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AN INVESTIGATION OF THE CHEMICAL COMPOSITION OF B. C. HERRING

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Purpose of the investigation

During the present summer an investigation into the chemical composition of the herring of B.C. was undertaken. Differences in composition of the various samples were studied from the point of view of variation due to the locality where the fish were caught and also from a point of view of seasonal fluctuations.

Sampling

Sampling was carried on during last winter by Dr. J.L. Hart and Mr. A. Tester. Since it has been shown frequently in the literature that there is a considerable variation in the individual fish of samples containing fish of the same size and age each sample collected consisted of about 30 fish to overcome any errors from this source. The fish were canned in four cans, one can containing the fish in the dry state, the other three being filled with water before being sealed.

The samples were:-

Place	Date	Can.	Fish	Can.	Fish	Can.	Fish.	Can.	Fish.
Cowichan Cap	Nov. 17	31.1	8a	2	7 x	3	7 x	4	8 x
Shelter Arm	Dec. 7	31.5	6a	6	5 x	7	5 x	8	6 x
Vernon Bay	Dec. 8	31.9	7a	10	7 x	11	7 x	12	7 x
Nootka	Jan. 13	32.13	6a	14	6 x	15	6 x	16	6 x
Barkley Sd.	Feb. 9	32.17	6a	18	6 x	19	6 x	20	6 x
Point Grey	July 13	32.21	6a	22	6x	23	6 x	24	6 x

a - denotes fish canned in the dry state
x - denotes fish canned in water.

Methods

Analyses were carried out for moisture, oil, protein, and ash. Moisture was determined by drying a weighed sample for 24 hours at 98°C. The residue was weighed and extracted for four hours with carbon tetrachloride and reweighed after drying for three hours at 98°C. The loss in weight was taken as the oil content. Nitrogen determinations were run on the dry oil-free residues using the Kjeldahl-Gunning method. The ash content was found by igniting a weighed sample of the dry oil-free solids for half an hour at dull red heat and then destroying any residual carbon with a few drops of concentrated nitric acid.

Results

The analyses results for each of the four cans per sample were combined and averaged to give the composition of the sample. The results were calculated both on the wet weight and dry weight basis and are given in Tables 1 and 2.

Discussion of Results

While the number of samples analysed during the summer were few and hence it is impossible to find hard and fast conclusions, from the data on hand several things are evident.

In the first place there is a variation in the fish due to the locality in which they were caught. This is seen on comparing samples 2 and 3. (Caught respectively on Dec. 7th in Sidney Inlet and Dec. 8th in Barkley Sound).

Sample	Total Solids	Oil	Protein	Ash	Av. Length (x)
2	32.2%	13.7	15.5	2.2	200.4 mm.
3	30.4%	12.8	14.3	2.1	194.1 mm.

Due to this factor it is impossible to trace accurately the seasonal fluctuation from the foregoing data although it furnishes the general trend of the changes.

By plotting the percentage composition of the various constituents against the date it is seen that there is a slight fluctuation in the protein and ash and a great fluctuation in the oil and moisture curves. Also it is seen that these two latter constituents in the nature of reciprocals, one falling while the other is rising. The changes are shown in Graph 1.

These findings are in agreement with the results of Johnstone (1) in England and Willie (2) in Germany who have carried on a study of the composition and seasonal fluctuations of the herring of their respective countries.

x. This data was supplies by Mr. A. Tester.

(1) Johnstone, J., Lancashire Sea Fisheries Report, 1917.
(2) Wille, V.O., Fische und Fischwaren, 1:3-7, 1932.

Table 1.

Average Composition of Herring (Wet Basis)

Sample	Caught at	Date	Moisture	Total Solids	Oil	Oil Free Solids	Protein (Nx6.25)	Ash
1	Cowichan Cap	17/11/31	66.9	33.1	15.0	18.0	14.7	2.3
2	Shelter Arm	7/12/31	67.8	32.2	13.7	18.5	15.5	2.2
3	Vernon Bay	8/12/31	69.6	30.4	12.8	17.6	14.3	2.1
4	Nootka	13/ 1/32	72.6	27.4	8.0	19.4	16.5	2.4
5	Barkley Sd.	9/ 2/32	73.4	26.6	7.4	19.2	15.7	2.2
6	Point Grey	--/ 7/32	64.2	35.8	19.3	16.5	13.7	1.8

Table 2.

Average Composition of Herring (Dry Basis)

Sample	Oil	Protein	Ash	Total
1	45.4	44.5	7.0	96.9
2	42.6	48.2	6.7	97.5
3	41.9	47.2	7.0	96.1
4	29.3	60.2	8.6	98.1
5	27.8	59.2	8.4	95.4
6	53.8	38.4	5.2	97.4

Note: Protein values have been calculated using the usual procedure of multiplying the nitrogen value by 6.25. Although this is the accepted method there is some doubt as to whether or not the factor for fish protein should not be higher. This would then increase the protein values making the totals for the constituents approach more closely to 100%, especially in the case of table 2.