KILLER WHALES CAUGHT IN THE COASTAL WATERS OFF JAPAN FOR RECENT 10 YEARS

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Killer whales, wearing the characteristic form which can be easily distinguished even at a glance, live in any sea and ocean of the whole world. It is generally believed that they give damages to fishing, whaling and sealing. Pike pointed out that they are the powerful enemy to salmon fishery and others in the Canadian waters. In the waters adjacent to Japan, they also give many damages and menaces to us. In the case of tuna long-line fishery (haenawa fishery) at the Indian Ocean, it is not rare that the most of the lined fishes are lost by killer whale. The study on these damages must be interesting but not be described in the present report.

From the taxonomical view point, there seems to be a problem in definition of the scientific name of this animal, although different scientific names are habitually used in the Pacific and the Atlantic Ocean. So the authors have studied on the dimension of skeleton of the species but do not report it this time, because this should be discussed separately.

In spite of the damage by this animal, there is no hunting for expulsion or utilization of this species in the world. In the coastal waters off Japan, the small cetacean whaling happen to catch killer whales to take toothed whale oil from their blubbers and bones and meat for the local consumption for food.

The gun used for the small cetacean whaling in Japan is 50 mm in diameter. That is one of the best type gun for minke-whale and Baird's beaked whale hunting. Until Sept. of 1952, the bore of the small cetacean whaling was standardized by regulation at 40 mm calibre, but since that year Gooernment has sanctioned to use 50 mm gun.

The present report is based on the catch records which had been sent to Fisheries Agency for recent 10 years.

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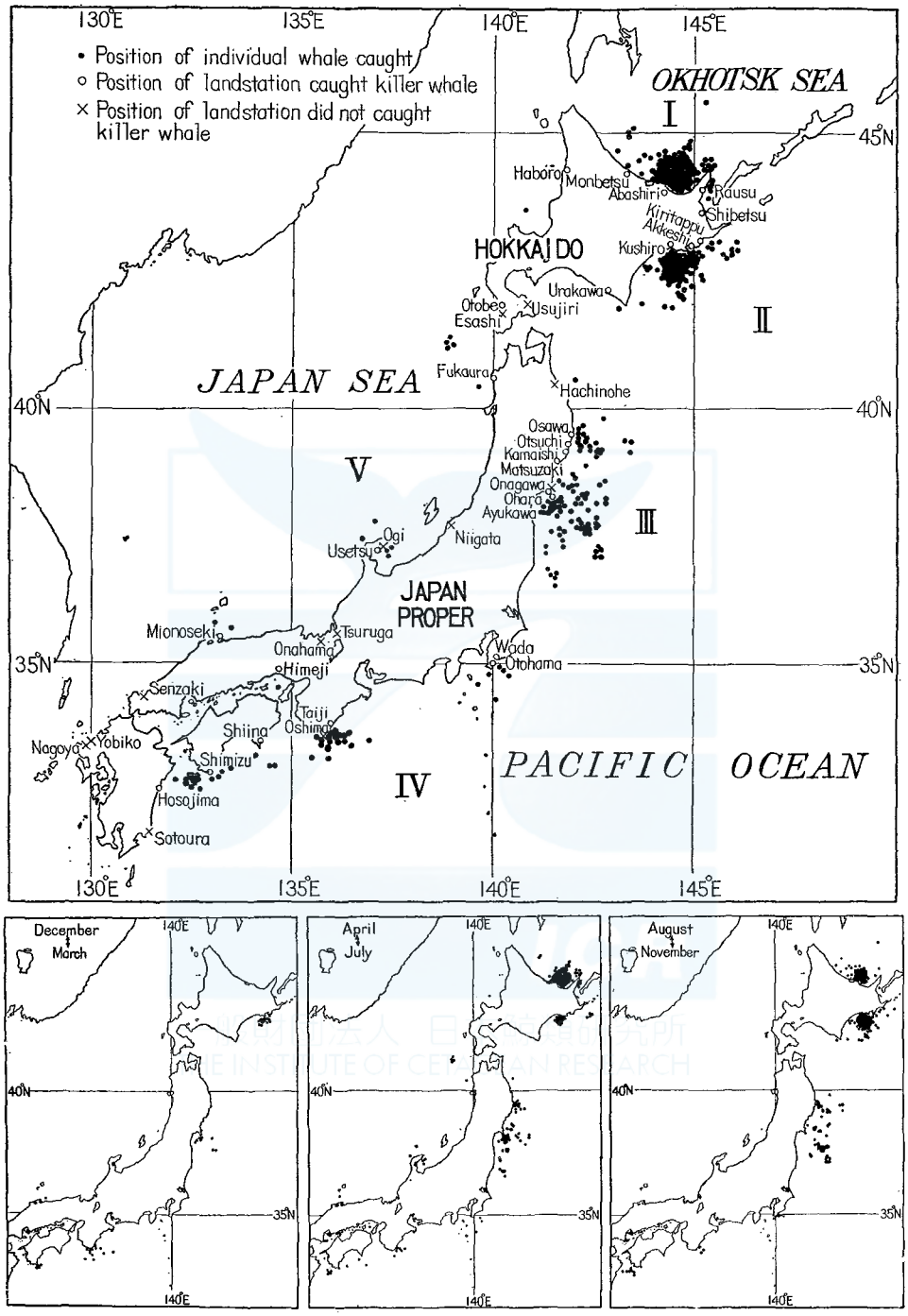

Fig. 1. Position of catch of killer whale in Japan, 1948-1957. Upper one: position of total catch and location of landstation. Lower three: seasonal movement of catch in every four months.

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BIOLOGICAL COMPOSITION OF CATCH

Annual catch Localities where killer whale were caught for recent 10 years is shown in Fig. 1 which shows five whaling areas. Area I is Okhotsk sea, Area II is the southern waters off Hokkaido and Area III is the eastern waters off Sanriku, north-eastern part of Japan proper. Area IV is the south-western part off Japan proper, from Inubo-saki to Sata-misaki of Osumi peninsula and Area V is Japan sea.

TABLE 1. ANNUAL CATCH OF KILLER WHALES IN DIFFERENT AREA, 1948–1957.

Years	Sex	Areas						Sex ratio
		I	II	III	IV	V	Total	
1948	Male	9		2	1		12	44.4
	Female	13		2			15	55.6
	Total	22		4	1		27	
1949	Male	5		10	4		19	44.2
	Female	15		5	4		24	55.8
	Total	20		15	8		43	
1950	Male	4	1	5	1		11	61.1
	Female	2	1	2	2		7	38.9
	Total	6	2	7	3		18	
1951	Male	9	17	9	4	1	40	59.7
	Female	7	11	6	3		27	40.3
	Total	16	28	15	7	1	67	
1952	Male	7	15	6	3	2	33	60.0
	Female	4	8	4	3	2	21	40.0
	Total	11	23	10	6	4	54	
1953	Male	9	18	12			39	60.0
	Female	5	7	11	2	1	26	40.0
	Total	14	25	23	2	1	65	
1954	Male	36	24	4	1	1	66	60.4
	Female	31	12				43	39.6
	Total	67	36	4	1	1	109	
1955	Male	11	20	5	4	3	43	55.8
	Female	20	4	5	3	2	34	44.2
	Total	31	24	10	7	5	77	
1956	Male	8	9	1	4		22	57.9
	Female	6	5	3	2		16	42.1
	Total	14	14	4	6		38	
1957	Male	8	16	7	3	1	35	50.7
	Female	15	6	11	2		34	49.3
	Total	23	22	18	5	1	69	
Total	Male	106	120	61	25	8	320	56.4
	Female	118	54	49	21	5	247	43.6
	Total	224	174	110	46	13	567	
	Sex ratio							
	Male	47.3	69.0	55.5	54.3	61.5	56.4	
	Female	52.7	31.0	44.5	45.7	38.5	43.6	

Area VI is the waters off Western Kyushu, the East China-sea. According to reports, however, no killer whale has been caught in this area.

TABLE 2. MONTHLY CATCH OF KILLER WHALES IN DIFFERENT AREA, 1948-1957

Month	Sex	Areas						Sex ratio
		I	II	III	IV	V	Total	
Jan.	Male			1	2		3	50.0
	Female			1	2		3	50.0
	Total			2	4		6	
Feb.	Male				1		1	33.3
	Female			2			2	66.7
	Total			2	1		3	
Mar.	Male		3	3	2	1	9	64.3
	Female		1	1	3		5	35.7
	Total		4	4	5	1	14	
Apr.	Male	11		6	2	2	21	55.3
	Female	12		3		2	17	44.7
	Total	23		9	2	4	38	
May	Male	11	4	9		4	28	53.8
	Female	11	2	8	1	2	24	46.2
	Total	22	6	17	1	6	52	
June	Male	10	3	4	4		21	39.6
	Female	19	1	7	4	1	32	60.4
	Total	29	4	11	8	1	53	
July	Male	19	12	8	4	1	44	53.7
	Female	24	5	5	4		38	46.3
	Total	43	17	13	8	1	82	
Aug.	Male	12	12	22	3		49	62.8
	Female	9	8	9	3		29	37.2
	Total	21	20	31	6		78	
Sept.	Male	10	16	6	1		33	55.0
	Female	8	6	11	2		27	45.0
	Total	18	22	17	3		60	
Oct.	Male	9	31	1	2		43	53.1
	Female	20	16	2			38	46.9
	Total	29	47	3	2		81	
Nov.	Male	24	32	1			57	67.1
	Female	15	12		1		28	32.9
	Total	39	44	1	1		85	
Dec.	Male		7		4		11	73.3
	Female		3		1		4	26.7
	Total		10		5		15	
Total	Male	106	120	61	25	8	320	56.4
	Female	118	54	49	21	5	247	43.6
	Total	224	174	110	46	13	567	

The division of area is largely arbitural, for it is based on the geographical separation and the number of whales killed there. Biologically speaking, Area II and Area III, for instance, should have been considered as one area. As shown in the Fig. 1, however, the localities of catch we apparently concentrated in the waters both off the southern Hok

kaido and off the east side of Sanriku. So these water are considered as separated.

The concentration of catch locality in the coastal waters is mostly caused by the restriction in the area to be covered by the catcher boats. The size of the boat used for the small cetacean whaling is restricted to be less than 30 tons by regulation and the average tonnage of the working

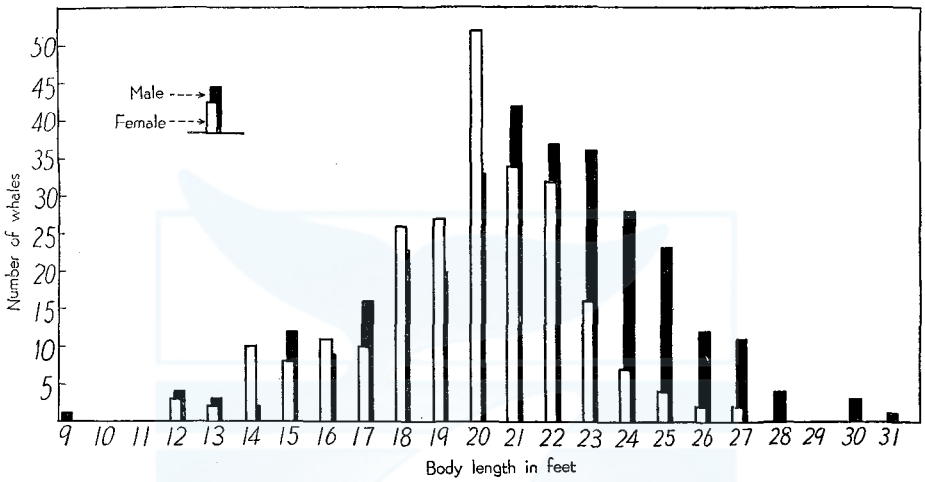


Fig. 2. Size distribution of killer whale, total of 10 years inclusive.

TABLE 3. AVERAGE LENGTH OF KILLER WHALE CAUGHT IN 10 YEARS

	Male	Female
1948	19.4	18.6
49	21.6	18.3
50	22.5	20.9
51	21.9	19.1
52	21.8	20.7
53	21.7	21.7
54	22.5	21.3
55	20.2	19.8
56	21.0	21.0
57	21.2	18.4
Total	21.5	20.0

TABLE 4. MONTHLY AVERAGE LENGTH OF KILLER WHALE CAUGHT IN 1948-1957

	Male	Female
Jan.	19.0	18.7
Feb.	21.0	18.0
Mar.	23.8	21.0
Apr.	20.4	20.5
May	22.3	19.1
June	19.2	19.1
July	19.4	20.0
Aug.	23.0	20.3
Sept.	22.2	18.9
Oct.	21.7	20.0
Nov.	21.2	20.9
Dec.	20.9	21.3
Total	21.5	20.0

boats is about 15 tons. In addition to the small size of the boats, their activity is more or less limited by the distance from landstation. These annual catch and their sex ratio are also shown in Table 1. There is no special description.

Monthly catch Monthly catch of killer whales is shown in Table 2 in the same manner to Table 1. This is the sum of the recent 10 years catch. In the under part of Fig. 1. The seasonal difference of catch are shown as three small figures. Very poor catch was shown in December-March. In April the catch increases suddenly, especially in the area I (Okhotsk sea). This is the time when the whaling boats are beginning to work. On the contrary, December till March is the pause of whaling, so that the working boats are few and the catch is very scanty. From August to November considerable amount of killer whales is shown in the area I and II where many catcher boats operated in these areas.

In spite of their fierceness, killer whale has an ardent passion for their children and their comrades, and they strongly co-operate against any enemies or foods. So that they do not readily disperse. When a member of their group is killed, it is possible to catch others without moving the catcher boat far away from the place when the first one was killed. In some cases a carcass of the dolphins or another whale are left to the killer whale to hunting range.

TABLE 5. AVERAGE LENGTH OF KILLER WHALE IN DIFFERENT AREA

Area	Male	Female
I	21.6	21.2
II	21.3	20.7
III	21.5	18.4
IV	19.6	18.6
V	21.4	20.3
Total	21.5	20.0

TABLE 6. AVERAGE LENGTH OF KILLER WHALE IN DISTANCE FROM LANDSTATION

Area	Sex	Distance	
		1–30 miles	31–60 miles
I	Male	22.1	20.8
	Female	20.6	18.4
II	Male	20.8	22.0
	Female	20.3	20.5
III	Male	20.6	23.4
	Female	18.9	20.0

TABLE 7. NUMBER OF WHALES CAUGHT IN DISTANCE FROM LANDSTATION

Distance from landstation	1–30 miles	31–60 miles	over 60 miles	unknown	Total
Number of whales	391	101	36	39	567
Percentage	69.0	17.8	6.3	6.9	100.0

The difficulty of the capture of killer whale is influenced by water temperature and quantity of food. For instance they are very active in warm water (20–25°C) which makes it difficult to catch them, but they become dull and whaling boat can approach to within shooting range in 10–15°C waters. This is a reason why more killer whales are caught in northern waters than in the southern waters of Kinkasan (in the area III) in Japan.

Size Distribution Size distribution of killer whale are shown in Fig. 2. This is also the sum of catch for recent 10 years. In Fig. 2, there is a peak at 21 feet for males and at 20 feet for females.

The smallest length of killer whale caught is 9 feet. The largest length is 31 feet for males and 27 feet for females. However, it seems that the some mistakes are involved in discerning sex. Because these data were reported by members of whaler but not by biologists or inspectors. In Table 3 the average length of annual catch are shown, and in Table 4 the average length of monthly catch are given. The largest average length appears in March and October for male and in April and November for female. But it is not appropriate to consider that the largest average length is closely related with migration. In Table 6 and 7 is shown the number of whales caught and their average length by distance of every 30 miles from landstations. 69% of total catch are observed in 1–30 miles distance area, this fact are explained that the activities of the catcher boats are not so extensive. No other noticeable trend is found in these tables.

REPRODUCTION

Judging from the number of catch, more foetuses should expected. But the data used for this report are very scanty. These are shown in Fig. 3. Three different dots plotted in this figure were from the re-

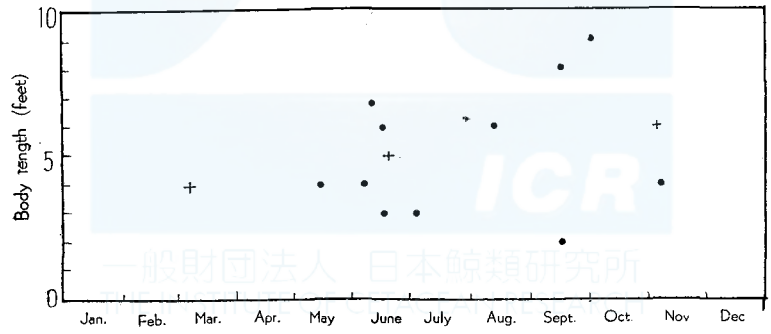


Fig. 3. Length of foetuses of killer whale plotted against the date of found.

port by Mr. Y. Matsuura. Judging from the figure, it seems vaguely that the pregnant period of killer whale would be more than one year. It may be 16 months. The body length in parturition might be about 9 feet. Because the smallest killer whale which has been caught is 9 feet long and the largest foetus is also 9 feet in length. The breeding season is not clear if considered from the growth curve of foetuses. Peak of breeding season is not apparent through the year or twice in a year. But principally the peak might be in May-July. In other hand the

photograph of killer whale in mating is shown as Fig. 4. This photograph was taken from airplane in June 22, 1957 by Mr. S. Takashima of the Kaiyo Aviation Company.

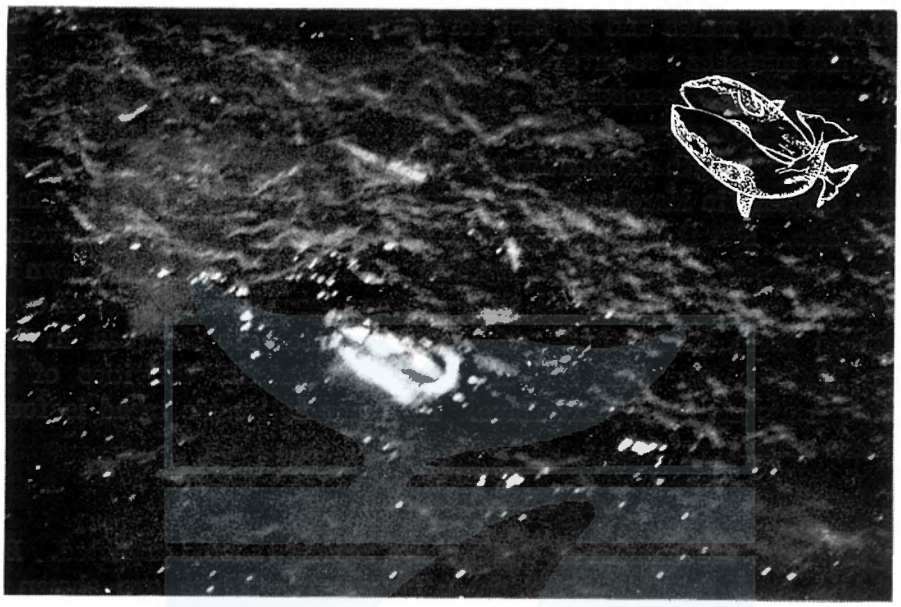


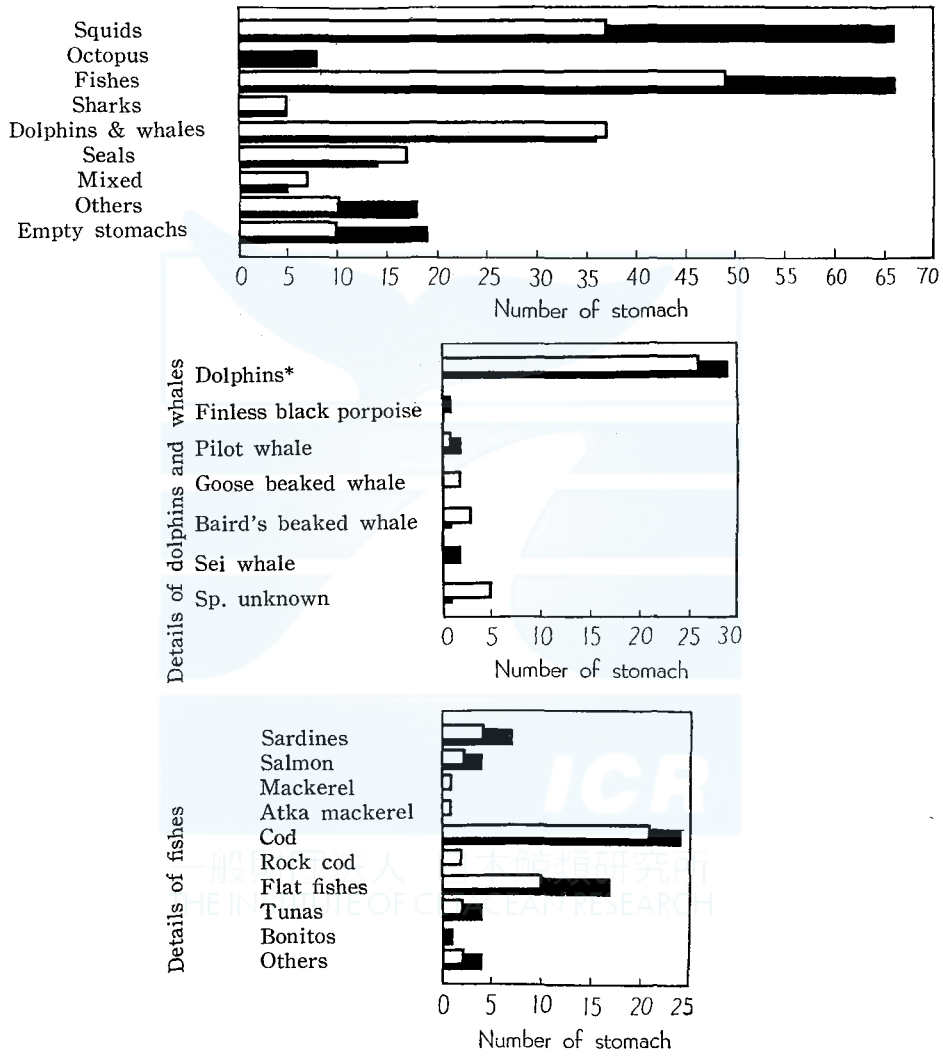
Fig. 4. Killer whale in mating (airial view)

FOOD

According to the famous report by Eschricht about the feeding habits of killer whale, 13 dolphins, 14 seals were found in the stomach and a seal was in his throat of the whale with 22 feet long. It is also reported that an amount of 60 calves of fur seal was observed in a stomach of this animal. Such avaricious feeding habits of killer whale have been collected and reported here. As explained in Fig. 5, the fishes, including sharks, are the dominant food and squids come second, then dolphins, whales and seals in this order. The details of these food items are given below. Dall's (Phocaenoides dallii dallii) and True's (Phocaenoides dallii truei) porpoises are mostly appeared in killer whales killed in the area I, II and V, and Blue-white (Stenella caeruleo-albus) dolphin in the area III and IV. The frequency of these food items accords to the distribution of dolphins and porpoises. Beaked whales and sei whale are also reported as the food of killer whale. When killer whales are flenced, many pieces of whale meat are only left in stomachs but in usually crew of whaling boats have seen killer whale attacking those species before they are caught. The most of seals were found in the

area I and II. They are mostly the small sized seal, Phoca vitulina or Pusa hispida.

As to the items of fish, cod is most dominant, second comes bottom flat fish, and then comes sardine. From these figures it is recognized that killer whale eats many kinds of food.



* Dolphins are mainly True's or Dall's porpoises in area II, III and V.

Fig. 5. Kinds of stomach contents of killer whale.

Food items are shown in Fig. 6 according to body length of killer whale. The group of small (young) whales less than 14 feet long is supposed to be in the weaning period of just after weaning. They eat

fishes or squids in the younger stage, and according to their growth, they can eat dolphins or any others. It seems that they can eat any kind of food if their mother break it to piece for them. According to their growth, quantity of fishes in stomach never changed perticuraly, but their catch of dolphins, whales and seals become many times. The quantity of fishes observed in stomach is rather constant regardless their size, but the larger foods as whales or dolphins can be seen only in the older animal.

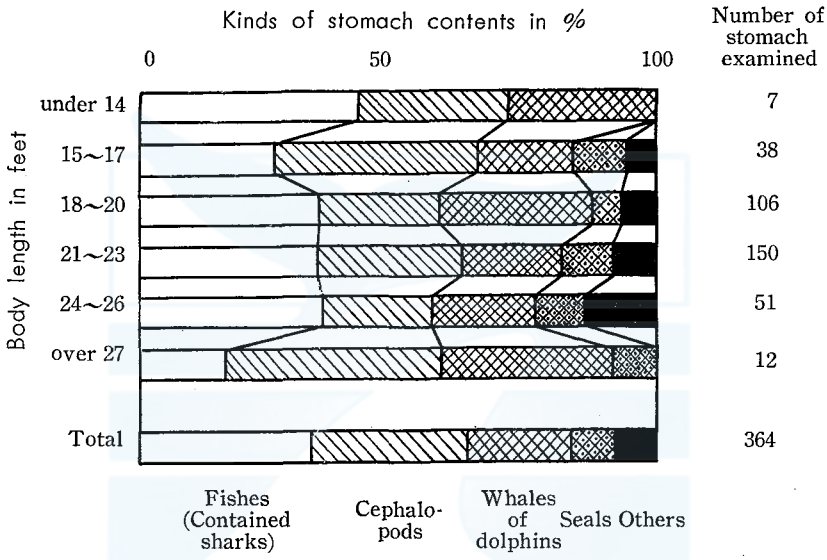


Fig. 6. kinds of stomach contents in different size of killer whales

UTILIZATION

Flencing method is not so different from that of other whale. Killer whale is utilized as well as the little piked whale and other small toothed whales (Baird's beaked whales, pilot whales etc.) in Japan.

The oil is obtained from their blubber and bones. The chemical property of this oil is roughly shown in Table 8. The killer whale oil has same market value to the sperm whale oil in Japan. The killer whale oil are utilized similar to the sperm whale oil.

Fresh meat is used for human food, The viscera and old meat are used for fertilizer or bait after boiled, cutted, chopped and dried.

TABLE 8. NATURE OF THE OILS TAKEN FROM MANY SPECIES OF THE TOOTHED WHALE

Species	Specific gravity $15\,d_4$	Refractive index (20°C)	Acid Value	Saponification Value	Iodine Value	Unsaponifiable matter
Sperm whale (Spermaceti)	0.8808 ~ 0.8848	1.4610 ~ 1.4633	—	147.1 ~ 148.5	71.4 ~ 74.2	36.0 ~ 38.6
(Blubber oil)	0.8733 ($30\,d_4$)	1.4620 (30°C)	1.2	131.6	82.4	36.4
Baird's Beaked whale	0.8752	1.4645	1.8	114.9	86.0	43.2
Dolphin	0.9286	1.4717	—	217.2	125.3	—
Common porpoise	0.9258	—	—	195.0	119.4	—
Pacific White Sided Dolphin	0.9289	1.4670	0.6	233.9	92.2	1.9%
Pilot whale	0.9250	—	1.5	195.4	100.5	—
Finless black porpoise	0.9360	1.4624	0.5	260.3	83.0	1.67
Killer whale	—	—	0.63	211.9	86.4	—

(After Y. Matuura: Marine-Mammales)

SUMMARY

1. In adjacent waters of Japan about 60 of killer whale were caught annualy.

2. Killer whales were caught mostly in Okhotsk and the southern waters off Hokkaido, because many small cetacean whaling ships are working in these area. In addition to it, killer whale is caught easily in the waters of low temperature.

They are very active in the waters of more than 20°C where it is rather difficult to catch them.

3. Average body length of killer whale is 21 feet for male, 20 feet for female. Maximum length is 31 feet for male, 27 feet for female.

4. Peak of breeding season of killer whale seems in May-July, and their pregnant period seems over one year. The body length in parturition is about 9 feet.

5. The most favorable food of killer whale is fishes, and squids, dolphins, whales, and seals come in this order.

6. According to their growth, chance of attack to dolphins, whales or seals is getting frequent.

7. The killer whale oil is sold almost by the same price of the sperm whale oil in Japan. The utilization of killer whale oil are also similar to sperm whale oil. Fresh meat is used for human food. The viscera and old meat are used for fertilizer or bait.

REFERENCES

KELLOGG, R. (1940). Whales, giants of the sea *Nat. Geogr. Mag.*, 77.

MATSUURA, Y. (1938). [On the killer whale caught in the adjacent waters of Japan]. *Zool. Mag.*, 50 (7). (In Japanese).

——— (1943). [Mrine mammals]. Tennen-sha., (In Japanese).

NAGASAWA, R. (1913). [Sakamata and Grampus]. *Zool. Mag.*, 25, (In Japanese).

——— (1916). [The scientific name of 11 species in Delphinidae caught in Japan]. *Zool. Mag.*, 28.

NORMAN, J. R. & F. C. FRASER (1949). *Field book of giant fishes.* New York, G. P. Putnam's Sons. p.

OGAWA, T. (1936). [Studies on the toothed whales in Japan]. *Botany and Zoology*, 4. (In Japanese).

SCHEFFER, V. B. & SLIPP, J. W. (1948). The whales and dolphins of Washington State with a key to the Cetaceans of west coast of North America. *The American Midland Naturalist*, 39 (2).

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