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Size related changes in fat content and fatty acid composition of *Amblygaster sirm* (Spotted sardinella, Hurulla)

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Abstract

In the present study the fat content and fatty acid compositions in three size classes (<15cm, 15-20cm, >20cm) of male and female *Amblygaster sirm* (Spotted sardinella, Hurulla) were evaluated. The fat content increased gradually with increasing size of the fish. While both males and females showed the above increase with size, the fat content of the female (4.15%) was consistently higher than that of the male (3.6%) Like most other fish unsaturated fatty acids were dominated by two members of then-3 family, EPA and DHA.

Keywords: Fat content, Fatty acids, EPA, DHA, *Amblygaster sirm*

Introduction

Fish has always been highly regarded as a nutritious food providing protein of high biological value, in addition to vitamins and minerals. Fish oils are now receiving increasing attention as a source of n -3 polyunsaturated fatty acids which have been reported to have beneficial effects on many disease states. Fish is an important source of animal protein for Sri lankans, as meat is not acceptable to all due to health, religious and superstitious beliefs.

Amblygaster sirm (spotted sardinella, Hurulla) is a commercially important and popular fish food in Sri Lanka. They inhabit tropical coastal waters and are pelagic. Massive schools are reported to come close to the shore and they are caught in considerable quantities in Sri Lankan waters (Sri Lankan fisheries year Book, 2000) Several studies on Fat and Fatty acid composition of related species such as herring *(Clupea harengus]* and Sardine *(Sardinella pilchardus)* have been reported. Seasonal changes in lipid composition have been reported in herring (Aro et al, 2000; Aidos et al, 2002) and Sardine (Beltran and Moral, 1990;Bandarra et al, 1997). Folkvord *et al* (1996) and Fraser (1987) reported on the fatty acid composition of herring larvae.Alvarez -Routes et al (1994) reported on the effects of different thawing methods on fat content and fatty acid composition of Sardine.

Jayasinghe et al (1996), Chandrasekhar (1993). Nair and Gopakumar (1978) reports on the fat and fatty acid composition of several edible fish including *Amblygaster sirm* in tropical waters.

The objectives of the present study were to determine the fat and fatty acid composition in male and female *A. sirm* in relation to size.

Materials and Methods

Samples of *Amblygaster sirm* were purchased from Kudalellama in Negambo from October 2005 to March 2006.The fish were immediately packed in crushed ice and then transported to the laboratory where they were cleaned with water. The sex of each fish was determined by observing the gonads after dissection, and grouped accordingly. Samples of edible part of the whole fish were obtained after removing the head, alimentary canal, fins and bones.

Soxhlet extraction method was used to determine the free fat content of fish samples. Majonnier flask method was used to determine the total fat content (Kirk and Swayer, 1991). To deteimine fatty acid composition,

fat was extracted and purified using Bligh and Dyer method. Then the samples were converted to methyl esters, identified and quantified by gas chromatography (column - Supelco wax 10 fused with silica capillary column 30m x 0.32 mm was used. Initial and final temperatures were 190°C and 220°C respectively and was programmed for a linear increase of 5 °C/min. The injector and detector temperatures were 250°C). Peaks were identified by comparison with reference peaks [Standard cod liver oil]. Concentration of each FAME was calculated as a percentage of the total fatty acids.

Results

The fat content per 100g edible portion gradually increased with the increasing size of the fish (fig. 1). While both males and females showed this increase with size, the fat content of the female was consistently higher than that of the male.

Table 1 shows the fatty acid composition of *A. sirm* in the three length classes for male and female pooled data.

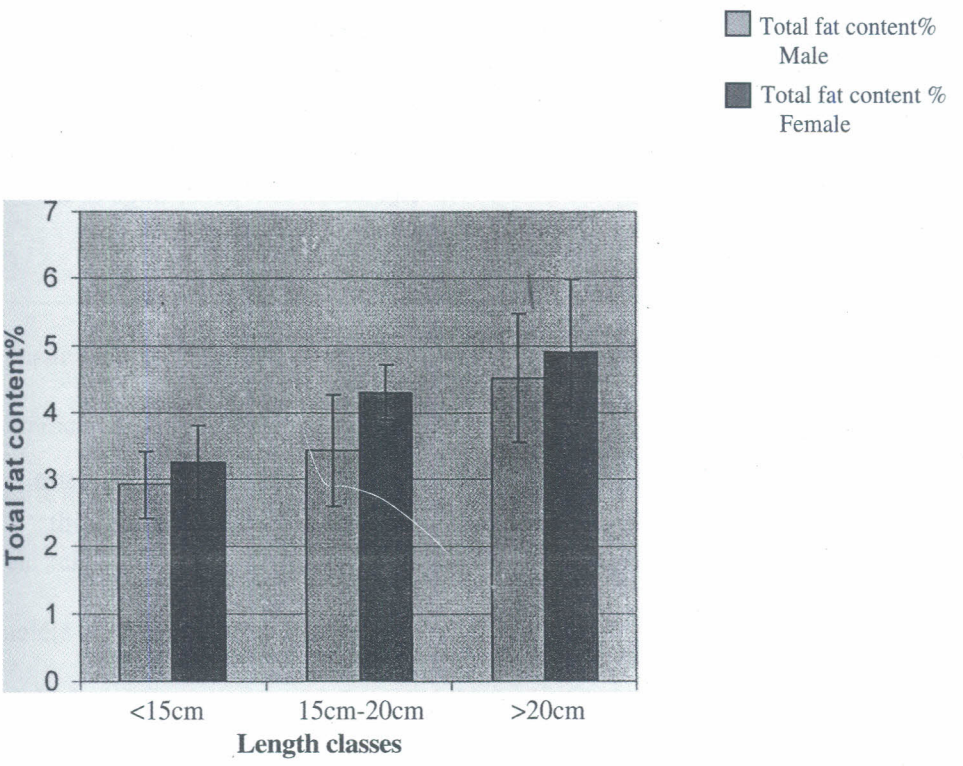

Figure 1. Variation in total fat content in male and female Ambiygaster sirm in the three length classes. (Mean + s.e, n = 6)

Table 1. Fatty acid composition in the three length classes for male and female *Amblygaster sirm* pooled data, (mean, n=3)

Fatty acids (%)		Length Classes		
		<15 cm	15 cm-20 cm	>20 cm
Myristic acid	14:0	7.71	6.56	7.44
Palmatic acid	16:0	29.04	27.32	15.37
Stearic acid	18:0	8.26	4.91	12.55
Oieicacid	18:1	7.45	11.6	15.09
Linoleic acid	18:2	4.72	8.78	6.27
Lenolenic acid	18:3	1.6	4.17	7.95
Arachidonic acid	20:4	3.39	2.32	1.72
Eicosapentaenoic acid	20:5	9.76	10.33	6.27
Docosapentaenoic acid	22:5	1.45	1.17	5.68
Docosahexaenoic acid	22:6	24.49	15	6.21

Discussion

The present study shows that the fat content of *Amblygaster sirm* increase gradually -with increasing size of the fish. While both males and females showed this increase, it was observed that the fat content of the females was consistently higher than that of the males. Lahti and Muje (1991) also reported that the fat content of the female vendace *(Coregonus albula)* was higher than that of the male. No literature reporting size related changes in fat content of *A. sirm* was available.

According to this study the fat content value for pooled data was 3.88g /100g edible portion. This value is comparable to the values obtained for *Ablygaster sirm* by Jayasinghe (1995) (3%) and Edirisinghe (1999) (4.2%). According to the "Table of food composition, for use in Sri Lanka" (Perera *et al.* 1989) Hurulla (Amblygaster sp.) is reported to have a fat content of 5g per 100g edible portions. The present study was carried out over a period of six months from October to March. During the above period a seasonal variation was clearly observed with the highest values (6.64%) occurring in October and the lowest (2.95%) in January. Wallace (1988) observed that in the Atlantic herring *(Clupea harengus)* the lipid content went from a low of 6% in April-May to a high of 20% by October. Nunes et al (1992) report that in the European Sardine *(Sardina pilchardus)* fat cycles between 1.6% and 22.4% on a whole body basis. Ackman (1995) reports that the triglyceride depot fat in edible fish muscle is subject to seasonal variation in all marine fish from cold northern (or Southern) latitudes. Compared to the Atlantic herring *(Clupea herengus)* and European sardine *(Sardina pilchardus)* the fat content of hurulla *(Amblygaster sirm)* was much lower, but a seasonal variation in the fat content during the period studied was clearly evident. In the tropical water fish the above seasonal variation may be due to the stress of spawning. In fish from temperate waters there is an additional need to adjust the metabolism for very cold waters during the winter Bandarra et al (1997) reporting on seasonal changes in lipid composition of sardine *(Sardina pilchardus)* state that minimum values were reached in March -April, Which coincided with spawning, and the highest values occurred in September -October after a heavy feeding period.

The most abundant fatty acid in all the size classes was palmitic acid (16:0). Like in most other fish the polyunsaturated fatty acids were dominated by two members of the *n-3* family, 20:5 *n-3* (eicosapentaenoic acid or EPA) and 22:6 *n-3* (docosahexaenoic acid or DHA). DHA content was significantly higher in the <15cm size class compared to the other two classes. EPA content did not show any significant difference among the size classes.

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