

NOTES

CHEMICAL COMPOSITION AND CALORIC CONTENT OF *AMBASSIS GYMNOCEPHALUS*

ABSTRACT

Proximate composition, organic carbon and caloric value of *Ambassis gymnocephalus* (Lacépède), an euryhaline fish, were determined to study the chemical changes during growth and maturity. The increase in protein, lipid and carbohydrate content with growth, in both males and females is interlinked with the maturity of gonads. Spent fishes of both sexes showed marked depletion of protein and lipid indicating their value as energy reserves during maturity and spawning. The study reveals that in a small fish, like *A. gymnocephalus*, analysis of the animal as a whole gives a reliable estimate of the chemical changes during growth and maturity.

THE PROXIMATE composition, percentage organic carbon and caloric content of *Ambassis gymnocephalus*, an euryhaline fish, growing to a maximum size of 80–85 mm have been estimated with a view to study the chemical changes taking place during growth and maturity.

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Material and Methods

A. gymnocephalus of different sizes were collected from the Cochin Backwater and separated into 5 mm size groups. Four or five fish of the same size and maturity stage were taken in each group. The analyses were done on material dried to constant weight at 105°C and homogenised. The homogenised samples were stored in a desiccator till the time of analysis.

All the analyses were on the entire animal. Moisture content was determined by drying the animal to constant weight at 105°C, ash at 550°C, protein by the modified Biuret method (Sumitra Vijayaraghavan and Vijayakumaran, 1979), lipid by the chloroform-methanol method of Bligh and Dyer (Raymont *et al.*, 1964) and total carbohydrate by the phenol-sulphuric

acid method (Raymont *et al.*, 1964). Organic carbon was determined by the method of EL Wakeel and Riley as described by Qasim and Jacob (1972). Caloric content was estimated by the wet oxidation method (Korzinkin and Tarkovskaya, 1964).

The fish were grouped into four classes - immature, maturing, mature and spent. When sex could not be determined the fish were classified as immature, those at initial stages of maturity (stage I to IV) as maturing, and those in the final stages of maturity (stage V and VI) as mature. Males and females were treated separately.

Results and discussion

In both males and females slight increase in protein and lipid contents has been observed, with increase in size, the increase in lipid content being comparatively higher. The bigger fish analysed (71–85 mm), however, recorded lowest values for all these components since they were spent ones. Thus, the increase in protein and lipid contents with size was interlinked with stages of maturity of the fish.

In the males lipid ranged between 7.18% and 15.26%, protein between 43.18% and 60.56% and carbohydrate between 1.26% and 2.23% of dry weight. The lowest values were recorded in the spent fish and the highest in maturing and mature ones. Percentage of ash ranged

from 22.61 to 42.90 and organic carbon varied between 21.78% and 32.15% of the dry weight. Caloric value of the males ranged from 3528.09

TABLE 1. *Percentage of water in Ambassis gymnocephalus*

No.	Mean weight of fish (g)	Percentage of water
1	0.722	74.15
2	0.860	77.00
3	0.901	74.85
4	1.425	73.60
5	2.155	71.38
6	2.666	70.77
7	4.424	70.11

to 4171.46 cal/g dry weight. Lowest carbon and highest ash content were recorded from spent fish. Though the caloric content did not show appreciable increase with size, the value was always low in the spent fish than the mature ones.

TABLE 2. *Chemical changes (% in dry wt.) during maturation in Ambassis gymnocephalus (male)*

Maturity stage	Lipid	Protein	Carbo- hydrate	Ash	Carbon	cal/g dry wt
Immature*	9.57	56.85	2.12	24.21	25.63	3730.44
Maturing	12.32	57.57	1.98	26.99	28.56	3753.10
Mature	14.78	59.01	2.23	22.61	28.51	4036.87
Spent	8.80	45.93	1.50	41.80	23.79	3688.37

* Values for immature fish are slightly lower due to the suspected presence of moisture in the dry sample.

TABLE 3. *Chemical changes (% in dry wt.) during maturation in Ambassis gymnocephalus (Females)*

Maturity stage	Lipid	Protein	Carbo- hydrate	Ash	Carbon	cal/g dry wt
Immature*	9.57	56.85	2.12	24.21	25.63	3730.44
Maturing	13.97	56.14	2.40	26.31	32.12	3617.69
Mature	15.40	58.66	2.01	23.71	30.18	3837.94
Spent	8.20	43.47	1.49	43.14	19.24	2777.10

* Values for immature fish are slightly lower due to the suspected presence of moisture in the dry sample.

Females also showed similar trend as the males. The lipid value ranged from 6.46 to 16.56%, protein from 40.82 to 62.00% and carbohydrate from 1.17 to 3.28% of dry weight. Ash

content varied between 18.12 and 43.14% and organic carbon between 22.03 and 37.30% of dry weight. The caloric value of the females was between 2694.98 and 3837.94 cal/g dry weight. As in the males lowest values were recorded in the spent fish.

Average percentage of water in *A. gymnocephalus* was 73.12 with a range of 70.11 to 77.0. A gradual decrease in percentage of water was observed with increase in size (Table 1).

The percentage of ash in *A. gymnocephalus* is comparatively higher than the values reported for other fishes by many authors in Vinogradov (1953) and by MacCallum *et al.* (1969). This is due to the greater proportion of bones and scales to the rest of the body in *A. gymnocephalus*.

Changes during maturity in males and females are given in Tables 2 and 3 respectively. Tilik (1932) has recorded that salmon suffers an incredible loss of organic constituents (99% of lipid,

72% of protein and 63% of ash) during spawning. These high values of depletion were evidently due to the fact that they abstain from feeding during this period. However, these extremes are not observed in other fishes, for example, *Gadus morhua* which feed fairly intensively throughout the year (Rae, 1968). In *A. gymnocephalus* appreciable depletion of protein and lipid due to spawning was observed. But it is difficult to compare these values to the results obtained by other workers since the present estimate was on the entire animal unlike earlier observations on muscles or individual body components. In fishes ash content of different tissues has been found to decrease due to spawning. The increase in ash content in the spent fish in the present study is because the bones and scales were included in the analysis. While there is a drain of organic matters from different tissues such as liver and muscle, the bones and scales remain comparatively unaffected during spawning period.

The energy reserves of *A. gymnocephalus*, in the form of lipids and proteins, increase during growth and maturity in *A. gymnocephalus*. Similar observations have been reported in other fishes also (Love, 1970). As in other fishes carbohydrate plays a minor part in the energy reserves of *Ambassis* and the depletion due to spawning is also negligible when compared to lipid and protein.

The study reveals that in a small fish like *A. gymnocephalus*, a reasonably good estimate of the changes in the major chemical components (protein, lipid, carbohydrate, ash and water) during maturity and spawning can reliably be made by analysing the animal as a whole. Nevertheless, if it is necessary to locate the nutrient reserves and to understand which of these reserves is mobile during periods of starvation, breeding and other stresses, a study of individual tissues is needed.

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