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THE FOOD OF THE ASIAN MOON SCALLOP
Amusium pleuronectes (L.)

by

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ABSTRACT

Observations on the food of *Amusium pleuronectes* based on the examination of the stomach contents of specimens ranging from 21 mm to 91 mm in shell height, and some notes on the feeding of scallops are here presented. Results showed that *A. pleuronectes* utilizes different kinds of planktonic food organisms such as diatoms, dinoflagellates, tintinnids, larvae of molluscs and crustaceans, etc.

INTRODUCTION

Eight references involving *Amusium* were culled from voluminous published works on commercially exploited scallops (Kopinski, 1978). Of these, the only work that could be cited, involving the Asian moon scallop *(A. pleuronectes)*, was that of Sanders (1970) on the Australian scallop industry. Not included in Kopinski's bibliography of scallops were the work of Habe (1964) which deals in detail with the taxonomic description of *Amusium* species including *A. pleuronectes,* and that of Heald (1978) on tagging of *A. balloti.* Except for two local publications on *A. pleuronectes* (Llana and Aprieto, 1980; Llana, 1983), literature on locally published works on scallops is wanting.

In an attempt to make a comprehensive study on the biology of the Asian moon scallop, several aspects were investigated including the food composition of the species. Although the study on this particular aspect was not exhaustive, yet it obtained results which set the first record of observations on the food of *A. pleuronectes.*

This paper is the last of three series of research papers on scallop biology based on a masteral thesis which I prepared under the guidance of Dr. Virginia L. Aprieto of the College of Fisheries, University of the Philippines in the Visayas. The thesis, with financial support from the Philippine Council for Agriculture and Resources Research and Development (PCARRD), was virtually part of the PCARRD-funded research project of the U.P. Institute of Fisheries Development and Research on Trawl Fishing Investigations of Traditional and Non-traditional Fishing Grounds in the Philippines.

MATERIALS AND METHODS

The materials used in this study were obtained from the trawl catches of the R/V ALBACORE (the research and training vessel of U.P. Visayas, College of Fisheries) in the Visayan Sea from June 1976 to March 1977.

A total of 100 specimens (10 individuals per month) were selected at random from scallop samples collected from the different fishing tracks established in the study area. Each specimen was first measured (with a Vernier caliper), then shucked, and the meat immediately preserved in about seven percent formalin and sea water to prevent any further digestion and decomposition of the stomach contents.

The gut contents were dissected in the laboratory and examined under a binocular microscope. Identifiable food organisms and/or particles were counted with the aid of a Sedgwick rafter cell. When the actual number of individuals of each recognizable food group was too many in one specimen to be counted individually and accurately, counting was done from aliquot portions. The total number of individuals was estimated using the formula:

$$N = \frac{\text{number of organisms}}{\text{aliquot volume}} \times \text{total volume (Jones, 1954).}$$

The relative quantities of the different food groups were assessed using the number and occurrence methods, i.e., by estimating the total number of individuals of each food group, and computing the percentage frequency of occurrence (Laevastu, 1965).

RESULTS AND DISCUSSION

The results of the examination of the stomach contents of 100 specimens of *A. pleuronectes,* varying in sizes from 21 mm to 91 mm in shell height, revealed the following food organisms and/or particles: diatoms, dinoflagellates, tintinnids, sponge spicules, molluscan larvae, foraminiferans, crustacean holoplankton and larvae, radiolarians, silicoflagellates, echinoderm larvae, nemertineans, detritus, and sand particles. The data on the monthly relative occurrence of each of these food groups are shown in Table 1. Photographs of some of these organisms as seen under the microscope are shown in Figure 1.

Table 1. **Relative occurrence of the different food groups identified from the stomach contents of 100 specimens (10 per month) of *Amusium pleuronectes* varying from 21 mm to 91 mm in shell height.**

Relative Occurrence (%) Food Group	June 1976	July	August	September	October	November	December	January 1977	February	March	Average Percentage
Diatoms	85.33	78.65	92.90	83.69	89.08	76.66	86.69	86.00	62.15	50.81	83.98
Dinoflagellates	6.99	7.81	3.64	9.16	3.26	5.90	2.35	0.93	3.93	12.75	5.36
Foraminiferans	0.07	0.27	0.05	0.44	0.61	1.01	0.41	0.57	1.67	4.81	0.50
Radiolarians	0.14	0.35	0.09	0.22	0.11	0.37	0.22	0.16	0.68	0.37	0.22
Tintinnids	1.36	1.55	0.74	2.02	2.45	3.25	1.02	0.29	0.63	2.35	1.56
Sponge spicules	0.22	0.54	–	0.05	–	0.05	1.15	3.67	13.56	12.64	1.07
Mollusks (pteropods & pelecypod larvae)	0.64	3.78	0.96	0.35	0.12	0.29	0.62	0.52	3.66	3.68	0.99
Crustaceans (holoplankton & larvae)	0.23	0.33	0.21	0.60	0.48	0.82	0.39	0.68	0.75	0.70	0.48
Others (silicoflagellates, echinoderm larvae, nemertineans, detritus)	3.35	2.57	0.27	1.54	1.44	2.96	3.59	1.38	3.94	5.28	2.07
Sand particles	1.67	4.16	1.13	1.94	2.45	8.69	3.58	5.79	9.03	6.59	3.77

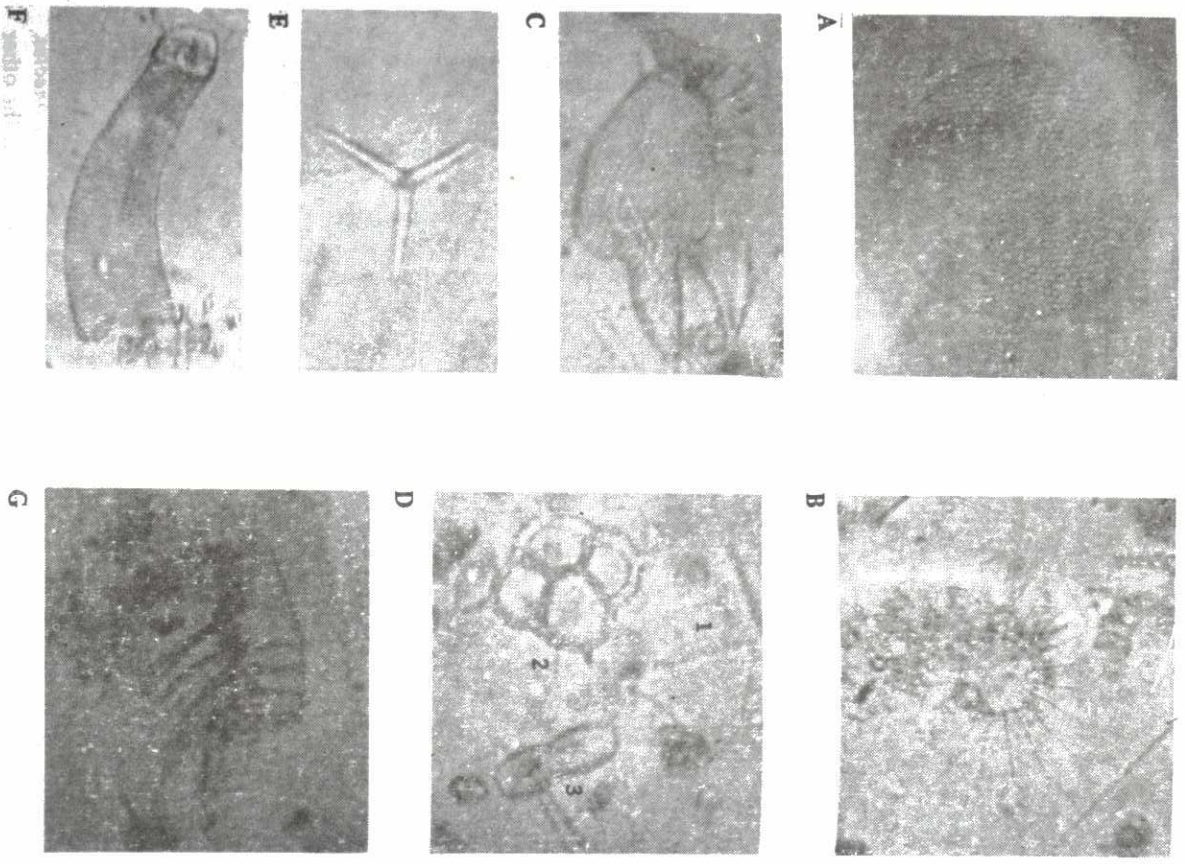

Figure 1. **Some of the food organisms found in the stomach of the scallop *Amusium pleuronectes*. A. *Coscinodiscus sp.* B. *Bacteriastrum sp.* C. *Dinophysis sp.* D. 1. *Triceratium sp.*, 2. *Dictyocha sp.*, 3. *Amphiprora sp.* E. *Leucoso-***

Figure 2 summarizes the data on relative occurrence and gives an overall picture of the frequency of occurrence of the different food groups identified from the gut contents of the entire sample. The diatoms comprised an average of 84 percent of the stomach contents of *A. pleuronectes* samples, while the rest of the food groups had a total average of only 16 percent.

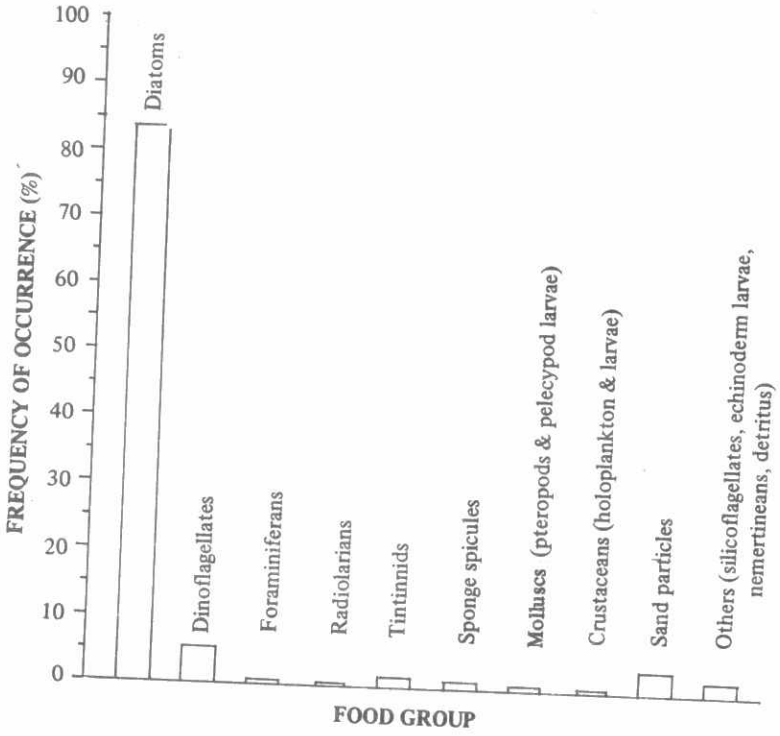

Figure 2.

Frequency histogram of the different food groups identified from the stomach contents of 100 specimens of the scallop *Amusium pleuronectes.*

The high percentage of occurrence of diatoms may not necessarily indicate that these organisms are the main food source of *A. pleuronectes.* Quite the contrary, this species of scallop may feed primarily on the other organisms identified but with low percentage of occurrence such as dinoflagellates, tintinnids, larvae of mollusks, etc. Smith (1955) reported that diatoms have a highly silicified cell wall, and that the siliceous portion remains unaltered after death and decay of a cell. This explains the occurrence of a great majority of diatoms in the gut contents of *A. pleuronectes.*

Broom (1976), in his review of biological data on three species of scallops, reported that Aravindakshan (1955) found the stomach contents of specimens of *Chlamys opercularis* (Queen scallops, about 75 mm long) to be composed of dinoflagellates, diatoms, small or whole or broken bits of crustacean larvae, particles of sand, and a fair amount of unrecognizable detritus. In view of the frequent occurrence of large numbers of apparently undigested diatoms in the rectal contents of *C. opercularis,* Aravindakshan inferred that the main sources of nutrition were probably detritus, dinoflagellates, eggs, sperms, and spores of algae.

The possible value of detritus (fine particles of dead organic matter) is not completely understood – some think it important while others question its significance (Bourne, 1964). Similarly, the value of sand particles is still not known; they may be without value, but they form a component part of the stomach contents as they cannot be excluded particularly if the water is heavily laden with silt.

Generally, the main food source of scallops is phytoplankton (Kirby-Smith, 1972). The species of plankton which are the best food of scallops are, however, not known, but diatoms and naked flagellates have been utilized for feeding both adult and larval scallops under culture (Bourne, 1964; Broom, 1976).

Scallops like most bivalves, are known to be filter feeders. The planktonic nature of the food organisms found in the stomach contents of *A. pleuronectes* adds support to earlier knowledge on the feeding habit of scallops. Unlike other filter feeders such as pelecypods, scallops have the ability to swim and they can rapidly expel accumulated wastes within the mantle cavity (Rees, 1957). This specialized excretory function is usually performed when swimming, by flapping its shell valves vigorously.

Bourne (1964) summarized the mechanism by which scallops feed, thus:

> **When resting normally on the bottom there are two openings between the edges of the mantle, one at the anterior end, which is the incurrent opening, and one at the posterior end which is the excurrent opening. Water is drawn through the incurrent opening into the mantle chamber and over the gills. As the water passes through the gills, minute plants and animals are strained out, collected, and passed forward along the gills to the palps and then into the mouth. Scallops can select their food and periodically the palps reject small masses (boluses) of food called "pseudo-faeces". The strained water then passes on through the gills, into the mantle cavity, and out the excurrent opening, often taking faecal pellets with it. Periodically a scallop will clap its valves violently, apparently eliminating materials; like pseudo-faeces, that may have clogged the gills or palps or lodged on the mantle.**

SUMMARY

The stomach contents of 100 specimens of *A. pleuronectes,* varying from 21 mm to 91 mm in shell height, were examined and found to be composed of diatoms, dinoflagellates, tintinnids, sponge spicules, molluscan larvae, foraminiferans, crustacean holoplankton and larvae, radiolarians, silicoflagellates, echinoderm larvae, nemertineans, detritus, and sand particles. Of these, the diatoms and flagellates have been reported to be utilized for feeding scallops in captivity.

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