracts where the i-th item occurred and Nt represents the total number of digestive tracts. The frequency of occurrence in the sample of prey items is defined as:

$$\%F'=(Ni/Ft)*100 \qquad (3)$$

where Ni represents the same as above and Ft represents the cumulative frequency of occurrence of all items in all the digestive tracts. In order to

describe prey importance patterns the Geometric Importance Index, GII of Assis (1996) was used. This index is defined as:

$$GIIj=(\Sigma Vi)j/\sqrt{n} \qquad (4)$$

where (Vi)j represents the value of the i-th RMPQ for item category j and n represents the number of RMPQs. For the prey importance analysis the dietary items were grouped into 12 major categories: Crustacea, Mollusca, Echinodermata, Algae, Sipunculida, Bryozoa, Pisces, Cnidaria, Porifera, Annelida, sand and unidentified material.

Individuals ranged from 200 mm to 435 mm, fork length. None of the 11 digestive tracts analyzed was empty and nine of them showed fullness of more than 50%. A total of 36 dietary items were registered (Table 1) including 34 taxonomic categories, three of them at species level. Figure 1 shows a graphic presentation of GII as suggested by Assis (1996). Preferential prey are crustaceans, secondary prey are molluscs and echinoderms, whereas the other major categories lie into occasional prey.

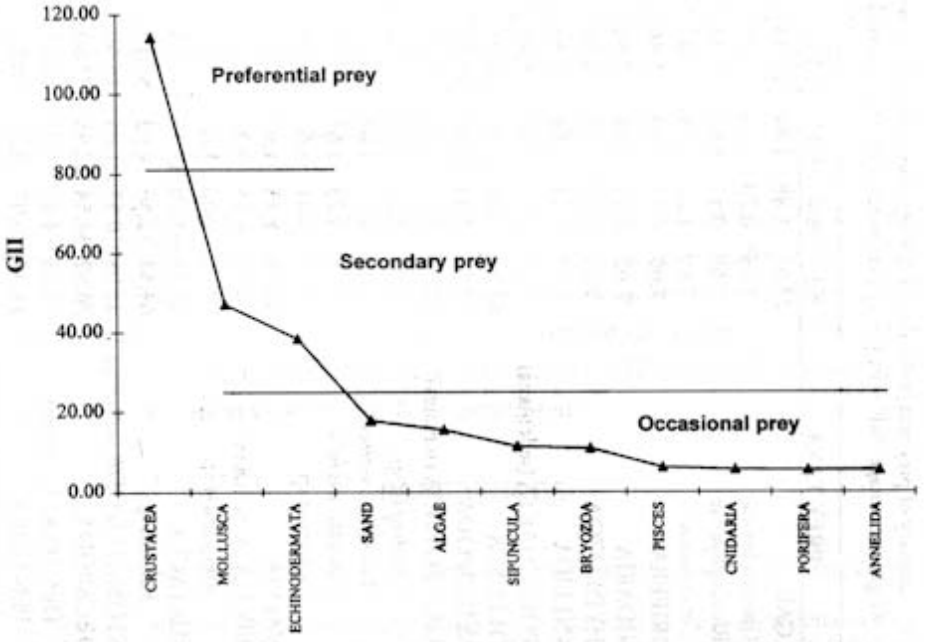


Figure 1. Prey importance in the diet of *Balistes vetula* individuals caught in the Gulf of Salamanca, Colombian Caribbean

Table 1. Summary of prey taxa in the diet of *Balistes vetula* collected in the Gulf of Salamanca, Colombian Caribbean. %F = frequency of occurrence, %W = weight percentage, %F' = frequency percentage, GII = Geometric Index of Importance (Assis, 1996).

| PREY TAXA | %F | %W | %F' | GII |
|---|---|---|---|---|
| **ALGAE** | **23.07** | **1.88** | **1.64** | **15.35** |
| Chlorophyceae | 7.69 | 0.70 | 1.64 | 5.79 |
| Rhodophyceae | 7.69 | 0.17 | 1.64 | 5.48 |
| Ceramiaceae | 7.69 | 1.01 | 1.64 | 5.97 |
| **PORIFERA** | **7.69** | **0.12** | **1.64** | **5.46** |
| **CNIDARIA** | **7.69** | **0.29** | **1.64** | **5.56** |
| HYDROZOA | 7.69 | 0.29 | 1.64 | 5.56 |
| **ANNELIDA** | **7.69** | **0.11** | **1.64** | **5.45** |
| POLYCHAETA (sedentaria) | 7.69 | 0.11 | 1.64 | 5.45 |
| **MOLLUSCA** | **61.53** | **3.40** | **16.39** | **46.95** |
| **GASTROPODA** | **61.53** | **2.25** | **11.48** | **43.45** |
| GASTROPODA (remains) | 30.77 | 2.01 | 4.92 | 21.76 |
| *Cerithiopsis* sp. | 7.69 | 0.01 | 1.64 | 5.39 |
| *Assiminea succinea* | 7.69 | 0.01 | 1.64 | 5.39 |
| *Fissurella nimbosa* | 7.69 | 0.23 | 1.64 | 5.52 |
| *Volvarina* sp. | 7.69 | 0.01 | 1.64 | 5.39 |
| **BIVALVIA** | **30.76** | **1.15** | **4.92** | **21.26** |
| BIVALVIA (remains) | 4.23 | 1.15 | 3.28 | 5.00 |
| *Amigdalum* sp. | 7.69 | 0.00 | 1.64 | 5.39 |
| **CRUSTACEA** | **92.31** | **67.70** | **37.70** | **114.15** |
| *Balanus* sp. | 61.54 | 32.56 | 4.92 | 57.17 |
| STOMATOPODA (remains) | 23.08 | 0.57 | 1.64 | 14.60 |
| **DECAPODA** | **76.92** | **34.54** | **22.95** | **77.60** |
| DECAPODA (remains) | 15.38 | 4.47 | 4.92 | 14.31 |
| PENAIDEA | 15.38 | 0.07 | 3.28 | 10.81 |
| **BRACHYURA** | **69.23** | **30.04** | **18.03** | **67.72** |
| BRACHYURA (remains) | 30.77 | 8.16 | 3.28 | 24.37 |
| Majidae | 23.08 | 16.25 | 3.28 | 24.60 |
| Leucossiidae | 7.69 | 0.61 | 1.64 | 5.74 |
| Gonodactylidae | 7.69 | 0.86 | 1.64 | 5.88 |
| Portunidae | 23.08 | 3.38 | 1.64 | 16.22 |
| Calappidae | 7.69 | 0.04 | 1.64 | 5.41 |
| Raninidae | 7.69 | 0.10 | 1.64 | 5.44 |
| *Dardanus fucosus* | 7.69 | 0.23 | 1.64 | 5.52 |
| Xanthidae | 7.69 | 0.37 | 1.64 | 5.60 |
| ISOPODA (remains) | 7.69 | 0.04 | 1.64 | 5.41 |
| **SIPUNCULA** | **15.38** | **2.35** | **1.64** | **11.18** |
| **BRYOZOA** | **15.38** | **0.04** | **3.28** | **10.80** |
| *Cupuladria* sp. | 7.69 | 0.02 | 1.64 | 5.40 |
| *Briozoa* sp. | 7.69 | 0.02 | 1.64 | 5.40 |
| **ECHINODERMATA** | **46.15** | **13.59** | **6.56** | **38.28** |
| OPHIUROIDEA (remains) | 30.77 | 5.27 | 3.28 | 22.70 |
| *Amphioidia* sp. | 7.69 | 6.99 | 1.64 | 9.42 |
| ECHINOIDEA (*Eucidaris* sp.) | 15.38 | 1.33 | 1.64 | 10.60 |
| **PISCES** | **7.69** | **1.19** | **1.64** | **6.08** |
| Bothidae | 7.69 | 1.19 | 1.64 | 6.08 |
| **SAND** | **23.08** | **4.31** | **3.28** | **17.70** |
| **UNIDENTIFIED MATERIAL** | **38.46** | **5.02** | **6.56** | **28.89** |
| Number of stomach analysed | | | 11 | |
| Size range (Fork Length, mm) | | | 200-435 | |

Among crustaceans the suborder Brachyura is the most important prey category (Table 1). As reported by Menezes (1979), in this study sand was an important item for this species (Table 1). The importance of unidentified material (Table 1) is a consequence of the feeding mode of *B. vetula*: to crush the prey on consumption (Menezes 1979).

The view that *B. vetula* exhibits a wide diet and carnivore and benthic feeding habits finds confirmation in this study. Our results differ from those of Menezes (1979) in that she found that adults (208 to 450 mm total length in her study, compared to 200 to 435 mm fork length in this study) *B. vetula* add fishes to their diet as preferential prey. Some fishes such as flatfish (Bothidae) were found in this study but they were an occasional prey. The results here differ from those of Randall (1967) and Reinthal *et al.* (1984) in that they identified *D. antillarum* as the preferential prey of *B. vetula* whereas in this study no indication of the presence of this particular item was found and echinoderms constituted secondary prey. Moreover, according to Reinthal *et al.* (1984) crustaceans and molluscs constitute the preferential prey of *B. vetula* in the absence of *D. antillarum*, but molluscs like echinoderms constituted only secondary prey. However, no definitive conclusion in this regard can be drawn and caution must be exerted due to the small sample size in our study.

## ACKNOWLEDGEMENTS

This work has been financed by COLCIENCIAS grant number 2105-09-176-94 to the project "Estudio ecológico pesquero de los recursos demersales del Golfo de Salamanca, Caribe colombiano. Estimación de la variabilidad de los componentes biológicos del sistema" and the Instituto de Investigaciones Marinas y Costeras, INVEMAR. Remarks by two anonymous reviewers are acknowledged.

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DATE RECEIVED: 23/07/99 DATE ACCEPTED: 02/05/00

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