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SEX RELATED ANNUAL VARIATIONS IN THE CHOLESTEROL CONTENTS OF SOME TISSUES OF A TELEOST, *WALLAGO ATTU*

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Cholesterol contents of liver, ovary, testes and muscles of *Wallago attu* show conspicuous cyclic fluctuations. The changes are more prominent in the female fish, than in the male. Higher values of cholesterol were usually found during the pre-spawning and the spawning period. Lower values were either in spawning period or immediately after spawning. The liver and muscle cholesterol contents are rapidly replenished, during spent phase of the fish.

INTRODUCTION

Cholesterol, one of the most important fatty acid constituent of fish body, show very high differences at inter and intra species level of the fish tissue (Love, 1970; Joshi, 1978) A feed back mechanism among the biochemical constituent is reported to exist between the blood and gonads of some fishes (Siddiqui, 1966a & b), besides many ecobiological factors are reported to influence cholesterol composition in fish tissues (Idler & Tsuyuki, 1959; Shell, 1961; Mc Cartney, 1967). Joshi (1980) reported sex related cyclic variations in blood glucose and cholesterol contents of a cat fish *H. fossilis*. However, similar studies on few other important tissues of a freshwater fish, especially from Indian sub-continent are conspicuously lacking. This communication reports annual variations in the cholesterol contents of some important tissues in the freshwater shark *Wallago attu*.

MATERIAL AND METHODS

Live specimen of *W. attu* of required size (25–30 cm) were obtained from the fishing grounds and directly brought to the laboratory in 100 L plastic drums containing natural water. On reaching laboratory fishes were immediately transferred to 25 L plasting troughs, with facility of areation. After about 4-6 hrs of resting the fish was anaesthetized with the use of 3% paraldehyde solution, following which each specimen was wiped dry, weighed to nearest gm, abdomen cut open, sexed and various tissues taken out in required amount, weighed, homogenate prepared in ice chilled water, transferred to plastic capped test tubes and stored in freezer till used. The estimation of cholesterol contents was done following the method of Rosenthal *et al.* (1960). All the samples were taken in the last week of each month and estimations made on the subsequent day of sampling. In the present study white muscles (from the mid dorsal region of the fish), liver and gonads were taken from equal number of male and female specimens.

RESULTS

Muscle : The cholesterol contents showed a gradual rise from January onward till April ($P < 0.01$). The depletion started during May, with an insignificant rise ($P > 0.01$) in July, continued till September. Little rise was noticed in the months of October and November with a fall in December (Table I) Two peaks, one in April and other in November were noted in the male fish, while the female fish revealed greater fluctuations round the year. The two peaks in female were found in the months of March and November. The lowest value of muscle cholesterol contents was noted in the month of January and August, in male and female fish, respectively.

Liver : Rich concentration of cholesterol was found in the liver of both sexes, though males had comparatively lower amounts of this sterole than in the females In both the sexes highest value was noted in the month of May, being 1350 ± 121 mg/dl and 1820 ± 196 mg/dl, in male and female fishes, respectively. The second highest value in both sexes was noted in the month of March (Table I) while the lowest values were found in the months of January and September for male and female fish, respectively. Liver showed many fold higher reserves of cholesterol contents than the muscles, round the year in both sexes.

Gonads : Differentiation in the cholesterol moities of testes and ovary persisted round the year. Except during October to January, there existed a significant

Table 1. Monthly variations in cholesterol contents of muscle, liver and gonads of *Wallago attu*. All values are mean ± S. D. for 7 observations each (mg/dl).

Month	Muscle		Liver		Gonad	
	Male	Female	Male	Female	Male	Female
Jan.	160 ± 30	145 ± 17	850 ± 41	980 ± 76	510 ± 37	485 ± 81
Feb.	192 ± 27	186 ± 15	1220 ± 37	1200 ± 80	526 ± 29	560 ± 46
March	205 ± 17	235 ± 19	1310 ± 71	1760 ± 53	735 ± 62	940 ± 78
April	210 ± 20	196 ± 14	1336 ± 36	1640 ± 71	828 ± 54	1050 ± 93
May	208 ± 15	157 ± 20	1350 ± 47	1820 ± 69	700 ± 86	1210 ± 107
June	187 ± 21	150 ± 21	1150 ± 82	1230 ± 72	945 ± 48	1350 ± 98
July	192 ± 30	163 ± 17	1200 ± 102	1072 ± 65	1250 ± 136	1670 ± 140
Aug.	162 ± 11	140 ± 18	1240 ± 63	921 ± 70	1010 ± 105	1685 ± 115
Sept.	170 ± 17	137 ± 18	1070 ± 51	705 ± 35	630 ± 80	510 ± 37
Oct.	185 ± 14	185 ± 21	1280 ± 39	1240 ± 46	502 ± 46	505 ± 80
Nov.	210 ± 18	230 ± 17	1140 ± 42	1320 ± 95	438 ± 35	460 ± 40
Dec.	176 ± 20	182 ± 27	1080 ± 81	1165 ± 81	421 ± 39	415 ± 40

($P < 0.01$) quantitative difference in two sexes. The peak values were noted in the months of July and August in male and female fish respectively, while fluctuation in lowest value of twin sexes were almost identical, except in the month of May when male fish showed a sudden depletion contrary to the rising pattern in the female fish (Table I).

DISCUSSION

Cholesterol is one of the most important sterol constituent, present in appreciable amount within all living tissues From the foregoing account it is clear that the gonads show a steady rise, attain peak values during monsoon months and then fall sharply. This show that need of the cholesterol contents increases as the gonads ripen and to meet this gonadial requirements some cholesterol is rapidly mobilized from the liver *via* blood (Joshi, 1980), perhaps some times muscles may also contribute towards enrichment of gonadial requirements, specially in the female fish. This would deplete the muscular and hepatic cholesterol reserves and the gonadial sterol would increase. This is what exactly happens perhaps in all fishes—as during this period blood cholestrol increases in *H fossilis* Joshi, 1980). The foregoing results for *W. attu* are a clear pointer towards this contention and explain why liver cholesterol fall when the gonadial sterol is increasing rapidly.

Mc Cartney (1967) observed lowest values of serum cholesterol in both sexes of *Salmo trutta*, during the spawning period, followed by a gradual rise. Thus from these earlier reports (Mc Cartney, 1967; Joshi, 1980) and the present observations it is inferred that the changes in the cholesterol metabolism are intimately related in these tissues and are perhaps under direct influence of the sex hormones. Besides, that the cholesterol may be transformed in other lipoidal moities in the developing gonads, partly to provide some structural material and some energy reserves. The serum phospho-lipid contents in *Salmo trutta* (Mc Cartney, 1967) also showed similar trend of fluctuations in both sexes.

The depletion in muscle cholesterol contents occuring during the spawning period may also be due to poor replenishment of the same-from the food. As during spawning period, feeding among fishes is usually disturbed and lowered due to paucity of food around, reduction of abdominal space due to ripening gonads and high pressure of the well distented ovaries in the case of a female fish. This contention finds ample support from the work of Idler & Tsuyuki (1958), on sockey-salmon and Siddiqui (1966a & b) on *Ophiocephalus punctatus*.

The alteration in the cholesterol moeity of the three tissues studied here in *W. attu* revealed wide range of changes in the female fish, than in the male. This is apparently due to higher demands of the maturing ovaries for various metabolites including the sterols. As a corollary it can be mentioned here that Tsujigado (1983) noted that scorpionfish contains more polyunsaturated fatty acid 22 : 6 in the ovary than in any other organ, whereas Takama *et al.* (1985) found that the same fatty acid predominates in both testes and the ovaries of Atlantic cod, than in other tissues. A rapid rise in the cholesterol contents of liver and muscles in these fishes, post spawning, only further strengthen the above explanation As the fish is found to eat voraciously—following the act of spawning and obviously depleted biochemical constitutents are replenished to a greater extent mainly before the onset of winters—when the gonads are spent as the fish is to pass a period of metabolic quisence and recuperation.

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