Food of Sei Whales (*Balaenoptera borealis*) caught in the Bonin Island Waters

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I. Introduction

The factory whaling was conducted from February to June every year after the World War II, and the biological investigations were put in practice when the carcases were treated on board the factory ship, but the stomach contents of sei whales had never been completely studied. The stomach contents of whales in these warm waters, far from Japan, seemed different from those in the adjacent waters of Japan, so we gathered every kinds of stomach contents when the carcases were treated on board the "Baikal-maru" in 1951.

On returning home, we requested the classification of them to the zoologists of the research institutes. Now we have got the answer of them, and wish to report on them in brief along with other description of research about the food of whales.

In the previous reports on the stomach contents of sei whales caught in these waters, including that in 1951, the species of them are found to be incorrect and must be corrected as follows.

Previous reports	Be corrected
Euphausia sp. or Eu.	*Thysanoessa gregaria* G.O. Sars.
Lantern fish or sardine	*Yarrella* sp.

In the following descriptions, we are indebted to Dr. Shigeru Motoda of the Hokkaido University on *Thysanoessa gregaria* and Dr. Tokiharu Abe of the Tokai Regional Fisheries Research Laboratory and Mr. Masao Watanabe of the Research Institute for Natural Resources on fishes, and moreover the crew of the factory ship "Baikal-maru". To all, we extend our sincere thanks.

II. Kind of Food

1. *Thysanoessa gregaria* G.O. Sars. Fig. 1.

These were found in large quantity in the stomachs of the sei whales caught in these waters. Total length is about 20–25 mm. It

is an approximate genus of *Euphausia* and is known from the Pacific, the Atlantic and the Mediterranean Sea. It has luminous organs and their luminating were seen even if it were got from the stomach when it was very fresh.

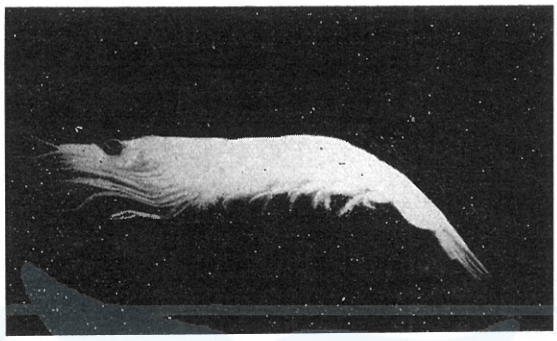

Fig. 1. *Thysanoessa gregaria* G.O. Sars. (×3)

2. *Yarrella* sp. (Gonostomidae) Fig. 2.

The body length of this species got from the stomachs of the sei whales caught in these waters was not more than 60 mm. Dorsal side of body is dark and ventral side silver. Luminous organs are around eyes and on the lower jaw and ventral side, 3 around eye, 2 lines on the lower jaw and ventral side before the anal fin, upper about 30 and

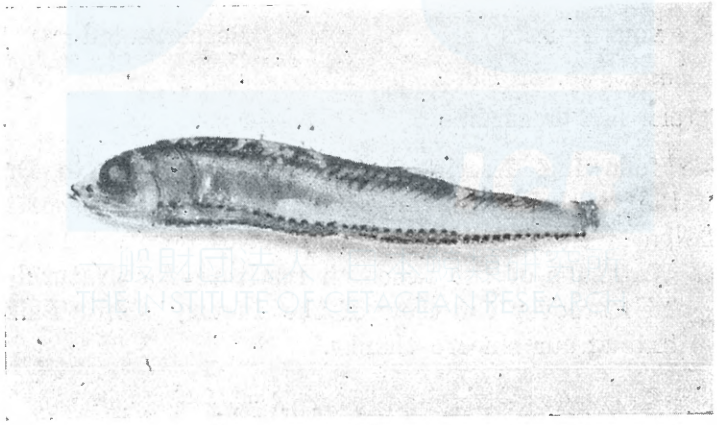

Fig. 2. *Yarrella* sp. (×1.5)

lower about 33–34 (10 of them on the back of opercle) and backward 1 line of 12–14. Dorsal fin: 12 soft rays, Pectoral fin: 8 soft rays, and about 40 scales in the lateral line. It resembles *Yarrella corythaela*

(Alcock) and is known from off Kochi, Kumanonada, Natal, Andamans, southern waters off Australia, etc.

In these waters, these fishes were sometimes found in full in the stomachs of the sei whales and sometimes in a small quantity mixed with *Thysanoessa*.

The data of founding of this species were as follows.

Date when the whales were caught	Whale	Location	Other food
15-30, 5 May	Sei, female 41 ft.	26-04 N 143-31 E	none
14-25, 〃	〃 male 40 ft.	26-16 N 143-35 E	〃
15-00, 10 May	〃 male 44 ft.	25-43 N 143-46 E	*Thysanoessa*
14-00, 14 May	〃 male 42 ft.	24-58 N 143-40 E	〃
16-55, 21 May	〃 male 42 ft.	25-41 N 143-55 E	none
12-15, 26 May	〃 female 44 ft.	25-50 N 143-36 E	*Thysanoessa*
11-05, 9 June	〃 male 41 ft.	25-41 N 144-02 E	none

3. Myctophum (Myctophum) asperum Richardson (Myctophidae) Fig. 3.

A line of luminous organs (about 25) are on the ventral surface, and 9 on the side scattered irregularly. Dorsal fin: about 12 soft rays. Pectoral fin: about 13 soft rays. Ventral fin: about 8 soft rays. Anal fin: about 22 soft rays. 39 scales in the lateral line. This species

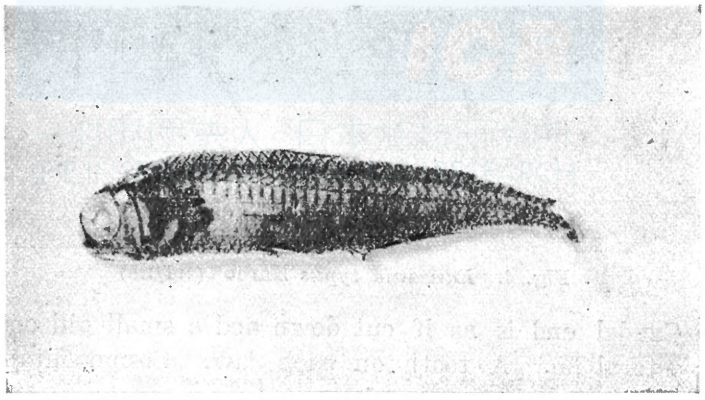

Fig. 3. *Myctophum (Myctophum) asperum* Richardson (×1/1.1)

is scattered widely in the Pacific and the Atlantic, and had been considered as "*Dascicopelus asper*", but recently the species above mentioned has come to be used.

In these waters, this species was not found alone in the stomachs of sei whales, but several mixed in *Thysanoessa*.

The data of founding of this species were as follows.

Date when the whales were caught	Whale	Location	Other food
07-15, 10 May	Sei. male 43 ft.	25-51 N 143-47 E	*Thysanoessa*
11-10, 〃	〃 male 42 ft.	25-34 N 143-50 E	*Thysanessa*, (in the 2nd stomach)
07-45, 20 May	〃 male 45 ft.	25-37 N 143-40 E	*Thysanoessa*
07-30, 〃	〃 female 44 ft.	25-43 N 143-50 E	〃

4. *Ranzania typus* Nardo (Molidae) Fig. 4.

This species was found once in the season. Total length about 14 cm., height about 3.5 cm., width about 2 cm. The body is com-

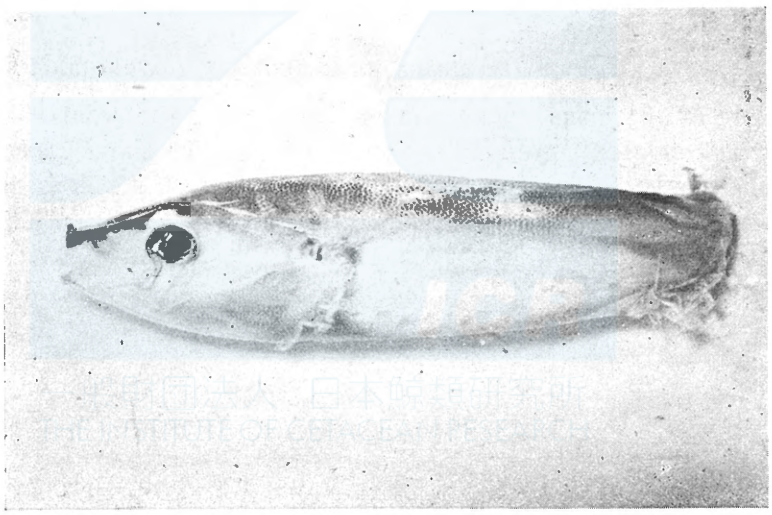

Fig. 4. *Ranzania typus* Nardo (×1/1.5)

pressed. Caudal end is as if cut down and a small gill opening is in front of pectoral fin. A tooth on each jaw. Cosmopolitan in warm seas.

The datum of founding of this species was as follows.

Date when the whale was caught	Whale	Location	Other food
06-40, 19 May	Sei, male 42 ft.	25-27 N 143-42 E	none

5. (a) *Argyropelecus* sp. (Sternoptychidae)

(b) *Polyipnus* sp. (Sternoptychidae)

Both of (a) and (b) were found only once in this season. They were so damaged that their species were unknown.

III. The State of Taking Food

Concerning the stomach contents, the first stomachs of all whales caught were investigated. The degree of quantity is classified into four classes; full (R), rich (rrr), moderate (rr), few (r) and empty (0).

The following table shows the quantity of food by month and by species in this whaling season, but fishes except *Yarrella* sp. are omitted as their numbers were very small.

	May			June			Total		
	T.sp.	Y.sp.	Total (%)	T.sp.	Y.sp.	Total (%)	T.sp.	Y.sp.	Total (%)
R	12	—	12 9.8#	5	—	5 9.4#	17	—	17 9.7#
rrr	16	—	16 13.1#	6	—	6 11.3#	22	—	22 12.6#
rr	41	(2)*	41 33.6#	14	—	14 26.4#	55	(2)*	55 31.4#
r	50	3 (1)*	53 43.4#	27	1	28 52.8#	77	4 (1)*	81 46.3#
No. of whales eating food	119	3 (3)*	122 59.8	52	1	53 69.7	171	4 (3)*	175 62.5
%	97.5	2.5 (2.5)*		98.1	1.9		97.7	2.3 (1.7)*	
Empty			82 40.2			23 30.3			105 37.5
Total			204 100.0			76 100.0			280 100.0

Note. R.....full rrr.....rich rr.....moderate r.....few
T.sp.....*Thysanoessa gregaria* Y.sp.....*Yarrella* sp.
*.....Figures in parentheses show the number or % of whales eating *Yarrella* sp. mixed with *Thysanoessa gregaria*.
#.....% to number of whales eating food.

Thus the main food was *Thysanoessa gregaria*, Schizopoda. 98% of whales having food in their stomachs had eaten *Thysanoessa gregaria* and whales eating *Yarrella* sp. only were 2% and those eating both *Thysanoessa gregaria* and *Yarrella* sp. were 4%.

Number of whales eating food was superior to that of whales whose stomachs were empty, 62.5% of all through the whaling season.

The following table shows the number of whales eating food and its percentage to all whales caught by ten days.

	1-10 May	11-20 May	21-31 May	1-10 June	Total
Number of whales investigated	50	72	82	76	280
Number of whales eating food	31	35	56	53	175
%	62.0	48.6	68.3	69.7	62.5

From this table it is found that the percentage was smallest in the period of 11–20 May, below 50%, and afterward it increased to near 70%. Regarding of the quantity, rather few food were found in the stomachs in most cases as shown in the previous table. Full stomsachs were only under 10% in each month.

IV. Weight of Food in Stomach

As mentioned before, the quantity of food in the 1st stomach was observed, but it had not been weighed in these waters yet. So this time it was weighed on 8 sei whales.

The method: the food out of the 1st stomach was put in an empty tin of kerosene, weighed and summed up.

No.	Whale			Time and Date of capture	Contents of the 1st stomach			
	Species	Sex	Body length		Kind	Weight	Mark used Quantity	Freshness
1	Sei.	female	40 ft.	06-00. 7 June	T.sp.	203.9 kg	R	fff
2	〃	〃	42	10-10. 〃	〃	156.0	〃	〃
3	〃	〃	42	11-00. 20 May	〃	155.0	〃	〃
4	〃	〃	43	12-30. 7 June	〃	129.0	〃	〃
5	〃	〃	40	07-50. 2 June	〃	121.0	〃	F
6	〃	male	40	14-10. 6 June	〃	95.9	rrr	ff
7	〃	〃	40	09-50. 4 June	〃	80.5	〃	〃
8	〃	〃	41	11-55. 20 May	〃	66.0	rr	fff

Note. T.sp.....*Thysanoessa gregaria* R.....full rrr....rich
rr.....moderate r.....few F.....very fresh fff....fresh
ff.....a little digested f.....nearly digested

In the upper table, the marks of quantity such as R, rrr, rr and r were determined by observation before weighed. This fact shows that the quantity was marked as R when the contents of the first

stomachs of the sei whales in these waters were more than 100–120 kgs.

And the stomach content of No. 1 whale in the upper table seemed to be the fullest condition.

V. Refferences

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(Fisheries Agency of Japanese Government)