

Whale Meat in Nutrition

BY

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(Received June 16, 1952)

1. Introduction

It is a matter of common knowledge that protein is one of the most important substances in nutrition, and it is also well known to all that protein, especially animal protein, in our Japanese food is inclined to the deficiency. They say repeatedly that protein, vitamin and calcium are the three big shortages in Japanese food. It is, therefore, most necessary to supply our daily diet with protein.

Protein food materials in agricultural, stock-raising and marine products, however, are in general insufficient and they are, therefore, high in price. In the commercial condition alone, we can never take the sufficient amount of protein daily, if we want to live within our present income. There are, hence, many difficulties in suppling this nutriment in sufficient amount under unavoidable productive and economical bad circumstances.

In the midst of such circumstances, over 3500 whales are caught yearly in the Antarctic Ocean and in the adjacent waters of Japan. And so we thought that it may be wise to make the most use of various organs of the whale body to improve our bad nutritive conditions.

That is why we have attempted this sitological study on whale meat.

In the first place we have done the nutritive chemical analysis of muscles and other organs of whales and compared the results with that of other animal foodstuffs.

In the second place we have investigated and studied the price, the taste and the art of cooking etc. of the whale meat.

2. The nutriments of various organs of whales

The nutritive chemical analysis of skin parts, muscles and internal organs etc. has been done on 4 species of whales: blue, fin, sei and sperm whale.

Moreover we have carried out the analysis of some canned whale meat for reference of our study.

The results are shown in Table 1.

Table 1. Nutrients of various organs (4 species of whales).

Organs	Species of Whales	Water %	Protein %	Fat %	Ash %	Fuel value Calories	Calcium (Ca) mg%	Phosphorus(P) mg%	Iron (Fe) mg%	NaCl mg%
Common meat (tinged with red)	Sperm	74.49	20.83	3.56	1.12	115	16	71	—	—
" (A)	"	74.00	23.77	1.09	1.14	105	9	82	5	—
" (B)	"	72.27	17.89	8.92	0.92	152	11	157	—	—
" (rapid freezing)	"	67.74	18.49	12.84	0.93	190	17	120	—	—
" (slow freezing)	"	67.74	18.49	12.84	0.93	190	17	120	—	—
Common meat (tinged with red)	"	67.88	23.90	7.15	1.07	160	7	205	20	145
"	"	70.46	24.49	4.10	0.97	135	8	135	9	7
"	Fin	72.71	23.27	2.95	1.07	120	11	193	5	65
"	"	68.61	18.49	12.09	0.81	183	8	122	6	29
"	"	83.93	22.87	12.35	0.81	203	4	112	6	51
"	"	77.80	19.57	1.65	0.98	93	22	83	—	—
"	"	75.88	20.16	3.15	0.81	109	—	—	—	—
"	"	49.76	14.88	34.68	0.68	372	25	90	1	—
"	"	73.93	21.90	3.21	0.96	117	—	—	—	—
"	"	62.88	22.04	14.09	0.99	215	32	412	—	—
"	Blue Sei	73.79	24.70	0.67	0.84	104	7	183	2	84
" (salted)	Fin	59.10	24.37	6.21	10.22	154	49	1125	4	—
Meat around ribs	Fin	62.35	18.84	18.18	0.65	238	5	70	6	38
"	"	69.52	22.35	7.20	0.93	154	14	117	3	—
"	Sei	77.48	21.60	0.33	0.58	89	6	69	3	26
Dorsal meat	Sperm	72.78	24.05	2.22	0.95	116	16	206	20	90
Tail meat	Fin	45.77	12.70	41.04	0.49	420	10	82	4	12
"	"	62.88	22.04	14.09	0.99	215	32	414	—	—
"	"	54.75	22.57	22.04	0.60	288	5	90	4	31
"	Sei	74.15	13.68	11.60	0.61	158	13	110	2	36
Tail flukes	Fin	53.20	28.59	17.95	0.26	276	8	45	2	9
"	Sperm	55.86	28.17	15.25	0.72	250	11	26	2	340
Ventral meat	Fin	64.06	19.15	15.43	0.76	218	5	141	3	68
"	"	73.62	21.48	4.06	0.84	123	14	87	6	256
"	"	75.05	22.00	2.02	0.93	106	6	161	3	106
"	"	68.51	24.06	6.60	0.83	156	10	85	4	71
"	Blue	71.10	21.77	6.24	0.89	143	6	137	3	145
"	Sei	72.67	21.80	4.75	0.72	130	6	96	3	52
Blubber of ventral grooves	Fin	54.07	22.21	22.55	0.54	291	8	21	2	310
"	"	61.05	22.48	15.80	0.68	232	8	42	3	268
"	Blue	60.48	20.24	18.72	0.56	249	8	29	2	244
Epidermis of head and back	Fin	65.87	30.31	2.62	1.20	145	36	111	11	101
Epidermis & Cutis of head	"	35.56	10.72	53.70	0.22	526	6	31	1	10
"	"	32.80	13.92	52.89	0.35	532	6	28	3	47
Epidermis & Cutis of back	"	24.63	10.08	65.05	0.24	626	4	21	2	86
Epidermis & Cutis	"	30.57	8.38	60.91	0.14	582	5	37	1	10,028
Jaw ligament	Sperm	72.73	18.30	7.87	1.10	144	23	63	21	389

Organs	Species of Whales	Water %	Protein %	Fat %	Ash %	Fuel value Calories	Calcium (Ca) mg%	Phosphorus(P) mg%	Iron (Fe) mg%	NaCl mg%
Nasal cartilage	Fin	85.47	13.13	0.13	1.27	54	62	10	2	142
"	Sei	86.65	11.50	0.21	1.64	48	48	18	1	101
Tongue	Fin ♂	18.27	9.20	7.62	0.91	681	27	28	1	481
"	Sei	41.10	7.48	50.71	0.71	486	8	21	1	520
"	Sperm	49.57	45.23	3.53	1.67	213	50	373	36	452
Oesophagus	Sperm	74.21	24.89	0.47	0.43	104	14	206	8	609
Stomach	Fin ♂	77.08	17.98	3.30	1.64	102	28	230	8	385
"	Sei	76.81	17.29	4.39	1.51	109	31	202	9	314
The first Stomach	Sperm	71.20	27.20	0.70	0.90	115	17	319	21	392
The second "	"	78.20	20.05	0.84	0.91	88	12	247	5	986
The third "	"	26.77	6.04	66.75	0.44	925	9	80	11	405
Small gut	Fin	80.78	14.07	4.04	1.13	93	11	103	3	256
"	" ♂	81.15	13.70	3.46	1.69	86	32	65	3	1,010
"	Blue	79.31	16.58	2.62	1.49	90	35	349	3	—
Large gut	Blue	73.66	14.12	11.44	0.78	160	29	498	15	—
"	Sperm	65.53	15.68	17.51	1.23	220	—	95	14	202
Lung	Fin ♂	77.92	19.92	0.55	1.61	85	49	134	10	729
"	Sei	76.65	20.03	1.50	1.82	94	38	161	16	825
"	Sperm	74.85	21.22	2.63	1.30	109	42	184	27	628
"	"	80.94	16.34	0.98	1.74	74	27	64	25	902
Heart	Fin ♂	79.16	18.68	1.20	0.95	86	9	231	9	115
"	Sei	72.26	17.22	5.51	1.01	118	8	160	8	175
Liver	Fin ♂	68.40	23.60	4.29	1.41	142	8	166	117	24
"	Sei	73.06	21.57	2.57	1.25	116	13	275	34	58
"	Sperm	73.83	20.75	4.47	0.95	123	13	154	45	108
Kidney	Fin	79.56	15.97	3.34	1.13	94	14	162	6	278
"	"	76.45	18.97	3.46	1.12	107	21	80	7	530
"	Sei	79.80	16.09	2.70	1.41	89	19	174	6	204
"	Sperm	66.47	15.04	17.25	1.24	215	36	107	11	631
Pancreas	Fin	77.51	16.38	4.45	1.66	106	31	446	11	342
"	Sei	75.45	17.90	4.79	1.86	115	14	386	4	460
"	Sperm	40.69	2.84	56.19	0.23	517	9	35	24	0
Spleen	Sperm	52.49	19.88	26.71	0.92	320	14	245	14	222
Testicle	Fin	83.97	12.18	2.68	1.17	72	14	112	5	370
"	Sei	82.54	14.40	1.84	1.22	74	10	249	4	263
"	Sperm	85.26	11.02	2.87	0.85	70	12	149	4	243
Ovary	Sei	81.61	16.80	0.47	1.12	71	17	107	5	604
Fat tissue of the intestine	Sperm	55.98	24.66	18.87	0.49	268	4	85	4	27
"	"	15.19	1.70	82.86	0.25	753	2	23	9	170

The facts which we have known from this analysis are as follows:

1) Protein

The content of protein of the epidermal part of the head and back (Fin wh.) was the most (30.31%) and that of pancreas and 3. stomach (sperm wh.) were the least (2.84 and 6.04% respectively). The content of it of muscles, so-called "red meat", was as shown under.

Blue wh.	22.40%
Fin wh.	23.27-18.49%
Sei wh.	24.70%
Sperm wh.	24.49-20.83%

2) Fat

The content of fat of the cutis and subcutaneous part (fin wh.) was the most (65.05%) and that of the nasal cartilage (fin wh.) was the least (0.13). The muscles show the content of fat from 0.13 to 34.68 in per cent. Many internal organs, except the tongue, show the content of 0.5-5.0 in per cent.

3) Calories

Calories culculated from the content of nutrients of various organs are between 604 (cutis and subcutaneous part of the back, the highest) and 51 (nasal cartilage, the lowest). The cutis and subcutaneous part and the tongue are especially rich in calories and it is clear that the calories generally become higher in proportion to the content of fat. The muscles show 48-420 cal.. The internal organs, except the special ones like the tongue, show the calories of 70-220. The stomach, pancreas and spleen are sometimes considerably rich in calories.

4) Calcium

The most content of calcium was found in the nasal cartilage of the fin whale (62 mg%) and the least in the cutis and subcutaneous parts of itself (4 mg%). In general the epidermal part and muscles are rich in calcium compared with the internal organs. Especially the nasal cartilage, the lung and the epidermal part contain a large amount of calcium. The content of it of the muscles lies between 5 and 36 mg per cent.

5) Phosphorus

The content of phosphorus of the pancreas (fin wh.) was the most (446 mg%) and that of the nasal cartilage (fin wh.) was the least. The

fatty parts of whales, such as the tongue and subcutaneous part, are in general low in phosphorus. The content of phosphorus of the muscles lies between 10 and 534 mg per cent.

6) Iron

The liver (fin wh. ♂) contained the most iron (117 mg%) and the tongue and the nasal cartilage etc. the least (1 mg%). The fatty parts of whales, such as the tongue and the cutis and subcutaneous part etc. are poor in iron. The content of iron of the muscles shows 2 to 20 mg per cent.

7) NaCl

The lung (sei wh.) contained the most NaCl (825 mg%) and the tail flukes (fin wh. ♂) the least (9 mg%). In general the lung, ovary, tongue and pancreas etc. indicate the large content of this salt. However, the skin parts and muscles, with the exception of the blubber of ventral grooves, are low in the salt.

It is evident that according to the tested materials, though they are samples of the same name, show extraordinary different contents of the salt. And we suppose that this fact might be caused by the samples which were accidentally mixed with salt when they were artificially frozen or stored or transported.

From the results above mentioned we summarize as follows:

a) The content of nutriment of organs of the whale does not indicate much difference depending on the species, sex, age or the area where the whale was caught.

b) Protein abounds in muscles, internal organs etc. and fatty parts of the body are low in this nutriment.

c) Fat abounds in skin parts.

d) Calories are as a rule in proportion with the content of fat of organs. Accordingly the skin parts are rich in them.

e) Minerals are abounded in internal organs.

f) When we compared whale meat with beef and pork etc. we found that they did not much differ in the content of nutriment.

3. Nutrients of canned whale meat

Table 2 shows the results of the measurement of nutrients of the canned whale meat which was made of the meat brought back frozen from the Antarctic Ocean.

Protein content of these products lies between 22.71% and 26.81%,

on the whole 25%. Fat between 3.42% and 7.61%, on the whole 4%. Minerals between 3.16% and 7.77%, on the whole 3.5%.

Some of these are seasoned with carbohydrate, NaCl and soy etc. and the sugar content of "yamatoni", which is a flavoured canned meat and is very popular one in Japan, was, calculated as cane sugar, 3.33 to 7.44%. It was hard to prove the existence of artificial sweet matter, like saccharine and dulcine. The amount of them has to be minimum, if any. "Yamatoni" of sperm whale meat and fin whale ventral meat, and merely boiled meat made of meat preserved with salt, contained 0.008, 0.011 and 0.009% nitre respectively which is used to bring out the colour of meat.

Table 2. Nutrients of whale meat canned.

Nutrients Canned meat	NaCl %	Protein %	Fat %	Ash %	Water %	Fuel value calories	Carbo- hydrate %
Yamatoni (Sperm)	—	26.45	4.21	3.64	61.38	161	4.32
" (Fin)	—	25.67	4.71	3.68	62.09	161	3.85
Meat (tinged with red, salted) boiled plain (Fin)	0.66	25.17	3.42	3.44	67.97	132	
Yamatoni of ventral blubber	Sugar % (as cane sugar) 3.33	26.34	5.90	3.77	60.66	172	
Yamatoni of ventral meat (Fin and Sei)	3.92	24.89	4.32	3.54	63.33	155	
Yamatoni of common meat (Fin)	7.38	26.81	3.71	3.75	58.35	170	
Yamatoni of ventral meat salted	7.44	22.71	4.66	3.16	62.03	163	
Yamatoni of heart (Fin)	6.82	26.26	7.61	3.68	55.63	201	

4. Price of whale meat

Since we acknowledged from results of our study that whale meat is in the nutritive value almost equal to other meat, especially beef and pork, we intended to make the best use of it. Therefore we first investigated the price of it and compared it with other protein food stuffs.

Those inserted in Table 3 were the retail prices of them on September 12, 1951 in the city of Tōkyō.

The non eatable parts of those food stuffs were put away, and the

protein content of the rest was calculated from the analytical data of the nutrients of the foodstuffs by grams.

Dividing the prices by the number of obtained grams, we were able to know the prices of each food stuffs per 1 gram protein. Thus we compared the prices with one another.

Through the investigation it became clear that whale meat was remarkably cheap and dearer a bit than the cuttle fishes which were caught in large quantities in the best season for the haul. Regarding the protein content and the price of whale meat, to say the least of it, we really believe that it is to be used with much effect on the daily diet.

Table 3. Prices of various protein foodstuffs (November 12, 1951).

Foodstuff	Retail price yen		Protein in 100 g of foodstuffs g	Price per 1 g protein yen
Whale meat (tinged with red)	100 momme	40.00	23.23	0.45
Tail flukes of whales	"	100.00	28.59	0.93
Beef (good)	"	150.00	20.10	1.99
" (common)	"	130.00	19.20	1.81
Pork (good)	"	180.00	21.40	2.24
" (common)	"	150.00	14.10	2.84
Sardine	"	33.00	17.00	0.52
Mackerel	"	67.00	18.00	1.00
Tunny	20 momme	15.00	23.00	0.87
Cuttle fish	100 "	22.55	17.00	0.35
Hen's egg	one (47 g)	15.00	16.10	1.98
Satsumaage (fried hashed fish in oil)	100 momme	50.00	14.10	0.85

The price is calculated from 100 momme=375 g.

5. Survey on school-children's taste to whale meat

Each man has own likes and dislikes, and some people like whale meat and others dislike.

It is also the truth that the popularity of whale meat differs, according to districts, for instance, it is relatively popular with the people who live in Kwansai and Kyūshū districts, and is unpopular with them in Kwantō and Tōhoku districts. That is how the people have been

Table 4. Survey on taste (animal foodstuffs). Percentage of dislike.

Classes	I. Class		II. Class		III. Class		IV. Class		V. Class		VI. Class		Averages in total					
	male	female	male	female	male	female	male	female	male	female	male	female	male	female	total			
Foodstuffs																		
Whale meat	8.9	10.8	19.8	7.6	11.3	18.9	8.8	11.3	20.1	8.6	15.0	23.6	10.6	18.1	128.7	10.5	15.0	25.5
Beef	6.1	7.0	13.1	6.9	10.1	16.9	5.8	9.3	15.1	4.5	9.4	13.9	3.1	9.8	12.9	2.8	6.4	9.2
Pork	7.4	7.7	15.1	6.9	10.7	17.7	6.7	10.1	16.8	5.6	10.5	16.1	4.7	10.4	15.1	3.2	6.9	10.1
Sardine	6.9	5.6	12.5	6.6	7.5	14.1	5.8	6.4	12.2	4.9	6.9	11.8	5.3	6.7	12.0	3.4	5.5	8.9
Sead	6.2	6.1	12.3	6.9	9.3	16.2	5.7	8.2	13.9	5.4	7.3	12.7	5.2	8.1	13.3	4.0	5.8	9.8
Tunny	5.0	4.4	9.4	3.8	5.9	9.7	4.3	5.1	9.4	2.8	5.1	7.9	3.2	5.2	8.4	2.1	4.0	6.1
Turbot	5.8	5.2	11.0	5.9	7.0	13.0	5.6	6.3	11.9	5.8	7.1	12.9	7.8	7.9	15.9	7.2	6.9	14.1
Saury	4.7	3.3	8.0	3.7	4.1	7.8	3.9	3.5	7.4	3.5	4.6	8.1	4.1	4.3	8.4	2.6	4.8	7.4
Mackerel	5.4	5.9	11.3	4.6	4.5	9.1	5.1	5.1	10.2	4.5	5.7	10.2	4.8	6.9	11.7	3.7	5.4	9.1
Cuttle fish	5.1	4.3	9.4	5.6	6.7	12.3	4.9	5.2	10.1	4.7	5.0	9.7	4.7	5.6	10.3	4.0	4.4	8.4
Eel	10.8	12.9	23.7	11.9	21.2	33.1	12.3	19.6	31.9	9.6	21.5	31.1	11.1	20.8	31.9	6.4	16.1	22.5
Salmon	5.4	5.8	11.2	5.0	6.1	11.1	3.6	4.9	8.5	3.8	3.8	7.6	1.7	2.6	4.3	1.4	1.6	3.0
Small fishes dried (for flavouring)	12.6	12.7	25.3	14.1	16.1	30.2	15.5	17.3	32.8	16.4	20.2	36.6	20.4	23.6	44.0	17.5	20.3	37.8
Carpet of the Philippines	6.1	5.8	11.9	4.9	6.3	11.3	4.8	6.0	10.8	4.8	6.7	11.5	5.8	7.3	13.1	2.6	6.0	8.6
Corbicula	6.4	6.0	12.4	5.9	7.4	13.3	5.6	7.1	12.7	5.0	8.1	13.1	6.4	8.8	15.2	4.2	7.0	11.2
Chikuwa	4.6	3.7	8.3	3.8	3.9	7.7	3.1	3.4	6.5	2.3	2.7	5.0	2.8	3.9	6.7	2.0	2.1	4.1
Hampen (fish)	6.0	5.2	11.2	5.6	6.4	13.0	4.8	5.9	10.7	4.4	6.8	11.2	5.1	7.2	12.3	4.0	4.2	8.2
Satumaage	3.8	3.2	6.5	2.9	3.9	6.8	2.5	3.2	5.7	2.9	3.3	6.2	3.1	4.2	7.2	2.2	3.1	5.3
Dried skim	8.9	11.0	19.9	12.1	16.9	29.0	14.7	18.9	33.6	15.3	22.1	37.4	17.7	25.4	43.1	14.2	20.0	34.2
Butter	4.7	4.6	9.3	6.4	7.1	13.5	4.6	6.1	10.7	4.3	6.6	10.9	3.3	6.2	9.5	2.6	4.3	6.9
Hens' egg	2.5	1.5	4.0	1.9	2.2	4.1	1.5	2.1	3.6	1.1	2.1	3.2	1.0	1.3	2.3	0.9	1.1	2.0
Tofu (Bean curds)	3.5	3.2	6.7	3.0	2.5	5.5	1.9	2.3	4.2	1.8	1.1	2.9	1.4	1.7	3.1	0.8	0.9	1.7
Natto (Fermented soy-beans)	6.3	6.9	13.2	6.3	7.7	14.0	5.3	6.4	11.7	5.8	8.1	13.9	4.2	8.1	12.3	3.2	6.0	9.2
Fried bean-curd	3.4	3.0	6.4	2.9	3.9	6.8	2.1	3.1	5.2	1.7	2.9	4.6	1.7	2.7	4.4	0.7	1.5	2.2
Miso (Bean paste)	7.6	6.9	14.5	9.0	9.0	18.0	8.1	6.9	15.0	6.9	9.8	16.7	6.3	7.4	13.7	4.4	5.5	9.9
Number of children inquired	1233	1248	2481	1236	1230	2468	1584	1431	3015	1327	1332	2659	1199	1155	2354	997	983	1980
																7578	7379	14957

concerned with the whale meat under the influence of the surroundings for a long time. This fact suggests us that the people who dislike whale meat may become fond of it, if they will be accustomed to eating of it. Hence we have endeavoured to know taste of the school-children to many common foodstuffs.

a) Survey on school-children's taste to common animal foodstuffs.

This survey was performed in 14957 primary school-children. We requested the children to record on the inquiry papers whether they like or dislike each foodstuffs whose names were printed on it, under the guidance of the teachers.

The results are as shown in Table 4.

Generally speaking Table 4 indicates as follows:

The children in 4. or 5. class show a tendency to the high percentage of disliking to a large majority of foodstuffs with some exception, children in 6. class, on the contrary, show lower percentage. Taken altogether, the percentage of disliking has a tendency to going down with the progress of the class. The percentage of disliking in female is commonly larger than in male, both in each class and in all the classes through. On an average, there are some foodstuffs which show significant high percentage of disliking, for instance, Niboshi (dried small fishes for flavouring) (34.5%), dried skim (32.9%), eel (29.1%) and whale meat (22.8%) etc..

In these four foodstuffs above mentioned, however, whale meat shows the lowest percentage.

b) Survey on school-children's taste to common vegetable foodstuffs.

The children of the primary school age have a tendency to dislike also some of the vegetable foodstuffs. We have accomplished this survey in 14060 primary school-children (see Table 5).

The results of this survey indicate that carrots, radishes, Welsh onions, Swedish turnips, edible burdocks are the vegetable foodstuffs for which a large number of the schoolchildren lose their taste. The percentage of disliking to edible burdocks is 22.2% and that to carrots is 53.4%. The percentages of disliking to onions, radishes, Welsh onions and Swedish turnips are situated between the two above mentioned, moreover the percentages for all these four are 27 and upwards.

c) Survey on school-children's taste to common vegetable foodstuffs cooked.

The grade of disliking to vegetable foodstuffs is different according to the variety of cooking, however carrots and onions etc. are on the whole hated by the school-children. We have investigated also this

Table 5. Survey on taste (vegetable foodstuffs). Percentage of dislike in 14957 schoolchildren.

Vegetables		Sex etc.		Male		Female		Total	
		number	%	number	%	number	%		
Vegetables	Carrots	3769	25.2	4224	28.2	7993	53.4		
	Radishes	3437	23.0	3543	23.7	6980	46.7		
	Turnips	1925	12.9	2200	14.7	4125	27.6		
	Edible Burdock	1681	11.2	1640	11.0	3321	22.2		
	Indian Lotus	1079	7.2	1109	7.4	2188	14.6		
	Potatoes	716	4.9	712	4.8	1428	9.8		
	Sweet Potatoes	482	3.2	409	2.8	901	6.0		
	Dasheen, Taro	600	4.0	565	3.8	1165	7.8		
	Egg Plants	1272	8.5	1128	7.5	2400	16.0		
	Cucumbers	467	3.2	351	2.3	818	5.5		
	Pumpkins	811	5.4	700	4.7	1511	10.1		
	Cabbage	796	5.4	859	5.7	1655	11.1		
	Spinach	769	5.1	809	5.4	1578	10.5		
	Sprouted Beans	1424	9.5	1476	9.9	2900	19.4		
	Welsh Onions	2486	16.6	2893	19.3	5379	35.9		
	Onions	3603	24.0	4140	27.8	7743	51.8		
Fruits	Pears	153	1.0	178	1.2	331	2.2		
	Apples	231	1.5	237	1.6	468	3.1		
	Oranges	166	1.1	114	0.8	280	1.9		
	Tomatoes	760	5.1	702	4.7	1460	9.8		
Sea weeds	Laminaria	938	6.7	1000	7.1	1938	13.8		
	Undaria	983	7.0	963	6.8	1946	13.8		
Grain Products	Bread	428	2.8	537	3.6	965	6.4		
	Rice-cake	258	1.7	308	2.1	566	3.8		
	Buckwheat Vermicelli	686	4.6	900	6.0	1586	10.6		
	Wheat Vermicelli	1038	6.9	1208	8.1	2246	15.0		
	Suiton (stock with back-wheat-cake)	2065	17.4	3033	20.3	5638	37.7		

subject and the results are as shown in Table 6. In this table, concerning vegetables, the number of disliking children to all the children inquired and the number of disliking children of each cooked vegetable to the number of children who explains that they have a dislike for the original uncooked vegetable itself, are indicated in per cent.

Table 6. Survey on taste (Vegetables cooked). Percentage of dislike in 14060 schoolchildren (7140 male, 6920 female).

Vegetables and dishes	Sex, number, %	Number and Percentage of disliking children to all the children inquired			Number of disliking children accordingly dishes to all the no. of children who dislike the very uncooked vegetables		
		Male	Female	Total	Male	Female	Total
Carrots		(3769) 25.2	(4224) 28.2	(7993) 53.4			
Fried Prepared with oil Gomokumeshi (boiled rice with vegetables) Boild		(1889) 13.4	(2207) 15.7	(4095) 29.1	23.6	27.6	51.2
		(1781) 12.7	(2126) 15.1	(3907) 27.8	22.3	26.5	48.9
		(1430) 10.2	(1482) 10.5	(2912) 20.7	17.9	18.5	36.4
		(2686) 19.1	(2767) 19.7	(5453) 38.9	33.6	34.6	68.2
Onions		(3603) 24.0	(4140) 27.8	(7743) 51.8			
Prepared with oil Stock of soy paste Boiled Curried Stock Stew		(1751) 12.4	(2007) 14.3	(3758) 26.7	22.6	25.9	48.5
		(1894) 13.5	(2109) 15.0	(4003) 28.5	24.5	27.2	51.7
		(1833) 13.0	(2005) 14.3	(3838) 27.3	23.7	25.9	49.6
		(1178) 8.4	(1486) 10.6	(2664) 18.9	15.2	19.2	34.4
		(1430) 10.2	(1799) 12.8	(3229) 23.0	18.5	23.2	41.7
Radishes		(3437) 23.0	(3543) 23.7	(6980) 46.7			
Boiled Stock of soy paste Grated		(2475) 17.6	(2382) 16.9	(4857) 34.5	35.5	34.1	69.6
		(1495) 10.6	(1550) 11.0	(3045) 21.7	21.4	22.2	43.6
		(1406) 10.0	(1445) 10.3	(2851) 20.3	20.1	20.7	40.8
Edible Burdock		(1681) 11.2	(1640) 11.0	(3321) 22.2			
Kimpira (chopped burdock fixed in oil) Boiled		(713) 5.1	(621) 4.4	(1334) 9.5	21.5	18.7	40.2
		(1316) 9.3	(1369) 9.7	(2685) 19.0	39.6	41.2	80.8

Parenthesized are the number of children inquired.

From the surveys (a, b, c), we can recognize that many food stuffs, both animal and vegetable, are hated by school-children, and not a few of them are more hated than whale meat is. When we knew, however,

that the disliking to whale meat is attributed to its particular odour, we must have views upon the importance of freshness, storage, transportation and cooking etc. of it. According to our opinion the disliking of school-children to whale meat will surely decrease in per cent and will approach the dislike level of beef and pork. In addition, we imagined that the number of disliking children includes the children of such kind who have a prejudice against whale meat. It can be easily thought that these children might have been affected by their daily home life.

This is why we have arranged the results of our survey according to the schools.

d) Survey on school-children's taste to foodstuffs according to the schools.

We have calculated numerically the number of children who like or dislike whale meat according to schools. The following statistics (Table 7.) are furnished by us.

As shown in Table 7, eighteen primary schools were concerned in this statistics. In every school the number of children who dislike meat is larger in percent in female than in male.

On the whole the percentage of disliking to whale meat is larger than to beef. The percentages of dislike to beef, pork and whale meat which are found in the children of the primary schools named Masago, Toyokawa, Hōkei, Toyotama and Haneda are almost alike. The percentages of dislike to whale meat in Morimura (in residential quarter), Hisamatsu (in the place where the government office center and commercial district lie), Yakumo (in residential quarter) and Seikwa (in commercial district) are markedly large and those in Otsuka school for the deaf, Shakuji (in agricultural district) and Kurihara (in agricultural and factory district) are relatively small. This difference may be caused by the standard of living of the children. Generally speaking the children attending to the former live in luxury and those attending to the latter live economically. For instance the Morimura primary school is well-known as one of the luxurious schools.

And the children in such a school as the Shakuji which is in agricultural district can not but to lead a indigent life.

If it is really so, the decrease of the grade and percentage of disliking of children to whale meat will become possible owing to the future study of cooking and getting the children accustomed to whale meat.

We lay emphasis on our opinion that all these matters are entirely

Table 7. Survey on taste (according to schools).
Percentage of dislike.

Location of school	Sex	Number of children	Pork		Beef		Whale Meat		
			%	%	%	Total	%	Total	
1. Showa School (Chūō)	♂	202	426	7.77	21.36	7.27	19.95	9.13	26.19
	♀	224		13.62		12.68		17.06	
2. Hisamatsu Sch. (Chūō)	♂	576	1158	7.51	21.07	5.61	15.88	13.73	36.01
	♀	582		13.56		10.27		22.28	
3. Seikwa Sch. (Daitō)	♂	397	764	6.67	17.93	6.02	17.28	11.39	28.40
	♀	367		11.25		11.26		17.01	
4. Masago Sch. (Bunkyō)	♂	516	1019	6.19	14.82	4.61	13.28	5.99	14.62
	♀	503		8.63		8.44		8.63	
5. Toyokawa Sch. (Kita)	♂	468	928	5.50	15.74	5.50	17.02	6.36	18.21
	♀	460		10.24		11.52		11.85	
6. Ōshima Sch. (Kōtō)	♂	669	1349	5.27	15.27	1.04	10.23	6.97	20.46
	♀	680		10.00		9.19		13.49	
7. Toyama Sch. (Shinjuku)	♂	438	897	5.91	18.17	4.57	15.83	12.04	32.00
	♀	459		12.26		11.26		19.96	
8. Yakumo Sch. (Meguro)	♂	745	1437	5.15	15.17	3.65	11.44	10.92	29.64
	♀	692		10.02		7.79		18.72	
9. IV. Suginami Sch. (Suginami)	♂	526	1031	5.24	14.45	4.08	12.51	6.79	18.91
	♀	505		9.21		8.43		12.12	
10. Kurihara Sch. (Adachi)	♂	268	587	6.64	9.71	6.64	11.75	6.30	16.52
	♀	319		3.07		5.11		10.22	
11. Ōizumi Sch. (Nerima)	♂	129	233	8.16	15.45	11.16	26.18	14.16	23.17
	♀	104		9.26		15.02		9.01	
12. Shakuji Sch. (Nerima)	♂	621	1127	4.95	9.98	5.74	12.00	6.26	13.15
	♀	506		5.03		6.26		6.89	
13. Hōkei Sch. (Nerima)	♂	212	455	8.36	22.41	8.34	24.40	4.06	20.11
	♀	243		14.05		16.04		16.05	
14. Toyotama Sch. (Nerima)	♂	278	552	7.46	18.00	5.64	18.36	7.09	18.18
	♀	274		10.45		12.72		11.09	
15. Haneda Sch. (Ōta)	♂	888	1792	6.14	14.73	5.36	12.11	6.14	14.01
	♀	904		8.59		6.75		7.87	
16. Morimura Sch. (Minato)	♂	169	375	4.80	15.47	4.47	12.27	17.86	56.00
	♀	206		10.67		8.80		38.14	
17. Ōtsuka Sch. for deaf (Toshima)	♂	64	119	4.20	8.40	1.68	4.20	2.51	10.92
	♀	55		4.20		2.52		8.41	
18. Attached Sch. to Educatinal Univ. (Bunkyō)	♂	412	708	6.47	13.48	4.62	9.81	15.42	25.38
	♀	296		7.01		5.19		9.96	
Averages				6.24	15.63	5.33	14.68	9.06	23.44
				9.39		9.35		14.38	

Names of wards are parenthesized.

applicable not only to children but also to adults.

From our point of view, it is of deep significance to inquire into

the dressing of whale meat which may be one of the valuable sources of animal proteins of our diets.

6. Cooking of whale meat

In order to supply Japanese diet with protein, we have engaged both in the study on cooking of whale meat and in the nutritive utilization of various organs of whales. At first, Arai, one of the authors tried to eat almost all the organs which are denoted in Table 1.

From this trial we knew that nearly all the organs can be made use of, though they differ on taste.

Among the organs concerned lungs and penes are so much tough that we can not chew them off, so far as they are commonly cooked.

The kidney, liver and heart etc. are, however, eatable with some relish. Intestines of the blue and fin whale are considerably delicious, though they are a little stiff. When they are steamed or boiled or roasted, they give out the perfume which has a remarkable resemblance to an ear-shell boiled or steamed. Some people are very fond of these boiled intestines notwithstanding slightly rough taste compared with pigs' intestines which are eaten to some extent by way of roasting (roasted pigs' intestines are sold under the name of "Yakitori" which is meant by roast fowl).

The people in Nagasaki district have for a long time used to eat the intestines of whales: intestines boiled and sliced are eaten as vine-gard dishes. The intestines of animals are in general long, so they are called "Hyakuhiro" in Japanese which is meant by a hundred fathoms. Especially the intestines of whales are long and big, and they are welcomed as a sign of enlarging. This is why the Nagasaki people have used to eat the whale intestines in honour of the New Year.

The whale meat, which is brought back frozen from the Antarctic Ocean, is nice, even if it is eaten raw. "Sashimi" of whale meat is well-known among men of the world (the literal meaning of Japanese "Sashimi" is sliced raw fish meat). The fresh whale meat has no disagreeable odour.

We have found a new method of cooking to serve nice dishes of whale meat.

Whale meat (frozen meat is the best) is thrown in a pan or a pot, added a small amount of salt and water, heated and boiled till the last drop of water volatilizes and the meat is a little burnt. Then we can obtain a lump of meat whose surface is rather brown or black. When

we deal with the meat in such procedure, it increases its delicacies very much, and no bad odour is smelt by us. It is true that the procedure gives rise to a special kind of nice sweet taste of the meat, although the mechanism of it is not yet clear.

Such a whale meat can be palatably used for many kinds of dishes in European, Chinese and Japanese styles.

If this meat is sliced and seasoned with bitter orange juice, or ginger soy, or grated radish and soy etc., it tastes very nice.

Furthermore, this meat can, for some time, be preserved without putrefaction and be used cutting at one's request.

The refrigerated meat sliced is a dainty if it is eaten as one grills on a iron plate after the roasting of the duck meat in a hunting ground. Such a method of cooking is called "Karibayaki" in Japanese; "Kariba" is meant by hunting ground and "Yaki" by roasting.

A bun, stuffed with minced intestine or liver which are flavoured with suitable spices, is also good.

We know still more cookings of whale meat, but we have to abbreviate detailed descriptions for further particulars of cooking of it so as this paper not to be lengthened. And we will mention the results of the survey concerning the taste of the school-children for whale meat cooked.

We have been interested in knowing how much do the schoolchildren really eat the whale meat cooked. In July and September 1951 we picked up 5 primary schools and selected 20 children (male and female 10 respectively) of each class (1.-6. class). Then we offered these children several test dishes of whale meat and had the returns, whether they ate the dishes with relish or not, written on inquiry papers. Selected primary schools are as follows:

The Second Takinogawa school (Kita), Akabane school (Minato), the Second Nerima school (Nerima), the Fifth Suginami school (Suginami), Haneda school (Ota).

(Parenthesized are names of wards)

Bills of fare for the test dishes, as the first attempt, are 8 in all as shown in Table 8.

Any two or three of them are adopted in each school.

From Table 8 and 9 we knew that the percentages of like or dislike are much influenced by cookery of foodstuffs. For instance, the stew made direct from raw whale meat was received unfavourably by the school children, while those from boiled whale meat caught the fancy of themselves. Whale bacon with cabbage, whale meat with mashed

Table 8. Menu of dishes (whale meat was used as a principal foodstuff).

Name of dishes	Name of food-materials	Quantity g	Name of dishes	Name of food-materials	Quantity g
Stew	Whale meat boiled plain	30	Whale Bacon with Saled	Whale bacon	20
	Potato	80		Potato	100
	Carrot	30		Carrot	30
	Onion	50		Cucumber	30
	Dried skim	7		Wheat flour	10
	Wheat flour	5		Dried skim	5
	Oil	3		Onion	a little
			Oil	4	
Gomokuni (boiled meat and other foodstuffs)	Sumitazuke (whale meat boiled)	25	Whale Bacon with Cabbage	Whale bacon	20
	Potato	100		Cabbage	30
	Carrot	50		Potato	50
	Onion	50		Onion	50
	Oil	3		Wheat flour	10
			Dried skim	5	
			Carrot	50	
Whale meat with mashed potato	Whale meat minced	20	Curried Stock with Whale Meat	Whale meat (tinged with red)	16
	Potato	100		Potato	80
	Carrot	30		Carrot	20
	Onion	30		Cabbage	20
	Dried skim	15		Onion	30
			Wheat flour	10	
			Oil	3	
Stew with vegetables and whale meat boiled	Whale meat (tinged with red)	15	Whale Meat boiled in Chinese style	Whale meat (tinged with red)	16
	Sugar	5		Minced pork	5
	Soy	—		Potato	50
	Radish	30		Carrot	20
	Potato	20		Welsh Onion	15
	Carrot	20		Wheat flour	5
	Cabbage	30		Sugar	3
	Wheat flour	10		Oil	3
	Dried skim	22			
	Oil	3			

Table 9. Survey on taste (according to dishes in which whale meat was used as a principal foodstuffs). Percentage of dislike.

Names of dishes	Whale meat used	Like %	Dislike %	Number of children inquired	Name of schools
Stew	Boiled plain	87	13	568	II. Takinogawa Sch.
"	"	79	21	1408	Akabane Sch.
"	"	63	37	541	II. Nerima Sch.
"	Raw	36	64	1300	V. Suginami Sch.
Gomokuni (boiled meat and other foodstuffs)	Sumitazuke (boiled)	67	33	568	II. Takinogawa Sch.
"	"	74	26	1408	Akabane Sch.
"	"	85	15	541	II. Nerima Sch.

Names of dishes	Whale meat used	Like %	Dislike %	Number of children inquired	Name of schools
Salad	Whale bacon	80	20	568	II. Takinogawa Sch.
"	Raw	75	25	1954	Haneda Sch.
Mashed potato	Minced	87	13	568	II. Takinogawa Sch.
Whale bacon with cabbage	Whale bacon	87	13	568	II. Takinogawa Sch.
Curried stock	Raw	88	12	1954	Haneda Sch.
Boiled in Chinese style	Raw	87	13	1300	V. Suginami Sch.

potato, curried stock with whale meat, whale meat boiled in Chinese style were rather more popular than beef and pork.

These facts suggest us that if we elaborate how to dress whale meat we may be able to obtain delicious dishes which are eaten by almost all the school children. And if so, there will be nothing to choose between the dishes of whale meat and beef or pork.

7. Conclusion

If whale meat is maintained fresh, dressed palatably and accustomed to be eaten, it will be good to eat even for the school children.

In such a case, whale meat will be not less delicious than beef or pork. Adults will easier be familiar to the taste of whale meat than the school children will be.

Concerning the content of nutriments whale meat never falls behind beef or pork.

Whale meat is therefore one of the very good animal protein food-stuffs for Japanese.

Many thanks to "Nihon Suisan Fishery Co. Ltd." and "Taiyō Fishery Co. Ltd." for their kindness in Supplying the materials, and also to the primary schools concerned for their enthusiastic cooperations with us in our survey.

(The Tōkyō-to Laboratories for Medical Sciences, Tōkyō)