LATERAL DISTRIBUTION AND BELLY FLAP & FILLET CHEMICAL COMPOSITION OF DOGFISH (*Squalus acanthias* L.) (DISTRIBUSI LATERAL KOMPOSISI KIMIA DAGING, KULIT PERUT DAN FILLET IKAN CUCUT BOTOL (*Squalus acanthias* L.)

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ABSTRACT

The chemical composition of lateral distribution and belly flap and fillet of dogfish was determined for a number of fish between April 1991 and May 1993. The chemical composition of fish largely influenced by species, sex, stage of maturation, season of capture, size, and the feeding habits of the fish. Three other factors which also affect the chemical composition are method of sample preparation (i.e. which part of the fish is taken, and the homogeneity of the sample), the method of analysis, and the freshness of fish. The mean values for proximate composition of front, middle and rear part of dogfish (in dwb) were 83.8 %, 84.1, 100 % crude protein, 31.87 %, 32.27 %, 18.19 % lipid, and 4.20 %, 4.31 %, 4.94 % ash for the male, while the female contain 81.6 %, 77.4 %, 88.8 % crude protein, 37.67 %, 45.44 %, 29.2 % lipid, and 4.38 %, 3.78 %, 4.07 %, respectively. It was found that the female dogfish had a higher lipid content and a lower moisture content than the male fish. The lipid content of all the fish decreased towards the tail and water content increased. The protein content of the fillet was higher than that of the belly flap, the latter having a higher lipid content.

RINGKASAN

Komposisi kimia daging ikan cucut botol (*Squalus acanthias* L.) selain dipengaruhi oleh jenis kelamin, tingkat kematangan gonad, ukuran, musim pada saat ikan tersebut ditangkap, dan kebiasaan makannya, juga dipengaruhi oleh metoda penyiapan sampel (daging dari tubuh ikan bagian mana yang diambil untuk sampel), metoda analisa kimia yang digunakan, dan tingkat kesegarannya. Rata- rata nilai proksimat dari bagian depan, tengah, dan belakang ikan cucut botol segar (dalam berat kering) berturut-turut adalah: protein kasar 83,8 %, 84,1 %, dan 100 %; lemak 31,87 %, 32,27 %, dan 18,19 %;; abu 4,20 %, 4,31

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%, dan 4,94 % semuanya untuk cucut jantan, sedangkan pada cucut betina adalah: protein kasar 81,6 %, 77,4 %, dan 88,8 %; lemak 37,67 %, 45,44 %, dan 29,2 %; abu 4,38 %, 3,78 %, dan 4,07 %. Sedangkan kadar airnya adalah: 74,77 %, 75,07 %, dan 77,90 % untuk cucut jantan serta 73,28 %, 72,01 %, dan 74,89 % untuk cucut betina. Telah ditemukan bahwa bagian ekor dari tubuh cucut botol cenderung mengandung lebih banyak protein kasar dan lebih sedikit lemak daripada bagian tengah dan depannya. Sedangkan bagian perutnya mengandung lebih banyak lemak dan kurang kandungan proteinnya daripada filletnya.

1. Introduction

The chemical composition of sea food comes quite close to that of land animals. The principal constituents are water, 66- 84 %; protein, 15-24 %; lipids, 0.1-22 %; and mineral substances, 0.8-2 % (Jacquot, 1961; Suzuki, 1981). The factors affecting chemical composition are numerous, being either of an intrinsic nature bearing upon genetics, morphology, and physiology, or environmental, relating to the living conditions, particularly the feeding. In detail, the differences in the chemical composition of fish are due to differences in: species, individual variation, anatomical (differences in size of fish and location of the flesh sample in the body), sex and sexual maturation, seasonal changes, and feeding habits (Suzuki, 1981; Zapsalis and Beck, 1985). Acording to Connel and Howgate (1986), variations in the availability of food, changes in season and the reproductive cycle can all have a great influence on the amount, consistency and composition of fish flesh, skin and internal organs of sharks. The differences are not only inter individual, but also intra-fish as well.

Shark has become more important as a human food since the end of the 1970's as stocks of more prized fish were reduced due to over fishing. Dogfish, as one of the Order Pleurotremata (Selachii, sharks), is included as one of a group of small sharks which are used as a source of meat and liver oil (containing high concentrations of vitamins A, D, and squalene). A species of dogfish, Squalus acanthias, was used as the sample for this study. It is thus assumed that this fish is a suitable model for sharks in general, with regards to distribution of the flesh chemical composition.

2. Experimental Methods

The sample preparation for lateral variation in composition of fillet were done as follow: three males and three famales dogfishes (the size were range between 73 - 78 cm length and 1247 -1394 gram weight for male and between 90 - 101 cm length and 3200 - 4400 gram weight for female, and the organoleptic assessment about 3 from 5 hedonic scale) were skinned, gutted, and be headed. The bodies then were cut to 3 parts, front (from the front of the first dorsal fin to the head forward), middle (behind the first cutting to the back of anal fin, where present the anus hole), and rear part. Each part of the flesh was deboned, mixed and chopped, with the belly flap excluded. All minced samples were each kept in a poly ethylene (PE) plastic bag (tied with a rubber band or using the plastic itself) and the-nFresh-iced dogfish (Squalus acanthias L.) were purchased from Grimsby fish-docks, with size range between 60 - 100 cm length and 900 - 4450 gram weight.

The sample preparation for belly flap and fillet chemical composition were done as follow: one male dogfish (80 cm) length and 1690 g weight; sensory assessment were about 3.5 from 5 hedonic scale) was gutted and headed. The fish was than split into two along the dorsal line. These were deboned and the fillets separated from the belly flap at the border line. The fillets and the belly flaps were cut into 4 parts.

Chemical reagents (all analytical grade, unless otherwise specifically mentioned) were from May & Baker Ltd., Rhone-Poulenc, Sigma, BDH, Prolabo, Hopkins & Williams Ltd., and Fisons.

The proximates analysis procedures were: protein (Kjeldahl method) and moisture from Egan et al. (1981), lipid from Bligh and Dyer (1959) as modified by Hanson and Olley (1963), non protein nitrogen (NPN) from a method cited by Surono (1991), total volatile basic nitrogen (TVB-N) from Anonymous (1981), Urea from AOAC (1990) number 967.07, while ash and pH using conventional methods.

3. Result and Discussion

3.1 Lateral distribution

The results on a dry weight basis (dwb) are presented in Table 1.

Table 1. Lateral Distribution of Chemical Component of Fresh Dogfish Flesh (% dwb, except moisture content)

COMPONENT	FRONT	MIDDLE	REAR
% Moisture:			
-Male	74,77 (0,08)	75,07 (0,42)	77,90 (0,12)
-Female	73,28 (0,09)	72,01 (0,2)	74,89 (0,14)
%Crude protein:			
-Male	83,8 (0,86)	84,1 (1,29)	100 (0,86)
-Female	81,6 (3,0)	77,4 (0,68)	88,8 (3,3)
%Lipid:			
-Male	31,87 (0,06)	32,27 (0,57)	18,19 (0,65)
-Female	37,67 (0,78)	45,44 (6,18)	29,2 91,91)
%Ash:			
-Male	4,20 (0,01)	4,31 (0,13)	4,94 (0,10)

Note: all values are means of triplicate determinations with standard deviation in parentheses. The ash content of cartilage was 11.96 (0.53) %.

The female dogfish had a higher lipid content and a lower moisture content than that the male fish. The lipid content of all the fish decreased towards the the tail and the water content increased.

The rear part had more red muscle than the rest of the fish, and is the most active part of the dogfish during swimming and it therefore requires more energy than the front and middle sections. This energy would be supplied by the red flesh, which contains more myoglobin and has an anabolism rate of 3 - 3.5 times higher than that of white muscle (Jacquot, 1961).

The greater lipid content of the female dogfish was probably due to their sexual maturation indicated by the presence of eggs and unborn young.

The percentage protein, lipid, moisture, and ash add up to more than 100 % (wwb) and (dwb). This was probably due to the high concentration of non protein nitrogen. These results do not agree with those of Tausin (1985) who stated that the chemical composition of front, middle and rear of dogfish fillets were not significantly different. This may be because fewer replicates were carried out in this work than in that of Tausin whose results were taken from 10 determinations.

The above results (Table 1) show that the female dogfish had slightly higher lipid content than that of the male. Therefore, it was decided to used male dogfish only for the following experiments, to try to avoid seasonal variations in chemical composition.

3.2 Belly flap and fillet

The total proximate composition (crude protein, lipid, moisture, and ash) of the fillet adds up to more than 100 % (see Table 2). The major cause of this was that the protein determination was based on crude protein, i.e. total N X 6.25. However the total nitrogen included non protein nitrogen at a level of 8 % in the fillet and 2.4 % in the belly flap. The NPN would be present as urea and ammonia, and so when the N content is multiplied by 6.25 this would result in an over estimate of the crude protein content. Another reason is that some of the samples were frozen prior to analysis which caused the appearance of crystals of ice on the surface. The flakes of ice were removed before weighing. This would result in a lower water content (i.e. higher solid matter) on analysis.

Table 2. Chemical Component of belly flap and fillet of Fresh Dogfish (% dwb, except the moisture content)

COMPONENT	BELLY FLAP	FILLET
% Moisture:	67(1,1)	76,2 (0,2)
% Crude protein:	43,9 (7,6)	69,8 (5,5)
% NPN TVB-N mg/100 g	2,43 (0,07) 437 (11,7)	7,96 (0,16) 886 (99)
% Lipid	46,38 (9,78)	32,34 (0,57)
%Ash:	6,51 (0,17)	4,52 (0,09)
%Salt	5,58 (0,48)	1,74 (0,03)

Note: all values are means of duplicates determinations with standard deviation in parentheses.

The protein content of the fillet was higher than that of the belly flap, the latter having a higher lipid content. It was not unexpected therefore, that the NPN content of fresh dogfish fillet was more than three times that of the belly flap (on dwb, 8 to 2.4 %) and that the TVB-N content was 1.5 higher (886 compared with 437 mg% in dwb).

The belly flap had higher percentage lipid, salt, and ash contents than the fillet. The lipid content of the belly flap was nearly one and half times than of the fillet (on dwb, 46 to 32 %). The belly flap acts as a lipid depot in dogfish. The lipid content of the belly flap was even higher than that of the tail end of the fish which contains more red muscle and is the most active body during swimming.

The salt content of the belly flap was more than three times higher than that of the fillet on dwb (5.6 to 1.7 %), and this was also reflected in the ash value. The dogfish, belongs to the Elasmobranchs, has nearly transparent, soft-rib cartilages. Some of this cartilage may have been included when the sample was chopped and may therefore have influenced the ash and also water content. The results from the previous experiment (see the note of Table 1) show that the cartilage contained 11.96 % ash with standard deviation 0.53.

4. Conclusions

The proximate composition of belly flap and fillet were: protein 2.4 and 8 %, lipid 46 and 32 %, ash 6.51 and 4.52 %, and moisture 67.7 and 76.2 %. The NPN content would effet the crude protein level, while the cartilage which was included would effect the ash level.

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