Mahasagar-Bulletin of the National Institute of Oceanography, 11 (1 & 2), 1978, 91-94.

CALORIC VALUES OF THE INGESTED FOOD OF THE GREY MULLET *MUGIL CEPHALUS* LINNAEUS

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ABSTRACT

Estimations of organic carbon of the fish *Mugil cephalus* L. and its ingested food were made for a period of one year. The ratio of body carbon to ingested food carbon ranged between 2 to 7. The average percentage of organic carbon of the fish was 45.86. It was found that when the body carbon was high, the food carbon was low. An increase in the organic carbon content of the fish was noticed during the spawning period. From the carbon content the caloric values of the ingested food and of the fish were determined. The energy units (calories) of ingested food were high in the months of February and September while the energy units (calories) of the fish was maximum during January and August.

Mugil cephalus L. is a catadromus fish and has come into much prominance as a cultivable species in several developing countries. Considerable work has been carried out on the biology and artificial propagation of mullets. However, chemical studies in relation to the food intake are limited. Qasim (1972) and Qasim and Jacob (1972) and Qasim, Sumitra-Vijayaraghavan and Easterson (1973) have pointed out the importance of the chemical analysis such as the estimation of organic carbon in the stomach contents of marine fishes and prawns for expressing the food in terms of energy units.

The present contribution deals with the seasonal variations in the organic carbon from which an estimate of caloric values of the fish and its ingested food can be made.

For the estimation of organic carbon, the body and ingested food contents of 355 specimens of *M. cephalus* ranging in size from 105 mm to 378 mm in length (LCF) were examined during a period of one year. The fishes were collected at monthly intervals from coastal lagoons and estuaries of Goa. The specimens were cleaned in the laboratory after removing the surface moisture and the total length, wet weight and the sexes were noted. The stomachs were dissected out and the contents emptied into a petridish and pooled together in bowls containing melting ice to avoid bacterial action as the degree of precision in the estimation of carbon have been found to depend upon the freshness of food in the gut (Qasim, 1972). After a thorough shaking a few sub-samples were taken for qualitative analysis. These were examined under a microscope and the organisms present in the stomach contents were counted and their volumes determined.

The flesh of the fish taken from different parts of the body were pooled and its total wet weight was determined. Then it was cut into small pieces and dried. The stomach contents were also dried in a hot air oven at 60-70°C. The dried materials were taken out, powdereda nd the percentage of organic carbon determined, following the method developed by El Wakeel and Riley (1957).

The analysis of gut contents revealed the dominance of decaying organic matter, blue-green algae, diatoms and foraminifers, copepods and sedimentary particles. Occasionally, dinoflagellates and gill raker fragments were also found in the stomach contents. Details of this work have been reported elsewhere (Das, 1977).

The percentage composition of organic carbon in the fish *M. cephalus* and its ingested food during the different months of the year (Table I) showed marked variations.

Table I. Energy values of the ingested food of *Mugil cephalus* in relation to the body energy values together with other relevant data.

Months	Date of collection	Total specimens used for analysis	Organic carbon in stomach contents (% dry weight)	Organic carbon in body (% dry weight)	Food cal/g dry weight	Body cal/g dry weight	Ratio Body carbon: Food carbon
January	19-1-76	30	8·40	52·50	1049·80	7753·00	6·25
February	18-2-76	33	23·40	45·30	3329·80	6658·60	1·93
March	9-3-76	28	9·90	46·80	1277·80	6886·60	4·72
April	6-4-76	35	14·60	44·40	1992·20	6521·80	3·04
May	21-5-76	25	12·00	40·50	1597·00	5929·00	3·37
June	20-6-76	31	20·70	41·30	2919·40	6050·60	1·99
July	22-7-76	23	7·20	46·50	867·40	7068·00	6·45
August	23-8-76	29	9·90	51·00	1277·80	7525·00	5·15
September	16-9-76	31	23·00	48·00	3269·00	7069·00	2·00
October	20-10-76	27	20·20	40·50	2843·40	5929·00	2·00
November	17-11-76	23	6·59	45·60	774·68	6704·20	6·91
December	15-12-76	40	20·40	48·00	2873·80	7069·00	2·35

The highest value of carbon in the fish was found during January and August, while the lowest values were during May, June and October. Similarly, the maximum values of carbon in the ingested food was found in February and September and the lowest in July and November. It can also be seen from the table that when the body carbon is high in January and August, the carbon content of ingested food is low.

The present investigation indicates that the body carbon is higher from November to March. A review of literature shows that *M. cephalus* has a breeding season from October onwards (Jhingran, 1958), (Anderson, 1958) observed the spawning period of this species in the Atlantic coast lasts from November to March. Hence, it is likely that the higher percentage of body carbon is related to the spawning period of fish.

Newell (1965) found sediment particles of less than 100μ in diameter to be much higher in both nitrogen and organic carbon content as compared to larger particles which the fish often ingests. Since the fine particles have significantly higher organic content of carbon than the coarser ones (Odum, 1968), the variation in the organic carbon in ingested food in different months may be due to differences in particle sizes ingested during feeding.

Fig. 1 illustrates the temporal variation to the ratio of body and ingested food carbon of the fish. It can be seen from the figure, that there is a definite seasonal cycle in the ratio of body and ingested food carbon. This may probably be attributed to variation

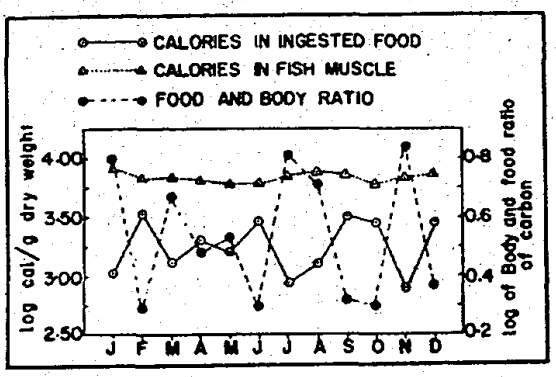

Fig. 1. Log caloric value of the fish and ingested food and log of body and food ratio of carbon of *Mugil cephalus* in different months.

in the quality of food consumed, maturity stage, spawning and growth of the fish as suggested by Qasim and Jacob (1972). The maximum ratio of body and food carbon was 6·91 in the month of November and the minimun was 1·93 in February. The values of correlation coefficient between body carbon and ingested food carbon was found to be not significant. The non-significance of the two values is probably because the caloric content of the fish is higher than that of the food as indicated by Qasim, Sumitra-Vijayaraghavan and Easterson (1973).

Organic carbon is an indicator of caloric value. From the data it may be inferred that the highest caloric value of the fish is probably due to the high body carbon present in those months. The carbon values of body and ingested food were converted into energy units (calories/g dry weight) by the equation given by Platt, Brawn and Irwin (1969). The caloric values of the fish were high during January and August (7753·00) and low during May and October (5229·00). In the ingested food, maximum caloric values were recorded during February (3329·80) and minimum during November (774·68) (Fig. 1).

ACKNOWLEDGEMENT

The author is grateful to Dr. S.Z. Qasim, Director, National Institute of Oceanography, Goa, for his guidance and constant encouragement in the work. Thanks are also due to Dr. M. J. George, Head of Biological Oceanography Division and Dr. Sumitra-Vijayaraghavan, Scientist, for their helpful suggestions and critically going through the manuscript.

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