A NOTE ON THE BIOCHEMICAL COMPOSITION OF THE INDIAN SHAD *ILISHA MELASTOMA* (SCHNEIDER)

G. S. D. SELVARAJ
Central Marine Fisheries Research Institute, Cochin-18.

ABSTRACT

Total protein, carbohydrate, fat and water content of the muscle, liver and gonads of *Ilisha melastoma* (Schneider) in the size range 90 mm to 185 mm in total length were determined. The variations in concentrations of these in relation to sex and maturation were noted. In *I. melastoma*, the existence of 'protein-water line' and 'fat-water line' was indicated.

While the analysis of a fish as a whole facilitates quantitative and qualitative estimate of specific biochemical substances in its body, the studies on components reveal where the nutrient is stored in bulk and which of the nutrient deposit is mobile and serves during the fish's various biological phases. The present paper deals with the proximate composition of the Indian shad, *Ilisha melastoma* (Schneider), with special reference to total protein, carbohydrate, fat and water content for this specific purpose.

I. melastoma generally occurs in the catches from the coastal waters in size range between 90 mm and 200 mm in length and the body weight ranging from 8.0 to 70.0 g. This species attains maturity when it grows beyond 140 mm in length. Peak spawning takes place during November-December months and juveniles appear in the catches during February to June, when they migrate into the bays and estuaries. Mature specimens are caught during October-December. Its population consists more of females, which grow larger than males.

Fresh specimens of *I. melastoma* were collected from the landing centres of Porto Novo during 1965-1966. Percentage of total protein was estimated using Micro-Kjeldahl technique. To determine total carbohydrate, the muscle, liver and gonad tissues were digested with hot trichloro acetic acid and then treated with phenol-sulphuric acid reagent to convert all the polysaccharides and oligosaccharides into readily soluble monosaccharides. The colour intensity was determined by spectrophotometer at 4900 A. Fat analysis was done by Soxhlet's method. The percentage of water content was estimated by drying the fresh tissues of muscle and gonad in hot-air oven at constant temperature of 95°C

until all the traces of moisture disappeared. Wet weight and dry weight were noted; samples were cooled and kept in glass tubes in a desiccator for further analyses.

For convenience, specimens of *I. melastoma* belonging to I, II and III stages of maturity were grouped as 'immature' and of IV, V and VI were grouped as 'mature,' and the period or season for the same as 'non-spawning' and 'spawning,' respectively.

Total proteins: Analysis of the proximate composition showed a decrease in muscle-protein from 24.5% to 17.5% of body weight for specimens ranging from 90 mm to 185 mm in length. Total nitrogen values also followed the same trend (Table 1). While younger specimens had 23.12%-24.5% muscle-protein, mature specimens had only 17.5%-20.0%, but the ovaries of the mature specimens (in stages IV & V) contained 23% (average of two values). Such depletion in muscle-protein during spawning period has been reported in many fishes (Love 1970). It may be due to the fact that the build-up of gonad is often accomplished at the expense of body-proteins.

TABLE 1. *Total protein and water content in the muscle of* I. melastoma (*% of wet weight*)

No. of Expt.	T.L. of fish (mm)	Total Nitrogen	Total Protein	Water content (Moisture)
1	90	3.85	24.5	67.55
2	95	3.9	24.4	68.59
3	110	3.8	23.75	67.35
4	115	3.7	23.12	71.16
5	180	3.2	20.0	72.00
6	185	2.8	17.5	71.25

Carbohydrates: The level of carbohydrate in transit did not appear to vary much with age and size in the muscle or liver, as do the other major components, although some marginal increase of carbohydrate in the muscle, liver and gonad with size of the specimens was noted (Table 2). The maximum concentration was found in the liver (2.0-2.25%) and the minimum in muscle (0.2-0.5% of wet weight). The study thus supports the view that carbohydrate plays an insignificant role as energy reserve in aquatic animals (Love 1970), since it is in very low concentration in the muscle, liver and gonad, and that its role in the mobilisation of energy during maturation and spawning may be negligible.

Fat content: In *I. melastoma*, fat content was more in the liver, followed by gonad and muscle, and its percentage in the liver and gonad increased with growth

TABLE 2. *Carbohydrate in* I. melastoma *(% of wet weight)*

No. of Expt.	T.L. of fish (mm)	Sex	Fish muscle	Liver	Gonads
1	95	Male	0.19	2.0	1.33
2	115	Male	0.25	2.15	1.55
3	185	Female	0.5	2.25	1.92

(Table 3), supporting the view of Hornell and Nayudu (1923) that older fishes are able to lay down fat reserve more readily because their growth rate is then slower. In the bigger *I. melastoma*, the increased fat in the liver seems more likely to act as an extra energy reserve to assist recovery during maturation of gonads and spawning.

TABLE 3. *Fat content in the muscle, liver and gonad and water content in the ovary of* I. melastoma *(% of wet weight).*

T.L. of fish (mm)	Sex	Muscle	Liver	Gonad	Water content (moisture) in ovary
90	Male	2.49	3.0	Not estimated	—
115	Male	2.73	3.9	Not estimated	—
140	Female	3.12	4.65	4.2	67.5
180	Female	2.77	5.25	5.34	65.25
185	Female	2.85	5.95	5.16	64.5
Average among females		2.91	5.27	4.9	65.75

Table 4 shows the changes in concentration of fat in the muscle with reference to sex and maturation. The data indicate that females are fattier than males. There is a marginal increase of fat content in the muscle of both sexes with growth during 'non-spawning' season and a depletion during 'spawning' season, and this depletion is more pronounced in the 'mature' famales than in the 'mature' males, a case that was met with also in *Clupea harengus, Trachurus trachurus* and *Salmo trutta* (Love 1970). During 'spawning' season, while the

muscle fat in females showed a reserve of 2.77% to 2.85% of body weight, that of 'mature' ovary (stage V) ranged from 5.16% to 5.34%, whereas, in the 'immature' females (during 'non-spawning' season), the fat reserve in the muscle was between 3.67% and 4.12% (Tables 3 & 4). The depletion in the muscle-fat reserve, accompanied by a rise of fat in the 'mature' ovary may be due to its shift from muscle to gonad. Although the data are inadequate, the males of *I. melastoma* also indicated the same trend to some extent.

TABLE 4. *Fat content in the muscle of* I. melastoma *(% of wet weight)*

Males		Females	
Spawning period 'Mature'	Non-spawning period 'Immature'	Spawning period 'Mature'	Non-spawning period 'Immature'
2.19	2.49	2.77	3.67
2.43	2.73	2.85	4.12

Water content: Although the water content in many fishes is reported to increase in mature specimens with fall in muscle-protein and fat (Love 1970), in the present investigation no such marked rise has been noted. But, while the percentage of mean water content in *I. melastoma* was about 70% (Table 1), the water content of 'mature' ovary (stages IV & V) showed a reduction (65.75%) with high storage of protein and fat (Table 3) as in the case of *Gadus morhua*, where the muscle contained 80.4% of water while its ovary contained 74% only (Braekkan 1958). The mean ash content of this species was estimated as 1.85% of wet weight.

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