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Title	STUDIES ON THE NUTRITIVE VALUE OF THE MEAT OF SEA CUCUMBER (STICHOPUS JAPONICUS SELENKA) : III. A Comparison of the Chemical Components of the Meat of Sea Cucumber with the Meat of Other Marine Animals
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Citation	北海道大學水産學部研究彙報, 5(4), 346-347
Issue Date	1955-02
Doc URL	<a href="https://hdl.handle.net/2115/22885">https://hdl.handle.net/2115/22885</a>
Type	departmental bulletin paper
File Information	5(4)_P346-347.pdf



STUDIES ON THE NUTRITIVE VALUE OF THE MEAT OF  
SEA CUCUMBER (*STICHOPUS JAPONICUS* SELENKA)

III. A Comparison of the Chemical Components of the Meat of  
Sea Cucumber with the Meat of Other Marine Animals

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The so-called meat (edible part) of sea cucumber consists mainly of connective tissue, as above stated, on the other hand, the edible part of aquatic vertebrates (including fish) and molluscs consists of muscular tissue. Hence there may be remarkable differences between them.

Estimations were made of the chemical components of food for human consumption derived from such creatures, from the sea cucumber (caught in January and August) and aquatic mammal (whale meat), fish meat (red flesh fish and white flesh fish), and molluscs (Cephalopoda, Gastropoda). The results are collected in Table 1.

Table 1. Comparative results of evaluations of proximate composition of the meat of sea cucumber and other aquatic animals<sup>(1a)(1b)</sup>

	Per cent in raw material				Calorie 100 gm meat	Per cent in dry-matter		
	Water content	Crude protein	Crude fat	Ash		Crude protein	Crude fat	Ash
Whale (red meat)	70.18	20.95	7.62	1.25	156	70.25	25.55	4.19
Dolphin	72.80	16.81	8.13	3.25	144	61.80	29.89	11.95
Herring	74.64	14.55	9.03	1.78	143	57.37	35.61	7.02
Cod	82.30	16.85	0.48	1.23	73	95.20	2.71	6.95
Ear-shell	73.00	24.56	0.44	1.98	104	90.96	1.63	7.33
Octopus	77.00	17.07	4.57	1.42	112	74.22	19.87	6.17
Clam	78.75	11.27	1.62	1.47	61	53.08	7.62	6.92
Oyster	80.38	13.31	1.51	1.96	68	67.84	7.69	9.99
Sea cucum- ber (Jan.)	84.89	6.50	1.44	2.73	40	43.02	9.53	15.68
(Aug.)	90.20	7.67	0.76	1.37	38	78.26	7.76	13.98

The chemical components of the meat of sea cucumber differ remarkably from those of other aquatic animal meats in respect to the fact that the former has a larger quantity of water and smaller quantity of crude protein and fat than the latter.

The fact that sea cucumber has larger quantity of ash may be because the meat of sea cucumber can not be separated from the spicule which corresponds to the bone of fish.

Aquatic vertebrates such as fish have a large quantity of fat in their muscular tissue (except cod or flat fish) and the amount of fat content varies seasonally having relation to the conditions of sexual glands.

Sea cucumber has glycogen in the meat as a reserve in addition to fat.

According to the results of experiments of the present authors, the quantities of glycogen estimated for sea cucumber, which is soon to enter hibernation with falling of water temperature in about December, or which is soon to begin breeding in about June, are 0.799% in original matter (5.28% in the dried matter) or 0.881% (8.09%) respectively. Such estimation have been made previously. According to evaluations of the amounts of glycogen in various sorts of fish meat, shark contains glycogen of 0.018% (as glucose)<sup>2</sup>, carp 0.29%<sup>2</sup>, bonito (3 hours after the death) 0.013%,<sup>3</sup> and *Gadus aeglefinus* (a kind of cods) 0.4~0.6%<sup>4</sup>. The amount of glycogen content in the meat of sea cucumber is larger than that in the meat of fish.

However, the amount of glycogen content in oyster meat varies seasonally, as much as 14.6~21.6% in from November to March of the next year, 8~9% in May, 6% in June (all the glycogen content is for the dried matter respectively)<sup>5</sup>.

The glycogen contents in the meat of sea cucumber is smaller than the maximum quantity contained in oyster meat, but almost the same as the minimum contents.

The amount of fat contents in the meat of sea cucumber is almost the same in oyster and clam meat.

Generally speaking, the amount of chemical components of the meat of sea cucumber is smaller in respect to the quantities of crude protein content and fat content, but is larger in the quantity of water content than other aquatic vertebrates. Therefore the calorie of the meat of sea cucumber is nutritively inferior to the meat of aquatic vertebrates and molluscs.

### Summary

The amount of water content in the meat of sea cucumber is about 90% being larger than that of fish meat. However, the amounts of protein and fat are very small in absolute values. That is to say, the nutritive value of the meat of sea cucumber is inferior to the meat of aquatic vertebrates and molluscs.

### Literature cited

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