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GRAY WHALES IN THE WATERS OF NORTHWESTERN WASHINGTON IN 1996 AND 1997

Gosho, M.E.[1], P.J. Gearin[1], J. Calambokidis[2], K.M. Hughes[1], L. Cooke[3], and V.E. Cooke[3],

[1]National Marine Mammal Laboratory
NOAA, NMFS, Alaska Fisheries Science Center
7600 Sand Point Way N.E., Bin C-15700
Seattle, Washington 98115-0070

[2]Cascadia Research Collective
Waterstreet Building
218 1/2 West Fourth Avenue
Olympia, Washington 98501

[3]Makah Tribal Fisheries Management Division
Makah Indian Nation
P.O. Box 115
Neah Bay, Washington 98357

ABSTRACT

The National Marine Mammal Laboratory conducted vessel surveys for gray whales (*Eschrichtius robustus*) in the summer and fall of 1996 and 1997 in northwestern Washington waters and off Vancouver Island. In 1996, the whales were concentrated on the northern Washington coast, while in 1997, the whales were mostly in the Strait of Juan de Fuca. Although a relatively large number of whale sightings were made, the photo-identification of the whales showed that only 18 individuals were present in 1996 and 28 individuals in 1997. The gray whales moved between areas along the Washington coast, in the Strait of Juan de Fuca, and off the coast of Vancouver Island. Despite intensive survey effort, the absence of identified animals implied that they had moved out of the study area during the season and later returned. Of the whales identified in 1996, 65% were re-sighted in 1997. Seven new gray whales were identified in 1996 and five new whales in 1997. Expansion of the study area and increasing the survey effort should provide a better estimate of the total size of this feeding aggregation, the number of new whales joining this group, and the extent of their range.

INTRODUCTION

The eastern North Pacific stock of gray whales migrates between calving grounds in Baja California, Mexico and feeding

grounds in the northern and western Bering Sea, Chukchi Sea, and western Beaufort Sea (Wolman, 1985). Although the majority are feeding in the northern grounds from late May to October, a small portion of the stock remains scattered along the west coast of North America. Summer sightings of gray whales have been reported from Mexican waters (Patten and Samaras, 1977), northern California (Mallonee, 1991), off the Oregon coast (Sumich, 1984), and on the west side of Vancouver Island, Canada (Darling, 1984).

The northbound migration of gray whales through Washington and British Columbian waters occurs from March to May with a peak from mid-March to mid-April (Pike, 1962). Gray whales have been seen in Washington waters throughout the year well outside the migratory period (Flaherty, 1983; Calambokidis et al. 1994). Photographic identification of these animals has revealed that some whales spend extended periods feeding in these waters and that some have returned to these areas numerous times over the past few years (Calambokidis et al. 1994; Calambokidis and Quan, 1997; Calambokidis and Schlender, 1998).

The National Marine Fisheries Service initiated a study of the gray whales in Washington in 1996 to better understand the occurrence, distribution, and abundance of gray whales in northwest Washington where the Makah Indian Tribe plans to conduct a ceremonial and subsistence hunt. The International Whaling Commission has approved a take of up to 5 gray whales per year.

METHODS

The study area was in northwest Washington from Sekiu to Tatoosh Island in the Strait of Juan de Fuca and from Tatoosh Island to Carroll Island on the northern Washington coast (Fig. 1).

Surveys were conducted using two NOAA vessels: a 24ft Almar (Aluminum Marine Company*) powered by a 200 HP outboard and a 22ft Boston Whaler* powered by a 225 HP outboard. Both vessels were equipped with radio, radar, and depth sounder. A differential GPS and portable computer was set up inside the cabin of the Almar to record vessel position every 60 seconds. The open Boston Whaler was equipped with a hand-held GPS; position was recorded manually.

Surveys were conducted from both vessels, however, once whales were sighted and counted, the survey would be interrupted while the whales were approached to be photographed. After an adequate number of photographs were taken, the survey would be resumed. Whenever possible, the depth of the water in which whales were present as well as behavior was noted.

Photographs were taken from the Almar using a Nikon* 8008 single-lens reflex camera equipped with a 300mm lens. The camera used aboard the Whaler was a Canon* EOS equipped with an 70-210mm zoom lens. Fuji Neopan* 1600 black and white print film was used in both cameras. The film was developed commercially, but the best photographs were cropped and printed at the National Marine Mammal Laboratory (NMML).

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* Use of trade name does not imply endorsement by NMFS

Additional identifications made during surveys by the Cascadia Research Collective (CRC) in 1996 and 1997 were also included in the analysis. Gray whales were identified on five surveys between 2 July and 6 October 1996 and eight surveys between 27 June and 10 August 1997. CRC also conducted surveys in other regions of Washington State including Puget Sound and Grays Harbor; matches to these areas are presented where appropriate.

Gray whales were individually identified based on photographs of the natural markings on the right and left sides of the whale, especially in the vicinity of the dorsal hump. Custom prints were made of the best photographs of individuals in each sighting. All photographs were compared by at least two matchers. An independent aid to matching was used as a final check that was based on the relative spacing between the knuckles along the dorsal ridge behind the dorsal hump. All photographs for each year were compared internally and then compared to a catalog of gray whales identified in Washington State and British Columbia in past years maintained by CRC (Calambokidis et al. 1994).

RESULTS

Survey effort and sightings

In 1996, NMML conducted gray whale surveys of the northern Washington coast and western Strait of Juan de Fuca beginning in June. By the end of November, 63 surveys of this area had been conducted (Table 1). These surveys covered almost 772nm and represented 86.5hr of survey effort. During these surveys, 97 gray whales were sighted. Three additional gray whales were sighted off effort.

In 1996, two additional surveys were conducted off Vancouver Island, Canada (Table 1). During one survey, four gray whales were sighted; during the other, none were seen.

In 1997, 84 gray whale surveys were conducted by NMML in the Strait of Juan de Fuca and off the northern Washington coast (Table 1). These surveys covered 1636nm and represented 175hr of survey effort. During these surveys, 158 gray whales were sighted. Eight additional surveys were conducted in 1997 off Vancouver Island, during which four gray whales were sighted.

In 1996, almost the same number of hours were spent surveying the Strait of Juan de Fuca as the northern Washington coast (Table 1). However, the majority of the gray whale sightings was made off the northern Washington coast rather than in the Strait of Juan de Fuca, even when corrected for distance surveyed (Table 1).

The opposite occurred in 1997 when more gray whales were sighted in the Strait of Juan de Fuca than off the northern Washington coast (Table 1). Both the number of gray whales sighted per nautical mile and the number per hour surveyed in the Straits were twice that off the Washington coast.

The monthly sightings of gray whales in the Strait of Juan de Fuca in 1996 were very sporadic (Table 2) despite the amount of

sighting effort expended there. Off the northern Washington coast, significant numbers of gray whales did not show up until August and September. By late July 1996, so few gray whales were seen in Washington waters that a survey was conducted from San Juan Point to the mouth of Nitinat Lake on Vancouver Island. During the three-hour survey off Vancouver Island, four gray whales were sighted, the same number of gray whales sighted in Washington waters after 18 surveys in the month of July.

In 1997, gray whales again appeared off the northern Washington coast in August and September, but the majority was present in the Strait of Juan de Fuca from June through September (Table 3).

Movements between areas

The identification of individual gray whales showed that fewer whales were actually present in the area than was indicated by the total sightings. Table 4 shows that of the 34 gray whales which were photographed by NMML in 1996, only 18 individual whales were present. In 1996, CRC also identified 27 gray whales in the Grays Harbor area and five gray whales in the study area to the north (Calambokidis and Quan, 1997). Of the 122 whales photographed by NMML in 1997, only 28 individual whales were present (Table 4).

The photo-identification of gray whales provided information on the movements of whales between the Strait of Juan de Fuca, northern Washington coast, Grays Harbor, and the southwest coast of Vancouver Island. In 1996, three gray whales moved between the Strait of Juan de Fuca and the northern Washington coast, two moved between the Straits and southwest Vancouver Island, and one moved between the northern Washington coast and southwest Vancouver Island. Three gray whales first sighted in Grays Harbor were subsequently re-sighted in the study area, one off the northern Washington coast and two in the Strait of Juan de Fuca (Calambokidis and Quan, 1997).

In 1997, nine gray whales moved between the Strait of Juan de Fuca and the northern Washington coast, two moved between the Staits and southwest Vancouver Island, and seven moved between the Washington coast and southwest Vancouver Island. None of the eight gray whales identified by CRC in Grays Harbor and surrounding areas were re-sighted along the northern Washington coast or in the Strait of Juan de Fuca in 1997 (Calambokidis and Schlender, 1998).

Presence in Washington waters and off Vancouver Island

A minimum estimate of the duration of the stay of these animals in the Strait of Juan de Fuca, northern Washington coast, and off Vancouver Island was calculated from the number of days between the first sighting and the last sighting. In 1996, the longest estimated stay for the 18 gray whales identified by NMML and five identified by CRC in the study area were 133, 115 and 100 days (Table 5). In 1996, the average duration for the 15 whales with more than one sighting was 61.9 days (Table 5).

The duration of the stay of the 28 whales identified by NMML in 1997 plus an additional whale identified by CRC is given in Table 6. The longest periods in 1997 were 104, 102, and 95 days and the average duration in 1997 for the 23 whales with more than

one sighting was 48.6 days (Table 6).

The data in Tables 5 and 6 were divided into five time periods in Table 7. In both 1996 and 1997, half of the identified gray whales were present only for around one month. The proportion of gray whales present for less than three months was 83% in 1996 and 89% in 1997(Table 7). It is unclear the degree which these shorter observation intervals reflect shorter stays in the study area or a failure to be sighted due to whales being missed or using areas not surveyed.

Some of the identified whales may have traveled outside the study area. Whale No. 87 was only sighted twice in 1996, by CRC on 9 May and by NMML on 18 September (133 days later). Whale No. 87 was not re-sighted in the study area in the intervening four months although numerous surveys were conducted. Whale No. 175 was sighted six times, first by NMML on 13 June and last by CRC on 8 October (115 days). However, whale No. 175 was not sighted at all for two months from 13 June to 16 August. Whale No. 145 was sighted off southwest Vancouver Island on 2 July and 9 October (100 days). This whale was not sighted for over two-and-a-half months from 6 July to 26 September (when it was sighted off the northern Washington coast). In 1997, whale No. 67 was not seen for two months from 3 August to 8 October. It appears that within the season gray whales move out of the study area to areas where there is little sighting effort.

Returning animals and new animals

Not all of the gray whales which summer in northwest Washington waters return every year and were photo-identified. Of the 29 gray whales which were identified in 1997, 18 (62%) had been sighted in 1996. Conversely, of the 23 whales identified in 1996 by NMML and CRC, 15 (65%) returned and were photo-identified in 1997.

In 1996, four gray whales (Nos. 185, 187, 210, and 212), which had not been seen previously in the area, were photo-identified by the NMML. Three additional new animals (Nos. 192, 205, and 209) were identified by CRC (Calambokidis and Quan, 1997) for a total of seven new gray whales in 1996. In 1997, five gray whales (Nos. 216 to 220), new to the area, were photo-identified by the NMML. Thus, it would appear that a preliminary estimate of new whales present in the study area is five to seven whales per year.

DISCUSSION and SUMMARY

In this study, sighting effort was concentrated from Tatoosh Island to Sekiu in the Strait of Juan de Fuca, and from Tatoosh Island to Carroll Island on the northern Washington coast. Gray whales have been reported both inside and outside Grays Harbor to the south (Calambokidis et al. 1994) and along the west coast of Vancouver Island to the north (Darling, 1984). Darling et al. (1998) estimated that the Vancouver Island gray whale population consisted of 35-50 whales. An extension of survey effort between Carroll Island and Grays Harbor and along the western

coast of Vancouver Island would probably increase sightings of feeding gray whales in Washington and British Columbian waters.

Gray whales summering in the waters of northwestern Washington and off southwestern Vancouver Island in 1996 and 1997 were present an average of 49 to 62 days. Some were sighted once and were not seen again, others were present as long as 4 months. These estimates should be regarded as the minimum estimated stay in the study area because it is only the time between the first and last sighting. It is possible that the animal remained in the area longer but was not photographed and identified as being present. Darling et al. (1984) reported that the Vancouver Island gray whales occupied the region for eight to nine months from March to December.

Gray whales in the northern Washington coast and Strait of Juan de Fuca may not have remained the whole time in the study area. Numerous surveys were conducted in the study area during which certain individuals were not re-sighted, implying that they had moved outside the area. Also, sightings of photo-identified whales show movements of whales between areas, such as Grays Harbor and the northern Washington coast, the Washington coast and Vancouver Island, and between the Strait of Juan de Fuca and Vancouver Island.

An estimated 5 to 7 new gray whales were identified in the northwest Washington feeding aggregation in 1996 and 1997. There is the possibility that some of these animals may have been present before and were just not identified photographically. However, there were also numerous gray whales which were sighted in the area but were not photographed. Some of these animals may have been new whales but were not identified.

Several gray whales which were sighted in 1997 had been first seen in 1984. However, the number of gray whales re-sighted in the study area between 1996 and 1997 ranged from 62% to 65%. Similarly, Darling (1984) found that an average of 37% of the gray whales observed off Vancouver Island were only seen that one year.

As more sighting surveys are conducted in this and adjacent areas and more photo-identification work is carried out, a better estimate of the total size of the feeding aggregation, the frequency of new whales joining this aggregation, and the extent of their range can be determined.

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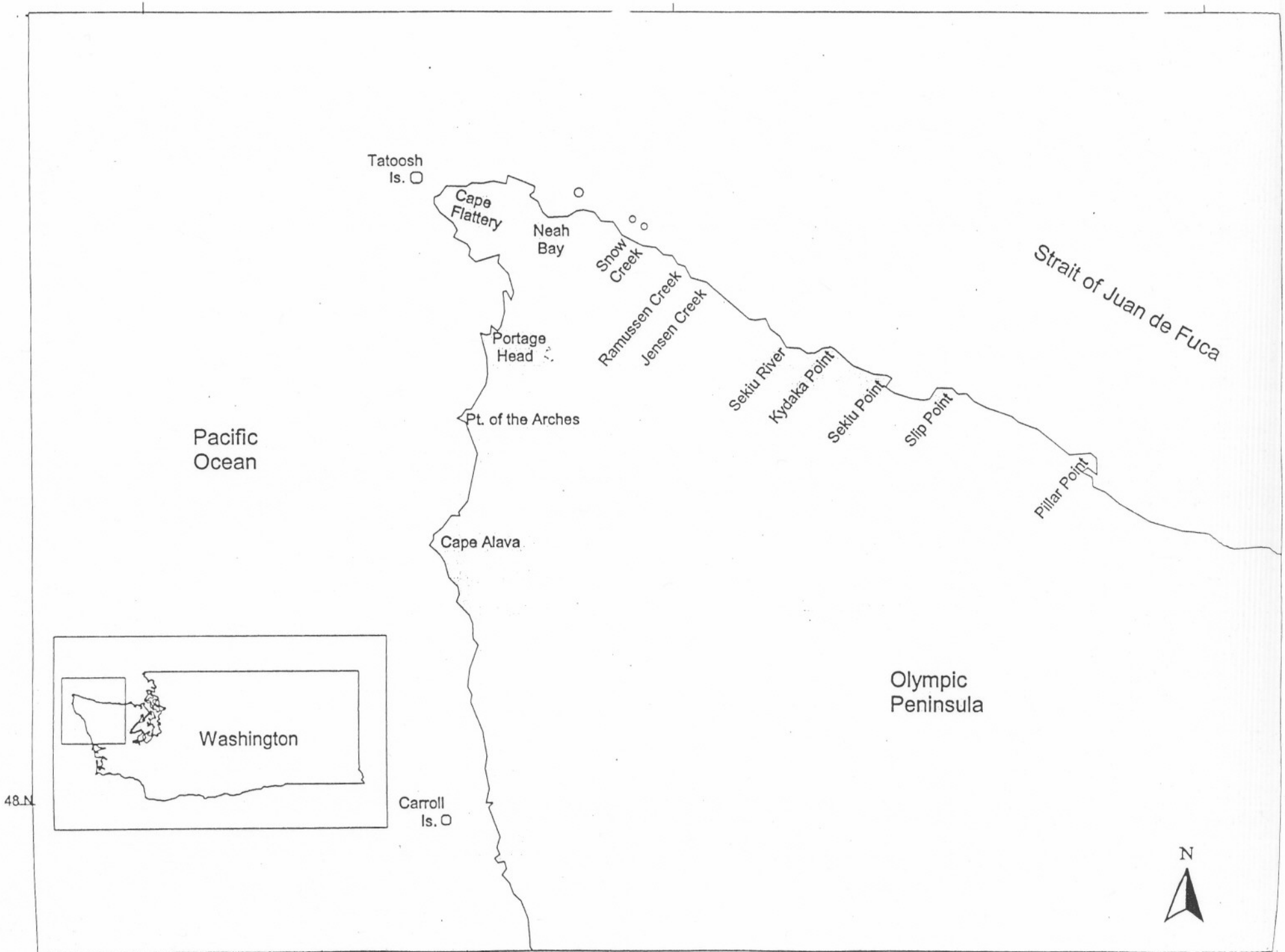

Figure 1. Northwestern Washington gray whale study area.

Table 1. Summary of NMML Vessel Surveys from Neah Bay in 1996 and 1997.

YEAR	AREA	NO. OF SURVEYS	DISTANCE (n.miles)	DURATION	WHALES SIGHTED	WHALES ID'ed	Whales per n.mi	Whales per hr
1996	Strait of Juan de Fuca	39	450.5	43.68 hr	8 (7.9%)	7	0.018	0.18
	Northern Washington Coast	24	321.3	42.82 hr	89 (88.1%)	23	0.277	2.08
	Vancouver Island	2	44.0	4.55 hr	4 (4.0%)	4	0.091	0.88
	TOTAL	65	815.8	91.05 hr	101	34 (33.7%)	0.124	1.11
1997	Strait of Juan de Fuca	57	920.2	93.45 hr	113 (69.8%)	87	0.123	1.21
	Northern Washington Coast	27	716.2	81.37 hr	45 (27.8%)	33	0.063	0.55
	Vancouver Island	8	185.1	19.82 hr	4 (2.5%)	2	0.022	0.20
	TOTAL	92	1821.5	194.64 hr	162	122 (75.3%)	0.089	0.83

Tab. 2. 1996 Gray whale surveys by month

	JUNE	JULY	AUGUST	SEPT	OCT	NOV	TOTAL
Strait of Juan de Fuca No. of Surveys:	3	11	12	11	1	1	39
No. of Hours:	5.97	17.26	10.49	7.38	0.50	2.08	43.68
No. of Nautical miles:	52.0	152.0	111.5	102.0	6.0	27.0	450.5
No. of Whales sighted:	3	2	1	2	0	0	8
Northern WA Coast No. of Surveys:	1	7	8	8	0	0	24
No. of Hours:	3.58	10.86	15.15	13.23			42.82
No. of Nautical miles:	31.8	91.0	93.0	105.5			321.3
No. of Whales sighted:	0	2	20	67			89
Southwest Vancouver Is. No. of Surveys:	0	1	0	1	0	0	2
No. of Hours:		2.88		1.67			4.55
No. of Nautical miles:		24.0		20.0			44.0
No. of Whales sighted:		4		0			4
Total Surveys:	4	19	20	20	1	1	65
Total Hours:	9.55	31.00	25.64	22.28	0.50	2.08	91.05
Total Nautical Miles:	83.8	267.0	204.5	227.5	6.0	27.0	815.8
Total Whales Sighted:	3	8	21	69	0	0	101

Table 3. 1997 Gray whale surveys by month

	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	TOTAL
Strait of Juan de Fuca No. of Surveys:	1	6	12	13	16	8	1	57
No. of Hours:	2.33	9.93	21.30	18.35	24.92	14.00	2.62	93.45
No. of Nautical miles:	15.2	63.2	219.1	207.0	235.0	141.7	39.0	920.2
No. of Whales sighted:	**2**	**15**	**27**	**29**	**36**	**4**	**0**	**113**
Northern WA Coast No. of Surveys:	1	3	5	7	8	2	1	27
No. of Hours:	2.33	7.42	19.47	17.85	25.77	6.12	2.42	81.37
No. of Nautical miles:	18.0	73.6	142.3	166.5	211.8	80.0	24.0	716.2
No. of Whales sighted:	**0**	**1**	**5**	**27**	**12**	**0**	**0**	**45**
Southwest Vancouver Is. No. of Surveys:	0	1	1	0	4	2	0	8
No. of Hours:		0.67	3.00		10.67	5.48		19.82
No. of Nautical miles:		11.0	19.0		102.1	53.0		185.1
No. of Whales sighted:		**0**	**1**		**2**	**1**		**4**
Total Surveys:	2	10	18	20	28	12	2	92
Total Hours:	4.67	18.02	43.77	36.20	61.35	25.60	5.03	194.63
Total Nautical Miles:	33.2	147.8	380.4	373.5	548.9	274.7	63.0	1821.5
Total Whales Sighted:	**2**	**16**	**33**	**56**	**50**	**5**	**0**	**162**

Table 4. Gray whale photo-identifications.

YEAR	NO. SIGHTED	NO. PHOTO ID'ED	NO. OF INDIVIDUALS
1996	101	34	18
1997	162	122	28

Table 5. Duration of stay of photo-identified whales in 1996.

Whale ID Number	Number of Sightings	Duration (Days)
37	1	
41	2	21
67	1	
68	6	55
80	7	60
83	2	22
87	2	133
88	1	
92	2	72
145	5	100
166	1	
174	1	
175	6	115
178	2	78
185	2	11
186	3	72
187	3	76
192	1	
193	1	
205	2	100
209	1	
210	2	7
212	2	7

Average= 61.9 days

Table 6. Duration of stay of photo-identified whales in 1997.

Whale ID Number	Number of Sightings	Duration (Days)
15	6	53
43	2	25
67	6	95
68	3	17
81	1	
83	1	
92	2	25
93	1	
107	2	43
127	3	9
141	2	41
166	4	57
174	4	25
175	10	73
177	6	57
178	7	104
180	9	39
185	9	102
186	1	
187	6	71
192	2	46
205	9	38
209	16	82
212	4	20
216	2	
217	3	17
218	1	
219	3	3
220	12	76

Average= 48.6 days

Table 7. Duration of stay (interval between first and last sighting) of photo-identified gray whales in the waters of northwestern Washington and off Vancouver Island.

DURATION	1996	1997
<1 week	8 (35%)	7 (24%)
1 week - 1 month	5 (23%)	7 (24%)
1 month - 2 months	2 (9%)	8 (28%)
2 months - 3 months	4 (17%)	4 (14%)
>3 months	4 (17%)	3 (10%)
TOTAL	23 (100%)	29 (100%)