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Seasonal Variation of Total Lipid Content in A Cyprirnid Barb Species *Puntius sophore*(Ham.)

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ABSTRACT

Total lipid contents of Puntius sophore (Ham.) were studied during the period of December,2019 to November,2020, from the river Dhansiri, Golaghat, India. The study sites lies between 26°42'11"N (Latitude) and 93°41'14"E (Longitude). The study period was divided into four seasons viz. winter(December-February), pre- monsoon (March-May), monsoon (June-August), post- monsoon (September- November). Lipid content varies seasonally at different habitat (lotic or lentic). The lipid content is seasonally varies significantly at 0.01 level. The lipid content of the fish is found to be higher in lotic habitat than the lentic habitat. Lipid content was higher during winter than Monsoon and Post monsoon season. In the present investigation it was observed that highest amount of total lipid found in winter in lotic habitat (301.62±14.62mg/g). The lowest value of total lipid in monsoon (107.23±4.67mg/g) and then gradual increase in postmonsoon (287.54± 36.74mg/g). It was osbserved during the study that a drastic difference in the total lipid content between lotic and lentic habitat was an important finding of the study. It may be noted that habitat condition and change of season have a significant impact on fat synthesis of the fish.

Key words: Lipids, habitats, lotic, lentic, monsoon etc.

INTRODUCTION

The North East region of India occupies an important position on account of its rich diversity of fish. The Brahmaputra and Barak and their tributaries form two important riverine systems of the region which is surrounded by hills on all sides and the two river valleys constitute the plains. The climate is sub-tropical and with more or less mild temperature.

Fish is rightly considered as the poor man's diet. Fish is a rich source of protein, vitamins and minerals with approximate composition as crude protein 14.2-22.8%, fat 0.6-19.4% and energy 76-273Kcal/100 gm. A special feature of fish flesh food is content of Vitamin B_{12} and also a good source of Calcium and Vitamin A. Fish also contains polysaturated fatty acids which provides protection against Cardio Vascular Diseases. The lipids in fish muscle have received much attention as source of EPA and DHA fatty acids in human diets.

The fat is not always uniformly distributed throughout the flesh of a fatty fish. For example in Pacific salmon there may be nearly twice as much fat in muscle from around the head as there is in the tail muscle. In white fish of the cod family, the fat content of the muscle is always low, usually below 1 per cent, and seasonal fluctuations in fat content are noticeable mainly in the liver, where the bulk of the fat is stored.

In all species of fish there is considerable variation in the total fat content, largely associated with spawning and with seasonal variations in intensity of feeding. Spawning may reduce the fat content of cod livers from 75 to about **40%.** In the herring, the most important British oily-fleshed fish, the fat content varies from less than **1%** to over **22%** (Lovern & Wood, **1937). A** curious example of variation is found in the common eel *(Anguilla vulgaris)* where, at any rate over a certain range, the percentage of fat in the flesh is proportional to the length of the fish (Lovern, **1938).**

Certain fatty acids are recognized as essential dietary ingredients for various species of animal, almost certainly including man. The well-recognized acids of this group are linoleic, linolenic and arachidonic. The animal can convert linoleic acid into arachidonic acid, in which form it probably exerts its specific effects. Linolenic acid cannot be converted by the animal into arachidonic acid, but possibly becomes a pentaenoic (Steinberg, Slaton, Howton & Mead, ***1957)*** or a hexaenoic acid (Holman, ***1956a).***

Fish fats should lower blood cholesterol levels. Fish oils resemble the more unsaturated type of vegetable oil in tending to lower blood cholesterol levels. Findings to this effect with human subjects have been reported by Bronte-Stewart, Antonis, Eales & Brock **(1956)** and by Keys ***et al.* (1957),** and similar effects have been reported for whale oil (Malmros & Wigand, **1957)** and seal oil (Bronte-Stewart ***et al.* 1956;** Harlow, **1957),** which have fatty-acid compositions generally like those of fish fats. The practical significance of these findings depends on the amount of fat-rich fish habitually consumed by any individual, in relation to the rest of his dietary fat intake.

Takama et al. (1985) reported seasonal variation in fat deposition in Mackeral and Capelin with tissue variation. Stansby and Hall (1967) reported approximately 70% of fatty acids with four, five or six double bonds in lipids from freshwater fishes which is slightly lower than that of the marine fish (approximately 88%). Fish oils with polyunsaturated fatty acids are "essential" to prevent skin diseases and have neurological benefits in growing children. Recently Eicosapentaenoic acid has shown great importance because of its preventive role in arteriosclerosis. Simopoulos et al. (1991) reported that eicosapen-taenoic acid in the blood is an extremely potent antithrombotic factor.

The freshwater fishes provide a great amount of nutrient food source for human. Therefore, information about the chemical composition of various species and their nutritional properties, biochemical structure and habitat condition is greatly needed. Impact of seasonal variations on the lipids and the lipid amount of the fish for its economical importance is of utmost necessary. However, little is known about the variations in the lipid profile in local fish fauna. Therefore, the present study was aimed to investigate the impact of both the seasonal variations in the amount of total lipid in Cyprinid barb i.e; *Puntius sophore***(Ham.)**.

MATERIALS AND METHODS

Fishes were collected in Golaghat, Assam, India from the river Dhansiri and nearby Lentic Habitat during the period of December,2019 to November,2020. The study period for water parameters was divided into four seasons viz. winter (December- February), pre- monsoon (March- May), monsoon (June- August), post- monsoon (September- November) .The fish sample taken is ***Puntius sophore*** (Ham.).

Preparation of Sample & Methods of Extraction of fish lipid

The weight of the fish sample is taken and recorded. The basic principle for the extraction is based on Folch's method (Folch-Pi et al. 1957) using less amounts of chloroform and methanol for the primary extraction step. The small pieces of fish are crushed and grinded into a smooth and fine paste and is homogenized in a monophasic chloroform/methanol/water mixture. Afterward a phase separation is induced by addition of chloroform and water. The homogenates are filtrated(funnel with folded filter paper) to recover the liquid phase. This mixture is centrifuged and the supernatant is taken. The total lipid is estimated following Folch's method for determination of total lipid content.

Table. I: Total Lipid (mg/g of Tissue) content of *Puntius sophore* (Ham.) in different seasons under Lotic and Lentic habitats.

Total Lipid (mg/g of tissue)			**Winter**	**Premonsoon**	**Monsoon**	**Postmonsoon**
	Lotic	Mean	301.62	125.34	107.23	287.54
		SD±	14.62	17.43	4.67	36.74
		SEM±	3.62	4.52	1.28	2.87
	Lentic	Mean	134.56	93.45	84.92	128.86
		SD±	20.52	11.32	7.48	8.18
		SEM±	4.58	2.15	1.71	2.72

Table II: Showing the significance of variation of total lipid in *Puntius sophore* (Ham.) in different seasons under two habitats (Lotic and Lentic)

Significance of Variation	Habitats	Total Lipid	
		t	p
t between Winter and Premonsoon	Lotic	42.22	<0.001
	Lentic	12.64	<0.001
t between Winter and Monsoon	Lotic	25.88	<0.001
	Lentic	17.28	<0.001
t between Winter and Postmonsoon	Lotic	1.74	>0.01
	Lentic	-1.12	>0.01
t between premonsoon and Monsoon	Lotic	12.33	<0.001
	Lentic	9.18	<0.001
t between Premonsoon and Postmonsoon	Lotic	27.46	<0.001
	Lentic	12.37	<0.001
t between Monsoon and Postmonsoon	Lotic	32.23	<0.001
	Lentic	4.33	<0.001

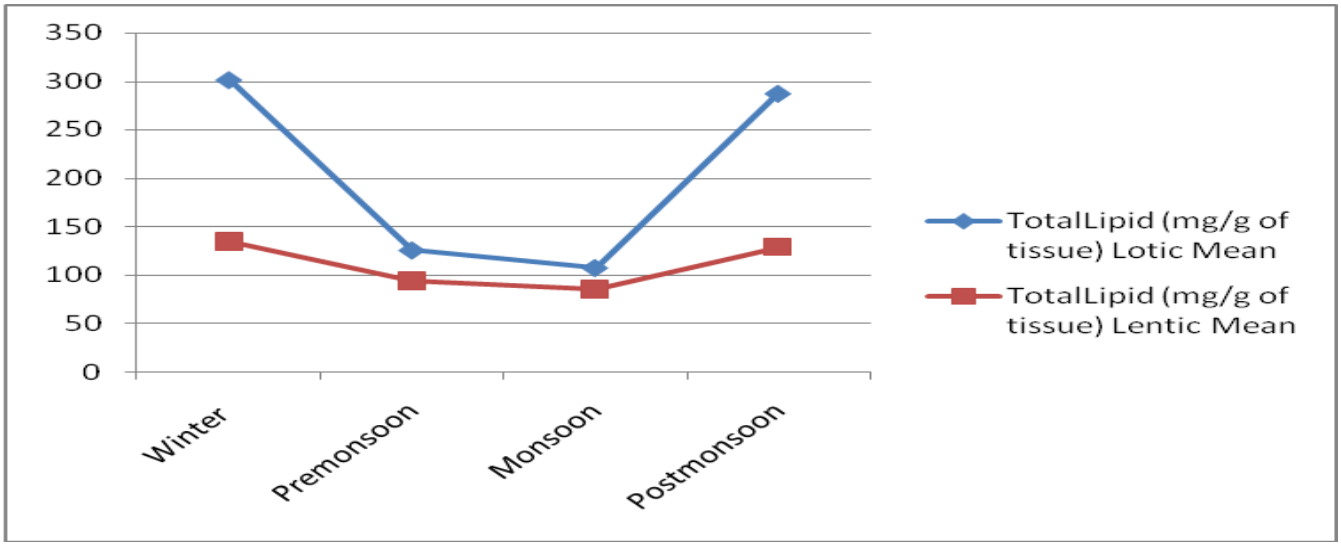

Figure 1: Seasonal variation of the Total Lipid Content in *Puntius sophore* (Ham.) (December, 2019- November 2020)

RESULTS AND DISCUSSION

Fishes show a marked seasonal variation in chemical composition. The lipid fraction is the component showing the greatest variation. West African shad (*Ethmalosa dorsalis)* shows a range in fat content of 2-7% (wet weight) over the year with a maximum in July (Watts, 1957). Corvina (*Micropogon furnieri*) and pescada-foguete (*Marodon ancylodon)* have a fat content range of 0.2-8.7% and 0.1-5.4% respectively (Ito and Watanabe, 1968). It has also been reported that the oil content of these species varies with size. Watanabe (1971) examined freshwater fish from Zambia and found a variation from 0.1-5.0% in oil content of four species including both pelagics and demersals.

In the present study the amount of total lipid from ***Puntius sophore*** (Ham.)**)** in four different seasons of the year under two habitat conditions was investigated and it was estimated that the values of lipid profile were significantly higher in the lotic habitat ($p<0.01$; Table:II). In the tissues of ***Puntius sophore*** (Ham.)the lipid contents were found to be affected by the seasonal variation and the habitat of the fish. Similar studies have also shown that lipid and fatty acid composition was influenced by seasonal variation (Agren et al., 1987; Dutta et al., 1985).

In this study it was found that storage of lipid varies during breeding and nutrition period. In the prebreeding and maturing season the lipid accumulates for the development of gonads (Castell et al., 1972) and the results of the present investigation, the increase in the amount of total lipid content in winter and postmonsoon (maturing season) in both lotic and lentic habitat justifies our results supporting the suggestions of the earlier workers.

In the present investigation the highest amount of total lipid content in ***Puntius sophore*** (Ham.)was observed in winter and postmonsoon in lotic habitat, however, in lentic habitat also relatively higher mean values were observed in winter and postmonsoon season (134.56±20.52; 128.86±8.18mg/g; Table:I). Habitat variation shows to have a significant impact on the lipid content of these particular tissue of ***Puntius sophore*** (Ham.). The highest amount of total lipid (301.62±14.62mg/g) was observed in winter season under lotic habitat followed by postmonsoon season of (287.54±36.74mg/g). The trend was found to be same in lentic habitat. The lowest value of total lipid in monsoon (107.23±4.67 mg/g) and then gradual increase in postmonsoon (287.54±36.74mg/g). A significant variation from 128.86 to 84.92mg/g ($p<0.001$) was observed in total lipid content in this particular freshwater fish from lentic habitat. However, in lotic habitat the trend was similar, with highest lipid content was observed in winter. It was osbserved during the study that a drastic difference in the total lipid content between lotic and lentic habitat was an important finding of the study. It may be noted that habitat condition and change of season have a significant impact on fat synthesis of the fish.

CONCLUSION

From the current study, it could be concluded that the the total lipid content of the Cyprinid Barb species ***Puntius sophore*** (Ham.) varies seasonally as well as on the basis of the habitat whether lotic or lentic. The lipid content is seasonally varies significantly at 0.01 level. The lipid content of the fish is found to be higher in lotic habitat than the lentic habitat. It is also observed during the current study that during Winter and Postmonsoon season the lipid contents are higher than the Monsoon and Premonsoon seasons.

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