RESULTS OF WHALE SIGHTING BY CHIYODA MARU NO. 5 IN THE PACIFIC SECTOR OF THE ANTARCTIC AND TASMAN SEA IN THE 1966/67 SEASON

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ABSTRACT

This report is the results on a survey of the whale stock and whaling grounds in the Southern Ocean by Chiyoda Maru No. 5 in co-operation by three Japanese Whaling Companies. The survey consisted of three main items, whale observation by eye, meteorological and oceanographical observation, and whale marking. During the survey, 5 blue whales, 22 fin whales, 4 humpback whales, 1,137 sei whales, and 481 sperm whales making a total of 1,469 larger whales were sighted.

According to discussion on the distribution of sei whale, the distribution density was highest in the Tasman Sea, 101 encounters and 864 count recorded, of which an encounter and a number of whale sighted per 100 sea miles were 0.47 and 28.61, respectively.

The distribution density of sperm whale was highest to the east of New Zealand, and the north of 50°S in latitude. That is, an encounter and a number of whale per 100 sea miles were 0.99 and 8.61, respectively.

INTRODUCTION

A survey of the larger whale stock and whaling grounds in the south of Australia, the Tasman Sea, and the Antarctic and Subantarctic Pacific area was carried out by Chiyoda Maru No. 5 in co-operation by three firms, Nippon Suisan, Taiyo Gyogyo, Kyokuyo Co. Ltd.

The survey ship left Osaka on 19th November 1966 and the survey commenced after leaving Fremantle on 7th December. After completion of the first half of the survey the ship called in Wellington for supplementary supplies and to pick up Dr. Gaskin. The survey was carried out from 7th December to 21st March with a duration of 103 days.

The survey carried out under the following headings:

1. Whale observation and count and other by eye.
2. Meteorological observations.
3. Oceanographic observation by bathythermograph
4. Whale marking.

The survey carried out mostly north of 50°S lat. in Antarctic Whaling Area IV(70°E to 130°E), V(130°E to 170°W), and VI(170°W to 120°W). The survey east of 170°W longitude however, was carried out mainly in areas between 52°–62°S

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latitudes.
Survey course.

Fig. 1 shows the number of each species of larger whale sighted. The survey area, based on meteorological and oceanographic conditions was divided into areas A (west of 150°E, south of Australia), B (Tasman Sea), C (north of 50°S east of New Zealand). and D (south of 50°S east of New Zealand) to facilitate processing of the data.

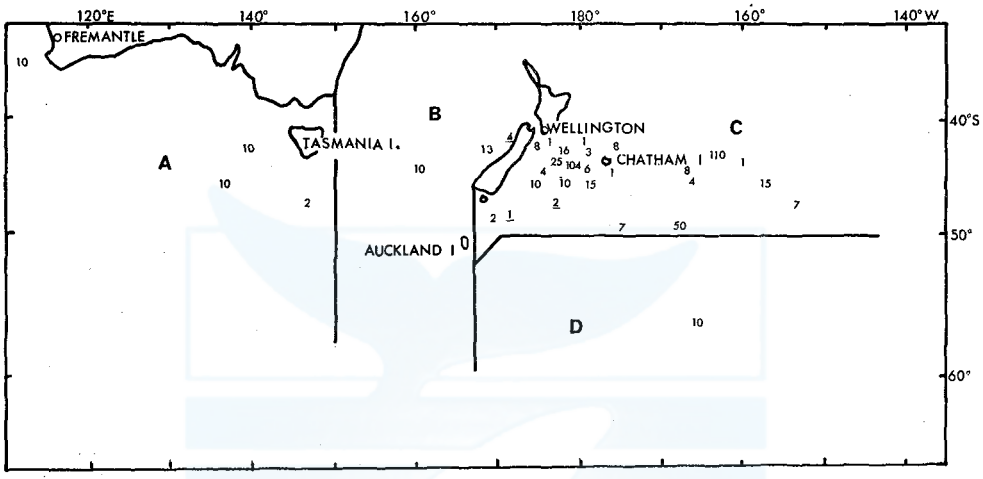

Fig. 1-a. Sightings of the larger whales by Chiyoda Maru No. 5 in 1966/67. Number without the underline shows the sei whale. Single underline shows the fin whales. Double underline shows the humpback whales.

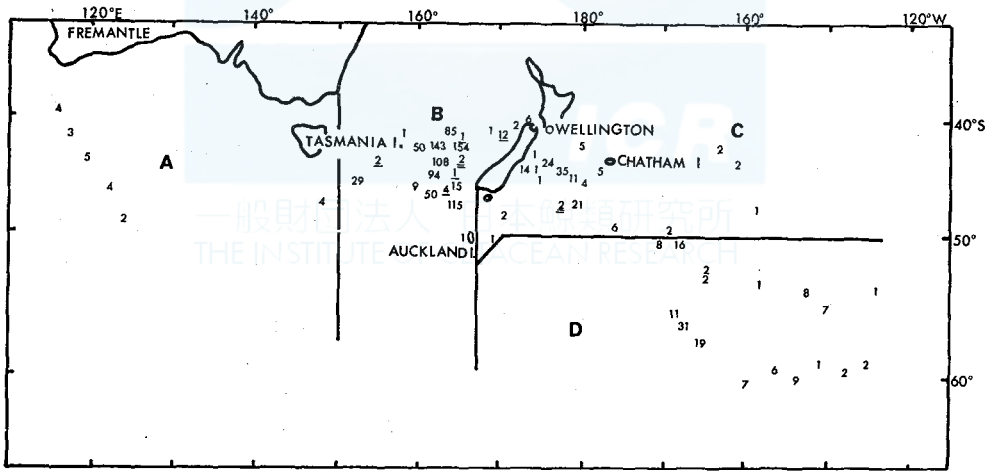

Fig. 1-b. Sightings of the larger whales by Chiyoda Maru No. 5 in 1966/67. Number without the underline shows the sperm whales. Underline shows the blue whales.

As in Fig. 1, on leaving Fremantle, at the initiation of the survey on 7th December from 34°39′S, 113°24′E the survey commenced southeast to the southernmost point of 52°40′S 128°38′E, then changed to a northeasterly course. On 20th December the survey was carried out in the vicinity of Tasmania I.. After sailing souththe ship again sailed from approximately 158°E the ship followed the 41°S latitude line.

From 30–31st December the ship made an emergency call in to Tasmania Bay on the South Island of New Zealand for emergency repairs. After completion of repairs the ship sailed west along the 42°S latitude and the area surveyed to approximately 160°E. The survey then carried out a large zigzag course towards the south to Auckland Island. From Auckland Island the ship sailed north almost parallel to the South Island of New Zealand.

After confirmation of the Antarctic Convergence the ship sailed west along 50°–60°S latitude, making the point 60°S, 160°W the southernmost point of this survey. From 170°W longitude by sailing along 47°S latitude the ship approached the South Island of New Zealand. The ship sailed north along the east coast of this island and at 18: 00 of 21st March brought the survey to a close.

SURVEY METHOD AND RECORDS

Observation by eye started before sunrise when it became sufficiently light to sight the whales and continued until darkness made it impossible. The observation post was built on the upper bridge and each watch team consisted always of 4–5 persons. Each of the watchmen were experienced and good observers.

The watch was cancelled as a rule when the Beaufort scale of wind was above 10 and visibility was less than 0.5 miles. Moreover in areas where the distributin potential was considered low from the data obtained on the survey during the day, navigation continued for the night in an endeavour to increase the survey area. For the period of the survey the effective survey time was approximately 1,356 hours (south of 40°S lat. approximately 1,315 hours).

Similarly the effective survey distance was 13,055 mls (south of 40°S lat. 12,646 mls). The distance from the upper bridge to the water line of the Chiyoda Maru No. 5 was approximately 9 meters and the estimated distance to the horizon from the formula

$$R = 2.07\sqrt{H}$$

was calculated to be 6.2 miles. Where R (sea mile) is the effective distance, and H (meter) is the height from the water line to the observer.

Using the six miles effective visible distance of Mackintosh and Brown (1956) the average visible field during the survey was 6.6 sea miles and the total area covered was calculated to approximately 162,000 square sea miles.

In observation telescopes were used and the officer on duty and the quatermaster on the bridge in addition to navigation duties kept lookout. So in reality 6–7 persons were engaged in sighting whales.

In determining the species of the whale the ship was brought as close to the whale as to enable the confirmation of the species.

In this survey, in area such as the Tasman Sea (Area B) where very high distribution density of whales was found, to avoid overestimation of numbers in group of 20–30 whales and above, the count was made so as to count down the number in the group. Moreover because of the limited survey time allotted for this area it cannot be said that a sufficient survey was carried out. It is therefore to take these points into account in the analysis of the whale count in this area.

The estimation of the distance to sighted whale was carried out in almost every instance. The estimation of distances was done by experienced observers and the results of tests made in estimating distance to icebergs were of sufficient accuracy to be used as data.

Observations in this survey were made not only on larger species of whales but also on smaller species of whales, fishes, sea birds and discoloured water.

DISCUSSION ON THE WHALE SIGHTING

Table 1 shows the number of different species of larger whales spotted in various areas, the survey distance in sea miles, the wind force (Beaufort scale) and average visibility. The survey distance excludes the distance covered by runs made during nights and when bad weather made sighting impossible.

The number of whales sighted according to species were blue whale 5, fin whale 22, humpback whale 4, sei whale 1,137 (includes 4 animals sighted north of 40°S) and sperm whale 481 making a total of 1,649 whales sighted. As stated previously the estimated count of sei whales especially in Area B was count down. Moreover because of lack of data on the quantitative distribution of blue whale, fin whale and humpback whale were not taken into consideration and reports made on sei and sperm whales.

As the survey distance covered 100–150 mls/day in establishing a criterion for expressing distribution density the number of whales sighted and the numbers of encounters made per 100 miles was made.

Sei Whale

The number of encounters made was highest in Area B, 101 encounters and 864 whales count recorded. These figures were respectively 49.8% and 75.9% of the totals. In this area encounters were made at the rate of 3.29 encounters/100 mls. which exceeds the rate of encounter in Area D where 59 encounters were made at the rate of 2.26 encounters/100 mls. The distribution density per 100 mls. in Area D averaged 5.08 and was only 18% of that of Area B (28.61 whales).

As Table 1 obviates the distribution density and number of sei whales in Area B as compared to those of other areas are extremely large. In this survey the number of encounters and the distribution density showed minimum values in Area 12 encounters 0.47 encounters 100 mls. (22 whales, 0.87 whales/100 mls.). The fact that the area was surveyed at the start of the whaling season (7th Dec.—22nd Dec.)

TABLE 1-a. NUMBER OF LARGER WHALES SIGHTED AND ENCOUNTER BY SPECIES AND AREA

Term	Area	Hour on watch (h, m)	Dist. on watch	Wind force	Vis.	Whales species					Total
						B	F	S	H	Sp.	
7, XII '66 22, XII '66	A	235 11	2,540	5.3	6.7	0 (0)	0 (0)	22 (12)	0 (0)	32 (5)	54 (17)
23, XII '66 13, I '67	B	309 11	3,068	4.7	7.2	4 (2)	20 (6)	864 (101)	2 (1)	23 (5)	913 (115)
14, I '67* 21, III '77	C	519 15	4,834	5.1	6.4	1 (1)	2 (1)	118 (51)	2 (1)	416 (48)	539 (102)
13, II '67 9, III '67	D	292 00	2,613	5.9	6.1	0 (0)	0 (0)	133 (59)	0 (0)	10 (2)	143 (61)
Total		1,355 37	13,055	5.1	6.6	5 (3)	22 (7)	1,137 (223)	4 (2)	481 (60)	1,649 (295)

* excepted the following term: 13, II '67 to 9, III '67.

TABLE 1-b. NUMBER OF SEI AND SPERM WHALES SIGHTED, AND FREQUENCY OF ENCOUNTER PER 100 SEA MILES

Term	Area	Number of whales/100′		Frequency of encounter/100′	
		Sei	Sperm	Sei	Sperm
7, XII '66 22, XII '66	A	0.87	1.26	0.47	0.20
23, XII '66 13, I '67	B	28.61	0.75	3.29	0.16
14, I '67* 21, III '67	C	2.44	8.61	1.06	0.99
13, II '67 9, III '67	D	5.08	0.38	2.26	0.08
Total		8.71	3.68	1.71	0.46

and the fact that the survey was carried out simply should be taken into consideration.

Meteorological conditions (wind, visibility etc.) can be taken up as being important factors in sighting of whales. As can be seen from Table 1, this survey in Area B was carried out under favourable meteorological conditions. However in relation to number and distribution density even by taking into account the favourable meteorological condition the figures of Area B, compared to those of other are as can be thought of as reflection conditions close to actual ones.

In the latter half of Area C (10th Mar.—21st Mar.) and Area D it is necessary to take into consideration the unfavourable sighting brought about by bad weather. With the results obtained in the survey of the latter half of Area C and Area D, it is therefore necessary to take into consideration the lowering of sighting capacity caused by unfavourable meteorological conditions.

Table 2-a) classifies the number of larger whales according to the different area of sighting and the number of whales according to the distance from the ship at sighting. Table 2-b) classifies the sei whale in the same way. Table 3 classifies the number of sei whale according to the distance from the ship when first sighted.

Mackintosh and Brown (1956) estimated the number of whales sighted within one mile of the ship as 80–90% of the acutal number. However this value should vary according to the observation structure, that is, the number of persons on watch and their sighting capacity etc. For the instance with the Chiyoda Maru No. 5 the heighest frequency of sighting to be at the 2–3 mile distance. As a rule 80–90% of the actual figures were considered sighted at this range. So the 384 whales sighted with the 3–4 miles range corresponds to 80% of the 480 whales and 90% of 427 whales. From this by homonizing the distribution density within a six miles radius

TABLE 2-a. ESTIMATES OF THE DISTANCES AT WHICH SIGHTINGS WERE MADE OF THE LARGER WHALE SPECIES

Area	Distance (sea miles)													Total
	1 >	1	1–2	2	2–3	3	3–4	4	4–5	5	5–6	6	6–7	7	
A	3	2	0	4	1	3	0	1	1	2	0	0	0	0	17
B	3	4	6	24	6	29	1	14	0	9	1	5	0	1	103
C	5	14	4	27	10	24	3	7	0	2	0	0	0	0	96
D	3	6	2	22	7	9	1	7	0	1	0	0	0	0	58
Tatal	14	26	12	77	24	65	5	29	1	14	1	5	0	1	274

TABLE 2-b. ESTIMATES OF THE DISTANCES AT WHICH SIGHTINGS WERE MADE OF THE SEI WHALE

Area	Distance (sea miles)													Total
	1 >	1	1–2	2	2–3	3	3–4	4	4–5	5	5–6	6	6–7	7	
A	2	1	0	3	1	1	0	1	1	2	0	0	0	0	12
B	3	4	4	20	6	28	0	11	0	7	1	4	0	0	88
C	3	7	1	17	5	13	0	4	0	1	0	0	0	0	51
D	3	6	2	20	8	8	1	7	0	1	0	0	0	0	56
Total	11	18	7	60	20	50	1	23	1	11	1	4	0	0	207

TABLE 3. NUMBER OF SEI WHALES SIGHTED BY ESTIMATES DISTANCE FROM THE BOAT TO WHALE

Area	Distance (sea miles)												Total
	1 >	1	1–2	2	2–3	3	3–4	4	4–5	5	5–6	6	
A	2	1	0	6	3	2	0	1	3	4	0	0	22
B	4	6	9	89	17	282	0	272	0	151	16	15	861
C	3	9	1	53	11	26	0	7	0	8	0	0	118
D	3	8	2	32	25	18	3	33	0	9	0	0	133
Total	12	24	12	180	56	328	3	313	3	172	16	15	1,134*

* excluding the whales which were not estimated the distance.

with ship as center the total number of whales within the survey range can be estimated (enlarged on later).

Furthermore Area D and the latter half of Area C the survey was carried out under extremely disadvantageous meteorological conditions. As a result, in using the data obtained in this survey to estimated the whale population in area it is necessary to take into consideration these conditions.

A comparison of the data by Chiyoda Maru No. 5 with data (nos. of sei whales sighted/100 mls.) taken by survey ships of Japanese whaling expeditions during the same year is shown in the Table 4.

As can be seen from this data the distribution density is highest in the Tasman Sea where in the past no large scale whaling was carried out.

TABLE 4. NUMBER OF SEI WHALES SIGHTED PER 100 SEA MILES TAKEN BY SURVEY SHIPS OF JAPANESE WHALING EXPEDITIONS AND CHIYODA MARU NO. 5 IN 1966/67

	Antarctic Whaling Area							Total
	I	II W	II E	III	IV	V	VI	
Survey ship of Whaling Exp.	4.32	0.45	2.46	5.71	4.41	—	—	5.57
Chiyoda Maru No. 5	—	—	—	—	1.40	12.21	3.54	8.68

Following, as already stated by Mackintosh and Brown (1956)

$$N=\frac{n\,A}{a\,P}$$

where N=estimated number of whales n=nos. of whales sighted
a=area survey P=sighting ratio

Accordingly, for the whole survey course because the average visual field was 6.3 miles the effective visual field was considered to be 6.0 mls. From the number of whales within the survey area south of 40°S latitude was estimated.

According to the data of the Chiyoda Maru No. 5 the sighting ratio (P) was calculated to be 39.5% (presupposing that 80% sighted within 2–3 mls. range) and 44.4% (presupposing 90% sighted within 2–3 miles range).

After that, Doi (1971) improved the sighting theory on whale and calculated the real rate of sighting P by species, the values of which were 0.112–0.221.

Sperm whale

The number of whales sighted and the number of encounters made were respectively 418 whales, 60 encounters and in comparison to sei whale their numbers are few.

In Area D south of 50°S latitude the numbers are fewest, the number of encounters made per 100 miles was 0.08 encounters and the number of whales per 100 miles was 0.38 whales. In Area C the maximum value of 48 encounters (0.99

encounters/mls.) was obtained. These values were respectively 86.5%, 80.0% of the totals.

The fact that 10 cases of whales swimming alone and 4 cases groups of more than 40 whales were sighted, was characteristic of this area. Special mention is made of the sighting of a group of about 50 whales which contained a few baby of estimated length of 4 meters on 17 March at position 44°28′S, 170°35′W.

MARKING SURVEY

Marking survey was carried out in Areas C and D. The results were as follows.

Species	H	HP	PH	R	M	Total	Rate of hit	Effective marked whale
Sei	5	0	4	0	10	19	26.3%	4
Sperm	25	1	0	3	22	51	49.0	24
Total	30	1	4	3	32	70	42.9	28

H : Hit, HP : Hit protruding, PH : Possible hit,
R : Ricochet, M : Miss.

SUMMARY

1) The results on a survey of the whale stock and whaling ground by Chiyoda Maru No. 5 in co-operation by three firms, Nihon Suisan, Taiyo Gyogyo, and Kyokuyo Co. Ltd. were described.

2) The survey area was covered from the south of Australia to the Subantarctic and Antarctic Pacific area, and was calculated to approximately 162,000 square sea miles.

3) The number of larger whale sighted were 5 blue whales, 22 fin whales, 4 humpback whales, 1,137 sei whales (include 4 animals sighted to the north of 40°S latitude) and 481 sperm whales making a total of 1,649 whales sighted.

4) A discussion on the distribution density which showed the number of whale sighted per 100 miles was made for sei and sperm whale.

The distribution density of sei and sperm whale according to area as follows:

Area	whale species: sei		sperm	
	distribution density	nos. of whale sighted	distribution density	nos. of whale sighted
A (south of Australia)	0.87	22	0.47	32
B (Tasman Sea)	28.61	864	3.29	23
C (east of New Zealand, north of 50°S)	2.44	118	1.06	416
D (east of New Zealand, south of 50°S)	5.08	133	2.26	10
Total	8.71	1,137	1.71	481

5) The numbers of effective marked whale were 4 sei whales and 24 sperm whales, respectively.

ACKNOWLEDGMENTS

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APPENDIX NUMBERS OF LARGER WHALES AND SIGHTINGS

Date	Noon Position	Hours on watch (h, m)	Dist. on watch (sea miles)	Wind force	Visibility (sea miles)	Species of whales					
						Blue	Fin	Sei	Hump.	Sperm	Total
AREA A											
7, Dec. '67	34°39′ S 113°24′ E	08 35	91	3	8					10(2)	10(2)
8	36°44′ S 114°00′ E	15 23	155	5	8						
9	39°15′ S 116°03′ E	16 25	163	5	8			4(2)			4(2)
10	41°22′ S 117°34′ E	16 13	157	5	8			3(1)			3(1)
11	43°45′ S 119°40′ E	17 25	175	5	8			5(3)			5(3)
12	46°16′ S 122°02′ E	15 40	163	6	8			4(2)			4(2)
13	48°56′ S 124°04′ E	16 00	165	7	7			2(2)			2(2)
14	52°02′ S 127°02′ E	15 40	173	6	8						
15	51°20′ S 130°01′ E	16 30	182	4	7						
16	49°04′ S 133°59′ E	15 35	175	6	8						
17	46°01′ S 136°38′ E	14 50	148	7	7					10(1)	10(1)
18	42°52′ S 139°48′ E	15 05	168	6	6					10(1)	10(1)
19	41°02′ S 142°42′ E	14 50	157	7	8						
20	42°29′ S 143°15′ E	14 50	139	6	8						
21	44°47′ S 147°00′ E	15 15	175	8	6						
22	47°19′ S 148°00′ E	15 30	154	5	8			4(2)		2(1)	6(3)
Total		235 11	2540					22(12)		32(5)	54(17)
AREA B											
23	47°49′ S 150°57′ E	15 55	161	0	0						
24	45°05′ S 152°46′ E	15 30	160	0	8			29(7)			29(7)
25	44°14′ S 151°40′ E	15 20	76	7	4						
26	43°13′ S 154°07′ E	14 45	160	7	8		2(1)				2(1)
27	41°03′ S 158°25′ E	15 05	178	7	8			1			1
28	40°56′ S 163°43′ E	14 50	151	7	8			85(5)			85(5)
29	40°52′ S 168°24′ E	14 55	158	3	8			1			1
30	Tasman Bay	05 30	58	—	—			6(3)			6(3)
31	Tasman Bay	03 20	37	—	—			2(2)			2(2)

1, Jan. '67	40°34′ S	171°44′ E	15	25	147	6	8	4(2)	12(1)	1			17(3)
2	41°59′ S	168°26′ E	15	40	172	2	8			154(3)		13(2)	167(5)
3	42°04′ S	164°38′ E	15	25	167	3	8		1	143(15)	2(1)		146(17)
4	41°57′ S	161°46′ E	14	55	156	5	8			50(5)			50(5)
5	42°01′ S	160°03′ E	15	25	144	6	8			108(4)			108(4)
6	43°41′ S	162°26′ E	15	10	134	6	8						
7	44°34′ S	164°51′ E	13	15	91	6	8		1				1
8	46°00′ S	164°31′ E	15	40	158	4	7		4(2)	15(4)			19(6)
9	44°46′ S	161°37′ E	15	30	159	2	8			94(21)		10(3)	104(24)
10	45°59′ S	159°54′ E	10	04	97	8	6			9(4)			9(4)
11	46°26′ S	161°15′ E	15	40	168	5	8			50(13)			50(13)
12	46°26′ S	164°30′ E	16	10	170	3	8			115(11)			115(11)
13	50°25′ S	165°53′ E	15	35	166	6	6			1			1
Total			309	11	3068			4(2)	20(6)	864(101)	2(1)	23(5)	913(115)
AREA C													
14, Jan. '67	50°23′ S	169°18′ E	15	40	132	5	4			1			1
15	48°09′ S	170°41′ E	15	40	140	5	3			2(2)		2(2)	4(4)
16	46°18′ S	173°28′ E	15	10	158	5	3	1					1
17	44°41′ S	174°42′ E	15	20	159	6	6			1		10(5)	11(6)
18	45°54′ S	176°30′ E	—		—	7	6						
19	44°59′ S	178°54′ E	15	20	128	4	8			11(2)		10(1)	21(3)
20	44°15′ S	178°01′W	15	25	161	2	8			5(3)		6(2)	11(5)
21	42°38′ S	179°49′W	15	10	136	1	8					3(1)	3(1)
22	42°50′ S	178°06′W	14	50	136	5	8					16(2)	16(2)
23	Wellington		—		—	—	—						
24	Wellington		—		—	—	—						
25	43°32′ S	177°30′W	14	10	152	7	6						
26	45°29′ S	179°49′W	15	20	180	8	7			4(1)		1	5(2)
27	44°28′ S	175°34′W	14	40	148	3	8					15(4)	15(4)
28	46°33′ S	171°12′W	14	35	148	6	8						
29	47°38′ S	166°45′W	14	50	143	3	8					8(2)	8(2)

Continued . . .

Date	Noon Position		Hours on watch (h, m)	Dist. on watch (sea miles)	Wind force	Visibility (sea miles)	Species of whales					
							Blue	Fin	Sei	Hump.	Sperm	Total
30, Jan. '67	42°08′ S	163°15′W	14 30	141	5	8			2(2)		110(2)	112(4)
31	43°52′ S	160°32′W	14 40	131	2	8			2(1)		1	3(2)
1, Feb. '67	45°42′ S	157°33′W	14 40	146	5	8					15(5)	15(5)
2	47°23′ S	158°38′W	14 40	139	3	8					7(2)	7(2)
3	47°34′ S	158°54′W	14 35	143	6	6			1			1
4	47°02′ S	163°40′W	14 10	92	8	4						
5	46°09′ S	166°07′W	14 50	99	4	8					4(1)	4(4)
6	44°01′ S	170°47′W	12 30	144	8	2						
7	42°16′ S	175°24′W	14 40	117	6	8					8(3)	8(3)
8	41°52′ S	179°52′ E	14 30	150	2	8			5(3)		1	6(4)
9	41°31′ S	174°59′ E	06 35	65	5	8					1	1
10	43°53′ S	176°35′ E	14 10	143	5	8		2(1)	4(2)		4(2)	10(5)
11	47°19′ S	179°22′ E	14 10	146	3	8			21(4)	2(1)		23(5)
12	49°23′ S	176°13′W	14 05	149	6	7			6(5)		7(1)	13(6)
Total			388 55	3726			1	2(1)	65(28)	2(1)	229(39)	299(70)
AREA D												
13, Feb. '67	51°23′ S	170°56′W	14 25	143	7	2			8(4)			8(4)
14	52°30′ S	165°00′W	14 40	147	8	7			2(2)			2(2)
15	53°15′ S	158°30′W	14 35	140	8	7			1			1
16	53°58′ S	152°39′W	14 05	140	4	8			8(5)			8(5)
17	54°56′ S	150°30′W	08 30	80	6	0.3			7(3)			7(3)
18	53°45′ S	144°48′W	07 40	78	11	5			1			1
19	53°05′ S	140°46′W	13 45	144	8	6						
20	54°53′ S	140°19′W	14 00	130	6	6						
21	55°54′ S	141°32′W	—	—	12	2						
22	57°05′ S	142°36′W	14 05	127	6	8						
23	58°43′ S	145°28′W	07 00	42	8	4			2(2)			2(2)
24	59°09′ S	147°45′W	14 40	109	4	7			2(2)			2(2)

Continued . . .

25	58°41′ S	151°09′W	12	20	109	2	7	1		1
26	59°48′ S	153°49′W	14	50	99	7	8	9(4)		9(4)
27	59°15′ S	156°24′W	14	30	129	6	7	6(4)		6(4)
28	59°39′ S	160°02′W	14	30	135	5	8	7(5)		7(7)
1, Mar. '67	59°55′ S	161°16′W	—		—	9	1			
2	58°53′ S	162°22′W	13	55	127	7	7			
3	57°17′ S	165°06′W	13	50	122	3	8	19(6)		19(6)
4	56°38′ S	167°03′W	14	00	122	4	8	31(6)	10(2)	41(8)
5	55°24′ S	168°17′W	12	55	123	5	8	11(5)		11(5)
6	54°03′ S	165°03′W	11	50	100	7	8			
7	52°38′ S	164°54′W	13	15	102	7	7	2(1)		2(1)
8	51°16′ S	166°47′W	05	15	48	6	6			
9	50°24′ S	168°17′W	13	25	117	5	7	16(7)		16(7)
Total			292	00	2613			133(59)	10(2)	143(61)
AREA E										
10, Mar. '67	49°19′ S	169°19′W	12	50	117	7	5	2(1)	50(1)	52(2)
11	46°54′ S	169°34′W	12	15	105	6	5			
12	46°48′ S	171°49′W	08	35	35	8	6			
13	46°43′ S	175°05′W	13	05	111	8	3			
14	46°45′ S	176°36′W	05	55	36	7	7			
15	46°54′ S	176°37′W	04	20	45	9	6			
16	46°56′ S	179°13′W	12	15	109	8	6			
17	44°31′ S	179°47′ E	12	25	107	6	7		104(4)	104(4)
18	44°33′ S	177°24′ E	12	45	102	3	8	35(13)	25(2)	60(15)
19	44°42′ S	174°39′ E	12	20	105	6	5	1		1
20	44°06′ S	172°35′ E	12	05	118	5	6	14(7)		14(7)
21	42°50′ S	173°43′ E	11	30	118	5	7	1	8(2)	9(3)
Total			132	20	1108			53(23)	187(9)	240(32)

* Where more than one animal was seen at a time, the number of sightings is given within brackets.