Beluga, *Delphinapterus leucas*, Distribution and Survey Effort in the Gulf of Alaska

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Introduction

Belugas, *Delphinapterus leucas*, are found in five stocks around Alaska: in the Beaufort Sea, eastern Chukchi Sea, eastern Bering Sea, Bristol Bay, and Cook Inlet (Hill and DeMaster, 1998). The geographically and genetically isolated stock in Cook Inlet (O'Corry-Crowe et al., 1997) has been the subject of an annual harvest by Alaska Native hunters. Concerns over the viability of this stock led to a program of regular, systematic aerial surveys each June or July since 1993 (Rugh et al., 2000) along with analysis of the aerial counts (Hobbs et al., 2000a). The resulting abundance estimates indicated that the Cook Inlet beluga population was small and declining (Hobbs et al., 2000b).

With increased attention on the Native harvest in Cook Inlet, there has been a renewed interest in the distribution of belugas elsewhere in the Gulf of Alaska. Huntington (2000) found that winter migration of Cook Inlet belugas into the Gulf of Alaska is a topic of great interest to Alaska Natives. The possibility that belugas are strictly confined to the waters of Cook Inlet is important to the management of the stock. The degree of isolation of Cook Inlet belugas affects the estimation of abundance with concomitant harvest implications.

Accordingly, this paper is a synthesis of available information, showing the number and geographical coverage of surveys in which belugas would have been reported if encountered. The area of coverage extends from Unimak Pass to Dixon Entrance, that is, across southern Alaska and adjacent inside waters (Fig. 1), and includes effort and sighting data from marine mammal research projects in the Gulf of Alaska. Beluga sightings were collated from these dedicated surveys and augmented by opportunistic records from fishing vessels, recreational operations, U.S. Coast Guard patrols, local pilots, and biologists on unrelated studies. The geographical area covered by the larger surveys is schematically demonstrated in the respective Figures 2–7.

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ABSTRACT—Beluga, Delphinapterus leucas*, distribution in the Gulf of Alaska and adjacent inside waters was examined through a review of surveys conducted as far back as 1936. Although beluga sightings have occurred on almost every marine mammal survey in northern Cook Inlet (over 20 surveys reported here), beluga sightings have been rare outside the inlet in the Gulf of Alaska. More than 150,000 km of dedicated survey effort in the Gulf of Alaska resulted in sightings of over 23,000 individual cetaceans, of which only 4 beluga sightings (5 individuals) occurred. In addition, nearly 100,000 individual cetaceans were reported in the Platforms of Opportunity database; yet, of these, only 5 sightings (39 individuals) were belugas. Furthermore, approximately 19 beluga sightings (>260 individuals), possibly including resightings, have been reported without information on effort or other cetacean sightings. Of the 28 sightings of belugas outside of Cook Inlet, 9 were near Kodiak Island, 10 were in or near Prince William Sound, 8 were in Yakutat Bay, and 1 anomalous sighting was well south of the Gulf. These sightings support archaeological and commercial harvest evidence indicating the only persistent group of belugas in the Gulf of Alaska occurs in Cook Inlet.*

Historical Review

Prior to the 1970's

Prehistoric Native communities of the Gulf of Alaska may have harvested or scavenged belugas as part of their subsistence activities (de Laguna, 1956; Yarborough, 1995). The Alutiiq from the old village of Chenega in Prince William Sound were reported to have hunted large whales, which Birket-Smith (1953) surmised included sperm or humpback whales, as well as "little finners, white whales, blackfish and porpoises." According to Heizer (1947), petroglyphs on the cliffs of Cape Alitak, on Kodiak Island, Alaska, may depict cetaceans such as "the sperm whale, killer whale, and perhaps the porpoise or beluga." At least one village excavated on the northwestern coast of Kodiak Island yielded a few skeletal parts identified as beluga (Kellogg, 1936). However, cetacean bone samples collected from these communities are usually not identified by species because of fragmentation or deterioration (Yarborough, 1995). Instead, the bones are often categorized as "porpoise" (usually harbor porpoise, *Phocoena phocoena*) or "whale" (sometimes "small whale," "large whale," or "baleen whale") (de Laguna, 1956; Yarborough, 1995; McCartney, 1998), making it difficult to determine the extent to which prehistoric societies of the gulf relied on belugas.

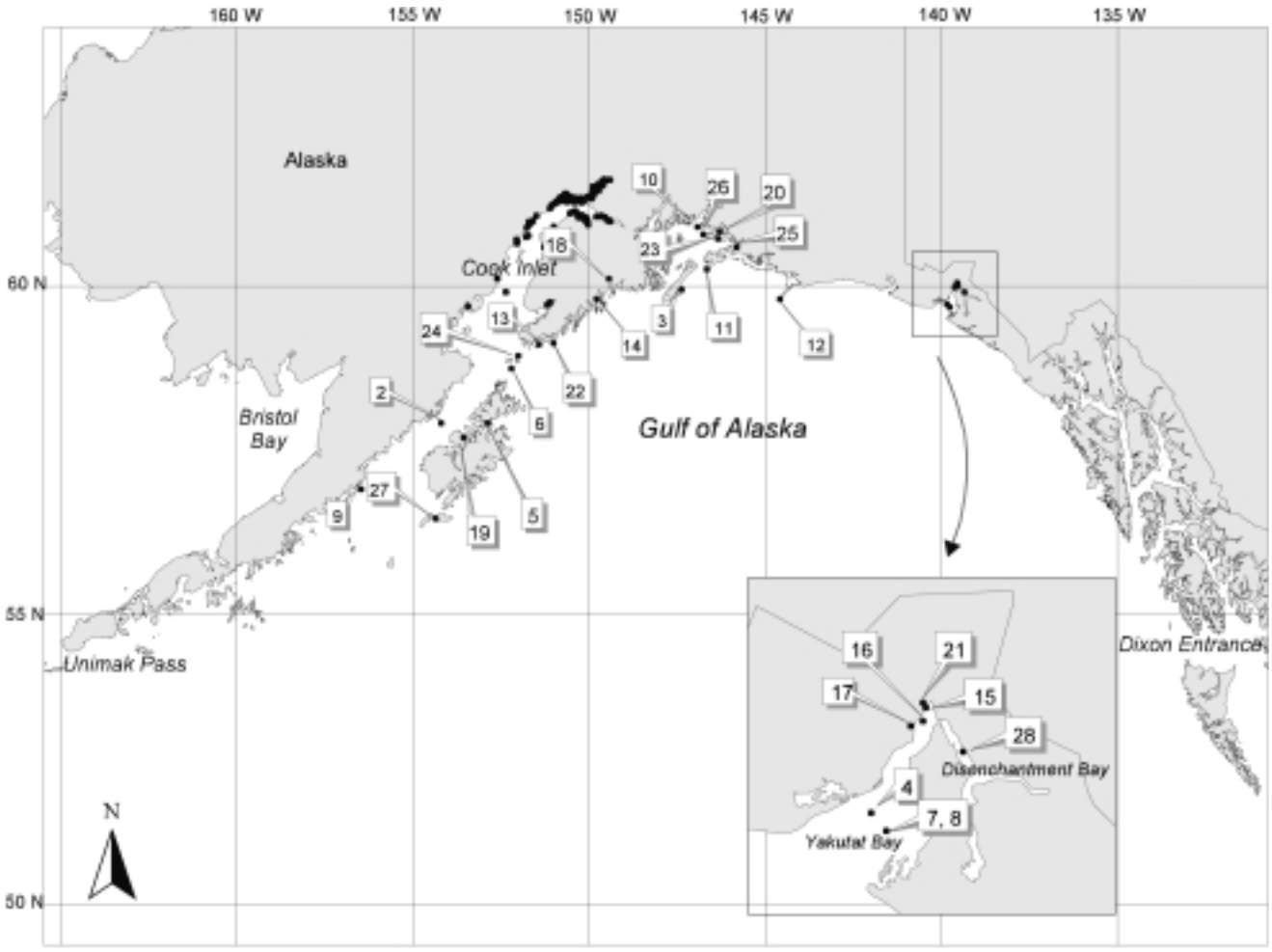

Figure 1.—Beluga sightings in the Gulf of Alaska. Sightings from 1993 to 2000 in Cook Inlet (Rugh et al., 2000) are shown but are not included in the sequence of map identification numbers in Table 1. The sighting (Map I.D. #1) in Washington is not shown on this map.

In general, whale bones represent only a small portion of the faunal remains identified in sites around Prince William Sound and Kodiak Island; porpoise bones, particularly bullae, were the greatest in number, but the majority of remains were from furbearing sea mammals (Kellogg, 1936; de Laguna, 1956; Yarborough and Yarborough, 1998).

During the modern era of commercial whaling, belugas were rarely targeted by whalers in the Gulf of Alaska, and only one of the commercial whaling stations operating between 1907 and 1939 reported harvesting or processing belugas (Tønnessen and Johnsen, 1982). The Beluga Whaling Company, founded in 1916 and based at the Beluga River in Cook Inlet, harvested 9 belugas from the Cook Inlet area in 1917, 42 in 1918, none in 1919, and 100 in 1920, after which the company went bankrupt (Bower and Aller, 1917, 1918; Bower, 1919, 1920, 1921).

In 1920, the U.S. Bureau of Biological Survey (BBS) was given the responsibility of enforcing Alaska fur laws, including the blue-fox, *Alopex lagopus*, industry in the Aleutian Islands, which required an extensive inventory of wildlife resources. This led to a biological survey in 1936 and 1937 covering most of the Aleutian Islands and the Alaska Peninsula. The ship-based survey included every island in the Aleutian chain, as well as islands south of the Alaska Peninsula and parts of Bristol Bay. Data were collected on invertebrate, bird, and mammal species sighted during the course of the survey. A report, prepared soon after the survey, was not published until 1959 (Murie, 1959). The report included qualitative descriptions of sightings and habitat. During the 2-year survey period, eight marine mammal species were observed: none were belugas. However, the report stated that the survey party was inexperienced at identifying cetaceans, and only the more easily identified species were considered positive sightings.

Dedicated Surveys

The 1970's

From November 1975 to April 1977, aerial surveys were flown over the Alas-

ka coastal and outer-continental-shelf waters (Harrison and Hall, 1978; Fig. 2). The surveys were designed to determine the seasonal distribution and abundance of marine mammals and birds. Approximately 40,000 km of trackline were surveyed in the Gulf of Alaska during January through October, with fairly intensive surveys occurring south of the Alaska Peninsula and extending from Kodiak Island west to the Aleutian Islands. All but 4 of the 35 belugas observed were seen in Cook Inlet. Those 4 were seen in March (1 whale) and July (2 whales) near Kodiak Island and in March (1 whale) near Prince William Sound (Table 1: Map I.D. no. 2, 3, 5). During the surveys, approximately 1,000 cetaceans were sighted, although the authors failed to list species (Harrison, 1979) other than belugas (Harrison and Hall, 1978).

A study of the breeding biology of avifauna in Prince William Sound was conducted from 28 April to 1 August 1976 (Nysewander and Knudtson[1]). The purpose of the study was to evaluate data on seabirds and shorebirds prior to the proposed petroleum developments in the area. Additional data were collected on marine mammal observations in the vicinity of this area. Six species of cetaceans were sighted; none were belugas.

Between May 1976 and October 1977, aerial and vessel surveys were conducted in Prince William Sound and the adjacent northern Gulf of Alaska (Hall[2]; Fig. 3) to document relative numbers, seasonal distribution, and major foraging grounds of cetaceans. The data were used by the Bureau of Land Management to evaluate the probable impacts on natural resources from development of petroleum reserves in Alaskan waters. No comprehensive studies of cetaceans in Prince William Sound had been conducted prior to this survey. Predetermined fixed transects were flown during the aerial portion of the study (3,970 km), and vessel survey tracklines (5,730 km) traversed areas that had been noted to have dense concentrations of cetaceans. Although 2,954 cetaceans were sighted during the surveys, none were belugas. However, belugas were included in a generalized table listing cetaceans reported from Prince William Sound (Table 1 in Hall[2]), but with no supporting references or data.

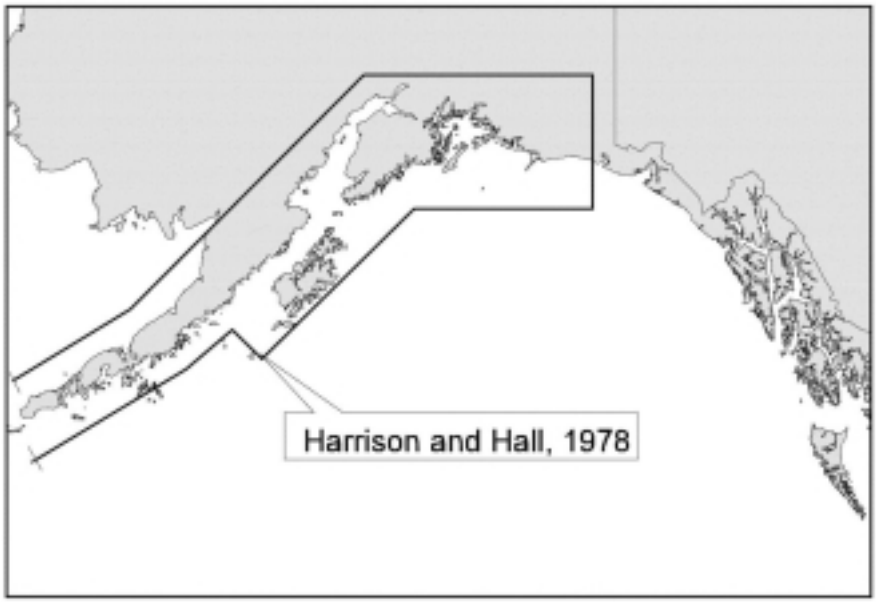

Figure 2.—Harrison and Hall (1978) marine mammal survey area.

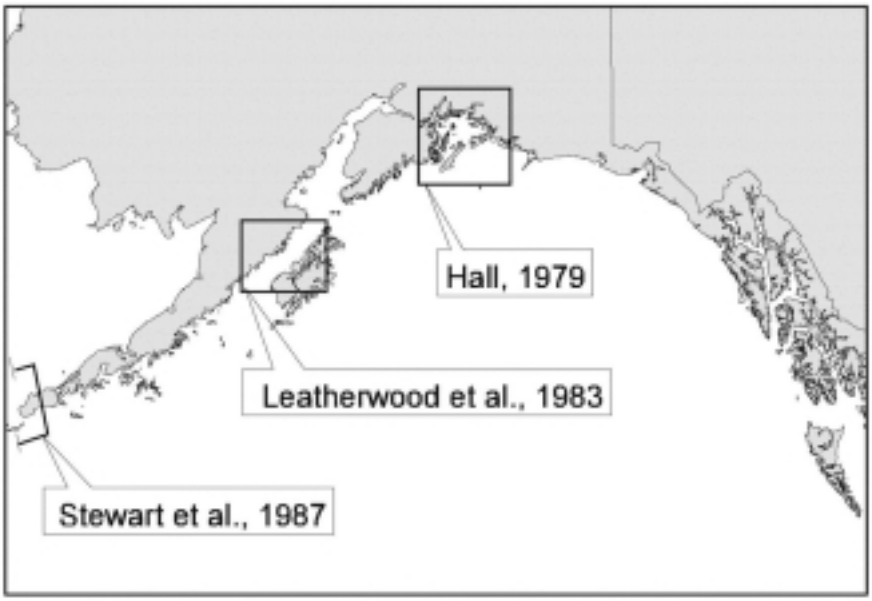

Figure 3.—Marine mammal survey areas of Hall (text footnote 2), Leatherwood et al. (text footnote 3), Stewart et al. (1987).

[1] Nysewander, D. R., and P. Knudtson. 1977. The population ecology and migration of seabirds, shorebirds and waterfowl associated with Constantine Harbor, Hinchinbrook Island, Prince William Sound, 1976. *In* J. C. Bartonek, C. J. Lensink, R. G. Gould, R. E. Gill, and G. A. Sanger (Editors), Population dynamics and trophic relationships of marine birds in the Gulf of Alaska and southern Bering Sea, Part IX, p. 500–575. Environ. Assessment Alaskan Cont. Shelf, Annu. Rep. 4, U.S. Dep Commer., Outer Cont. Shelf Assess. Program.

[2] Hall, J. D. 1979. A survey of cetaceans in Prince William Sound and adjacent vicinity—their numbers and seasonal movements. Environ. Assessment Alaskan Cont. Shelf, Final Rep. 6 (Biol. Stud.):631–726.

The 1980's

From February 1982 to March 1983, Leatherwood et al.[3] conducted a series of surveys for marine mammals in the eastern Bering Sea and Shelikof Strait (Fig. 3) to identify and describe habitat use by endangered whales. Distribution and abundance of marine mammals other than endangered whales was also documented. The Shelikof Strait study area (16,500 km^2) lies between Kodiak Island and the Alaska Peninsula and includes the southwest end of Cook Inlet. Surveyors flew 53,230 km, of which 5,524 km were in Shelikof Strait. During the eight survey periods, 1,649 marine mammal sightings were made during systematic survey effort, of which 305 were in Shelikof Strait. Although belugas were observed repeatedly in Cook Inlet during transit flights into and out of Anchorage, only one was seen outside of the inlet (Table 1: Map I.D. no. 9; Fig. 3).

[3] Leatherwood, S., A. E. Bowles, and R. R. Reeves. 1983. Aerial surveys of marine mammals in the southeastern Bering Sea. U.S. Dep. Commer., NOAA, OCSEAP Final Rep. 42(1986):147–490.

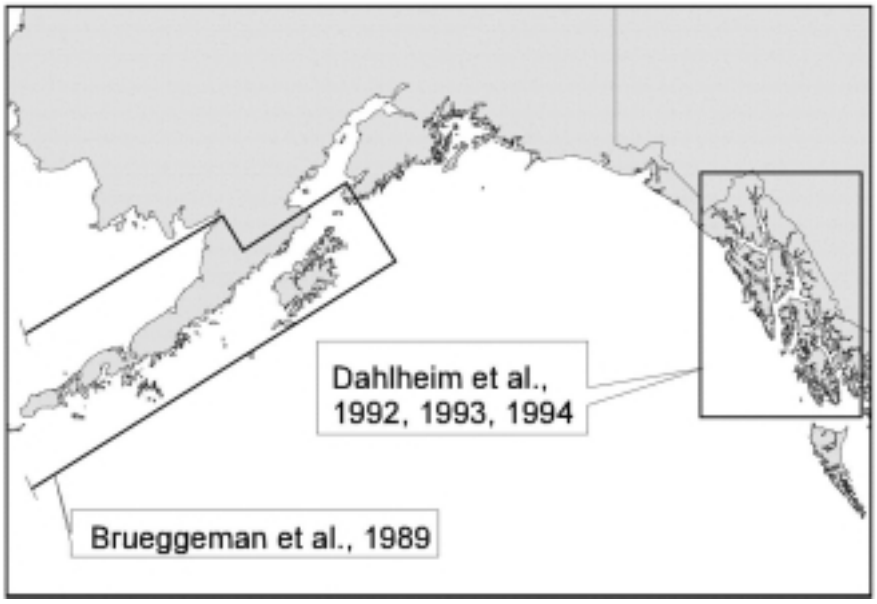

Figure 4.—Marine mammal survey areas of Dahlheim et al.(text footnotes 9,10,11), and Brueggeman et al.(text footnote 4).

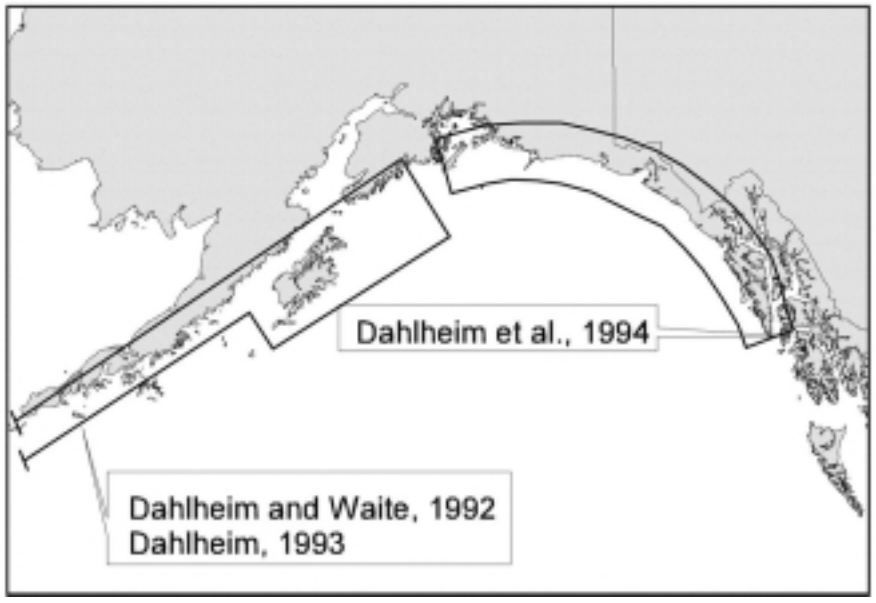

Figure 5.—Marine mammal survey areas of Dahlheim et al. (text footnote 11), Dahlheim and Waite (text footnote 6), and Dahlheim (text footnote 7) .

Between 26 July and 26 August 1984, aerial surveys were flown over the former Akutan whaling grounds north and south of Unimak Pass (Stewart et al., 1987; Fig. 3). The purpose of the survey was to search for cetaceans and to determine if low densities, which had been reported in the past, were artifacts of sparse coverage and poor survey conditions or were representative of the number of whales in the area. Surveys covered about 26,700 km^2 and were flown at the time of year when the greatest abundance of cetaceans was expected on the whaling grounds, based on historical records. There was a total of 78 cetacean sightings during systematic surveys and 24 cetacean sightings while transiting between Anchorage and Dutch Harbor. None of the sightings were belugas.

In 1985, 1986, and 1987, a series of surveys were conducted north and south of the Alaska Peninsula and in the eastern Aleutian Islands (Brueggeman et al.[4]; Fig. 4) to determine distribution, abundance, and habitat use patterns of endangered whales and other marine mammals. The 1985 aerial survey covered 74,000 km of trackline over the shelf, slope, and rise of the continental margin during seven periods between April and December. The 1986 aerial survey covered 33,300 km of trackline north and south of the Alaska Peninsula during four periods between March

[4] Brueggeman, J. J., G. A. Green, R. A. Grotefendt, R. W. Tressler, and D. G. Chapman. 1989. Marine mammal habitat use in the North Aleutian Basin, St. George Basin, and Gulf of Alaska. *In* L. E. Jarvela and L. K. Thorsteinson (Editors), Proceedings of the Gulf of Alaska, Cook Inlet, and North Aleutian Basin Information Update Meeting, Feb. 7–8, 1989, Anchorage, Alaska, p. 97–108. OCS Study MMS 89-0041, U.S. Dep. Inter., Miner. Manage. Serv.

and October. However, the 1986 survey was specifically for sea otters, *Enhydra lutris*, and did not list cetacean sightings. The 1987 NOAA *Miller Freeman* vessel survey covered over 3,700 km of trackline south of the Alaska Peninsula during June and July. Of the 2,000 cetacean sightings made in 1985 and 1987, none were belugas.

Intermittently between 1984 and 1991, several thousand hours of aerial survey effort were conducted for sea otters between Yakutat Bay and the Kenai Peninsula (Monnett[5]). Survey effort was concentrated in the eastern half of Prince William Sound between 1987 and 1989 and the western half of the Sound between 1989 and 1991. Cetacean sightings were noted during these surveys; however, no belugas were seen.

The 1990's

In 1992, the National Marine Mammal Laboratory (NMML) of NOAA's National Marine Fisheries Service (NMFS) initiated a study of killer whales, *Orcinus orca*, in Alaska. A 45-day vessel survey covering 5,254 km was conducted in the Bering Sea and western Gulf of Alaska from 9 July to 22 August (Dahlheim and Waite[6]). The survey area focused on the central and eastern Aleutian Islands, southeastern Bering Sea, south side of the Alaska Peninsula, and the waters surrounding Kodiak Island (Fig. 5). The objectives of the survey were to obtain a minimum population estimate of killer whales using photo-identification techniques and to establish baseline data for detecting annual changes in abundance. Seven species of cetaceans were sighted during the survey, none of which were belugas. This survey was continued from 13 July to 24 August 1993 (43 days), covering 8,334 km in the eastern Aleutian Islands, southeastern Bering Sea, south side of the Alaska Peninsula, and Kodiak Island Archipelago (Dahlheim[7]; Fig. 5). Six species of cetaceans were sighted, and again, none were belugas.

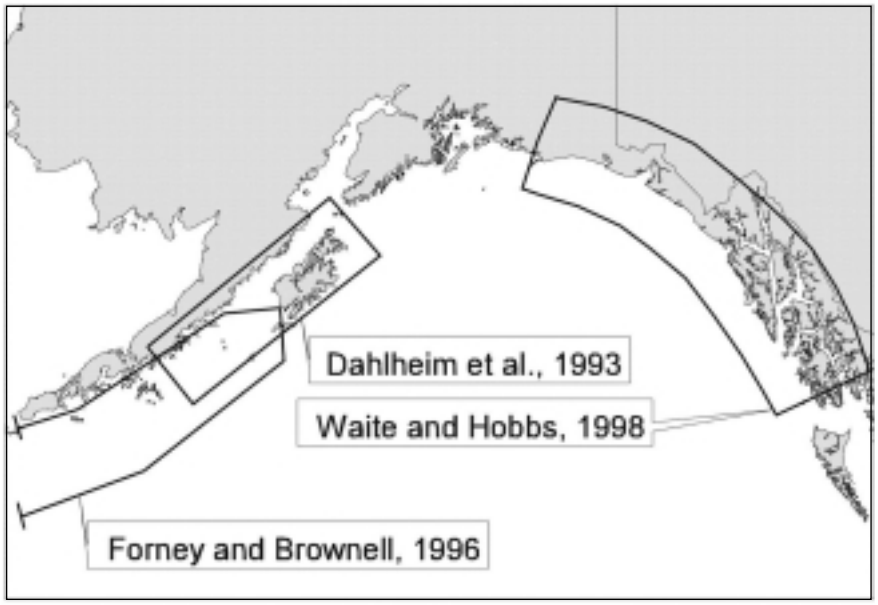

Figure 6.—Marine mammal survey areas of Dahlheim et al. (text footnote 10), Forney and Brownell (text footnote 12), and Waite and Hobbs (text footnote 14).

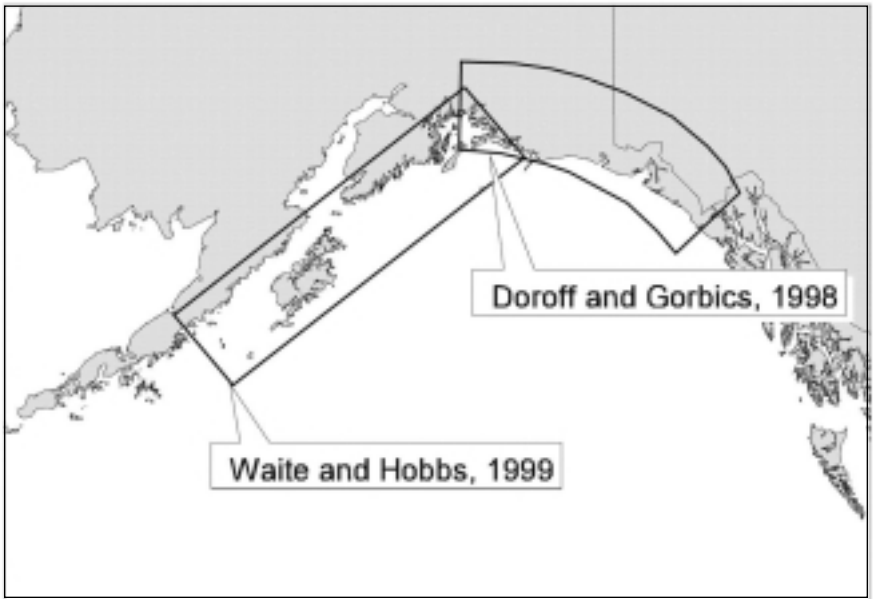

Figure 7.—Marine mammal survey areas of Doroff and Gorbics (text footnote 13) and Waite and Hobbs (text footnote 15).

During 1991–93, the NMML conducted a 3-year study of harbor porpoise to obtain minimum population estimates in Alaska coastal waters (Dahlheim et al., 2000). The survey area was divided into seven regions based on geographic considerations to facilitate

[5] Monnett, C. 1999. U.S. Dep. Inter., Miner. Manage. Serv. Anchorage, Alaska. Personal commun. via K. Laidre, on file at NMFS Natl. Mar. Mammal Lab., Seattle, Wash.

[6] Dahlheim, M. D., and J. M. Waite. 1992. Abundance and distribution of killer whales (*Orcinus orca*) in Alaska in 1992. Annu. Rep. to MMPA Assessment Program, Off. Protect. Resour., NMFS, NOAA, 1335 East-West Hwy., Silver Spring, MD 20910, 19 p.

[7] Dahlheim, M. D. 1993. Abundance and distribution of killer whales (*Orcinus orca*) in Alaska, 1993. Annu. Rep. to MMPA Assessment Program, Off. Protect. Resour., NMFS, NOAA, 1335 East-West Hwy., Silver Spring, MD 20910, 17 p.

Table 1.—Documented sightings of belugas in waters south and east of the Alaska Peninsula, excluding Cook Inlet. Some positions were approximated based on descriptive locations.

Map I.D. no.	Date	Location	Latitude Longitude	Group size	Source	Type[1]
1	4/23/40	Tacoma, Wash.	47°16′N 122°33′W	1	Scheffer and Slipp (1948)	I
2	7/16/75	Shelikof Strait, near Kodiak I.	58°00′N 154°11′W	2	Harrison and Hall (1978)	D
3	3/29/76	Montague Island, Prince William Sd.	59°57′N 147°22′W	1	Harrison and Hall (1978)	D
4	5/31/76	Yakutat Bay	59°45′N 139°50′W	21+5[2]	Fiscus et al.[3], Calkins and Pitcher[4]	P
5	3/83/77	Marmot Bay, between Kodiak and Afognak I.	58°00′N 152°52′W	1	Harrison and Hall (1978); also Consiglieri et al. (text footnote 16)	D
6	4/12/78	Barren Islands, north of Kodiak I.	58°48.9′N 152°11.9′W	3[5]	Consiglieri et al. (text footnote 16)	P
7	4/20/79	Yakutat Bay	~59º42′N 139º45′W	6	Mallot[6]	I
8	7/15/79	Yakutat Bay	~59º42′N 139º45′W	Several	Cox and Ranney[7]	I
9	8/6/82	SW entrance of Shelikof Strait, west of Kodiak I.	56°59.5′N 156°27.6′W	1	Leatherwood et al. (text footnote 3)	D
10	7/25/83	Near Bligh Island, Prince William Sd.	60°50′N 146°55′WI	200	Campbell (text footnote 18)	I
11	5/10/87	Cape Hinchinbrook, Prince William Sd.	60°14.07′N 146°38.08′W	1	NMML POP, unpubl. data[8]	P
12	5/11/87	Cape St. Elias off Kayak Island, Prince William Sd.	59°49.0′N 144°34.03′W	1	NMML POP, unpubl. data[8]	P
13	8/1/87	Between E. Chugach I. and the Kenai Pen., north of Kodiak I.	59°10.03′N 151°24.08′W	8	NMML POP, unpubl. data[8]	P
14	Summer 1988	Aialik Bay, at the entrance of Holgate Arm, Prince William Sd.	59°48.5′N 149°46.5′W	1[9]	NMFS 1992[10]	I
15	9/24/93	Disenchantment Bay, Yakutat Bay	60°02.10′N 139°32.10′W	2	Ream[11]	I
16	2/19/97	Disenchantment Bay, Yakutat Bay	60°01.5′N 139°33.1′W	10	Hubbard et al. 1999	I
17	8/20/97 to 8/25/97	W. of Disenchantment Bay, S. of Turner Glacier, Yakutat Bay	59°59.17′N 139°37.06′W	1–5[12]	Small and Lowry[13]	I
18	9/6/97	Resurrection Bay, Seward, near the shiplift, Prince William Sd.	60°06.55′N 149°25.68′W	6–8	Daley[14]	I
19	Winter 1997	W. Uganik Bay near Village Islands, Kodiak I.	57°47′N 153°33′W	1	Little[15]	I
20	8/9/98	St. Mathews Bay, Prince William Sound	60°46.3′N 146°16.9′W	1	Janka[16]	I
21	11/16/98 to 12/8/98	Disenchantment Bay, Yakutat Bay	60°03′N 139°33′W	6–11[17]	Molthen[18] and Howard[19]	I
22	7/14/99	Near tip of Gore Pt., East of Elizabeth I.	59°11′N 151°0′W	5	St. Peter[20]	I

Continued on facing page.

survey coverage (Fig. 4). Each of the seven areas was surveyed at least once over the 3-year period. Line-transects were covered by the NOAA ship *John N. Cobb* and a NOAA Twin Otter[8]. In 1991, three vessel surveys were completed in the inside waters of southeastern Alaska (20 April–3 May, 15–25 July, and 12–19 September), with aerial surveys completed in 1991 in Cook Inlet (1–2 August) (Dahlheim et al.[9]). In 1992, vessel surveys were conducted in southeastern Alaska (29 April–12 May, 11–23 June, and 10–24 September) and aerial surveys were conducted off Kodiak Island and the south side of the Alaska Peninsula (6 July–9 August) (Dahlheim et al.[10]). In 1993, vessel surveys were completed in the inside waters of southeastern Alaska (30 April–13 May, 7–20 June, and 22 September–3 October) and aerial surveys in the offshore waters from Dixon Entrance to Prince William Sound (1–26 June) (Dahlheim et al.[11]). Over the 3-year survey period, nine species of cetaceans were identified; however, with

[8] Mention of trade names or commercial firms does not imply endorsement by the National Marine Fisheries Service, NOAA.

[9] Dahlheim, M. D., A. E. York, J. M. Waite, and C. Goebel-Diaz. 1992. Abundance and distribution of harbor porpoise (*Phocoena phocoena*) in southeast Alaska, Cook Inlet, and Bristol Bay, Alaska. Annu. Rep. to MMPA Assessment Program, Off. Protect. Resour., NMFS, NOAA, 1335 East-West Hwy., Silver Spring, MD 20910, 26 p.

[10] Dahlheim, M. D., A. E. York, J. M. Waite, and R. Towell. 1993. Abundance and distribution of harbor porpoise (*Phocoena phocoena*) in southeast Alaska and the western Gulf of Alaska, 1992. Annu. rep. to MMPA Assessment Program, Off. Protect. Resour., NMFS, NOAA, 1335 East-West Hwy., Silver Spring, MD 20910, 13 p.

[11] Dahlheim, M. D., A. E. York, J. M. Waite, and R. Towell. 1994. Abundance and distribution of harbor porpoise (*Phocoena phocoena*) in southeast Alaska and the offshore waters of Dixon Entrance to Prince William Sound, 1993. Annu. Rep. to MMPA Assessment Program, Off. Protect. Resour., NMFS, NOAA, 1335 East-West Hwy., Silver Spring, MD 20910, 25 p.

Table 1.—Continued.

Map I.D. no.	Date	Location	Latitude Longitude	Group size	Source	Type[1]
23	7/27/99	Simpson Bay, Prince William Sound	60°40′N 146°20′W	1	Dodge[21]	I
24	8/1/99	Barren Is.	59°00′N 152°00′W	1	Rutledge[22]	I
25	9/3/99	Simpson Bay, Prince William Sound	60°33′N 145°48′W	1	Anderson[23]	I
26	9/4/99	Goose I., Prince William Sound	60°44′N 146°45′W	1	Matkin[24]	I
27	8/00 to summer 2001	Alitak Bay, south end of Kodiak I.	56° 32′N 154° 20′W	1	Wynne and Lord[25]	I
28	8/14/00 to 8/15/00	Bancas Pt. and Russell Fjord, Yakutat Bay	59° 55′N 139° 20′W	6 (4–8)	Herter and Plafker[26]	I

[1] D = dedicated marine mammal survey with records of effort and other cetaceans seen; P = sighting of a beluga on a survey without dedicated effort (e.g. sightings from the POP database); I = incidental beluga sighting without effort information.

[2] Fiscus et al. (1976) report the sighting as 21 adults and 5 subadults (cited as personal commun. from D. Calkins) while Calkins and Pitcher (1977) only report 21 animals.

[3] Fiscus, C. H., H. W. Braham, and R. W. Mercer. 1976. Seasonal distribution and relative abundance of marine mammals in the Gulf of Alaska. p. 19-264. Final Rep. Outer Continental Shelf Environ. Assessment Program, U.S. Dep. Inter., Bur. Land Manage.

[4] Calkins, D., and K. Pitcher. 1977. Unusual sightings of marine mammals in the Gulf of Alaska. *In* Abstracts of the Second Conference on the Biology of Marine Mammals, San Diego, CA, 12–15 December 1977, p. 53.

[5] Comment in POP database states “slate gray, young”.

[6] Mallot, B. 1979. Personal commun. ADFG records, Anchorage.

[7] Cox, D., and G. Ranney. 1979. Personal commun. ADFG records, Anchorage.

[8] Laidre, K. L., and S. A. Mizroch. 1997. Geographic distribution of marine mammals in the North Pacific Ocean, National Marine Mammal Laboratory, 1958–1995. Unpubl. NMML data, 17 p.

[9] Reported by sport fishermen. Color photographs show the animal to be a subadult milling around several boats. No other belugas were observed in the vicinity.

[10] NMFS. 1992. Status report on Cook Inlet belugas (*Delphinapterus leucas*). Unpubl. doc. prep. by NMFS Alaska Reg. Off., 222 West 7th Ave., #43, Anchorage, AK 99513, 22 p.

[11] Ream, R. 1993. National Marine Mammal Lab., NMFS, NOAA. Personal commun. via D. Rugh, NMML, NMFS, Seattle, Wash.

[12] According to R. Small, Native hunters report seeing belugas in the area year round. Sightings on the 20 and 21 Aug. included large white animals only.

[13] Small, R., and L. Lowry. 1997. Alaska Dep. Fish Game, Anchorage, Alaska. Personal commun. via D. Rugh, NMML, NMFS, Seattle, Wash. This sighting includes four resightings of the same group. This group was also seen by Bert Adams, Sr. (Yakutat Tribal President) in July 1997.

[14] Daley, N. 1997. Personal commun. via C. Matkin to B. Mahoney, NMFS Alaska Reg. Off., Anchorage.

[15] Little, D. 1997. Personal commun. via B. Mahoney, NMFS, Alaska Reg. Off., Anchorage.

[16] Janka, D. 1998. National Marine Fisheries Service, AKR. Personal commun. via B. Mahoney, NMFS, Alaska Reg. Off., Anchorage.

[17] Whales were in pancake ice and in the same location on both days. Several large white adult whales were observed in the group. No whales were observed on 8 Dec. when heavier ice was in the area However, Lt. K. Howard, USCG, reported 10–11 whales (3 of which were gray) on 16 Nov., 3 Dec., and 8 Dec. in a small cove northwest of Brady Glacier (personal commun. to B. Smith, NMFS, Alaska Reg. Off., Anchorage), possibly the same group observed by D. Molthen.

[18] Molthen, D. 1998. United States Coast Guard. Personal commun. via S. Moore, NMML, NMFS, Seattle, Wash.

[19] Howard, K. 1998. United States Coast Guard. Personal commun. via B. Mahoney, NMFS, Alaska Reg. Off., Anchorage.

[20] St. Peter, J. 1999. Personal commun. via B. Mahoney, NMFS, Alaska Reg. Off., Anchorage.

[21] Dodge, B. 1999. Prince William Sound Science Center. Personal commun. via B. Mahoney, NMFS, Alaska Reg. Off., Anchorage.

[22] Rutledge, A. 1999. Personal commun. via B. Mahoney, NMFS, Alaska Reg. Off., Anchorage.

[23] Anderson, P. 1999. Charter boat operator, Cordova, AK. Personal commun. via D. Rugh, NMML, Seattle, Wash.

[24] Matkin, C. 1999. P. O. Box 15244, Homer, AK 99603. Personal commun. via D. Rugh, NMML, Seattle, Wash.

[25] Wynne, K. 2000. Univ. Alaska Fairbanks, Kodiak, AK, and N. Lord, journalist. Personal commun. via B. Mahoney, NMFS Alaska Reg. Off., Anchorage. A young, lone beluga was seen in Alitak Bay intermittently between August 2000 and summer 2001 (at the time of this writing). It seemed to be quite tame and had a propellor-like scar on its back.

[26] Herter, M., and G. Plafker. 2001. U.S. Geological Survey. Personal commun. via L. Jemison, Alaska Dept. of Fish and Game, Anchorage, AK.

the exception of Cook Inlet, there were no beluga sightings in any of the seven survey regions (Dahlheim et al.[9,10,11]).

In August 1994, a vessel survey was conducted south of the Aleutian Islands to assess abundance and distribution of large whales in historical whaling grounds (Forney and Brownell[12]) (Fig. 6). The survey covered 3,797 km of trackline, but this included areas well west of Unimak Pass. Eight species of cetaceans were sighted during the survey, but none were belugas.

In August of 1995 and 1996, aerial surveys were conducted in the Gulf of Alaska to determine the distribution of sea otters along the outer coast and their abundance within Yakutat Bay (Doroff and Gorbics[13]). The first survey was conducted from Cape Suckling to Cape Spencer during 8–9 August 1995 (Fig. 7). The second survey was conducted from Cape Hinchinbrook to Cape Suckling during 19–23 August 1996. Of 907 marine mammal sightings, no belugas were recorded in either year.

In 1997, the NMML began a series of surveys conducted over a 3-year period to estimate abundances of harbor porpoise, Dall’s porpoise, *Phocoenoides dalli*, and Pacific white-sided dolphins, *Lagenorhynchus obliquidens* (Waite and Hobbs[14,15]). Between 27 May and 28 July 1997, 53 survey hours covered parts

[12] Forney, K. A., and R. L. Brownell. 1996. Preliminary report of the 1994 Aleutian Island Marine Mammal Survey. Pap. SC/48/O11 pres. to IWC Sci. Committee 1996, 9 p.

[13] Doroff, A., and C. Gorbics. 1998. Sea otter surveys of Yakutat Bay and adjacent Gulf of Alaska coastal areas—Cape Hinchinbrook to Cape Spencer 1995–1996. Final Rep. to Minerals Manage. Serv., 949 E. 36th Ave. Suite 300, Anchorage, AK 99503. OCS Study MMS 97-0026, 45 p.

[14] Waite, J. M., and R. C. Hobbs. 1998. Small cetacean aerial and vessel survey in southeast Alaska and the eastern Gulf of Alaska, 1997. *In* P. S. Hill, B. Jones, and D. P. DeMaster (Editors), Marine Mammal Protection Act and Endangered Species Act Implementation Program, 1997, p. 23–35, U.S. Dep. Commer., NOAA, Natl. Mar.

Continued on next page.

of southeastern Alaska and the eastern Gulf of Alaska from Dixon Entrance to Cape Suckling, including Yakutat Bay (Fig. 6). A concurrent vessel survey was conducted in Glacier Bay and Icy Strait aboard the NOAA ship *John N. Cobb*. The vessel survey totaled 45 hours and was conducted 31 May–5 June. In 1998, from 27 May to 28 July, aerial surveys included Prince William Sound and the Gulf of Alaska from Cape Suckling to the Alaska Peninsula as far as the Semidi Islands, including Shelikof Strait (Waite and Hobbs[15]) (Fig. 7). The western end of the Alaska Peninsula was surveyed in 1999 as a part of the survey in Bristol Bay. In these three years, 846 marine mammal sightings were made during the aerial surveys in the Gulf of Alaska and adjacent waters, and 303 sightings were made during the vessel survey, but there were no sightings of beluga whales in this area, including the survey in Yakutat Bay under excellent conditions. The only belugas that were seen were in Bristol Bay and Cook Inlet.

In September 1999, aerial surveys were begun to document the seasonal distribution of Steller sea lions, *Eumetopias jubatus*, and cetaceans around the Kodiak Archipelago (Wynne[16]). These surveys were flown once a month, each usually taking 4 h to complete. Approximately 12 h were flown in 1999 and 48 h in 2000. Wynne[16] also reported flying a repetitive series of surveys (4.5 hours for each of 7 or 8 flight-days per year) each August since 1992, looking for harbor seals, *Phoca vitulina*, in the Kodiak vicinity. All cetacean sightings were reported for these surveys (7 species), but no belugas were seen.

Opportunistic Records

Platforms of Opportunity Program

In addition to the marine mammal sightings reported during dedicated surveys (listed above), the NMFS maintains a database of marine mammal observations collected during both dedicated and opportunistic surveys. Sightings made in the Gulf of Alaska between 1958 and 1980, including incidental observations reported to the NMFS Platforms of Opportunity Program (POP), were summarized by Consiglieri et al.[17]. The report provided an overview of seasonal distribution and relative abundance of marine mammals in the Gulf of Alaska. Data were gathered from four sources: 1) the NMML Dall's Porpoise Research Program (operated from NOAA and U.S. Coast Guard ships from 1975 to 1980); 2) the NMML pelagic fur seal, *Callorhinus ursinus*, program (1958 to 1974); 3) an Outer Continental Shelf Environmental Assessment Program (OCSEAP) dedicated summer vessel cruise in 1980; and 4) POP observers on NOAA or other ships. Forty percent of the POP database consisted of sightings with quantified effort, most of which occurred after 1975. Laidre and Mizroch[18] updated the listing of marine mammal sightings to include POP records collected through 1995 (Fig. 1). Sighting data are from the entire Gulf, extending north from lat. 54°N to the Alaska coast and from long. 133°W to 157°W, inclusive of all data collected from 1958 to 1995. Of the 141 beluga sightings in the POP database, only 5 (39 belugas) occurred in the Gulf of Alaska (Table 1: Map I.D. no. 4, 6, 11, 12, 13).

In addition to the 4 beluga sightings that occurred during dedicated marine mammal surveys and the 5 sightings from opportunistic studies without known effort, there were 19 incidental records without any information on effort or other cetaceans seen. For example, beluga sightings reported from commercial or recreational fishing boats, tourists, and bird surveys have been included here; however, this network of information cannot be evaluated in terms of the amount of time spent searching for animals that may have resulted in a beluga sighting.

The first incidental sighting in this record, a beluga seen near Tacoma, Washington, in April 1940 (Scheffer and Slipp, 1948), is anomalous, though the sighting was well documented and seems credible (Table 1: Map I.D. no. 1). The approximate distance from upper Cook Inlet is well over 2,500 km, similar to the distance belugas are known to swim annually from the ice front in the Bering Sea to the Beaufort Sea.

In these records, there was only one sighting of more than 30 beluga whales at a time, other than in Cook Inlet where 200–400 are seen regularly (Rugh et al., 2000): a report of 200 belugas in Prince William Sound on 25 July 1983 (Campbell[19]; Table 1: Map I.D. no. 10). Note that in the same year in Cook Inlet, 262 belugas were counted on 27 May, 13 belugas on 24 June, and 176 belugas on 20 July (Calkins[20]). This unusual record occurred during a season following a particularly strong El Niño event (Enfield, 1989) which may have affected fish distribution.

Summary and Conclusions

Very few dedicated marine mammal surveys were conducted in the Gulf of Alaska prior to the 1970's. Since then marine mammal survey effort has intensified, yet reported sightings of belugas have not increased. During the 13 well documented surveys reported here, over 23,000 cetaceans were seen; however,

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[14] *(cont.)* Fish. Serv., Alaska Fish. Sci. Cent. Proc. Rep. 98–10.

[15] Waite, J. M., and R. C. Hobbs. 1999. Small cetacean aerial survey in Prince William Sound and the western Gulf of Alaska in 1998 and preliminary harbor porpoise abundance estimates for the southeast Alaska and the Gulf of Alaska stocks. *In* A. L. Lopez and D. P. DeMaster (Editors), Marine Mammal Protection Act and Endangered Species Act Implementation Program, 1998, p. 39–53, U.S. Dep. Commer., NOAA, Natl. Mar. Fish. Serv., Alaska Fish. Sci. Cent. Proc. Rep. 99–08.

[16] Wynne, K. 2000. University of Alaska Fairbanks, Kodiak, Alaska. Personal commun. via D. Rugh, on file at NMFS Natl. Mar. Mammal Lab., Seattle, Wash.

[17] Consiglieri, L. D., H. W. Braham, M. E. Dahlheim, C. Fiscus, P. D. McGuire, C. E. Peterson, and D. A. Pippenger. 1982. Seasonal distribution and relative abundance of marine mammals in the Gulf of Alaska. Final Rep., p. 189–280. Outer Cont. Shelf Environ. Assessment Program, U.S. Dep. Inter., Bur. Land Manage.

[18] Laidre, K. L., and S. A. Mizroch. 1997. Database modifications and data analysis for the Platforms of Opportunity Program at the National Marine Mammal Laboratory, 1958–1995. Unpubl. doc., 13 p., on file at NMFS Natl. Mar. Mammal Lab., Seattle, Wash.

[19] Campbell, B. 1999. Oregon State Dep. Fish Wildl., Springfield. Personal commun. via K. Shelden, on file at NMFS Natl. Mar. Mammal Lab., Seattle, Wash.

[20] Calkins, D. G. 1984. Belukha whale. Vol. IX of Susitna hydroelectric project; final report; big game studies. Alaska Dep. Fish Game., Doc. 2328, 17 p.

only 5 were belugas (4 sightings) (Harrison and Hall, 1978; Leatherwood et al.[3]; and Table 1). Of the surveys conducted in the Gulf of Alaska reported in the POP database, nearly 100,000 cetaceans were seen (Table 2). Of these, 1,789 (141 sightings) were belugas; however, only 39 (5 sightings) were outside of Cook Inlet. Furthermore, approximately 260 belugas (19 sightings) have been reported without information on effort or other cetacean sightings. Compared to the thousands of other cetaceans that have been reported, these 28 sightings collected over two decades indicate belugas are relatively rare in the Gulf of Alaska outside of Cook Inlet. In contrast, belugas have been recorded on virtually every survey for whales in Cook Inlet; for example, Klinkhart's [21] two surveys in 1963–64; Murray and Fay's[22] survey in August 1978; Calkins'[23] seven surveys in most months of the years 1974–79; Calkins'[20] two surveys in April through August 1982–83; the Hansen and Hubbard[24] surveys February through March 1997; and the nine June/July surveys by Rugh et al. (2000) during 1993–2000.

The beluga sightings in the Gulf of Alaska (Table 1, Fig. 1) occurred in three general areas: 9 were seen near Kodiak Island (including sightings west of Kodiak and east to the Kenai Peninsula); 10 were from Prince William Sound and east to Kayak Island (generally sightings of only a single animal each, Fig. 8); 8 were from Yakutat Bay; and 1 anomalous sighting was from south of the Gulf. In Table 1, there were only three reports of belugas in Yakutat Bay in the 1970's, but fishermen recalled often seeing 10–20 belugas there during this same time (Morris et al., 1983). There were no subsequent reports of belugas in Yakutat Bay until the 1990's. This may either be due to the lack of a mechanism to report sightings or to the lack of belugas; however, geologists with the U.S. Geological Service who have spent part of each summer in Yakutat Bay since 1964 never saw belugas there until August 2000 (Table 1). In 1997–98, several sightings of 5–10 animals were reported, including multiple sightings within a week of each other (Table 1). Notably, the Yakutat sightings occurred in all seasons of the year. However, these sightings were noncontiguous; therefore, they do not indicate that these whales are a resident population. These belugas are considered to be occasional visitors from Cook Inlet—only 1,000 km away—rather than permanent residents (Calkins[25]; Hubbard et al., 1999; Huntington, 2000) because many dedicated surveys in this area have not found belugas (Fig. 2–7). Currently, there is no satisfactory evidence to determine whether these whales are part of the Cook Inlet stock or whether they are a separate population.

The apparent geographic isolation of belugas in Cook Inlet is supported by mitochondrial DNA analyses which show distinct differences between Cook Inlet belugas and the other four stocks of belugas in Alaska (O'Corry-Crowe

Figure 8.—Beluga whale seen in Prince William Sound on 9 August 1998. Photo by Dave Janka (Table 1 footnote 16).

Table 2.—Sightings of marine mammals in the Gulf of Alaska (excluding Cook Inlet) from the reported literature in this review where sightings are listed by species. Number of individuals is a minimum because some authors only reported number of sightings. This table does not include beluga sightings reported without information on effort or other cetacean sightings.

Marine mammal	Individuals
Dolphin and porpoise	55,897
Medium-sized cetacean	9,111
Large whale	19,814
Pinniped	64,677
Unidentified cetacean	14,485
Unidentified pinniped	5,522
Beluga	44
Total	169,550

[21] Klinkhart, E. G. 1966. The beluga whale in Alaska. State of Alaska Dep. Fish Game, Juneau, Fed. Aid Wildl. Restor. Proj. Rep. Vol. VII, Proj. W-6-R and W-14-R, 11 p.

[22] Murray, N. K., and F. H. Fay. 1979. The white whales or belukhas, *Delphinapterus leucas*, of Cook Inlet, Alaska. Pap. SC/31/SM12 pres. to IWC Sci. Committee, June 1979, 7 p.

[23] Calkins, D. G. 1979. Marine mammals of lower Cook Inlet and the potential for impact from Outer Continental Shelf oil and gas exploration, development and transport. Alaska Dep. Fish Game, 333 Raspberry Rd., Anchorage, 89 p.

[24] Hansen, D. J., and J. D. Hubbard. 1998. Distribution and abundance of Cook Inlet beluga whales (*Delphinapterus leucas*) in winter. U.S. Dep. Inter., Bur. Land. Manage., Minerals Management Serv., Environ. Stud. Sec., Alaska OCS Reg., 949 East 36th Ave., Anchorage AK 99508-4363, Draft Final Rep., 34 p.

[25] Calkins, D. G. 1989. Status of belukha whales in Cook Inlet. *In* L. E. Jarvela and L. K. Thorsteinson (Editors), Proceedings of the Gulf of Alaska, Cook Inlet, and North Aleutian Basin Information Update Meeting, Feb. 7–8, 1989, Anchorage, Alaska, p. 109–112. OCS Study MMS 89-0041, U. S. Dep. Inter., Bur. Land. Manage., Minerals Manage. Serv.

et al., 1997). This high degree of genetic discreteness indicates there has been a long and consistent isolation of belugas in the waters of Cook Inlet. The paucity of belugas outside of Cook Inlet is further supported by archeological evidence, commercial whaling records, and marine mammal surveys. Although scattered sightings led to speculation that belugas may range along the northern part of the Gulf of Alaska (Murray and Fay[22]), overwhelming evidence supports our conclusion that the only persistent group of belugas in the Gulf of Alaska is in Cook Inlet.

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