NOTES ON THE DIET OF GERRES MACRACANTHUS BLEEKER, 1854 (PISCES:GERREIDAE)

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The food of Gerres macracanthus Bleeker, 1854 from inshore waters near Townsville, North Queensland, Australia, was studied from April 1984 to April 1985. Analysis of gastrointestinal contents revealed G. macracanthus to be a carnivore, feeding mainly on benthic invertebrates, particularly polychaetes. Molluscs, e.g. gastropods and bivalves, microcrustaceans and detrital materials make up the rest of the diet.

Fish can generally be classified on the basis of their feeding habits as carnivores, herbivores, omnivores and detritivores. Qasim (1972) further subdivided these categories basing his subdivision on detailed analysis of the gastrointestinal contents. His classification, however, can be arbitrary in application, as most fish have mixed diets, varying considerably with locality, season and size of the fish.

Information on the food of Gerres macracanthus is non-existent, probably because of its confused identity. It has been synonymized with G. filamentosus Cuvier,1829 by Fowler (1928, 1933), who stated that G. macracanthus was based on immature examples of G. filamentosus. Various authors, e.g. Smith (1972), FAO (1974, 1983) and Cyrus and Blaber (1982b), followed this synonymy on the bases of the similarity in their meristic characters and the absence of mature specimens of G. macracanthus and, conversely, of juveniles of G. filamentosus from the samples. Contrarily, Weber and de Beaufort (1931), Munro (1967) and Venkataraman and Badrudeen (1975) have treated the two as distinct species. The author also holds them to be separate species on the bases of differences in the morphological characters and the presence in the samples of juvenile G. filamentosus and adult (with running ripe gonads) G. macracanthus (Dolar, 1986).

This paper describes the diet of G. macracanthus collected from the coastal waters of Townsville, North Queensland.

MATERIALS AND METHODS

The specimens were collected from Cleveland Bay (146° 55' in the vicinity of Townsville, North Queensland, Australia. The

study site is characterized by a soft, muddy bottom, and the depth ranges from 5 to 20 m. The water in this area is usually slightly turbid. Salinity variation is dependent upon summer wet season discharge from small local rivers and the Burdekin River to the south (Walker, 1981).

In order to obtain comprehensive information on the diet, a year-round collection was made, with a total of 234 specimens collected and examined. Sampling was carried out using a demersal otter trawl with a gape of 11 m and cod end mesh of 32 mm, from the James Cook University research vessel, the James Kirby. The trawl shots were of 20 minutes duration, and were conducted between 0900 and 1700 hours. The trawling formed part of the ongoing investigation by N.E. Milward of the inshore fishes in the vicinity of Townsville, North Queensland. The fish were frozen on board and later transferred to the laboratory freezer.

In the laboratory, the fish were thawed out for examination, but kept chilled during handling. The total and standard lengths were measured to the nearest mm using a 500 mm measuring board. The gut contents were examined under a stereomicroscope and a compound microscope, if needed. Items not readily recognizable were preserved in 10% formalin or 70% alcohol for a more detailed examination. Food items were identified to the lowest taxon possible, based on Light et al. (1961), Wickstead (1965) and Barnes (1974), and with the assistance of people familiar with the local invertebrates. Recognition of polychaetes, which were invariably in a partial, or near total, digestion was based upon the distinctive mandibles and setae.

To quantify the prey items, three methods were used: the percent occurrence, numerical and volumetric methods as described by Hynes (1950), with some modifications of the volumetric method to facilitate assessment of the smaller food items. In the modified method, food items were compared with blocks of known volume after the technique of Larimore (1957). Individually, these methods have certain shortcomings, but taken collectively, they may provide a good measure of species' diet.

RESULTS

A summary of the food items found in the alimentary tracts of the adults averaged from the different months using the three methods is shown in Figure 1. Food items comprising less than 3% were lumped together under the heading "misc" (miscellaneous). It is evident that polychaetes are the dominant food item. Molluscs (bivalves and gastropods), amphipods, cheliferans and juvenile brachyurans also contribute considerable amounts. Detrital materials (organic debris plus mud and sand grains) were observed to be present in 60 to 100% of the individuals examined. Undigested plant materials, i.e. Halophila and Halodule, and

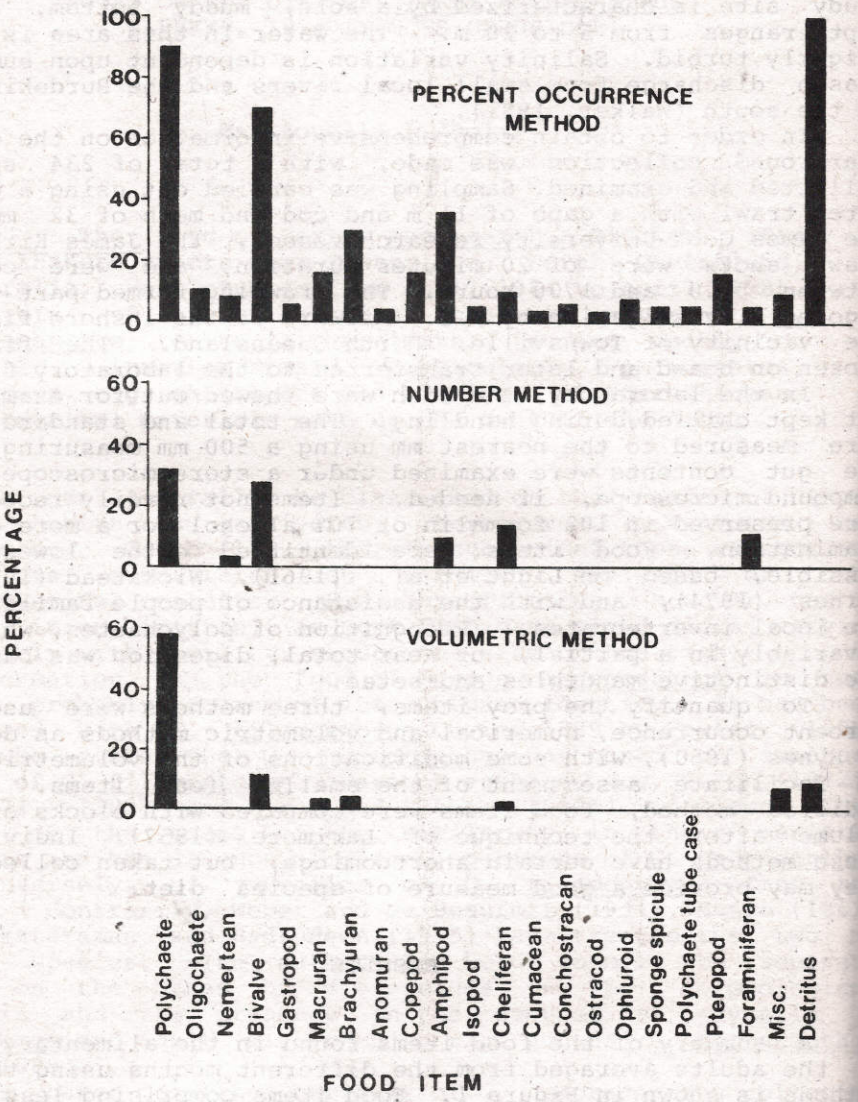

Fig. 1. Graphical representation of the food items found in the gastrointestinal tracts of G. macracanthus using the three methods of quantification.

siphon tips of bivalves were occasionally found (less than 3% in all the methods used) in the gastrointestinal tracts.

DISCUSSION

The results indicate that G. macracanthus is a carnivore and a benthic feeder, feeding mainly on the benthic invertebrates, particularly polychaetes, with small benthic and epiphytic crustaceans, i.e. amhipods, decapods, cumaceans, isopods and cheliferans, comprising the rest of the diet. This observation agrees closely with that made by Prabhakara Rao (1968) on G. oyena and G. filamentosus, Etchevers (1978) on Diapterus rhombeus, Cyrus and Blaber (1983b) on G. acinaces, G. oyena, G. rappi and G. oblongus and Dolar (1986) on G. poieti and Pentaprion longimanus.

However, some differences from the observations of other workers also appeared. Examples are the low occurrence and quantity of seagrass blades and siphon tips. The 2 to 3% occurrence of seagrass blades varies markedly from that observed by Austin (1971) in Diapterus rhombeus and by Chacko (1949) in three other species of gerreids. These two authors reported aquatic macrophytes to be the main component of the food items taken by the respective species they studied. Likewise, bivalve siphon tips comprised a very low percentage both in occurrence and quantity of the food items of the study species. This observation differs from that of Cyrus and Blaber (1983b, 1984) on G. filamentosus, which was noted to feed mainly on bivalve siphon tips.

Whole bivalves were observed to be taken more often than just siphon tips in the study species. The same observation was made by Prabhakara Rao (1968) for G. filamentosus and G. oyena from India. Whitfield (1980) reported that whole bivalves provide twice as much energy value as siphon tips. Therefore, if the bivalve resource is sufficiently large and can withstand the predation pressure, this mode of feeding would be advantageous to the fish. However, where the bivalve population is limited, feeding only on the siphon tips could be preferable since they would constitute a more rapidly renewable resource, as pointed out by Cyrus and Blaber (1983b).

The high incidence and large quantity of detrital material observed in the guts of the study species is suggestive of its importance in the diet of G. macracanthus and further strengthens the claim of a benthophagus way of life. Prabhakara Rao (1968) and Austin (1971) also recorded detritus as one of the major food items of G. oyena, G. filamentosus and Diapterus rhombeus. Settled detritus is a heterogeneous mixture of animal and plant remains, silt and sand particles coated with decaying organic matter and large colonies of bacteria and infusorians. It is perhaps the most readily and universally abundant food material

in shallow areas of the sea, estuaries and lakes (Qasim, 1972). The importance of detrital material as food has been recorded for Ethmalosa fimbriata (Blay and Eyeson, 1975), Sarotherodon mossambicus (Bowen, 1979) and Clistorina magnifica (Anderson, 1976). Chemical analysis shows that detrital material contains carbohydrates, proteins (mainly from bacteria) and a substance believed to contain a significant amount of amino acids, which could be as valuable as assimilated protein on a weight for weight basis (Bowen, 1979). Bowen (1979) reviewed the nutritional constraints and strategy in detritivory. He stated that generally, detritivores are confronted with the problem of gaining adequate digestible protein in their diet. However, he argued that this constraint is overcome by the detritivores by using the following measures: (a) selective feeding on protein rich detrital aggregates, (b) selective ingestion of the protein-rich elements of the detrital material and (c) complementing calories gained from detritus with protein-rich animal foods. In the present study, the presence of polychaetes, molluscs and microcrustaceans in the gastrointestinal tracts of G. macracanthus suggests that this species probably employs strategy C.

ACKNOWLEDGEMENTS

I wish to thank Dr. Peter Arnold for his help in the identification of the semi-digested food items, Dr. N.Milward for accommodating me in his sampling trips and the International Development Program (IDP) for the fellowship which supported my research.

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