

Fat and Water Contents of the Muscle and Gonad of *Otolithus argenteus* in Relation to Gonad Growth

V. VINAYAK and B. NEELAKANTAN

Post-Graduate Department of Marine Biology, Kodibag, Karwar-581 303

Fat and water contents of the muscles and gonads in relation to gonad growth in *Otolithus argenteus* from Karwar are reported. Water content showed an inverse relationship to lipid in both the sexes. Variation in somatic body weight was found associated with the fluctuations in lipid contents.

In fishes, the nutrients for germinal tissue growth may be drawn from somatic tissues. Earlier investigations (Masurekar *et al.* 1977; Pandey *et al.* 1976; Hickling, 1947; Idler & Bitness, 1960) showed that fat reserves stored in muscle, liver and intestine are transferred to the gonads during maturation. Recently, Medford & Mackay (1978) suggested that in order to measure the energy transfer from the body to the gonads, the amount of nutrients in the body and gonads must be determined at various stages of sexual maturity. Although some information is available on biochemical studies of fishes from India, very little attention has been paid to study such aspects in fishes of Karwar and the present paper reports the fat and water content of the muscles and the gonads in relation to gonad growth in *Otolithus argenteus*, an important edible fish of Karwar.

Materials and Methods

O. argenteus collected monthly from commercial catches at Karwar from November 1978 to October 1979 were cleaned, length and sex noted. The stage of maturity was determined following the classification of International Council of Exploration of the Sea (Wood, 1930). Individuals ranging in total length 26 to 28 cm were taken so as to reduce size dependent variability. 20-22 fishes in each sex were utilised for each analysis. For each fish, the stomach was emptied and gross body weight determined. Gonad was blotted dry and weighed. The somatic body weight was noted as the gross body weight without gonad and liver. The required samples were dried in an electric

oven to constant weight to determine the water content. Extraction of lipid was effected by a modification of the method of Bligh & Dyer (adopted by Gopakumar, 1965) and the results are summarised in Tables 1, 2 & 3.

Results and Discussion

In males, the somatic body weight fluctuated significantly. It was high and relatively stable from April to October with a peak of 250 g in May. It then decreased during the advanced maturing stages and period of spawning to 212 g. In females

Table 1. Percentage lipid and water content (wet-weight basis) in muscle of *O. argenteus*

Stage	Female		Male	
	Lipid	Water	Lipid	Water
1	14.64	70.82	11.18	76.03
2	4.67	82.03	6.05	79.40
3	13.24	72.18	11.12	75.26
4	12.25	73.04	10.04	76.17
5	7.79	78.87	8.15	78.57
6	8.47	78.12	9.62	76.76
7	2.70	83.14	3.37	81.82

Table 2. Percentage lipid and water content (wet-weight basis) in gonads of *O. argenteus*

Stage	Female		Male	
	Lipid	Water	Lipid	Water
1	2.87	82.17	4.58	80.30
2	3.24	81.35	5.02	79.50
3	7.75	76.17	7.34	77.60
4	14.55	70.04	9.06	76.41
5	17.46	68.40	13.68	71.80
6	17.90	68.09	14.40	70.10
7	2.07	86.59	3.60	84.10

Table 3. Gonad weight of *O. argenteus* in different months

Month	Male	Female
November	4.12	18.64
December	2.60	17.29
January	2.20	14.50
February	1.40	88.40
March	0.85	2.14
April	0.58	0.46
May	0.73	1.41
June	0.88	3.08
July	1.64	9.26
August	3.35	14.95
September	3.70	16.60
October	4.05	17.52

Gonad weight (g) calculated for 27.5 cm total length

the somatic body weight was relatively constant from April to October except in May when it reached 254 g. (Fig. 1). The lipid and water content in the muscle varied and was similar in sexes in each month. The pattern of fluctuation in the lipid content was the same as that of somatic body weight. The maximum concentration of lipid in both sexes were noted during the first stage, when it was 14.64% and 11.18% for female and male respectively. The lowest values were noted in the sixth stage. The water content varied in proportion to the changes in the lipid percentage (Table 1). Growth of the gonads commenced from April when the ovary and testis were 0.1 and 1.2% of the gross body weight and it was almost the

same in both the sexes. Ovary weight reached the maximum, namely, 7% of the gross weight in November. About 14.5% of this increase was in April to June and the remainder in July to November, whereas, the testis contributed to 1.6% of the gross body weight in November, about 8.5% of which was noted in April to June and 91.5% in July to November. This lipid concentration of gonads increased gradually with maturation, culminating at sixth stage with 19.79% in females and 14.4% in males, while the lowest was 2.07% and 3.6% in females and males respectively during the spent stages. The water content showed an inverse relationship to lipid, in both the sexes.

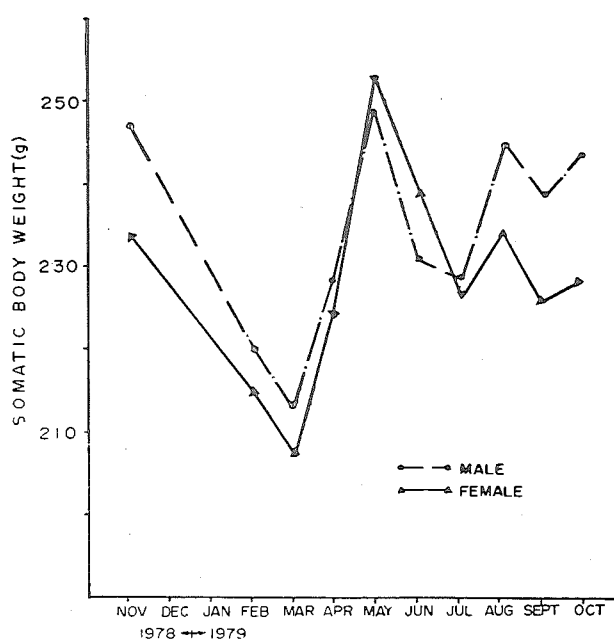


Fig. 1. Somatic body weight of *O. argenteus* in different months

Lipid accumulates in various organs prior to the maturation of gonads (Love, 1957). Bailey (1952) reported that in salmon and herring, the lipid is concentrated within and between muscle fibres. The use of muscle tissue as an energy source has been well documented in salmon (Idler & Bitness, 1958).

The variation in the somatic body weight is associated with the fluctuation of lipid composition. It may be noted that because of insufficient lipid reserves, endogenous

protein becomes more important than endogenous lipid as an energy substrate in the metabolism of fish (Medford & Mackay, 1978). The marked decrease in somatic body weight during spawning may be surmised as the result of catabolic activity of whole muscle tissue. It is interesting to note that the somatic body weight was almost the same in both the sexes during early stages of maturation. But the occurrence of low values of somatic body weight in females of *O. argenteus* during advanced maturity stages might be as a result of more nutrient requirement of the ovaries. Similar observations were made in other fishes (Chidambaram *et al.* 1952; Chrazan, 1950).

In the case of *O. argenteus* gonad weight increased with maturation. The ovary weight attained a maximum of 7% of gross body weight, which is higher than the weight of the testis. This increase in weight may be attributed to the accumulation of nutrients, especially of fat, to meet the additional energy requirements for the growth of the ovary. The body of the male contains generally more amount of fat than in female (Banerji & Bagchi, 1970). The depletion in the lipid content of muscles between ripe and spent stages in both sexes indicates that accumulated lipids are utilized during spawning (Masarekar *et al.* 1977). Thus, it gains support for the fact that feeding is poor or nil in matured fish, as Sekharan (1955) has found that the heavy feeding led to the accumulation of fat, in the muscles of *Trichiurus haumela*. The fluctuation in the percentage of water has only shown its inverse relationship, as it apparently reflects the fact that any lipids possess marked hydrophobicity, which effects the percentage content of water in the tissues. After reviewing the work of Luhmann (1963), Meyer (1958) attempted to prove the existence of greater correlation between fat content and gonad growth in herring. Our studies also showed the existence of such a correlation.

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