

# A second survey of seals in the King Haakon VII Sea, Antarctica

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The second seal census was carried out in the King Haakon VII Sea, Antarctica, in January 1975. The methods employed were the same as used in the 1974 survey, and the census extended over approximately 46 NM<sup>2</sup>. Population densities of crabeater seals *Lobodon carcinophagus* and leopard seals *Hydrurga leptonyx* were higher than those obtained in the same area in 1974. The density of Weddell seals *Leptonychotes weddelli* and Ross seals *Ommatophoca rossi* were considerably higher than in 1974 and the density of Ross seals is the highest recorded. Crabeater seals were the most abundant species though the percentage of the sample was lower than recorded by other workers. Pack ice was more concentrated in 1975 and group size of crabeater seals was lower than found in 1974. Ross seals were predominantly solitary and leopard seals were solitary. No fast ice was available and solitary Weddell seals were found in the pack ice. Crabeater seals and Ross seals preferred small floes with smooth surfaces, while Weddell seals haul out on the largest floes available in the absence of fast ice.

The first detailed survey of seals in the pack ice of the King Haakon VII Sea off Queen Maud Land, Antarctica, undertaken by the Mammal Research Institute, was carried out in January/February 1974 (*Hall-Martin*, 1974). This survey concentrated on the population density and species composition of the crabeater seal *Lobodon carcinophagus*, Weddell seal *Leptonychotes weddelli*, Ross seal *Ommatophoca rossi* and leopard seal *Hydrurga leptonyx*. This paper presents the results of the second survey from the M.V. *RSA* in the King Haakon VII Sea, during January/February 1975.

A number of seal surveys have been carried out elsewhere along the coast of Antarctica but mainly in the Ross and Weddell Seas and near the Antarctic Peninsula (*Eklund & Atwood*, 1962; *Bonner & Laws*, 1964; *Øritsland*, 1970; *Ray*, 1970). *Erickson*, *Siniff*, *Cline & Hofman* (1971) have stated that the seals of Antarctica represent the world's largest unexploited mammal populations, but relatively little is known about their abundance, distribution and population dynamics.

## Study area

The area covered during this survey lies between 3° 40' W and 1° 40' W and south of 70° S as far as the Antarctic ice shelf. The following bukten were visited and examined for the presence of fast ice: Tukkies, RSA, Polarbjorn, Polarsirkel, Totten, Muskeg, VW, Otter, and Belgianbukta. Other than a strip of old and high bay ice in a crack in the ice shelf east of Belgianbukta, no fast ice was recorded in any of the bukten during the survey. The fast ice had already broken out and drifted away.

On arrival in Antarctica the pack ice was 33 km wide near Muskegbukta but varied in places to only a few

*'n Tweede opname van robbe in die Koning Haakon VII-see, Antarktika, is in Januarie 1975 gemaak. Dieselfde metodes is gebruik as in die 1974-opname, en ongeveer 46 vierkante seemyl is gedek. Hoër bevolkingsdigthede van krapeterrobbe Lobodon carcinophagus en luiperdrobbe Hydrurga leptonyx is gevind as in dieselfde gebied in 1974. Die bevolkingsdigthede van Weddell-robbe Leptonychotes weddelli en Ross-robbe Ommatophoca rossi was aansienlik hoër as in 1974 en laasgenoemde is die hoogste wat nog berig is. Krapeterrobbe was volopste alhoewel hulle 'n laer persentasie van die monster verteenwoordig het as wat in ander ondersoekte gevind is. Die pakys was meer gekonsentreer in 1975 en die groepe van krapeterrobbe was kleiner as in 1974. Ross-robbe was meestal alleenlewend en luiperdrobbe was alleenlewend. Geen vaste ys was beskikbaar nie, en alleenlewende Weddell-robbe is in die pakys gevind. Krapeter- en Ross-robbe verkies klein ysskotse met gladde oppervlakte, en Weddell-robbe sleep hulle uit op die grootste ysskotse wanneer daar nie vaste ys is nie.*

kilometres wide. In the survey areas the pack ice concentration was usually between 0,3-0,5 but reached 1,0 on one occasion. *Hall-Martin* (1974) has discussed the seasonal trend in pack ice in the study area.

## Methods

The method used in the second seal census follows as closely as possible the procedure proposed by *Siniff, Cline & Erickson* (1970) and adopted by *Hall-Martin* (1974) when the first seal survey was undertaken in the King Haakon VII Sea. Counts were made from the ship's bridge, 10 m above the waterline, by the observer with two or three assistants. All seals visible were counted but only those within 200 m on either side of the ship's track were included in the calculations of population density. Seals were identified using the criteria suggested by *Ray* (1970). When difficulty was experienced in identification the ship was either manoeuvred closer to the seal or if necessary sleeping seals were woken with a blast from the ship's foghorn. The same procedure was adopted by *Hall-Martin* (1974).

Although no rangefinder was available for determining the limits of the census strip, a sighting board as described by *Siniff et al.* (1970) and used by *Hall-Martin* (1974) was available but seldom used. At no time was there difficulty in establishing whether a seal was inside or outside the census strip.

The ship normally cruised through the pack ice in the direction intended to census and its exact position was determined as frequently as possible. Because of the concentrated pack ice encountered from time to

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time it was often necessary for the ship to take an erratic course. *Hall-Martin* (1974) experienced the same difficulties which makes the two surveys comparable in this respect. The officers who helped *Hall-Martin* in 1974 were on the Bridge of the *RSA* during the present seal census and consequently they were asked to follow the same procedure as adopted previously.

Air and sea temperatures, wind velocity and direction, ice concentration (in tenths), floe size and ice surface physiognomy, and details concerning the group size, association with other species, behaviour and periods of activity of the seals were recorded in the same manner as by *Hall-Martin* (1974). The lowest air temperature recorded was  $-12^{\circ}\text{C}$  at Muskegbukta on 27th January. Generally air temperature ranged from  $-3^{\circ}\text{C}$  to  $+2^{\circ}\text{C}$  and sea temperature from  $-3^{\circ}\text{C}$  to  $0^{\circ}\text{C}$ . Wind velocity and direction differed daily and on one occasion reached a velocity of force five, creating large swells in the pack ice. Light snow fell only on three occasions.

## Results and Discussion

The ship's course through the King Haakon VII Sea is shown in Fig. 1 and the census data obtained during the survey are shown in Table 1.

### Population density

The mean density of crabeater seals during the present survey was found to be 1,52 per  $\text{km}^2$  (5,2 per  $\text{NM}^2$ ), which is higher than the figure (0,72 per  $\text{km}^2$ ) obtained for the same area by *Hall-Martin* (1974). It is however of the same order as that obtained by *Ray* (1970) when he recorded crabeater seals in the Ross Sea at a density of 5,8 per  $\text{NM}^2$ , and the figure of 4,85 per  $\text{NM}^2$  recorded in the Weddell Sea by *Siniff et al.* (1970). Similar to the findings of *Hall-Martin* (1974) the crabeater seal was the most common seal in the study area during this survey.

Ross seals were seen on 132 occasions during the survey, giving a density of 0,85 per  $\text{km}^2$  (2,9 per  $\text{NM}^2$ ) which prior to this survey was the most concentrated

population of Ross seals ever recorded.

Only 3 leopard seals were seen during the census giving a density of 0,02 per  $\text{km}^2$  (0,1 per  $\text{NM}^2$ ). *Hall-Martin* (1974) recorded a density of 0,01 per  $\text{km}^2$  (0,04 per  $\text{NM}^2$ ) in the same area in 1974.

Weddell seals occurred at a density of 0,10 per  $\text{km}^2$  (0,4 per  $\text{NM}^2$ ) in the pack ice. No fast ice or bay ice occurred at the time. *Hall-Martin* (1974) found only one Weddell seal in the pack ice in 1974, the others being found on fast bay ice.

### Species composition

The species composition recorded during this survey is given in Table 1. *Hall-Martin* (1974) found that in 1974 88,5 per cent of seals counted were crabeater seals, and *Nel* (1966) reported 80,8 per cent crabeater seals in 1964. *Øritsland* (1970) reported 84,7 per cent in the south-west Atlantic pack ice, while *Siniff et al.* (1970) mentioned 99,5 per cent crabeater seals in the Weddell Sea. *Erickson et al.* (1971) found over a three-year period that crabeater seals made up 97,0 per cent of the seals in the Weddell Sea. During this survey crabeater seals comprised only 58,5 per cent of the seals counted. The proportion of crabeater seals is probably so low on account of the much larger proportion of Ross seals counted during this survey as compared to previous surveys in the same area (*Nel*, 1966; *Hall-Martin*, 1974).

*Hall-Martin* (1974) found that Ross seals comprised 9,6 per cent of the seals counted, and *Nel* (1966) recorded 12,5 per cent in 1964. During this survey Ross seals comprised 32,4 per cent of the total seals counted. *Hall-Martin* (1974) has already pointed out that the percentage of Ross seals in the study area is much higher than found elsewhere.

Previous authors (*Øritsland*, 1970; *Ray*, 1970 and *Hall-Martin*, 1974) have indicated that Weddell seals are almost exclusively confined to fast ice. During this survey no fast ice was found in the study area and Weddell seals, comprising 4,0 per cent of the total seal population, were only seen on pack ice.

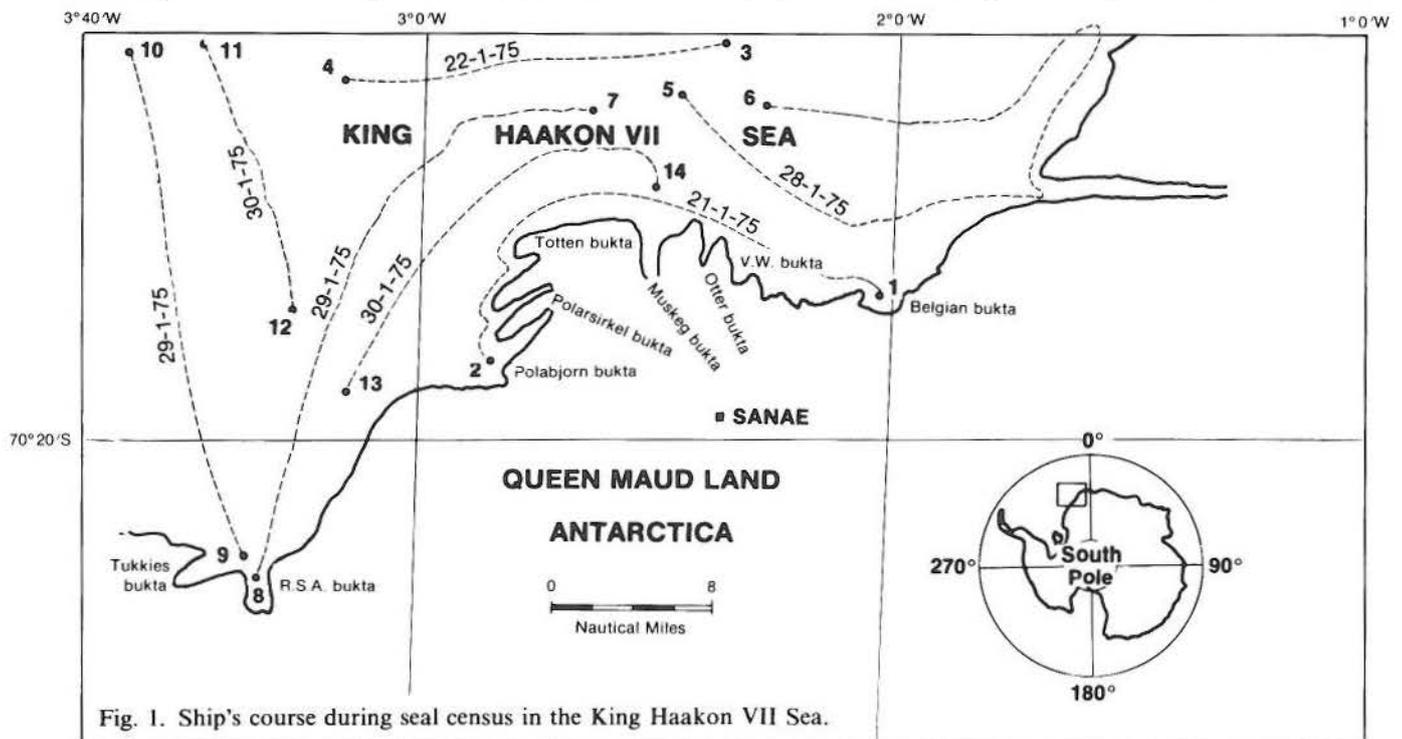


Fig. 1. Ship's course during seal census in the King Haakon VII Sea.

**Table 1**  
Results of seal census in King Haakon VII Sea,  
Antarctica 20 - 30 January, 1975

Date	Time	Starting position	Finishing position	NM <sup>2</sup> censused	Ice condition (tenths)	Seals*					T
						Crab.	Ross	Leo.	Wed.	Unid.	
21.1.75	0920-1250	70° 13' S 2° 01' W	70° 17' S 2° 50' W	6.9	0.2-0.6	24	8	2	1	3	38
22.1.75	1830-2100	70° 01' S 2° 22' W	70° 03' S 3° 10' W	4.9	0.3-0.8	8	3	1	0	0	12
28.1.75	0800-1714	70° 04' S 2° 28' W	70° 4' S 2° 19' W	10.6	0.3-0.9	36	28	0	5	4	73
29.1.75	0800-1310	70° 04' S 2° 39' W	70° 27' S 3° 20' W	7.5	open sea -0.7	29	9	0	1	0	39
29.1.75	1330-1736	70° 26' S 3° 21' W	70° 01' S 3° 39' W	5.8	open sea -0.6	23	11	0	2	3	39
30.1.75	0800-1030	70° 01' S 3° 29' W	70° 14' S 3° 19' W	3.9	0.2-0.9	24	15	0	0	2	41
30.1.75	1205-1855	70° 08' S 3° 10' W	70° 08' S 2° 30' W	5.9	0.4-1.0	94	58	0	7	6	165
Totals				45.5		238	132	3	16	18	407
Average seals per NM <sup>2</sup> in 45.5 NM <sup>2</sup>						5.2	2.9	0.1	0.4		
Average seals per km <sup>2</sup> in 156.1 km <sup>2</sup>						1.52	0.55	0.02	0.10		
Species composition in per cent						58.5	32.4	0.7	4.0	4.4	100

\* Crab = Crabeater seals      Wed. = Weddell seals  
 Ross = Ross seals      Unid. = Unidentified seals  
 Leo. = Leopard seals      T = Total number of seals in census

### Distribution in relation to ice condition

During the survey 238 crabeater seals were seen in ice concentrations varying from 0.1-1.0 (Table 2). Of these 94 (39.5 per cent) were seen on the final afternoon of the survey when the ice concentration varied from 0.4-1.0 after strong winds three days previously, and 65.9 per cent of the crabeater seals seen on that afternoon occurred in an ice concentration of 1.0.

Excluding the census of this particular afternoon, the figures show that the crabeater seals favoured ice concentrations of 0.2-0.5 and few were seen in more concentrated ice. *Hall-Martin* (1974) found most crabeater seals in pack ice concentrations of 0.1-0.3. During his survey ice concentration varied from 0.1-0.4 and thicker ice was only rarely encountered.

By including the census of the afternoon of 30th January, the overall figure shows that most crabeater seals occurred in ice with a concentration of 1.0. Exclud-

ing this particular census, the results are similar to *Hall-Martin's*. However, the two surveys are not entirely comparable since during the 1974 survey thick pack ice was avoided, but in 1975 the ship worked into heavy pack ice with progress often down to only half a knot. This census had to be abandoned short of the objective. Including the results from the census done in pack ice with a concentration of 1.0, the occurrence of crabeater seals shows two peaks, the first in a pack ice concentration of 0.3-0.5 and the second at a concentration of 1.0.

A total of 132 Ross seals was seen in ice concentrations of 0.2-1.0 (Table 3). The most favoured ice concentration appeared to be 0.4-0.6 with another peak in very concentrated ice. On the final afternoon of the census when pack ice concentration was of the order of 1.0, 38 (28.8 per cent) of the Ross seals were seen. The results indicate that the majority of Ross seals occur in medium to high concentration pack ice.

**Table 2**

Numbers of crabeater seals counted during the census related to pack ice concentration, King Haakon VII Sea, Antarctica, 20 - 30 January, 1975

Details	Seals counted	Ice concentration in tenths										Total
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	
Census excluding afternoon (30.1.75)	n	2	15	44	43	21	6	7	4	2	0	144
	%	1.4	10.4	30.6	29.8	14.6	4.2	4.8	2.8	1.4	0	100.0
Census of afternoon (30.1.75)	n	0	0	0	12	11	4	5	0	0	62	94
	%	0	0	0	12.8	11.7	4.3	5.3	0	0	65.9	100.0
Total census including afternoon (30.1.75)	n	2	15	44	55	32	10	12	4	2	62	238
	%	0.8	6.3	18.5	23.1	13.4	4.2	5.1	1.7	0.8	26.1	100.0

**Table 3**  
Number of Ross seals counted during census related to pack ice concentrations, King Haakon VII Sea, Antarctica 20 - 30 January, 1975

Details	Seals counted	Ice concentration in tenths										Total
		0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1,0	
Census excluding afternoon of 30/1/75	n	0	1	7	12	14	19	11	3	7	0	74
	%	0	1,3	9,5	16,2	18,9	25,7	14,9	4,0	9,5	0	100,0
Census of afternoon of 30.1.75	n	0	0	0	2	4	12	2	0	0	38	58
	%	0	0	0	3,5	6,9	20,6	3,5	0	0	65,5	100,0
Total census including afternoon of 30/1/75	n	0	1	7	14	18	31	13	3	7	38	132
	%	0	0,8	5,3	10,6	13,6	23,5	9,8	2,3	5,3	28,8	100,0

**Table 4**  
Distribution of seals according to ice surface condition and floe size, King Haakon VII Sea, Antarctica, 20 - 30 January, 1975

Species	Sample	Ice surface		Floe size in m <sup>2</sup>		
		Smooth	Hummocked	<500	500-1 000	>1 000
Crabeater seal	n	114	62	68	64	44
	%	64,8	35,2	38,6	36,4	25,0
Ross seal	n	56	38	55	27	12
	%	59,6	40,4	58,5	28,7	12,8
Leopard seal	n		3	1	1	1
	%		100,0	33,3	33,3	33,3
Weddell seal	n	10	3	1	5	7
	%	76,9	23,1	7,7	38,5	53,8

It has been suggested by a number of workers that the scarcity of Ross seals could be due to their preference for dense pack ice (Laws, 1953; Eklund & Atwood, 1962; King, 1964; Ray, 1970), while others have not supported this view. Øritland (1970) found most Ross seals in pack ice of medium density and Siniff *et al.* (1970) found no Ross seals in the Weddell Sea though they continually penetrated heavy pack ice. Hall-Martin (1974) found during his survey of the King Haakon VII Sea in January/February 1974 that most Ross seals were in relatively open pack ice but he seldom penetrated heavy pack ice. The results from this survey support the suggestion that Ross seals prefer concentrated pack ice.

As only three solitary leopard seals were seen during the survey no conclusions are drawn. All Weddell seals observed were solitary and in pack ice. Usually they occur on fast ice but during this survey in which no fast ice was observed, they hauled out onto pack ice. It is interesting to note that they did not vacate the area in search of fast ice.

Hall-Martin (1974) recorded the distribution of crabeater and Ross seals according to ice surface condition and floe size. The same was done during this survey using the same criteria for surface condition and floe size (Table 4). Both crabeater and Ross seals appear to prefer small, smooth-topped floes, which compares favourably with Hall-Martin's findings. When fast ice is not available, it appears that Weddell seals haul out on the largest smooth-topped floes available.

### Group size

During this survey no large groups of crabeater seals were seen as in January / February 1974 when eight groups of 10 or more were encountered (Hall-Martin, 1974). The data on crabeater seals are shown in Table 5. The mean group size was 1,4 per group. This is lower than Hall-Martin's figure of 2,4 seals per group. However Hall-Martin obtained a mean group size of 1,7 seals per group if the large groups he found when pack ice availability was limited were excluded from his calculations. During this survey pack ice concentration was high and it appears that group size is generally lower under these circumstances. Siniff *et al.* (1970) recorded a similar relationship between group size and pack ice concentration in the Weddell Sea.

Data on group sizes of Ross seals is shown in Table 6. It is clear that the Ross seal is a predominantly solitary animal during the time of the survey, and this

**Table 5**  
Group sizes of Crabeater seals in the King Haakon VII Sea, Antarctica, 20 - 30 January, 1975

No. of seals per group	Observed frequency	Total no. seen	Percentage of total
1	116	116	69,5
2	39	78	23,3
3	7	21	4,2
4	3	12	1,8
5	1	5	0,6
6	1	6	0,6
	167	238	100,0

**Table 6**

Group sizes of Ross seals in the King Haakon VII Sea, Antarctica, 20 - 30 January, 1975

No. of seals per group	Observed frequency	Total no. seen	Percentage of total
1	110	110	91,0
2	11	22	9,0
	121	132	100,0

compares well with *Hall-Martin* (1974). However eleven pairs of Ross seals were observed compared to only two pairs seen by *Hall-Martin* in 1974. Seven of the eleven pairs were seen in heavy (1,0) pack ice concentrations. The sex of only two pairs could be determined and in both cases consisted of adult male and female. One pair consisted of an adult female with a young pup only half the length of the female. This female was exceptionally dark in colour and appeared to have recently moulted, while the pup was much paler.

around midday and most common in the early to late afternoon with a decline in the evening. Crabeater seals were found to be common from 08h00 - 12h00 but most common from 16h00 - 19h00. Generally the diurnal hauling-out pattern is similar to that described by *Hall-Martin* with the exception of the abundance of crabeater seals between 16h00 - 19h00. This is undoubtedly related to the slow passage through heavy ice concentrations on the last afternoon of the survey, during which 39,5 per cent of the total number of crabeater seals counted during the survey were seen.

## Postscript

A large number of crabeater seals were seen during an oceanographic survey not related to the seal research programme, on 10 February 1975. At 11h00 the *R.S.A* entered the pack ice at a point 80 kilometres from the Antarctic ice shelf (69°23'S 0°42'E). In a period of 20 minutes 300 crabeater seals were counted (Table 8). The pack ice concentration varied from open sea to 0,3 with very few large floes, but these floes were packed with crabeater seals. Four seals seen in the water made

**Table 7**

Mean numbers of seals counted on pack ice during different time periods, King Haakon VII Sea, Antarctica, 20 - 30 January, 1975

	Time periods					
	08h00-10h00	10h00-12h00	12h00-14h00	14h00-16h35	16h35-19h00	18h35-20h48
Crabeater seals	11,0	10,8	8,8	10,7	33,2	8,0
Ross seals	4,0	6,0	3,8	10,0	15,3	3,0

## Interspecific relations

At no time during this survey was more than one species of seal seen together on an ice floe although different species were seen on separate ice floes that touched each other. On two occasions a single crabeater seal was found on one ice floe and a Ross seal was located on a floe some 50 metres away. In the same area *Hall-Martin* (unpublished report) found crabeater and Ross seals on the same ice floe, in January / February 1974 on four occasions, and on another four occasions leopard seals and crabeater seals were together on the same ice floe. His observations were made when the pack ice had broken up completely in the study area and the only available ice was a few floes which had been trapped in the bukten by tide and wind.

Pack ice conditions were different during this survey and at no time was there a shortage of floes on which the seals could rest.

## Diurnal variation

The mean number of Ross and crabeater seals seen in different time periods is shown in Table 7. The time periods used in this survey differ from those used by *Hall-Martin* (1974) and no seals were counted before 08h00. Because of the slow speed through difficult ice conditions on the afternoon of 30th January, this entire census was done between 16h35 - 19h00. The same variables reducing the validity of comparisons as described by *Hall-Martin* were experienced. However the results indicate that Ross seals were less common

repeated and unsuccessful attempts to haul out on a floe already occupied by 14 crabeater seals. The average group size was 8,6 per group which is considerably higher than recorded by other workers: 2,2 (*Siniff et al.*, 1970), 2,1 (*Erickson et al.*, 1971), and 2,4 (*Hall-Martin*, 1974). The limited number and extent of the ice floes probably accounts for the local high concentration of crabeater seals, as pointed out previously by *Hall-Martin* (1974). During the same period one Ross seal and two leopard seals were also seen. Air temperature was -8°C and sea temperature -2°C.

**Table 8**

Group sizes of crabeater seals seen during an oceanographic survey not related to the seal survey on 10 February, 1975

No. of seals per group	Observed frequency	Total no. seen	Percentage of total
1	4	4	11,4
2	4	8	11,4
3	2	6	5,7
4	4	16	11,4
5	1	5	2,9
6	2	12	5,7
7	2	14	5,7
8	2	16	5,7
9-12	5	56	14,3
13-16	4	61	11,4
17-20	3	56	8,6
more than 20	2	46	5,7
	35	300	99,9

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