

## **FINAL CONTRACT REPORT**

### **GRAY WHALE PHOTOGRAPHIC IDENTIFICATION IN 2002: COLLABORATIVE RESEARCH IN THE PACIFIC NORTHWEST**

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## INTRODUCTION

Since 1998, there has been a collaborative effort among a number of research groups conducting photographic identification of gray whales in the Pacific Northwest (Calambokidis et al. 2000, 2002a, 2002b). This reports summarizes field effort conducted by Cascadia Research in 2002 for gray whales and the results of the photographic comparison from this effort as well as that from field work conducted by the National Marine Mammal Laboratory (NMML), University of Victoria, West Coast Whale Research Foundation, the Marine Mammal Education and Research Program (MMERP) at Humboldt State University, Coastal Ecosystems Research Foundation, and the operator of the Juan de Fuca Express (a coastal ferry service). The field effort reported and these comparisons were conducted under contract to NMML.

## METHODS

Surveys were conducted from California to British Columbia by Cascadia Research and collaborating researchers. Survey effort is described in detail below for Cascadia Research. Only brief summaries of the effort by collaborating researchers is provided here with more complete information available in the reports by the individual research groups.

### Effort by Cascadia Research

A total of 22 surveys were conducted by Cascadia Research in 2002 between 6 April and 16 October in the waters off California, Oregon, and Washington (Table 1). This included both dedicated and opportunistic surveys. These surveys yielded 135 identifications of 71 unique gray whales (Table 2). A summary of the survey effort conducted is summarized below:

- A small boat surveys was conducted in northern Puget Sound on 1 May 2002 out of Everett and covered Saratoga Passage and the waters around Camano and Whidbey Islands. Three opportunistic surveys were conducted aboard the whale-watch vessel *Keet* (operated by Mosquito Fleet out of Everett).
- Four surveys were conducted around in BC waters from 31 July to 7 August 2002 as part of a collaborative survey with Canada Department of Fisheries and Oceans. Gray whales were identified along the northern coast of Vancouver Island on three days and in the Cape Caution area on one day. A search was also conducted of gray whale habitat on the eastern side of the Queen Charlotte Islands but none were seen.
- One survey was conducted out of La Push covering waters along the northern Washington Coast on 16 July 2002 using Cascadia's RHIB. This included offshore effort to search for humpback whales.
- Nine surveys were conducted off Oregon from 11 August to 16 October 2002 using Cascadia's RHIB. Some of these were in association with humpback whale effort offshore. Three days of surveys out of Port Orford were the most productive for obtaining gray whale identification photographs.
- Four surveys were conducted for gray whales in two regions off northern California from 17 August to 13 October 2002.

### **Effort by NMML and collaborators**

Collaborating researchers conducted surveys to identify gray whales in a number of areas. Details of identifications obtained by NMML and Humboldt State University are provided in Tables 3-4 and overall summaries for all collaborating researchers are listed in Tables 5-6 as well as summarized below:

- **National Marine Mammal Laboratory**: NMML obtained suitable identification photographs of gray whales from 88 encounters representing 65 unique individuals. Most of these were from Kodiak Island (60 encounters of 42 individuals) with a small numbers of identifications from California, Oregon, Washington, and British Columbia (Table 3, 6).
- **Humboldt State University**: HSU conducted surveys off northern California and obtained 71 identifications of 35 individual whales. Identifications were obtained from 13 June to 18 October 2002 (Tables 4,6).
- **Brian Gisborne, Juan de Fuca Express**: Brian Gisborne obtained 435 identifications of 69 unique whales as part of his water taxi service between Port Renfrew and Bamfield. Identifications were obtained along the southern portion of Vancouver Island from 12 May to 4 October 2002.
- **Jim Darling, West Coast Whale Research Foundation**: Jim conducted surveys along the west coast of Vancouver Island from Clayoquot Sound south to Barkley Sound on four days from 5 July to 1 October 2002. These yielded 14 identifications of 12 unique whales.
- **Coastal Ecosystems Research Foundation**: CERF obtained identifications 1 July to 14 September 2002 primarily in the vicinity of Cape Caution. Identification photographs were obtained on 295 occasions representing 41 unique individuals.
- **University of Victoria**: UVIC obtained identifications photographs from Clayoquot Sound north along the west side of Vancouver Island from 5 July to 3 September 2002. Identification photographs were obtained on 121 occasions of 83 unique individuals.

### **Photographic identification procedures**

Procedures during Cascadia vessel surveys were similar to those used previously (Calambokidis *et al.* 1994). Effort data were recorded every 30 min and when there was either a course change or a change in the environmental conditions. We recorded time, position (latitude and longitude from GPS) and environmental conditions (sea state, visibility, precipitation, cloud cover, and swell height). When a gray whale was found, the time, position, number of animals, and behaviors were recorded. Whales were approached to 30-50 m and followed through several dive sequences until suitable identification photographs could be obtained. At the end of a sighting the time, location, and roll and frame numbers of photographs taken during each observation were also noted.

For photographic identification of gray whales, both left and right sides of the dorsal region around the dorsal hump were photographed when possible. *Ilford* HP-5 negative film was used with *Nikon* 35mm cameras with 300mm f4.5 lenses. We also photographed the ventral surface of the flukes for identification when possible. The latter method was not as reliable as the sides of the whale because the gray whales did not always raise their flukes out of the water. Markings used to distinguish whales included pigmentation of the skin, mottling, and scarring, which varied among individuals. These markings have provided a reliable means of identifying gray whales (Darling 1984). We also identified gray whale using the relative spacing between the knuckles along the ridge of the back behind the dorsal hump. The size and spacing of these bumps varies among whales and does not change over the years we have tracked whales.

Comparisons of whale photographs were made in a series of steps. First, all negatives of gray whales were examined and the best shot of the right and left sides of each whale (for each sighting) were selected and printed (7 x 2.5 inch). To determine the number of whales seen during the season, the prints were then compared to one another to identify whales seen multiple days. Finally a comparison was made to our catalog of whales seen in past years. Whale photographs that were deemed of suitable quality but did not match our existing catalog (compared by two independent matchers) were assigned a new identification number and added to the catalog.

### **Analysis procedures**

To examine interchange of whales among regions and control for sample size we computed an interchange index, which is similar to the inverse of a Petersen capture-recapture estimator (Calambokidis *et al.* 2001). This was calculated as:

$$Interchange\ Index = \frac{\#matching}{(n1 * n2)} * 100$$

A Petersen capture-recapture model was used to estimate abundance as has been done in a variety of studies relying on photographic identification of large whales (Hammond 1986, Calambokidis and Barlow In Press) and has been used for gray whales in the past (Calambokidis *et al.* 2002a).

## RESULTS AND DISCUSSION

Photographs by all collaborating organizations yielded 1,159 identifications (a time and location a whale was identified) of 253 different individual gray whales (after within-year resightings) in 2002 (Table 6 and 7). This is more total identifications and different individuals than has been identified in any past year. Identifications were obtained from a broad area from Northern California to Kodiak, Alaska. Large samples with close to 100 identifications representing more than 40 different individuals were obtained from many regions including California, Oregon, S Vancouver Is., W Vancouver Is., and N Vancouver Island. The small number of identifications from Puget Sound were from early in the season (prior to 1 June).

Among the 253 whales identified, 152 or 60% were whales known from previous years and already in the catalog maintained at Cascadia. The proportion of whales known from previous years varied somewhat by region (Table 6) but for all areas with substantial samples, except Kodiak, it was well over 50% (Table 6). All three sub-areas of British Columbia had very high proportions of whales known from previous years (74-80%).

Identifications from Kodiak, Alaska provided the first opportunity to look at interchange with this region. Out of 42 unique whales identified in that region in 2002, 4 had been previously identified in other areas. While this is a much a lower proportion (10%) than in our study regions it is surprising because it is farther north than whales in the Pacific Northwest feeding aggregation had been previously identified.

Sighting histories of three of the four whales identified in Kodiak in 2002 that had been seen in previous years in the Pacific Northwest were atypical (Table 7). Only one had a long sighting history; ID #152 had been seen as early as 1992 by Jim Darling (his ID 92-14) in the Clayoquot Sound area and as early as 1995 by CERF (their ID G032) in the Cape Caution area. Since 1998 it had only been seen in August and September of 1999 by NMML along the west coast of Vancouver Island. Two others (ID# 232 and 566) had only been seen in previous years in the Pacific Northwest when they were mothers with calves. ID#232, a very distinct animal with a large bulge on the right side, had been seen multiple times off Vancouver Island in 1998 by CRC, Gisborne, and NMML and in 2001 by Gisborne and Darling in all cases accompanied by a calf (ID#620 in 2001). ID#566 had only been seen as a mom with a calf in July 2000 by HSU in northern California (mom of Pea). The fourth whale (ID#639) had only been seen once at that was in California as well on 28 October 2001 .

Movements among most other areas in 2002 were fairly common (Tables 8 and 9). Interchange rates were highest among close neighboring areas with SJF-NWA, SJF-SVI, NWA-SVI, and SVI-WVI all having indexes greater than 0.6 (shown in bold in Table 9). Intermediate interchange rates were seen among regions more widely separated and lowest rates or no interchange seen among the most distant sites. Whales identified in Oregon or California were not seen off the most northern BC sites and only at low interchange rates with the N Washington or S Vancouver Island sites. As has been the case in the past, the few whales seen in northern Puget Sound early in the season were not seen in any other region.

Except for the Northern Puget Sound whales, most other individuals identified early in the season (April and May) were resighted later in the season (Table 10). Both the whales identified in April were resighted in July through September. The same was true for the late season whales; some whales identified in October had been seen in every month after April.

Capture-recapture estimates of abundance using the 2002 identifications yielded results very similar to previous years (Table 11). We did not include Kodiak in these estimates because of the low interchange rate between all other areas and Kodiak and because this area had not been sampled in past years. Estimates excluding California and Oregon came out at around 200 and estimates with California and Oregon at 264-279 (Table 11). One new aspect of the 2001-2002 estimates is that these are now broken down by right and left sides. More complete data from all participants allowed us to generate separate estimates by sides and avoid the small bias due to missed matches for whales that were only known by single sides.

## ACKNOWLEDGEMENTS

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## REFERENCES

- Calambokidis, J. and J. Barlow. In press. Abundance of blue and humpback whales in the eastern North Pacific estimated by capture-recapture and line-transect methods. *Marine Mammal Science* 20(1), 2004.
- Calambokidis, J., J. Quan, L. Schlender, M. Gosho, P. Gearin, D. Goley, and C. Toropova. 2000. Gray whale photographic identification in 1999: Collaborative research by Cascadia Research, the National Marine Laboratory, and Humboldt State University. Final Report to the National Marine Mammal Laboratory, Seattle, WA.
- Calambokidis, J., G.H Steiger, J.M Straley, L.M. Herman, S. Cerchio, D.R. Salden, J. Urbán R., J.K. Jacobsen, O. von Ziegesar, K.C. Balcomb, C.M. Gabriele, M.E. Dahlheim, S. Uchida, G. Ellis, Y. Miyamura, P. Ladrón de Guevara P., M. Yamaguchi, F. Sato, S.A. Mizroch, L. Schlender, K. Rasmussen, J. Barlow and T.J. Quinn II. 2001. Movements and population structure of humpback whales in the North Pacific. *Marine Mammal Science* 17(4):769-794.
- Calambokidis, J., J.D. Darling, V. Deecke, P. Gearin, M. Gosho, W. Megill, C.M. Tombach, D. Goley, C. Toropova, and B. Gisborne. 2002a. Abundance, range and movements of a feeding aggregation of gray whales (*Eschrichtius robustus*) from California to southeastern Alaska in 1998. *Journal of Cetacean Research and Management* 4(3):267-276.
- Calambokidis, J., M. Gosho, P. Gearin, J.D. Darling, W. Megill, M. Heath, D. Goley, and B. Gisborne. 2002b. Gray whale photographic identification in 2001: Collaborative research in the Pacific Northwest. Report to the National Marine Mammal Laboratory, Seattle, WA. Cascadia Research, 218½W Fourth Ave., Olympia, WA 98501. 19pp
- Darling, J.D. 1984. Gray whales (*Eschrichtius robustus*) off Vancouver Island, British Columbia. In M.L. Jones, S.L. Swartz and S. Leatherwood (eds.) *The Gray Whale, Eschrichtius robustus*. Academic Press, Orlando. xxiv+600pp.
- Hammond, P. S. 1986. Estimating the size of naturally marked whale populations using capture-recapture techniques. Report of the International Whaling Commission (Special Issue 8):252-282.



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Table 1. Summary of field effort by Cascadia Research in 2002 for gray whales off the California, Oregon and Washington coasts.

Date	Ves	Lead	Launch	Region	Other activities	Time		Durat (h)	nmi	Gray whales		
						Beg	End			S#	A#	ID#
6-Apr	Keet	CM/S	Everett	WA	2 whale-watch trips	10:07	14:48	4.7		1	1	0
7-Apr	Keet	NM/S	Everett	WA	Whale-watch trip	10:15	12:05	1.8		1	2	0
19-Apr	Keet	CM/J]	Everett	WA	2 whale-watch trips	10:10	14:50	4.7				
1-May	N1	JAC	Everett	WA		8:15	21:30	13.3	139	2	4	4
16-Jul	N1	JAC	La Push	WA	Humpback	7:55	21:30	13.6	136			
31-Jul	N1	JAC	Pt Hardy	NBC		6:15	15:30	9.3	117	6	7	7
1-Aug	N1	JAC	<i>Curve of Time</i>	NBC		10:45	22:00	11.3	64	1	1	1
4-Aug	N1	JAC	<i>Curve of Time</i>	NBC	Search for ER on QC	18:15	22:30	4.3	57			
7-Aug	N1	JAC	<i>Curve of Time</i>	NBC		7:35	17:31	9.9	81	19	22	24
11-Aug	N2	JAC	Newport	OR	CC	9:10	17:13	8.1	73			
13-Aug	N2	JAC	Newport-Florence	OR	CC	7:25	17:40	10.3	81			
16-Aug	N2	JAC	Salmon Hbr	OR	CC	8:30	20:30	12.0	94			
17-Aug	N2	JAC	Pt Orford	OR	ER	9:20	14:45	5.4	20	7	13	12
17-Aug	N2	JAC	Pt St George	NCA	Humpback	17:35	19:43	2.1	16	1	1	1
6-Sep	N2	JAC	Pt Orford	OR		9:25	19:25	10.0	80	26	47	47
7-Sep	N2	JAC	Florence	OR	Humpback	8:30	21:13	12.7	104			
17-Sep	N1	TEC	Pt St George	NCA	Poor weather	10:42	12:54	2.2	12	1	2	1
12-Oct	N1	TEC	Shelter Cove	NCA	Humpback	8:45	16:27	7.7	113			
13-Oct	N1	TEC	Pt St George	NCA	Humpback	7:47	18:40	10.9	143			
14-Oct	N1	TEC	Port Orford	OR		8:12	17:35	9.4	60	22	35	38
15-Oct	N1	TEC	Coos Bay	OR	Humpback	7:39	17:00	9.4	137			
16-Oct	N1	TEC	Florence	OR	Humpback	8:06	18:51	10.8	140			
Totals						22 days		184	1668	87	135	135



ID	QL	QR	QF	Date	Stime	Etime	#	Calf	#ID	Lat	Long	Region	Comment	Pho 1	Roll 1	Frames 1
297		C		06-Sep-02	18 30		10	0	8	42 49.9	124 35.1	SOR	QUICK RUN THRU GROUP	JAC	29,30	14A-E,1
565	C	B	B	06-Sep-02	18 30		10	0	8	42 49.9	124 35.1	SOR	QUICK RUN THRU GROUP	JAC	29,30	14A-E,1
091	A	A		06-Sep-02	18 50		5	0	5	42 49.47	124 35.55	SOR		JAC	30	2-21
204	A	B		06-Sep-02	18 50		5	0	5	42 49.47	124 35.55	SOR		JAC	30	2-21
365	B		B	06-Sep-02	18 50		5	0	5	42 49.47	124 35.55	SOR		JAC	30	2-21
510	C	A		06-Sep-02	18 50		5	0	5	42 49.47	124 35.55	SOR		JAC	30	2-21
663		C		06-Sep-02	18 50		5	0	5	42 49.47	124 35.55	SOR		JAC	30	2-21
562	C	B		17-Sep-02	11 25	12 16	2	0	1	41 46.96	124 15.96	NCA		TEC	22	14-31
554	A	A	C	14-Oct-02	09 12		1	0	1	42 43.90	124 35.74	SOR		TEC	50,51	35-36,0A-3A
660	C			14-Oct-02	09 27		2	0	2	42 47.19	124 36.20	SOR		TEC	51	4A-8A
551	A			14-Oct-02	09 27		2	0	2	42 47.19	124 36.20	SOR		TEC	51	4A-8A
655	B			14-Oct-02	09 46	09 54	1	0	1	42 47.33	124 35.74	SOR		TEC	51	9A-13A
043	B	A		14-Oct-02	10 05		1	0	1	42 47.85	124 35.37	SOR		TEC	51	14A-18A,20A
231	A	B		14-Oct-02	10 10		1	0	1	42 47.83	124 35.21	SOR	FAST MILLING	TEC	51	19A
551		B		14-Oct-02	10 27	10 57	2	0	1	42 47.86	124 35.42	SOR	FAST MILLING	TEC	51	21A
280	A	C		14-Oct-02	10 55		2	0	2	42 48.81	124 35.84	SOR	MD PLM SEEN;FST MLNG	TEC	51	22A,28A-33A
192	A			14-Oct-02	10 55		2	0	2	42 48.81	124 35.84	SOR	MD PLM SEEN;FST MLNG	TEC	51	22A,28A-33A
204	B	C		14-Oct-02	11 29		1	0	2	42 49.98	124 35.67	SOR	SCARBACK?MDPLM;SPYHP	TEC	51,52	34A-E,1-3
364	A			14-Oct-02	11 29		1	0	2	42 49.98	124 35.67	SOR	SCARBACK?MDPLM;SPYHP	TEC	51,52	34A-E,1-3
624	A			14-Oct-02	11 37		1	0	1	42 50.13	124 35.42	SOR		TEC	52	4-8
204	A	A		14-Oct-02	11 40		4	0	4	42 50.14	124 35.45	SOR	4 SINGLES;MUD PLUME	TEC	52	9-18
364	A			14-Oct-02	11 40		4	0	4	42 50.14	124 35.45	SOR	4 SINGLES;MUD PLUME	TEC	52	9-18
663		A		14-Oct-02	11 40		4	0	4	42 50.14	124 35.45	SOR	4 SINGLES;MUD PLUME	TEC	52	9-18
669	C	A		14-Oct-02	11 40		4	0	4	42 50.14	124 35.45	SOR	4 SINGLES;MUD PLUME	TEC	52	9-18
169		B	C	14-Oct-02	11 54		1	0	1	42 50.05	124 35.18	SOR		TEC	52	20-22
067	A	C		14-Oct-02	11 54		3	0	3	42 50.05	124 35.18	SOR		TEC	52	23-27
169	A			14-Oct-02	11 54		3	0	3	42 50.05	124 35.18	SOR		TEC	52	23-27
169		B		14-Oct-02	11 54		3	0	3	42 50.05	124 35.18	SOR	Was 667	TEC	52	23-27
091	A	A	C	14-Oct-02	12 00		1	0	1	42 50.04	124 35.41	SOR		TEC	52	28-31,35
014	A	A		14-Oct-02	12 04		1	0	1	42 50.15	124 35.16	SOR		TEC	52	32-34,36
067	A			14-Oct-02	12 31		2	0	3	42 49.97	124 35.04	SOR		TEC	53	1-8
089	A			14-Oct-02	12 31		2	0	3	42 49.97	124 35.04	SOR		TEC	53	1-8
091		B		14-Oct-02	12 31		2	0	3	42 49.97	124 35.04	SOR		TEC	53	1-8
067		B		14-Oct-02	12 42		3	0	5	42 49.77	124 35.08	SOR		TEC	53	8-15
366	A			14-Oct-02	12 42		3	0	5	42 49.77	124 35.08	SOR		TEC	53	8-15
555	A	A		14-Oct-02	12 42		3	0	5	42 49.77	124 35.08	SOR		TEC	53	8-15
668		B		14-Oct-02	12 42		3	0	5	42 49.77	124 35.08	SOR		TEC	53	8-15
206	A			14-Oct-02	12 42		3	0	5	42 49.77	124 35.08	SOR		TEC	53	8-15
668	A	B		14-Oct-02	12 53		1	0	1	42 49.44	124 34.64	SOR		TEC	53	16-19
206		B		14-Oct-02	12 55		2	0	2	42 49.56	124 34.89	SOR		TEC	53	20-21
654	A			14-Oct-02	12 55		2	0	2	42 49.56	124 34.89	SOR		TEC	53	20-21
006	B			14-Oct-02	13 09		2	0	2	42 49.44	124 35.54	SOR	MUD PLUME;FRIENDLY	TEC	53	22-26
669	C			14-Oct-02	13 09		2	0	2	42 49.44	124 35.54	SOR	MUD PLUME;FRIENDLY	TEC	53	22-26
656	C	B		14-Oct-02	13 35		1	0	1	42 47.03	124 35.90	SOR		TEC	53	27-31
670		A	A	14-Oct-02	13 45		1	0	1	42 49.76	124 36.13	SOR	MUD PLUME	TEC	53	32-E
554	B	A		14-Oct-02	13 53		1	0	1	42 46.82	124 35.21	SOR		TEC	54	1-6













Table 6. Summary of gray whale identifications in 2002 by region showing organization and month.

Region	Total Identif.	Unique IDs	Identifications by organization							Month seen						Seen		
			BG	CERF	CRC	HSU	JD	NMML	UVIC	4	5	6	7	8	9	10	Prev	%
N California	74	36			2	71		1				32	5	10	11	16	21	58%
Oregon	99	46			97			2					2	12	47	37	33	72%
N Washington coast	13	12						13			4			7		2	8	67%
Strait of Juan de Fuca	3	3						3		2					1		1	33%
N Puget Sound	4	2			4						4						2	100%
S Vancouver Island	441	69	435					4	2		16	62	193	144	15	11	51	74%
W Vancouver Island	138	88					10	7	121				59	39	37	3	70	80%
N Vancouver Island*	327	44		295	32								46	174	106		35	80%
Kodiak	60	42						60						60			4	10%
Total	1159	342	435	295	136	71	14	88	121	2	24	94	305	447	221	91	225	
Unique IDs	253	253	69	41	71	35	12	65	83	2	15	45	100	156	99	59	152	60%

\* includes northern side of Vancouver Island and waters around Cape Caution

Table 7. Sighting histories from 1998 to 2002 of whales seen in both Kodiak and other regions.

ID	Contr	Date	Yr	Lat	Long	Location	Regio	Tot	Cal	PHO	Roll	Frames	1	Comment	Other	IDS
152	NMMI	13-Aug-99	1999	49 23	126 27	OFF MATLAHAW	WVI	8	MG	28		01-37				
152	NMMI	12-Sep-99	1999	49 28	126 35	S. OF SPLIT CAPE	WVI	8	PJG	11		08-27				
152	NMMI	18-Aug-02	2002	57 19.59	152 25.04	Kodiak	KAK		LM	6		1-9		4 ER from roll D cont. & 2 ER	736	
232	BG	06-Jul-98	1998	48°38.2	124°47.8	Dare Riv	SVI	6	BG	28		17		Mother? w/ growth on side		
232	BG	06-Jul-98	1998	48°38.2	124°47.8	Dare Riv	SVI	6	BG	29		04		Mother? w/ growth on side		
232	NMMI	17-Jul-98	1998	48 36	124 43	E. Carmanah	SVI		PG	7		19,27,34		Mother? w/ growth on side		
232	BG	07-Aug-98	1998	48°34.63	124°39.46	Walbran Riv	SVI	2	BG	46		13		Mother? w/ growth on side		
232	NMMI	25-Aug-98	1998	48 36	124 43	E. Carmanah	SVI		PG	R9		13-15		Mother? w/ growth on side		
232	CRC	27-Aug-98	1998	48 36.90	124 46.35		SVI		JAC	36		15		Mother? w/ growth on side		
232	BG	05-Jul-01	2001	48 42.67	125 01.26	Barge Wr-Tscowis	SVI	2	1 BG	39		8-25		cow & calf	620	
232	JD	31-Jul-01	2001	48 09	126 00	Ahous Bay	WVI	2	1 JD					Cow-232 deformed, calf-620	620	
232	NMMI	15-Aug-02	2002	57 21	152 27	Kodiak	KAK		LM	A		27-35			738	751
232	NMMI	15-Aug-02	2002	57 22.46	152 26.35	Kodiak	KAK		LM	1		2-11		Deformed back( Lump on right side)		
566	HSU	06-Jul-00	2000	41 33	124 06	Klamath	NCA		DG	4		15				
566	HSU	26-Jul-00	2000	41 22	124 05	N Gold Bluff Bch	NCA		DG	8,9		21,22/23,31		Mom of Pea		
566	HSU	26-Jul-00	2000	41 22	124 05	N Gold Bluff Bch	NCA		DG	10		3		Mom of Pea		
566	NMMI	17-Aug-02	2002	57 20.77	152 29.66	Kodiak	KAK		LM	5		1-9		2 ER	729	758
639	HSU	28-Oct-01	2001	41 44.49	124 11.35	PSG	NCA		DG	31,32		11-,all			554	619 611 642 643 644
639	NMMI	15-Aug-02	2002	57 22.85	152 26.86	Kodiak	KAK		LM	1		12-36		same as roll PJG 1 frame 4	721	724 726 733 747 758
639	NMMI	15-Aug-02	2002	57 21	152 27	Kodiak	KAK		PJG	1		1-9				

Table 8. Interchange of gray whales between regions in 2002. Matrix value shows number of gray whales seen in both areas.

Region	IDs	Region								
		NCA	SOR	NWA	WSJ	NPS	SVI	WVI	NVI	KAK
N California	36	-								
S. Oregon	46	5	-							
N Washington coast	12	1	1	-						
Strait of Juan de Fuca	3			1	-					
N Puget Sound	2					-				
S Vancouver Island	69	3	12	8	2		-			
W Vancouver Island	88	4	6	4	1		42	-		
N Vancouver Is.*	44						6	10	-	
Kodiak, Alaska	42									-

Table 9. Interchange index for gray whale resightings among regions in 2002.

Region	IDs	Region								
		NCA	SOR	NWA	WSJ	NPS	SVI	WVI	NVI	KAK
N California	47	-								
S. Oregon	46	0.23	-							
N Washington coast	12	0.18	0.18	-						
Strait of Juan de Fuca	3	0.00	0.00	<b>2.78</b>	-					
N Puget Sound	2	0.00	0.00	0.00	0.00	-				
S Vancouver Island	69	0.09	0.38	<b>0.97</b>	<b>0.97</b>	0.00	-			
W Vancouver Island	88	0.10	0.15	0.38	0.38	0.00	<b>0.69</b>	-		
N Vancouver Is.*	44	0.00	0.00	0.00	0.00	0.00	0.20	0.26	-	
Kodiak, Alaska	42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-

Table 10. Resightings of gray whales between months in 2002. Matrix value shows number of different whales seen in both months.

	IDs	Months						
		4	5	6	7	8	9	10
April	2	-						
May	15	1	-					
June	45	1	7	-				
July	100	2	8	24	-			
August	156	2	7	20	59	-		
September	96	2	4	16	42	58	-	
October	47		2	9	16	15	20	-

Table 11. Petersen capture-recapture abundance estimates for seasonal resident gray whales. Estimates based on new 2002 data are shown along with estimates reported previously.

IDs used	Sample 1		Sample 2		Match	Est.	CV
	Year	n	Year	n			
<b>New estimates with 2002 data (IDs after 1 June only)</b>							
Left sides, WA-BC only	2001	130	2002	138	88	<b>204</b>	0.04
Right sides, WA-BC only	2001	121	2002	139	87	<b>193</b>	0.03
Left sides, NCA-BC	2001	164	2002	189	111	<b>279</b>	0.03
Right sides, NCA-BC	2001	155	2002	194	114	<b>264</b>	0.03
<b>Estimates using 2000-01 data from Calambokidis et al. (2002b)</b>							
Seen >1 June*	2000	112	2001	180	63	<b>319</b>	0.07
Seen >1 June & w/o California	2000	86	2001	151	53	<b>244</b>	0.07
<b>Estimates using 1998-99 data from Calambokidis et al. (2000)</b>							
Seen >1 June & w/o PS or GH	1998	134	1999	127	63	<b>269</b>	0.06
also w/o California	1998	134	1999	93	56	<b>222</b>	0.06
<b>Estimates based on 1996-98 data (from Calambokidis et al. 2002a)</b>							
Seen >1 June & w/o PS or GH	1997	29	1998	134	22	<b>175</b>	0.09
Seen >1 June & w/o PS or GH	1996	28	1998	134	22	<b>169</b>	0.09

\*All IDs from Puget Sound and almost all from Grays Harbor were prior to 1 June in 2001