# OVERALL CHEMICAL COMPOSITION OF DOGFISH (*Squalus acanthias* L.) (KOMPOSISI KIMIA KESELURUHAN DAGING IKAN CUCUT BOTOL (*Squalus acanthias* L.)

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## ABSTRACT

The chemical composition 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 fresh dogfish were 20.7 % crude protein (12.5 % net protein), 5.20 % lipid, and 1.2 % ash, while the moisture content was 74.58 %.

## 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 ikan cucut botol segar adalah: protein kasar 20,7 % (12,5 % diantaranya merupakan protein bersih); lemak 5,20 %; abu 1,2 %; dan kadar air 74,58 %. 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.

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## 1. Introduction

The composition of aquatic animals is extremly varied. 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.

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 malc 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 then

Fresh-iced dogfish (Squalus acanthias L.) were purchased from Grimsby fish-docks, with size range between 60 - 100 cm length and 900 - 4450 gram weight.

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

The experiment data was investigated as shown in Table 1.

Table 1. Chemical Composition of Fresh Dogfish Flesh (means and range)

| COMPONEN | WET WIGHT BASIS (WWB) | DRY WEIGHT BASIS (DWB) |
|---|---|---|
| % Moisture [69] | 74-58 (2-64)<br>68-78 | |
| % Crude Protein [46] | 20-7 (2.9)<br>14-25 | 81-7 (16.8)<br>44-103 |
| % Net Protein[30] | 12.5 (2.4)<br>8-15 | 52.4 (10.9)<br>31-69 |
| % NPN[24] | 1.68 (0.32)<br>0.78-1.87 | 5.39 (1.55)<br>2.43-7.96 |
| % Urea[9] | 1.68 (0.36)<br>1.28-1.94 | 7.14 (1.18)<br>5.78-7.90 |
| TVB-N(mg/100 g)[39] | 222 (41)<br>141-318 | 915 (188)<br>437-1241 |
| pH[15] | 6.49 (0.4)<br>6.42-7.20 | |
| % Lipid[40] | 5.20 (3.4)<br>2 - 8 | 20.08 (11.5)<br>6.51-46.38 |
| % Ash[15] | 1.2 (0.51)<br>0.9-2.1 | 4.6 (1.10)<br>3.7-6.5 |
| % Salt[9] | 0.85 (0.82)<br>0.33-1.8 | 2.93 (2.30)<br>1.47-5.58 |

Note: The superscript numbers indicate the number of determinations; values in parentheses indicate the standard deviation from the mean.

The percentage composition of protein, lipid, moisture, and ash were in agreement with the range of figures stated in the literature (Jacquot, 1961; Gordievskaya, 1973; Morris, 1975; and Suzuki, 1981). However the results for TVB-N were far higher (222 mg% wwb) than those reported by Tausin (1985). Tausin found the TVB-N (wwb) of dogfish flesh to range from 17.5 to 48.5 mg%, with an average value of 19.9 mg% (with standard deviation 7.90). The difference could be due to differences in analytical procedure (Tausin homogenized the sample in distilled water whilst in this experiment the sample was homogenized in

2 % boric acid solution). Elliot (1952) cited by Stansby et al. (1968), after carrying out total volatile base determinations on dogfish-muscle extracts without the removal of protein, reported values commonly as high as 250 mg and sometimes as high as 500 mg total volatile base nitrogen per 100 g of dogfish after ice storage of the minced flesh for 10 days. On the other hand, Southcott et al.(1960), using protein-free dogfish extracts, reported values of less than 25 mg total volatile base nitrogen per 100 g of dogfish for storage of fillet for up to 21 days in ice. Southcott et al.(1960) also showed that the total volatile base can increase to values as high as 200 mg total volatile base when dogfish are stored at a temperature (5°C, for example) substantially above that melting ice. Thus, high values of the TVB-N results of these experiment could be due to dissolving some of the protein into 2 % boric acid solution (which was initially proposed to avoid the evaporation of ammonia during samples homogenising) and/or from protein degradation which could occur during preparation of the samples (which was carried out at about 5°C for 3 to 5 hours before being further processed, frozen, or analyzed.

Vyncke (1970) (using micro diffusion method) gave a limit of acceptability of dogfish flesh of 55 - 60 mg% N. However, the dogfish samples which were used in this work were given approximately organoleptic score of over 3 out of 5 (see sample preparation in section 2), which means that they were still acceptable. This work was also carried out on the white flesh of dogfish fillet.

## 4. Conclusions

The overall composition of fresh dogfish were 20.7 % crude protein (12.5 % net protein), 5.20 % lipid, and 1.2 % ash, while the moisture content was 74.58 %. The present of red muscle in the sample would effet the crude protein and lipid level, while the high level of TVB-N value would effect the crude protein level.

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