

## CHOLESTEROL DYNAMICS IN OVARY, LIVER AND MUSCLE OF A HILL STREAM TELEOST *GARRA MULLYA* (SYKES) IN RELATION TO EGG MATURATION.

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### ABSTRACT

Cholesterol dynamics in the liver, ovary and muscle of a hill stream teleost *Garra mullya* during annual reproductive cycle has been described. Cholesterol content of liver and ovary exhibited more or less similar cyclical changes, maximum during spawning season (June-August) and minimum during resting phase (November-January). The muscle cholesterol was low in comparison to liver and ovary and was found maximum in June. However, the cyclical changes in muscle cholesterol were less pronounced than those in ovary and liver. Analysis of variance (ANOVA) showed significant variation in ovary and liver ( $p < 0.001$ ).

### INTRODUCTION

Cholesterol, an important source of gonadal steroid (Schulster *et al.*, 1976) exhibits dynamism in different tissues specially in muscle, liver and gonad of most of the teleosts because of cyclical breeding behaviour of these fishes. Hence, the pattern of dynamics is a cyclical one which can be correlated with gonad maturation and spawning periods. Several reports are available on the cholesterol profile of various tissues in the different species of teleosts. A detailed account of biochemical composition including cholesterol of sockeye salmon during spawning migration has been reported (Idler and Bitners, 1958, 1960; Idler and Tsuyuki, 1958). Reports are also available on the cholesterol variation in certain Indian teleosts viz. *Heteropneustes fossilis* (Singh and Singh, 1979; Sherni, 1981); *Channa punctatus* (Siddiqui, 1966), *Puntius chilinoides* (Nauriyal and Singh, 1985). However, the information regarding dynamics of cholesterol contents of hill stream fishes is limited to a few species like *Schizothorax richardsonii* and *Glyptothorax pectinopterus* (Singh and Nauriyal, 1990). So far, no such work has been done on the seasonal biochemical fluctuation in the fishes from hill streams of Chotanagpur plateau having different climatic conditions owing to its height from MSL. In the present communication an attempt has been made to report the cholesterol dynamics of liver, ovary and muscle in relation to egg maturation in hill stream teleost *Garra mullya* from Chotanagpur plateau, India.

## MATERIALS AND METHODS

Mature specimens of *Garra mullya* were collected from Suvarnarekha river for 12 months in 1988 on 5-6 random days between 10th and 25th of every month. The ovary, liver and bone free muscle were dissected out and estimation of their cholesterol content was done following standard method of Kabara (1962) using spectrophotometer (Systronics 106 MK II). An equal proportion of trunk and tail muscle was taken for analysis so as to get standard value because the biochemical composition of the muscle of two regions shows variation (Mustafa and Jafri, 1978).

Statistical analysis for variance (ANOVA) was done for the annual data.

## RESULTS AND DISCUSSION

Results of the cholesterol values have been presented in Table-1. The spawning season of *Garra mullya* at the site of present study is from July to September (Khan and Mehrotra, 1991). The ovary remains in the resting immature stage from November to January, and preparatory maturing phase ranges from February to April, while during May-June the ovary attains ripening stage. By July-August the oocytes become fully ripe leading to the beginning of spawning. It was observed during the present study that the cholesterol content of both liver and ovary exhibited more or less similar cyclical changes showing maximum value during spawning season (June to August) and thereafter decreasing in both tissues to minimum value in November (Table-1). During resting phase (November-January) the cholesterol level showed non-significant variation and from February onwards it began to increase. The muscle cholesterol was lowest with respect to that in ovary and liver and was found to be maximum in June (Table-1). Analysis of variance showed significant annual variation in ovary and liver ( $p < 0.001$ , Table-1).

Cholesterol is regarded as the main precursor for steroid hormone which remains under the influence of gonadotropins secreted from pituitary gland (Schulster *et al.*, 1976; Mukherjee and Bhattacharya, 1982). Increased levels of gonadotropins in the serum of teleost has been found during mature stage of reproductive cycle (Okuzawa *et al.* 1986). Idler and Tsuyuki (1958) have reported fall of serum cholesterol in *Oncorhynchus nerka* at the time of maximum sexual activity and Idler and Bitners (1958, 1960) observed a fall of cholesterol in the gonad and liver of *Salmo trutta* during spawning migration. During the present study, the maximum cholesterol content in both liver and ovary was found during ripe stage (June-July) and minimum during resting/immature stage (November-January, Table-1). Similar results have been noticed in many Indian teleosts like *Ophiocephalus punctatus* (Siddiqui, 1966); *Heteropneustes fossilis* (Singh and Singh, 1979; Sherni, 1981); *Puntius chinodes* (Nauriyal and Singh, 1985); *Schizothorax richardsonii* and *Glyptothorax pectinopterus* (Singh and Nauriyal, 1990). From the present study it appears possible that in *Garra mullya* both ovary and liver act as reservoir to meet the increased cholesterol demand for steroidogenesis during the period of maximum sexual activity. However, a more or less steady level of muscle cholesterol indicates that it remains unaffected by the maturation of eggs during the course of reproductive cycle of the fish.

TABLE -1

Monthly fluctuation of cholesterol (mg/gm tissue) in the ovary, liver and muscle of *Garra mullya*.

C. D. value = Critical difference value between two months.

MONTHS	OVARY	LIVER	MUSCLE
January	3.80 ± 0.06	5.20 ± 0.24	0.76 ± 0.17
February	4.90 ± 0.26	5.99 ± 0.22	0.90 ± 0.12
March	5.60 ± 0.18	6.23 ± 0.26	1.50 ± 0.09
April	9.00 ± 0.33	8.50 ± 0.29	1.58 ± 0.09
May	10.40 ± 0.12	10.82 ± 0.26	1.57 ± 0.11
June	13.30 ± 0.49	12.50 ± 0.41	1.78 ± 0.19
July	14.50 ± 0.45	11.65 ± 0.28	0.92 ± 0.11
August	14.30 ± 0.29	11.54 ± 0.22	0.98 ± 0.15
September	11.10 ± 0.51	6.25 ± 0.29	0.93 ± 0.16
October	9.70 ± 0.23	6.53 ± 0.42	0.76 ± 0.10
November	3.60 ± 0.14	5.42 ± 0.32	0.80 ± 0.13
December	3.40 ± 0.80	5.31 ± 0.24	0.76 ± 0.10
C. D. Value	0.86	0.70	0.38
F =	195.45	131.02	8.13
	p<0.001	p<0.001	p<0.05

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