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Original Research Paper

Nutritional Status and Energy Content of a Freshwater Spiny Eel, *Mastacembelus armatus* During Reproductive Cycle

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Mastacembelus armatus
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ABSTRACT

The nutritional and energy content in form of the protein glycogen and fat along with moisture content of muscle, liver and ovary were examined with respect to reproductive cycle in female *Mastacembelus armatus*. In the muscle and liver the content of protein glycogen and lipid were found highest in the resting phase compared to the other phase. On the other hand these were found high in ovary in the spawning phase compared to the other phase. Similarly the energy content of the muscle and liver was also found high in resting phase than the other phases. The energy content of ovary was found highest during spawning season in comparison to the other phases of reproductive cycle. A decline of the nutrients in the muscle and liver during the spawning phase is observed, which may be attributed to less feeding during this period and diversion of body reservoirs to the gonads development during spawning phase.

INTRODUCTION

Consumption of fish, prawns and seafood provides important nutrients to a large number of people worldwide and, thus, make a very significant contribution to nutrition. The total food supply available from marine and inland sources would give an apparent availability as a live weight equivalent of about 13 kg per year for each inhabitant in world. In developed countries, this is 27 kg per capita, while only 9 kg per capita in developing countries. India is an agrobased country blessed with vast inland waters in the form of ponds, rivers, lakes, reservoirs and many small water pockets, which is an excellent ecological condition for aquaculture practices.

Biochemical analysis is an index of nutritive value because of many biomolecules are correlated with some of the properties of organisms that are nutritionally significant. The accurate measurement of biochemical composition and freshness quality are important from both economic and processing aspect. In laboratory fish may be considered as a biochemical entity.

The nutritional status and the biochemical composition studies have been made by several workers. David & MacDonald (2002) have studied the seasonal biochemical composition of tissues of *Cucumaria frondosa*. Azam et al. (2004) have observed the biochemical composition of ten different fresh fishes from Bangladesh. Similarly, Kamal et al. (2007) have studied the biochemical composition of some small freshwater fishes from Bangladesh. Merayo (1989) has seen the seasonal changes in the biochemical composition of the muscle and liver of bib (*Trisopterus luscus*) from Spain. Mittal et al. (1995) have studied carbohydrates in the epidermal mucus cells of *Mastacembelus pancalus*. Nair & Gupakumar (2006), Radhakrishna et al. (1983), Subramanian et al. (2008), Nakagawa et al. (2000) have studied the biochemical composition from various angles to add to the knowledge to this subject.

MATERIALS AND METHODS

For the present study, the freshwater eel *Mustacembelus armatus,* also called as Tyer track eel, was taken for the biochemical study. It is a carnivorous fish found in various freshwater resources of this region. This fish is having high commercial food value compared to rest of the fishes of the Marathwada region. For the present investigation, fish were collected from Yeldari, Masoli and Karpara reservoirs of Parbhani district of Maharashtra for one year (March 2007 to February 2008). The fresh fish were collected and kept in insulated icebox with sufficient amount of ice. All the samples were brought to the laboratory and muscle, liver and ovaries were isolated after careful observation in to small bottles and stored in deep freeze for further study. Female muscles, liver and ovaries were used for the analysis.

The protein content was determined by the Lowery's method as described by Schacterle & Pollack (1973). The carbohydrates were determined by anthrone method described by Carroll et al. (1956). The lipid content of tissues was estimated by the chloroform methanol (2:1) extraction method described by Folach et al. (1957). The dry matter of the tissue was determined by heating the tissues at 110°C for 48 to 72 hrs until a constant weight. The water content of the tissue was calculated as the difference between the weight of fresh and dry tissues. The energy content was determined in terms of calories as per Karzinkin & Tarkovskoys (1964) and Jana & Pal (1980) as fat being equivalent as 9.3, protein and glycogen as equivalent 4.1.

RESULTS AND DISCUSSION

On the basis of histological details and Gonado Somatic Index (GSI) of *Mastacembelus armatus*, the fish seems to breed from July to September in the Marathwada region (Ahirrao 2002).

The biochemical composition presents analogous profile during spawning season of female muscle. The protein and fat contents decrease gradually in the muscle from resting phase (December to June) onwards decreasing significantly in the spawning phase (June to September). The content of glycogen was observed highest in the rising phase (December to January), which decrease gradually in the

Table 1: Variation in nutrients (mg/g) and energy content (Cal./100g) of female *M. armatus*.

Phase	Muscles				Liver				Ovaries			
	Mois-ture	Prot-ein	Glyc-ogen	Fat	Mois-ture	Prot-ein	Glyc-ogen	Fat	Mois-ture	Prot-ein	Glyc-ogen	Fat
Resting (Dec.-Jan.)	75.30	19.10	3.12	3.79	74.23	18.51	4.18	4.82	71.31	13.34	1.38	1.20
Calories		78.31	12.79	35.21		45.89	17.13	44.82		54.69	5.65	11.19
Preparatory (Feb.-April)	75.58	15.03	2.01	3.20	74.80	14.34	3.25	4.11	70.63	14.08	1.02	2.84
Calories		61.62	8.24	29.76		58.79	13.73	38.22		57.72	4.18	26.41
Pre spawning (May-June)	73.38	13.02	0.36	2.18	75.01	12.68	1.02	3.06	69.78	16.18	3.12	4.01
Calories		53.38	1.47	19.99		51.98	4.18	28.45		66.33	12.79	37.29
Spawning (July-Sept.)	75.28	12.72	0.30	1.81	74.40	11.28	1.08	2.10	69.08	20.21	4.68	3.87
Calories		52.15	1.23	16.33		46.24	4.42	19.53		82.86	19.18	35.99
Post Spawning (Oct.-Nov.)	74.80	16.84	0.51	2.64	72.38	14.33	0.98	3.08	70.62	14.43	1.05	2.09
Calories		69.04	2.09	24.55		56.75	4.01	28.64		59.16	4.30	19.43

preparatory phase (February to April) and falls during prespawning phase (May to June) and further lower in spawning phase (June to September). The decrease of these during the spawning phase may be attributed to less feeding during this period and diversion of body reserves to gonadal development during spawning and breeding season.

The biochemical composition of liver also showed somewhat similar trend to that of the muscle. The protein, glycogen and fat contents of liver gradually decrease from resting phase (December to January) onward to the spawning phase (June to September) and gain rise to the level in the post spawning phase (October to November) as also reported by Hunge & Baile (2004) in *H. fossilis* (Table 1 & Fig. 1).

The ovary shows different biochemical profiles opposite to that of muscle and liver. The level of protein, glycogen and fat contents of ovary gradually increase from preparatory phase (February to April) and become significant in the spawning phase (June to Sept.) but later falling in the post spawning phase (October to November).

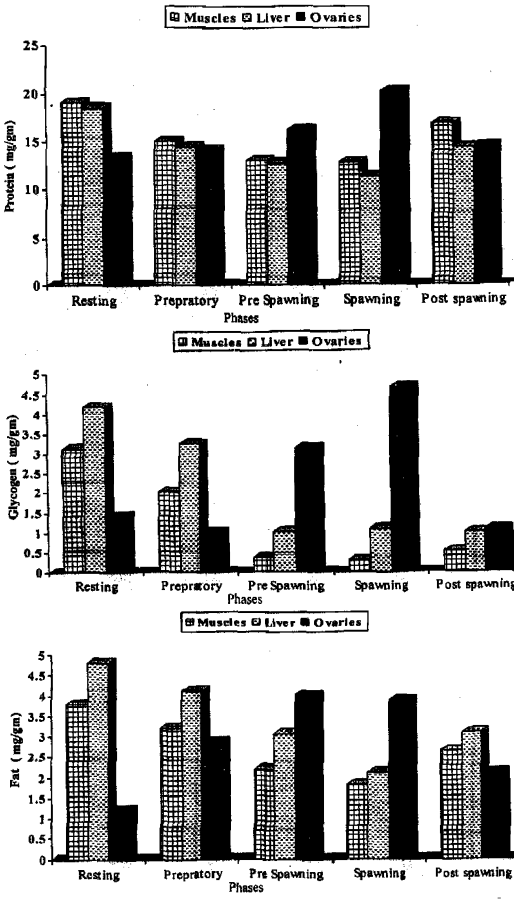

Fig. 1: Variation in protein, glycogen and fat contents in muscles, liver and ovaries.

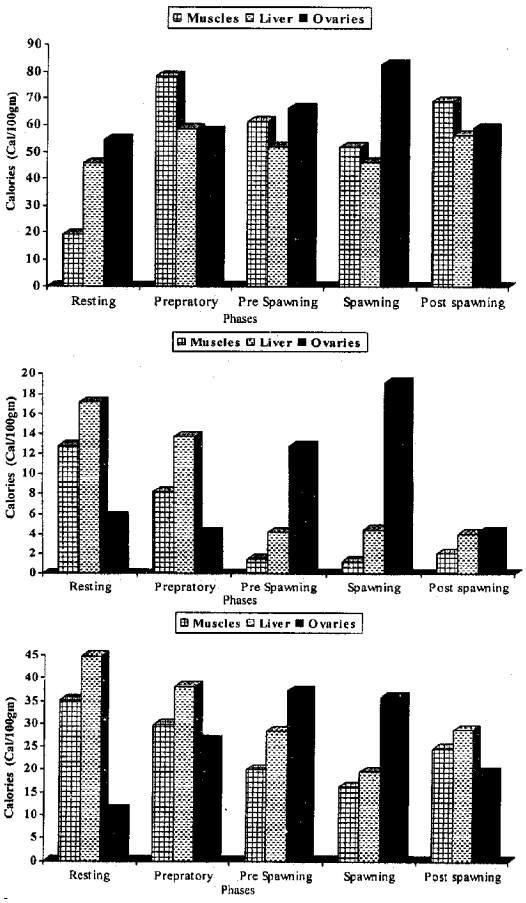

Fig. 2: Variation in energy content in muscles, liver and ovaries.

The percentage of moisture in muscle ranged from 73.38 to 76.28, in the liver from 72.30 to 75.01 and in ovary from 69.08 to 71.31. The muscle shows that it is rich source of energy as compared to liver and ovaries. It may serve as a good food with a great option for a healthy weigh loss diet as it contains 126 calories/100g (Table 1 & Fig. 2), which is much less compared to Caviar (268 Cal.), Shark (187 Cal.), Anchovies canned (276 Cal.), grilled Herrings (203 Cal.), fried Mackeral (254 Cal.), Sardine in oil (220 Cal.), fried whiting (189 Cal.), Marine eel (236 Cal.), Cat fish (195 Cal.) and carps (162 Cal.) as per previous observations.

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