DISTRIBUTION OF MARINE MAMMALS IN THE COASTAL ZONE OF THE EASTERN CHUKCHI SEA DURING SUMMER AND AUTUMN

by

Kathryn J. Frost, Lloyd F. Lowry, and John J. Burns

Alaska Department of Fish and Game
1300 College Road
Fairbanks, Alaska 99701

Assisted by

Susan Hills, Kathleen Pearse, and Jesse Venable

Final Report
Outer Continental Shelf Environmental Assessment Program
Research Unit 613, Contact Number NA 81 RAC 000 50

1 March 1983

TABLE OF CONTENTS

		Page
I.	Summary	569
II.	Introduction	570
III.	Current State of Knowledge	571
IV.	Study Area	578
V.	Methods	578
VI.	Results	580
	A. Hope Basin	580
	B. Barrow Arch	597
VII.	Discussion	614
	A. Spotted Seal	614
	B. Walrus	615
	C. Belukha Whale	618
	D. Harbor Porpoise	620
	E. Killer Whale	620
	F. Minke Whale	623
	G. Gray Whale	623
VIII.	Conclusions	623
	A. Adequacy of Sighting Data	623
	B. Importance of Coastal Regions to Marine Mammals	626
	C. Potential Effects of OCS Activities	627
IX.	Needs for Further Study	629
X.	Literature Cited	631
Appendix I.	Geographical Coordinates of Locations Referred to in the Text	641
Appendix II.	Source Names Index	645

LIST OF FIGURES

Figure Page

1. Map of the study area showing Outer Continental Shelf planning areas and subdivisions used in data compilation. 579

2. Map of the Hope Basin, regions HB 1, HB 2, and HB 3 584

3. Map of the Barrow Arch, regions BA 1 and BA 2 598

4. Map of the eastern Chukchi Sea showing major haulouts used by spotted seals 616

5. Map showing the only regularly used walrus haulout in the coastal zone of the eastern Chukchi Sea 617

6. Map of the eastern Chukchi Sea showing sightings of belukha whales in the coastal zone 619

7. Map of the eastern Chukchi Sea showing sightings of harbor porpoises in the coastal zone 621

8. Map of the eastern Chukchi Sea showing sightings of killer whales in the coastal zone 622

9. Map of the eastern Chukchi Sea showing sightings of minke whales in the coastal zone 624

10. Map of the eastern Chukchi Sea showing sightings of gray whales in the coastal zone . . , ... 625

LIST OF TABLES

Table		Page
1.	Geographical subdivisions of the Chukchi Sea study area	581
2.	Information sources consulted in addition to published literature	582
3.	Sightings of coastal marine mammals along the northern Seward Peninsula, Hope Basin, region HB 1	585
4.	Sightings of coastal marine mammals in Kotzebue Sound, Hope Basin, region HB2	588
5.	Sightings of coastal marine mammals from Cape Krusenstern to Cape Lisburne, Hope Basin, region HB 3	592
6.	Sightings of coastal marine mammals from Cape Lisburne to Wainwright, Barrow Arch, region BA 1	599
7.	Sightings of coastal marine mammals from Wainwright to Barrow, Barrow Arch, region BA 2	607

1. Summary

A study was conducted with the objectives of compiling all available sightings of marine mammals in the coastal zone of the eastern Chukchi Sea during summer and autumn and evaluating the importance of coastal areas to the various species. Specific attention was given to identification of terrestrial hauling areas used by pinnipeds, and bays, lagoons, and estuaries utilized by cetaceans. The study area included the mainland coast from Cape Prince of Wales to Point Barrow.

Based on available sightings, it was possible to identify in general terms the areas of greatest importance to marine mammals, as well as to examine some aspects of seasonal distribution and abundance in specific areas. Although marine mammals inhabit the entire coastal zone of the eastern Chukchi Sea during summer and autumn, their distribution is far from uniform. Spotted seals haul out in large numbers at Cape Espenberg and near Utukok and Akoliakatat passes in Kasegaluk Lagoon. They are abundant but do not haul out in large numbers in Eschscholtz Bay, Hotham Inlet, the Noatak and Kukpuk River estuaries, throughout Kasegaluk Lagoon, and in the mouths of the Kuk and Kugrua rivers. The only regularly used haulout for walruses is at Cape Lisburne. Major concentration areas for belukhas occur in Kotzebue Sound, particularly Eschscholtz Bay, and near Kasegaluk Lagoon. Harbor porpoises are occasionally present along the entire mainland coast. Killer whales occur regularly in low numbers, often in pursuit of gray or belukha whales. We located only three sightings of minke whales in the coastal zone, in Kotzebue Sound and off Cape Lisburne. Gray whales occur all along the coast but are especially numerous between Icy Cape and Point Barrow.

Available data indicate substantial fluctuations in numbers of animals at particular locations but are not adequate to measure those fluctuations or explain their causes. We suggest that OCSEAP initiate studies on representative species and areas, particularly spotted seals at Cape Espenberg and Kasegaluk Lagoon and belukhas in Kotzebue Sound and Kasegaluk Lagoon, in order that the effects of OCS activities on marine mammals in the coastal zone can be rigorously evaluated.

II. Introduction

The marine mammal fauna of the Chukchi Sea is much less diverse than that of the Bering Sea. Of the 26 species found in the Bering Sea, 10 are known to regularly occur in Alaskan waters north of Bering Strait. During approximately 9 months of the year, the northern seas are covered by ice, and the marine mammals present then--ringed seals (Phoca hispida), bearded seals (Erignathus barbatus), and polar bears (Ursus maritimus)--are those that are strongly ice associated and adapted to living in the pack or landfast ice. During summer months these species remain ice associated and move northward and offshore to summer in the pack ice. During the ice-free months there is an influx of species from the south. Some, such as spotted seals (Phoca largha), belukha whales (Delphinapterus leucas), and walruses (Odobenus rosmarus divergent), are ice associated during winter but prefer the more open ice front or pack, and some, such as harbor porpoises (Phocoena phocoena) and gray whales (Eschrichtius robustus), are not ice-adapted species. Not all of the species present during ice-free months are found near-shore. Those species regularly or potentially utilizing the coastal zone during summer and autumn include the spotted seal, walrus, belukha whale, harbor porpoise, and gray whale.

Killer whales (Orcinus orca) and minke whales (Balaenoptera acutorostrata) may occasionally be present in the Chukchi Sea, including the coastal zone. Although they are not known to occur there in significant numbers, they were-included in this report. Polar bears are not regular summer-autumn inhabitants of the coastal zone; however, they do come ashore in early winter to den and have their young. Bowhead whales (Balaena mysticetus) migrate through the Chukchi and western Beau fort seas twice annually. Although they may sometimes pass through the coastal zone, they do not linger there; they are generally found farther offshore.

Nearshore areas are attractive to marine mammals for a variety of reasons. While in the coastal zone, spotted seals, belukha whales, and harbor porpoises forage on the abundant food resources available in nearshore waters. Spotted seals and walruses haul out at specific coastal locations where they rest between feeding forays. Gray whales are probably not specifically attracted to the coastal zone but utilize it as a continuum of the shallow feeding areas of the Chukchi platform.

While major features of the distributing and biology of these species are generally known e.g., Lowry et al. 1982b), specific published information on the r utilization of coastal waters of the Chukchi Sea is generally not available. Proposed OCS leases will offer for sale much of the area adjacent to important coastal marine habitats in the Chukchi Sea. Potential effects of OCS exploration, development, and production activities on marine mammals include not only chronic and catastrophic discharge of hydrocarbons into the environment, but also disturbance factors associated with both onshore and offshore activities. Information on the distribution of marine mammals in the

coastal zone must be of adequate resolution to provide input for tract selections, selection of onshore facilities sites, designation of transportation corridors, and design of stipulations relating to the nature and timing of activities. In addition, such information is required in order to evaluate "normal" changes in the distribution and numbers of marine mammals in coastal areas, as well as to monitor the future impacts of OCS activities.

This project has included two major components. The first involved field work, designed to increase the data available on distribution and food habits of marine mammals along the western coast of Alaska. Included were shipboard and aerial surveys and collections of animals conducted during May to October 1981. Results of the field studies have been compiled and reported (Lowry et al. 1982a). The second component consisted of a compilation of all available data on distribution and abundance of marine mammals in the coastal "zone of western Alaska during summer and autumn. The compilation of distributional information has been prepared in two parts, a previous report covering the Bering Sea coast, which was prepared and submitted to OCSEAP in September 1982, and this report, which covers the Chukchi Sea.

III. Current State of Knowledge

A. Spotted Seals

Published information on the distribution of spotted seals is limited to general descriptive accounts of their overall distribution (Shaughnessy and Fay 1977, Bigg 1981) or of their distribution in the Bering Sea ice front in spring (Burns 1970; Fay 1974; Burns and Harbo 1977; Burns et al. 1980; Braham et al., in press a). In late winter and spring, the entire Bering-Chukchi population is concentrated in or near the ice front (Burns and Harbo 1977, Burns 1978), with major pupping and breeding concentrations in the Bristol Bay-Pribilof Islands region, Karaginski Bay, and the Gulf of Anadyr (Shaughnessy and Fay 1977). As the ice disintegrates and recedes in spring, spotted seals move generally northward and toward the coast. During summer they are common along the eastern Bering and Chukchi Sea coasts, where they haul out on land, particularly isolated, sandy beaches and barrier islands. They are common in bays, at the mouths of major rivers, and in estuaries (Burns and Morrow 1975). A few animals move eastward into the Beaufort Sea (Burns 1978). In autumn and early winter, as shorefast ice begins to form, spotted seals move offshore and southward to the edge of the pack ice (Fay 1974).

The population of spotted seals in the Bering-Chukchi region has been estimated at 280,000-300,000, of which 80,000 occur in Karaginski Bay (Burns 1978).

B. Pacific Walrus

Pacific walruses inhabit the broad continental shelf of the Bering and Chukchi seas. They migrate seasonally from wintering areas in the Bering Sea to summering grounds on the coast of the Bering and Chukchi seas and the Chukchi Sea ice edge. Based on observations conducted from 1960 to 1976, there are two areas of concentration in late winter and early spring, one south and west of St. Lawrence Island and the other in Bristol Bay (Fay 1982). The actual location of these concentrations is somewhat dependent on the extent of ice in the Bering Sea, which the animals use as a resting platform when not engaged in other activities such as feeding and breeding. Mating occurs in February-March, and females give birth in April-May while moving north with the receding ice edge. Much of the population migrates northward through Bering Strait in April and May. Subadults and females with young follow the retreating ice edge northward and summer primarily in the northern Chukchi Sea (Estes and Gilbert 1978). Adult males form large herds on hauling grounds in Bristol Bay, Bering Strait, and along the Chukchi Peninsula.

Most aerial surveys of walruses have been conducted over the pack ice in Bering Sea in spring or over the Chukchi Sea ice edge and coastal rookeries along the Chukchi Peninsula in late summer-early autumn. Thus, there are numerous accounts of winter-spring distribution in the offshore Bering Sea (e.g., Kenyon 1960b, Kenyon 1972, Burns and Harbo 1977, Krogman et al. 1979) and summer distribution in the Chukchi Sea (e.g., Fedoseev 1962, Gol'tsev 1972).

Fay (1957) summarized the historical and present status of walruses and reported that in the 1930's walrus herds were present on hauling grounds at Cape Thompson, Cape Lisburne, and Icy Cape. By the 1950's, however, there were no regular hauling grounds in Alaska except the Walrus Islands in Bristol Bay. Fay also noted that, after 1900, records of walruses east of Point Barrow were rare.

Dunbar (1949), Bee and Hall (1956), and Harington (1966) discussed the occurrence of walruses east of Point Barrow. All reported that walruses were occasionally seen along the northern Alaskan and Canadian coasts east to Hershel Island and rarely at Banks Island in the eastern Beaufort Sea. Bee and Hall listed 12 records of sightings between Point Barrow and the Alaska-Yukon border.

Fedoseev (1962) discussed the distribution and status of Pacific walruses based on aerial surveys flown in autumn 1960. He noted that walruses were most abundant in the vicinity of Wrangel Island and that they hauled out on land at five locations, including Wrangel and Herald islands and three locations on the Chukchi Peninsula. Fedoseev's surveys did not include the American sector of the Chukchi Sea, but he cited Fay in saying there were no extant haulouts along the Alaskan Chukchi coast.

Gol'tsev (1972) reported on an autumn 1970 aerial survey for walruses in the western Chukchi Sea. He found that there were four onshore haul ing grounds: one in the Gulf of Anadyr, two in Bering Strait, and one along the Chukchi coast. His surveys did not extend to the American Chukchi coast.

In autumn 1975, Gol'tsev (1976) again conducted aerial surveys of walruses in the Soviet sector of the Chukchi and northern Bering seas. He reported nine coastal hauling grounds, two of which were in the Chukchi Sea, and noted that a substantial increase in the Pacific walrus population had occurred since his previous survey. As in 1970, the 1975 survey included only the Soviet sector of the Arctic.

Krogman et al. (1979) summarized the historical and recent distribution and abundance of walruses. They noted that walruses have always been abundant along the Alaskan Chukchi coast but that few are found east of Point Barrow. They estimated that from July through September about 40% of the population along the Chukchi Sea ice front is located between 161°W and 166°W.

The best synoptic overview of walrus distribution in Alaska is provided by Fay (1982), in which he maps and discusses distribution by month. He states that solitary animals may overwinter near Point Hope, but that most walruses migrate southward through Bering Strait in October-December. Most return northward in April-July to spend the summer in the pack ice of the Chukchi Sea. From July through September, many are concentrated i n the ice off the coast from Icy Cape to Barrow. He reported no recently used haulouts along the Alaskan Chukchi coast.

C. Belukha Whale

Belukha whales are widely though not uniformly distributed throughout seasonal ly ice-covered waters of Alaska. They spend the winter in offshore waters associated with drifting ice. In spring, as soon as the ice begins to break up and move offshore, they move toward the coast, some making extensive northward migrations in excess of 2,000 km, whi le others move relatively short distances. Most belukhas appear to spend the summer in coastal waters, concentrating in shal low bays or estuaries of large rivers, although an unknown proportion may remain associated with offshore pack ice. In late summer to late autumn, they move general ly south and away from the coast, ahead of or with the advancing pack ice (Kleinenberg et al. 1964, Fay 1974, Gurevich 1980, Seaman and Burns 1981). Major summer concentrations in the Chukchi Sea occur in Kotzebue Sound and along the coast from Cape Lisburne to Point Barrow, primarily in the Kasegaluk Lagoon region (Seaman and Burns 1981; Burns et al., in prep.).

General accounts of the distribution of belukhas in Alaskan waters have been presented by Nelson (1887), Gurevich (1980), Seaman and Burns (1981), and Burns et al. (in prep.). Nelson found belukhas to

be common summer residents from Bristol Bay north to Point Barrow. He considered them to be migratory over most of their range, moving north in spring as the ice melted and receded and south in autumn as the pack ice advanced. Seaman and Burns, and Burns et al. summarized the distribution of belukhas by 2-month intervals and also concluded that most belukhas winter in the drifting ice of the Bering Sea, move northward and toward the coast in spring and summer, and leave the coastal zone in late summer to late autumn. Burns et al. (in prep.) present a detailed discussion of the distribution of belukhas in the Chukchi Sea.

Braham et al. (in press b) plotted more than 400 sightings of a total of almost 2,000 belukhas. Many sightings were made in conjunction with spring bowhead whale surveys from Point Hope to just east of Point Barrow. They described the spring migration of belukhas from the Bering Sea through the Chukchi Sea to the eastern Beaufort Sea, noting that those whales summering in the Canadian Beaufort pass through the Chukchi in mid- to late April and May, using the nearshore lead. In May 1976 numerous belukhas were seen between Icy Cape and Point Barrow, and offshore to the northeast of Point Barrow. On three survey flights in May 1977, about 250 belukhas were seen from Cape Krusenstern to Cape Thompson. In transiting the Beaufort Sea to Banks Island, belukhas use offshore lead systems, rather than remaining nearshore as they do in the Chukchi Sea. Sightings in August through October suggest that the westward autumn migration of belukhas past Point Barrow is predominantly offshore.

Harrison and Hall (1978) presented results from 80,000 km of aerial survey track lines, 6,000 km of which were in the Beaufort Sea and 2,000 in the Chukchi Sea. They observed belukhas in July and August in the western Beau fort Sea; all sightings occurred approximately 100 km offshore in water depths of 1,800 m. In the Chukchi Sea, surveys were flown in June, August, and October, and no live belukhas were seen. Harrison and Hall concluded that few belukhas remain in offshore waters of the Chukchi Sea during summer.

Ljungblad (1981) and Ljungblad et al. (1982) reported the results of aerial surveys for endangered whales in the northern Bering, Chukchi, and Beau fort seas. In spring 1980 they made 284 sightings of 3,404 belukhas, 2,042 of which were from the Chukchi and Beaufort seas. Over 1,900 of those were seen in the Beaufort, and virtually all were in offshore waters. Belukhas were sighted on two of three flights in the Chukchi Sea and 14 of 28 flights in the Beaufort. In August through October, whales were seen on only one of 41 flights in the Beaufort and on none of four flights conducted in the southern Chukchi Sea in late October. In 1981, belukhas were sighted in the Chukchi Sea on four of six spring flights and five of 12 summer flights. Most survey track lines were in offshore waters. Monthly coastal surveys were conducted from Nome to Deadhorse in April through July. Most belukhas were seen in April (213) and May (79), with very few sighted in June (14) and July (1). On mid-June surveys of the southern Chukchi, belukhas

were seen in Eschscholtz Bay and along the coast from Sheshalik to Cape Krusenstern.

Johnson (1979) reported sightings of belukha whales in conjunction with aerial surveys for birds in the central Beaufort Sea. In September 1977 he observed 75-100 belukhas swimming westward near Pingok Island, and in September 1978 an estimated 35 belukhas were seen near Thetis Island. In two summers of field work in Simpson Lagoon, no whales. were seen between the barrier islands and the coast.

Fraker et al. (1978) and Fraker (1979) discussed the spring migration of belukhas in the Beaufort Sea in light of ice conditions and aerial surveys flown in the eastern Beaufort. They, like Braham and Krogman (1977), coneluded that belukhas migrate eastward in the offshore leads in the polar pack rather than in the nearshore leads along the mainland coast.

D. Harbor Porpoise

Harbor porpoises are the smallest cetaceans found in Alaskan waters. They are commonly found near the coasts, often in waters less than 20 m deep (Tomilin 1957, Leatherwood and Reeves 1978). Limited evidence from the North Atlantic indicates that they migrate inshore in spring and offshore in autumn (Prescott and Fiorelli 1980). They are apparently poorly suited to living in extremely cold water; their metabolic rate is high despite a blubber layer comprising 40% of total body weight, and their body surface to volume ratio is greater than for other cetaceans (Prescott and Fiorelli 1980).

There are few published records of harbor porpoises north of Bering Strait. Hall and Bee (1954) reported the taking of two harbor porpoises, an adult female and several days later a calf, off Point Barrow in August 1954. Van Bree et al. (1977) reported a sighting of two, one of which was killed and retrieved by an Inuit hunter, in July 1973 in the Mackenzie River delta. Burns and Morrow (1975), based on personal observations and conversations with Eskimo residents, indicated that harbor porpoises probably occur in low numbers in the Chukchi Sea every summer.

E. Killer Whale

There is very little published information on the distribution of killer whales in Alaska. Tomilin (1957) reported that they occur in the southern Chukchi Sea in August and September. Dahlheim (1981) summarized their worldwide distribution and reported that killer whales occur north into the Chukchi and Beaufort seas. Ivashin and Votrogov (1981a) noted that killer whales were relatively scarce in the Chukchi Sea but migrated near Mys Uelen, Mys Ikigur, and Mys Serdtse Kamin. In the southern Chukchi, they were found farther from the coast.

F. Minke Whale

Pacific minke whales are distributed widely in inshore waters, often within 160 km of the coast, as well as in the southern edge of seasonal pack ice (Omura and Sakiura 1956, Tomilin 1957). There is little specific information on their distribution in the coastal waters of western Alaska. Tomilin (1957) reported that Pacific minke whales occur from the Chukchi Sea and Bering Strait to the coasts of Korea and China, and to Mexico. Along the west coast of North America, he reported them to occur from Kotzebue Sound to California. Most sightings from northern waters were made in summer, particularly August and early September, and most animals were observed to be feeding. Tomilin believed that whales occurring in the Chukchi Sea migrated south in winter.

Ivashin and Votrogov (1981b) described sightings of minke whales along the Chukchi Peninsula north to Mys Serdtse Kamin. They found these whales to be present in the coastal zone from about June to October, usually within 24 km and often within 1-3 km of the shore. Their sightings suggested that minke whales in the Chukchi Sea are present in low numbers and that they occur mostly as solitary individuals.

G. Gray Whale

The eastern Pacific stock of gray whales winters in the warm coastal waters of Baja California and the southern Gulf of California. From late February to May, the whales begin a northward migration, following the coast closely and occasionally stopping to rest or feed (Pike 1962). They enter the Bering Sea through passes in the eastern Aleutian Islands, particularly Unimak Pass, in April and May and continue moving along the coast of Bristol Bay and southern Nunivak Island, then toward St. Lawrence Island, where they arrive in May or June (Pike 1962, Braham et al. 1977, Frost et al. 1982). Upon reaching the vicinity of St. Lawrence Island, the whales disperse to spend the summer feeding in the shallow waters (usually less than 50-60 m deep) of the northern and western Bering Sea, the Chukchi Sea, and, to a much lesser extent, the Beaufort Sea (Pike 1962, Rice and Wolman 1971). Gray whales begin their southward migration in September or October, passing through Unimak Pass between late October and early January, and arrive in Baja California mainly in December to January (Pike 1962, Rugh and Braham 1979, Rugh 1981).

The eastern Pacific gray whale population was once severely depleted by commercial whaling but has since recovered to near pre-exploitation levels (Scheffer 1976, Blokhin 1979, Rugh and Braham 1979). Ohsumi (1975) estimated an original population of about 15,000 and suggested that it declined to a low of 4,400 in 1875. By the early 1970's, the population had increased to an estimated 11,000 (Rice and Wolman 1971, Mitchell 1973) and by 1980 to between 16,500 (Reilly et al. 1980) and 18,500 (Herzing and Mate 1981).

The distribution and migration of gray whales has been described most completely by Pike (1962) and Rice and Wolman (1971). Pike noted that gray whales do not move into the Chukchi Sea until the ice leaves, but that they are abundant along the Chukchi coast from July through September. He reported northward-migrating gray whales off Cape Thompson in the first half of July and southward-migrating whales as early as August near Wainwright and Cape Prince of Wales. He found gray whales to be present near Point Barrow until mid-September but generally scarce in that region. Rice and Wolman (1971) summarized northward and southward migrations.

Maher (1960) reported on recent records of gray whales along the north coast of Alaska. He presented the details of 10 animals killed at Wainwright and Barrow and described observations of gray whales near Cape Sabine, Wainwright, and Barrow. Based on those observations and information from the Eskimos, Maher mapped the movements of gray whales along the Chukchi coast, concluding that these whales arrive off Wainwright and Barrow in late June or early July and depart for the south in August or September, depending on ice conditions.

Wilke and Fiscus (1961) reported several sightings of gray whales in the southern Chukchi, although not in the coastal zone. On 10 and 16 August 1959, groups of about 100 were seen feeding in the southeastern Chukchi Sea. Additional sightings of 2-20 whales were made from 19-29 August. A group of 20 was seen on 29 August traveling generally southward.

Marquette and Braham (1982) discussed the distribution and catch of gray whales by Alaskan Eskimos. They noted that, although gray whales are common in the Chukchi Sea, most are seen in offshore areas. The exception is near Cape Lisburne, where gray whales are seen nearshore east of the cape in August and September. Marquette and Braham also reported that gray whales are seen regularly in low numbers near Wainwright and Barrow in July through September and occasionally at considerable distances to the east of Barrow.

Ljungblad (1981) and Ljungblad et al. (1982) reported on aerial surveys of endangered whales in the Beaufort, Chukchi, and northern Bering seas. In spring 1980 and 1981, they saw no gray whales north of Bering Strait. In July 1980, gray whales were sighted close to the beach near Point Hope, Cape Lisburne, Point Franklin, and Barrow, and in late October a few were seen just north of Bering Strait. In June 1981, gray whales were sighted nearshore near Wainwright; in July they were seen from Kivalina to Cape Lisburne, near Icy Cape, and near Point Franklin; and in August off Wainwright.

IV. Study Area

The principal emphasis of this study has been to document marine mammal utilization of coastal areas of western Alaska. This report covers information obtained for the eastern Chukchi Sea, which includes the Alaska coast from Bering Strait to Point Barrow. The study area was divided into two major sub-areas which correspond to the U.S. Department of Interior Outer Continental Shelf planning areas (Fig. 1). For purposes of cataloging information and for presentation of results, each planning area was divided into geographical regions which are described in Table 1. Geographical coordinates of specific locations referred to in text are given in Appendix I.

Our intention in this report has been to include all sightings of relevance to marine mammal distribution in the coastal zone. While it is obvious that sightings of animals hauled out on land or in lagoons and estuaries are significant, the evaluation of sightings made at sea is less straightforward. We did not attempt to review and compile all of the available pelagic sighting data. In general, sightings made within 5 km of the coast have been included. For gray whales, sightings made somewhat farther offshore are listed.

V. Methods

We have attempted to make a complete review of all available sightings of marine mammals in the coastal zone of the Chukchi Sea during summer and autumn. Our intention in restricting the study to the summer-autumn period was to eliminate the seasons when the coastal zone is covered by shorefast ice, which excludes most species of marine mammals. By so doing, we have eliminated from our study ringed seals and bearded seals, which, in Alaska, only very rarely utilize terrestrial haul outs. We have included in this report any sightings of the seven species discussed in section II which occurred during the open-water season.

As discussed in section IV, the study area has been limited to the coastal zone of the Chukchi Sea. Emphasis was given to identification of terrestrial hauling areas of pinnipeds, and lagoons, bays, and estuaries regularly utilized by cetaceans and pinnipeds. We have not reviewed all available pelagic sightings of cetaceans and generally have included only sightings made within 5 km of the shore. We have dealt primarily with sightings made since 1950 and have not attempted a complete review of earlier historical information, since what is available is usually presented in general terms and is of anecdotal value. Reports and sightings of beached, dead animals have not usually been included.

The idea of cataloging sightings and information on distribution of Chukchi Sea marine mammals is not new. In fact, a number of investigators have maintained files of sightings, and we have benefited greatly from their efforts. Although some relevant information is contained

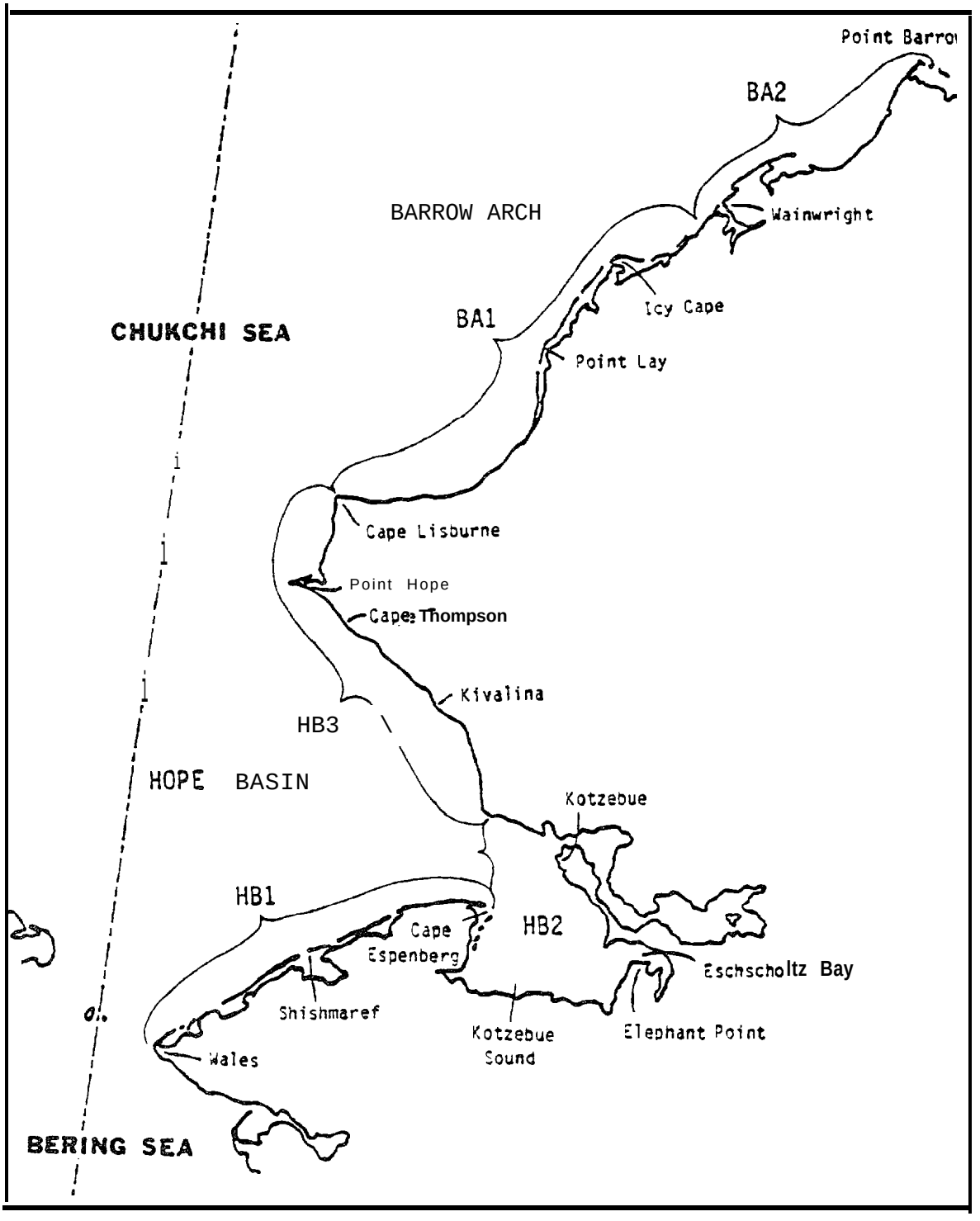

Figure 1. Map of the study area showing Outer Continental Shelf planning areas and subdivisions used in data compilation.

in published literature (e.g., see section III), much of the specific information on sightings is usually lost in the process of data reduction. We have therefore, to the maximum extent possible, derived sighting information from original sources, which are usually the files of individual investigators or agencies and notes and observations of field biologists. Sources which we have used, in addition to published literature (section X), are given in Table 2. The observations and files of personnel associated with the U.S. Fish and Wildlife Service wildlife refuge system and with the Alaska Department of Fish and Game have been particularly useful. Dr. F. H. Fay (University of Alaska, Institute of Marine Science) contributed much from the wealth of data he has collected during many years of observing Alaskan marine mammals.

Data were recorded on formatted sighting cards, which were cataloged by species and area. Geographical subunits of the study area are shown and described in section IV. Depending on the specificity of the data source, we recorded for each sighting the species, number of animals, date, time, location, and any other significant observations such as sex/age classes, apparent behavior, etc.

We have presented our results principally in a series of tables in which sightings are ordered by species, location, and time of year. The location given to each sighting is generally the nearest recognized geographical locale. For example, sightings of both seals hauled out at and whales swimming by Cape Lisburne are recorded as at Cape Lisburne. Place names and associated geographical coordinates are from Orth (1971) and are listed in Appendix 1. Some place names not in Orth (1971) are included in tables, maps, and Appendix 1; latitudes and longitudes of those places were determined from 1:250,000 USGS maps. Acronyms for sources given in data tables are explained in Appendix II. We have indicated the source from which we obtained the data, which may not in all cases be the original observer. Sightings for a particular species and area are arranged by time of year to elucidate seasonal patterns in abundance.

Although the data-compilation phase of this project terminated at the end of calendar year 1981, new information has been regularly received during the course of preparation of the report. We have incorporated as much of this new information as possible; however, we do not consider the data included for the summer of 1982 to be complete.

VI. Results

A. Hope Basin (Figure 2; Tables 3-5)

Spotted Seal

Spotted seals are present along the entire northern coast of the Seward Peninsula, but there are no major haul out sites in that region. At Cape Espenberg, however, over 1,000 seals have been seen hauled out

in late August, making this the largest known hauling area in Hope Basin. In late September 1981, at least 400 seals were present in that area, al l of which were seen in the water.

Spotted seals are present throughout Kotzebue Sound, but there are no major haul outs comparable to that at Cape Espenberg. Seals haul out on the rocks near Chamisso Island in late summer and autumn. Many are present in late summer and autumn in Eschscholtz Bay, particularly at the mouth of the Buck land River. They occasionally haul out on the tip of Elephant Point. These seals are also present in Hotham Inlet, sometimes in Selawik Lake, and around the islands of the Noatak River delta, where they occasionally haul out. They do not, however, haul out there in large numbers on a regular basis due to intense human activity along the north coast of Kotzebue Sound.

Spotted seals are present but not particularly abundant in summer along the coast from Cape Krusenstern to Cape Thompson and Point Hope. However, in autumn they are quite numerous in the Kukpuk River estuary (near Point Hope) and up to 30 km upriver, where they congregate to feed on locally abundant fishes such as salmon (*Oncorhynchus* spp.) and smelt (*Osmerus mordax*). In November 1959, there was reported to be an unusual ly large number of seals in Kivalik channel and also many arctic cod (*Boreogadus saida*) in the area. There is no indication that seals haul out near Point Hope, probably due to human activity there.

Table 1. Geographical subdivisions of the Chukchi Sea study area.

Hope Basin

HB 1 - north coast of Seward Peninsula from Cape Prince of Wales to and including Cape Espenberg

HB 2 - Kotzebue Sound from just south of Cape Espenberg to, but not including, Cape Krusenstern

HB 3 - coast from Cape Krusenstern to, but not including, Cape Lisburne

Barrow Arch

BA 1 - Cape L sburne to just south of Wainwright

BA 2 - Wainwr ght to and including Point Barrow

Table 2. Information sources consulted in addition to published literature.

ADF&G (Alaska Department of Fish and Game) Annual Project Segment Reports - Federal Aid in Wildlife Restoration Projects, 1960-1981.

ADF&G Files - Fairbanks, Nome

ADF&G Herring Surveys - southern Chukchi Sea to Kotzebue Sound, aerial surveys

ADF&G Marine Mammal Field Reports - cruises and aerial surveys

ADF&G Marine Mammal Harvest Data

Alaska Maritime NWR (National Wildlife Refuge) - letter to refuge manager requesting information from files

Burns, J. - ADF&G, field notes 1962-1982

Entuziast cruise report - joint US/USSR marine mammals cruise in August 1982

Fay, F. - Institute of Marine Science, Univ. Alaska, Fairbanks

Field, P. - ADF&G, field notes 1979 (Point Hope)

Frost, K. - ADF&G, field notes 1975-1982

Hills, S. - ADF&G, field notes

Kelly, B. - Institute of Marine Sciences, Univ. Alaska, Fairbanks; and ADF&G; field notes 1977-1982

Lowry, L. - ADF&G, field notes 1975-1982

Table 2., continued

Melchior, H. - ADF&G, personal communication

Nelson, R. - ADF&G, field notes, field reports

Quinlan, S. - ADF&G, seabird biologist; personal communication

Schamel, D. - Institute of Arctic Biology, Univ. Alaska, Fairbanks; personal communication

Seaman, G. - ADF&G, field notes, field reports 1975-1980

Selawik NWR - Annual Report 1981 and letter to refuge manager requesting data from files

Shanahan, C. - ADF&G, field notes 1967 (Wainwright)

Springer, A. - seabird biologist, personal communication

Strickland, D. - ADF&G, field notes 1978 (Wainwright)

USFWS (U.S. Fish and Wildlife Service) Aerial Surveys for waterfowl - NPRA (National Petroleum Reserve Alaska)
Barrow to Wainwright to Utukok Pass; 28 May 1978; R. King
Agiak - Cape Sabine - Point Lay - Icy Cape - Wainwright - Peard Bay - Barrow; 16 August 1978; R. King
Barrow - Dillingham; 15-22 September 1977; R. King
Barrow - Point Lay; 21 September 1978; R. King

USFWS SBCS (Seabird Colony Status) Reports - files of all sightings/censuses/visits to established seabird colonies along entire Alaskan coast, usually visited during breeding season; 1976-- A. Springer and D. Roseneau; 1977 - A. Degange and A. Sowls

USFWS Walrus Harvest Reports - 1980 and 1981

USFWS Walrus Survey - joint project with ADF&G and Soviet Union, 10-23 September 1980, Barrow to Bristol Bay.

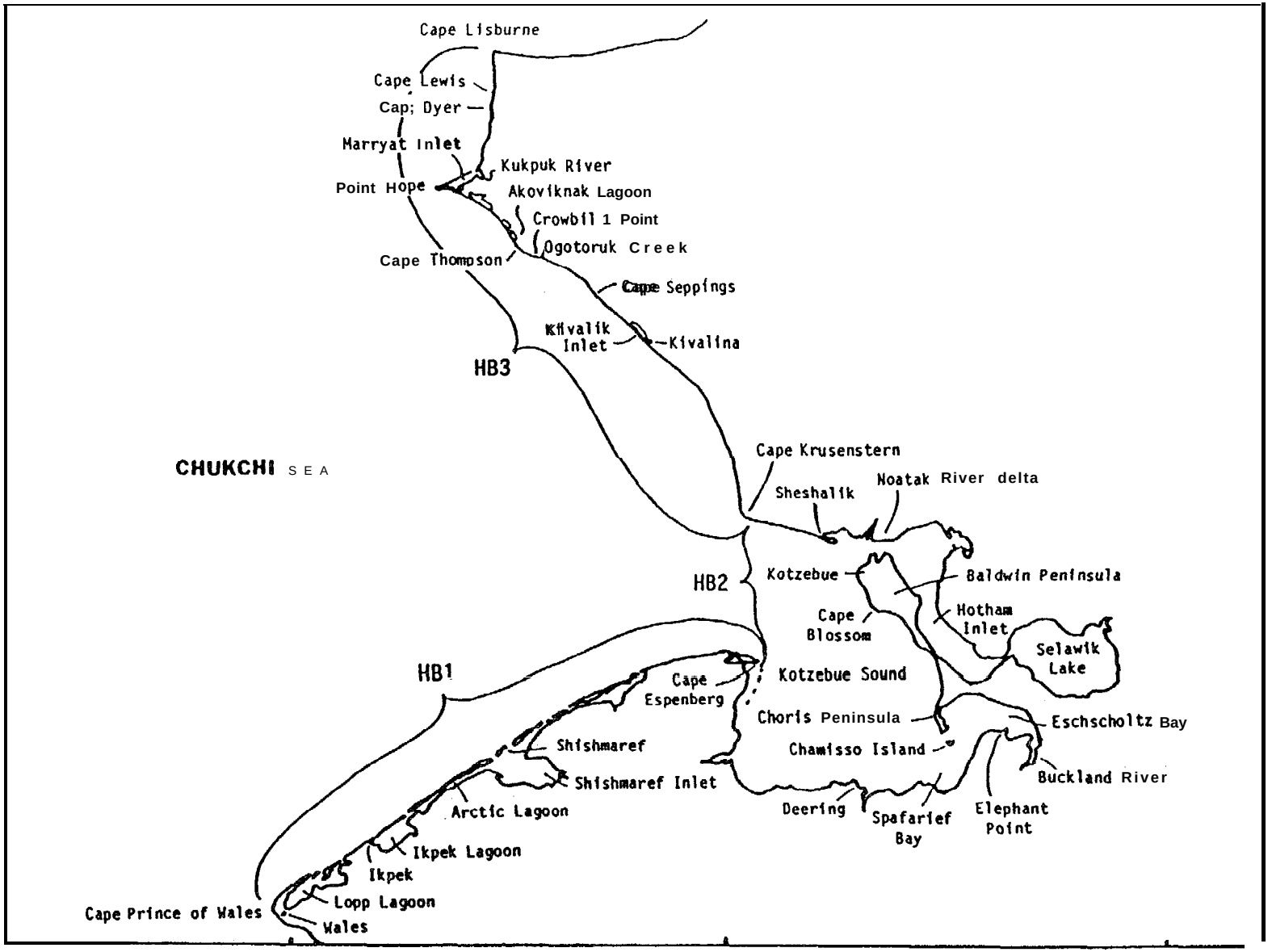

Figure 2. Map of the Hope Basin, regions HB 1, HB 2, and HB 3.

Table 3. Sightings of coastal marine mammals along the northern Seward Peninsula, Hope Basin, region HB1.

Location	Date	Number	Comments	Source
SPOTTED SEAL				
Wales	Jun	very abundant		Bailey and Hendee 1926
Wales to Shishmaref	10 Jun 81	many	hauled out on broken-up ice floes	K. Frost*
Wales	11 Jun 72	present	1st of year taken	J. Burns
	22 Jun 66	some	1st of spring taken	"
	summer-autumn	many	present in any of bays, lagoons, or estuaries, including Lopp, Ikpek, and Arctic lagoons and Shishmaref Inlet; haulout depends on intensity of human activity; present throughout summer, move into rivers and haul out more in autumn	"
Shishmaref	late Jun - early Jut 71	present	hunted	"
	Jul-Aug 72	present	"	"
Shishmaref Inlet	late summer-autumn	many	inside and outside the inlet; hunted	Shishmaref residents through G. Seaman
Shishmaref spit	late summer-autumn	present	some?imes haul out	"
Shismaref	10 Sep 65		26 killed	ADF&G, Nome files
	autumn	present	often hunted	F. Goodhope through J. Burns
	late Nov 72	present	hunted	J. Burns
Shishmaref-Cape Espenberg	summer-autumn	many	hauled out on low sand beach	Alaska Planning Group
Cape Espenberg	late Aug	1,000 +	year unknown; hauled out; photos to document	F. Fay
	21 Sep 81	400	at least 1 seal had been hauled out on the spit off the Cape--others were moving from the lagoon to the ocean through the pass	L. Lowry
	summer-autumn	> 1,000	hauled out at tip of the Cape	Alaska Planning Group
	summer-autumn	many	excellent hauling area; many seals use this area	J. Burns

Table 3., continued

Location	Date	Number	Comments	Source
BELUKHA WHALE				
Cape Prince of Wales, 3 mi NW of	Feb 77	3 +	trapped i n ice	Wales hunters through G. Seaman
Wales	late Mar - early Apr	many	moving N; ice present; usual ly pass by at this time	residents through R. Tremaine
Cape Prince of Wales, 20-30 mi N	6 Apr 81	> 150	including cow/calf pa rs	Ljungblad et al. 1982
	28 May 79	2 small pods	close to shore; 1 pod of 8+; hunted	R. Tremaine
Wales	5 Jun 81	2	seen moving N offshore by Fred Ozenna	USFWS walrus harvest rep. 1981
	8 Jun - 3 Dec	present		LenSink 1961
Wales to Shishmaref	Ott 75	few present	aerial survey	G. Ray
Ikpek to Cape Espenberg	breakup and throughout summer	common	once seen commonly in this a r e a	Shishmaref residents through G. Seaman
Lopp and Arctic lagoons	late Jun, Jul early 1900's	present	seen by reindeer herders of Wales and Shishmaref; some years a few, others there'were several hundred; would remain for several weeks if undisturbed	"
Shishmaref, 15-20 mi w and s of	5 Mar 76	30-35	apparently trapped on ice; hunted	Shishmaref hunters through G. Seaman
Shishmaref, 4 mi W near shore	4 Jun 79	20 +	1 gray, 1 part gray	C. Weyiouanna through R. Tremaine
Shishmaref Inlet	Jul	present	occasional ly entered dur ng periods of high water	Shishmaref residents through G. Seaman
Shishmaref, along coast	Jul-freeze-up	present	sometimes caught in nets set in drifting ice near vi l lage at freeze-up; no often sighted near Shishmaref in recent years	"
Shishmaref	early Ott	present	used to go in west channel ; sometimes tangled in seal nets in early Ott	C. Weyiouanna
HARBOR PORPOISE				
Chukchi Sea	summer	present	probably present in low numbers every summer based on personal observations and Eskimo residents	Burns and Morrow 1975

Table 3., continued

Location	Date	Number	Comments	Source
KILLER WHALE				
Chukchi Sea	summer	present	probably present every summer in low numbers; occasionally in the coastal zone	coastal residents through J. Burns
Shishmaref Inlet	summer, 1970's	1	reliable source	Shishmaref residents through G. Seaman
Shishmaref	summers	present	residents see every summer	"
Ikpek to Cape Espenberg	29 Jul 80	1	dead on beach	D. Stewart through J. Burns
GRAY WHALE				
Wales	May-Jul 78, 79	present	many moving northward close to shore in May Jun, fewer in Jul	S. Hills
Cape Prince of Wales	10 Jun 81	1	swimming, leaving mud trail	K. Frost
	1 Jul 77	30-50	appeared to be feeding	"
Cape Prince of Wales to Icy Cape	Jul 58	"many"	feeding 8-15 mi from shore; seen from tugboat Neptune	Pike 1962
Cape Prince of Wales, N of	Aug 58	1	feeding in 5 fathoms of water; mud trail seen from tugboat Neptune	"
	24 Aug 59	20	moving S, scattered	Wilke and Fiscus 1961

Table 4., continued

Location	Date	Number	Comments	Source
BELUKHA WHALE, cont.				
Eschscholtz Bay, by Gallahan on N side of bay	15-16 Jun 79	low 100's (200 +)		belukha hunters through G. Seaman
Eschscholtz Bay	15-18 Jun 80	many	hunted	K. Frost
	15-16 Jun 81	present	hunted	J. Burns
Eschscholtz Bay, W end	16 Jun 78	100-150 seen, more present	hunted	hunters through G. Seaman
Eschscholtz Bay	17, 18 Jun 78	present	hunted	G. Seaman
Spafarief Bay	18 Jun 79	*30-40*	hunted; ice not far offshore	Deering hunter through G. Seaman
Chamisso Is., N and W of	19 Jun 79	300-600		Munz Airlines pilot and NANA pilot through G. Seaman
Eschscholtz Bay, near mouth	19 Jun 78	50-100 +		belukha hunters through G. Seaman
Eschscholtz Bay	19 Jun 81	few		J. Burns
Eschscholtz Bay, central	20 Jun 78	*50-75*		hunters through G. Seaman
Eschscholtz Bay, NE corner	21 Jun 82	100 +	seen at night	A. Fields through J. Burns
Chamisso Is.	21 Jun 79	about 100	moving into bay	hunters through G. Seaman
Eschscholtz Bay	22 Jun 82	present	1st hunt of the year	J. Burns
	23 Jun 80	800 +		Elephant Pt. hunters through J. Burns
Chamisso Is., N of	Jul 60	*900-1,200*	moving N along Choris and Baldwin Peninsula	J. Burns
Buckland R., N of mouth of	4 Jul 78	several hundred	along shore	L. Thomas
Eschscholtz Bay, along NW shore	8 or 9 Jul 78	900-1,000	appeared to be milling; new calves present; seen from air	N. Lee
Kotzebue Sound and Hotham Inlet	spring-summer	present - "large numbers"	". . . feed in the shallow, warm waters near the river deltas."	Foote and Williamson 1966
Kotzebue Sound	31 May - 23 Ott	present		Lensink 1961
	summer	present	very abundant at times	Nelson 1887

Table 4., cent i nued

Location	Date	Number	Comments	Source
BELUKHA WHALE, cont.				
Sheshalik area	15-25 Jun 79	groups of lo's to 75-1oo		Sheshalik/Kotzebue people through G. Seaman
Sheshal ik	21 Jun 82	present	as of this date, ± 20 whales had been netted	local hunters through J. Burns
HARBOR PORPOISE				
Kotzebue Sound, W of Cape Blossom	summer	present	source described porpoise fitting description of harbor porpoise	Y. Wilson through G. Seaman
Kotzebue Sound	summer	present	sometimes caught in salmon nets	Kotzebue residents through J. Burns
KILLER WHALE				
Eschscholtz Bay	late Jun 79	3 o r 4	chasing either gray or minke whale	G. Seaman
	summer	present	occur regularly in summer; sometimes there when belukhas are there	Buck land residents through G. Seaman
Buck land R. mouth	summer, late 70's	1	good source	Buck land resident through G. Seaman
MINKE WHALE				
Kotzebue Sound	Sumner	present		Y. Wilson through G. Seaman
Eschscholtz Bay	autumn 78 or 79	2	beached in mouth of Buck land River; Seaman has one of skulls	G. Seaman
GRAY WHALE				
Kotzebue Sound, W of Baldwin Peninsula	summers	present		Kotzebue Sound residents through G. Seaman
off Kotzebue Sound	Jul 58	present	feedi ng	Pike 1962
Kotzebue Sound	10-20 Aug 59	200 +	feed i ng	Wilke and Fiscus 1961
Sheshal ik	early Jul 80	I	18- or 19-ft gray whale ki l led by hunters	P. Merrit through J. Burns

Table 5., continued

Location	Date	Number	Comments	Source
BELUKHA WHALE, cont.				
Pt. Hope to Barrow	28 Apr-22 May 76	present	at least 20 waves; most sightings from Wainwright to Barrow	Marquette 1977; Braham et al., in press b
Pt. Hope	30 Apr - 16 May	present	seen	Fiscus and Marquette 1975
Pt. Hope, 15 mi SE	May 76	several groups of 8-15	swimming S along shore ice toward Kotzebue Sound	Pt. Hope residents through G. Seaman
Pt. Hope	2 May - 12 May	present	ma in concentrate ions	Fiscus and Marquette 1975
	1 May 79	10	moving N in lead in ice	P. Field
	2 May 79	15	"	"
	3 May 79	30	"	"
	4 May 79	30	"	"
	5 May 79	60	"	"
	6 May 79	1500 +	"	"
	7 May 79	some	"	"
	8 May 79	50	"	"
	9 May 78	present		"
	19 May 80	± 1000	1st verified major movement of year by Pt. Hope	D. Smullen
Pt. Hope, S shore	late Jun 79	75 + 100	moving N	D. Frankson
Pt. Hope	20 Jul 1887	present	females with calves plus 2 or 3 males near each female; swimming up and down the shore	Nelson 1887
	Sep-Ott	present	moving S along shore	Pt. Hope seal hunters through G. Seaman
HARBOR PORPOISE				
off Cape Thompson	18 Sep 81	2	boat observation; water depth 5 m	L. Lowry
off Cape Dyer	18 Sep 81	3	boat observation; water depth 25 m	"

Table 5., cent inued

Locat ion	Date	Number	Comments	Source
GRAY WHALE, cont.				
Pt. Hope, N of	20 Jul 80	2	within 2 km of beach; feeding and social behavior	Ljungblad 1981
Pt. Hope to Cape Lisburne	20 Jul 80	3	aerial survey for bowheads	Hobbs and Goebel 1982
Pt. Hope	8 Jul 81	present	feeding; 3 cow/calf pairs	Ljungblad et al. 1982
	summer	present		Durham 1979
	25 Jul 81	present		Ljungblad et al. 1982
Pt. Hope to Cape Lisburne	summer-autumn	present		Marquette and Braham 1982
Pt. Hope, W of, to Cape Lisburne	Aug 82	11	one 10 mi W Cape Lisburne; two 10-15 mi SSW Pt. Hope; eight about 20 mi W Kivalina	Fay and Kelly 1982

Walrus

There are no major hauling areas for walruses in Hope Basin. In the 1930's and 1940's, large numbers occasionally hauled out at Cape Thompson; however, none have been known to haul out there in recent years. Single animals or small groups are occasionally seen on the beach from Cape Krusenstern to Cape Lewis. Walruses infrequently haul out on the tip of Point Hope spit and on the barrier islands at the north end of Marryat Inlet.

Belukha Whale

Belukhas are seen migrating along the coast of the Seward Peninsula through leads in the ice from late March until June but apparently no longer frequent that area during the summer. According to long-time residents of Shishmaref, these whales were once commonly seen from breakup through summer al l along the coast. in some years up to several hundred might be present in Arctic or Lopp Lagoon, where they would remain or several weeks if undisturbed. They also occasionally entered Shishmaref Inlet. Near Shishmaref, belukhas were sometimes caught n nets set in drifting ice in early October. Residents report that be ukhas have not often been sighted near Shishmaref in recent years.

Belukhas are very common in Kotzebue Sound during summer, generally first arriving in early June. The largest sightings have been made in and near Eschscholtz Bay. Over 1,000 whales were seen in June 1973; 900-1,000 on 8 or 9 July 1978; 500-700 on 13 June 1978; 800+ on 23 June 1980; and over 1,000 on 13 June 1981. Sightings of groups of several hundred whales are common. Belukhas are reported to move into Eschscholtz Bay on rising tides and leave on falling tides. They are commonly seen along the western shore of the Baldwin Peninsula and in northern Kotzebue Sound in the Sheshalik area, where sightings of groups of 75-100 whales are not uncommon.

Northward migrating belukhas are seen swimming through leads in the ice along the coast from Cape Krusenstern to Point Hope (primarily near Point Hope) during late March through June or early July. Near Kivalina in June 1979 200-300 whales were seen moving northwest along the coast. Belukhas are also reported to be common near Kivalina during the first 3 weeks of September but rare after then. At Point Hope most sightings are in Apri l and May of whales on their way to the Mackenzie River estuary. Some sightings have been made in June and July. In September and October, belukhas are seen moving south along the shore near Point Hope.

Harbor Porpoise

Reports by residents of villages along the Chukchi coast suggest that harbor porpoises are probably present in low numbers every summer. Harbor porpoises are reported by residents of Kotzebue Sound to be present there in summer. They are occasionally caught in salmon nets.

Harbor porpoises probably occur all along the coast from Cape Krusenstern to Cape Lisburne. Two sightings were made on 18 September 1981: two individuals were seen in 5-m water depth off Cape Thompson, and three were seen in 25 m of water off Cape Dyer.

Killer Whale

Killer whales are present in the Chukchi Sea in low numbers every year. Residents of Shishmaref report seeing them every summer. During the mid-1970's, one killer whale entered and was seen inside Shishmaref Inlet. A dead one washed up on the beach between Ikpek and Cape Espenberg in July 1980.

[n late June 1979, three or four killer whales were seen chasing a gray or minke whale in Eschscholtz Bay. In the late 1970's, a single animal was seen in the mouth of the Buck land River. Older residents report that killer whales occur quite requlariy outside the entrance to Eschscholtz Bay. They sometimes co-occur with belukhas, scaring them into the Bay and preventing them from coming back out.

At Kivalina, residents also report that killer whales are regularly seen, sometimes chasing belukhas in close to shore and killing them. At Point Hope there is a long history of killer whales killing or beaching gray whales north of the Point.

Minke Whale

We located only two sightings of minke whales in Hope Basin. In autumn 1978 or 1979, two of these whales beached themselves in the mouth of the Buckland River. A resident of the Kotzebue area reported that whales fitting the description of minke whales are sometimes present in summer in Kotzebue Sound.

Gray Whale

Gray whales have been seen moving north by Cape Prince of Wales in May through early July. They were seen feeding in that area in June through August.

Gray whales have been seen in Kotzebue 'Sound, sometimes in substantial numbers. In August 1959 over 200 were reported to be feeding there. They are more regularly seen and reported along the coast from Kivalina to Cape Lisburne, where sightings of small groups including cows with calves have been made in July and August. Animals were often sighted within 100-200 m of shore and were sometimes engaged in feeding or social behavior.

B. Barrow Arch (Figure 3; Tables 6-7)

Spotted Seal

Spotted seals are present in the water near Cape Lisburne in summer and autumn but do not haul out there due to unsuitable terrain. They are extremely abundant to the north in Kasegaluk Lagoon, where they are ubiquitous from the south end of the lagoon to the north end. They become common there in mid- to late July and remain so through September. On 18 September 1974, there were an estimated 2,500-3,000 seals in the lagoon. The two major haulout areas in the lagoon are on the sandbars just east of Utukok Pass and on the sandbars and spits on either side of Akoliakatat Pass. Sightings at Utukok Pass include 700-900 seals on 10 July 1978; 400-500 on 19 and 20 July 1979; 1,000 on 15 August 1981; and 300 on 17 September 1981. At Akoliakatat Pass, the largest sighting was of approximately 1,000 seals on 15 August 1981. Other haul out areas include Kukpowruk Pass, the entrance to Avak Inlet, and several spits 5-10 km up Avak Inlet. Spotted seals are often present but do not haul out in the lagoon and mouth of the Kokolik River near Point Lay, where they feed on salmon, smelt, and other fishes.

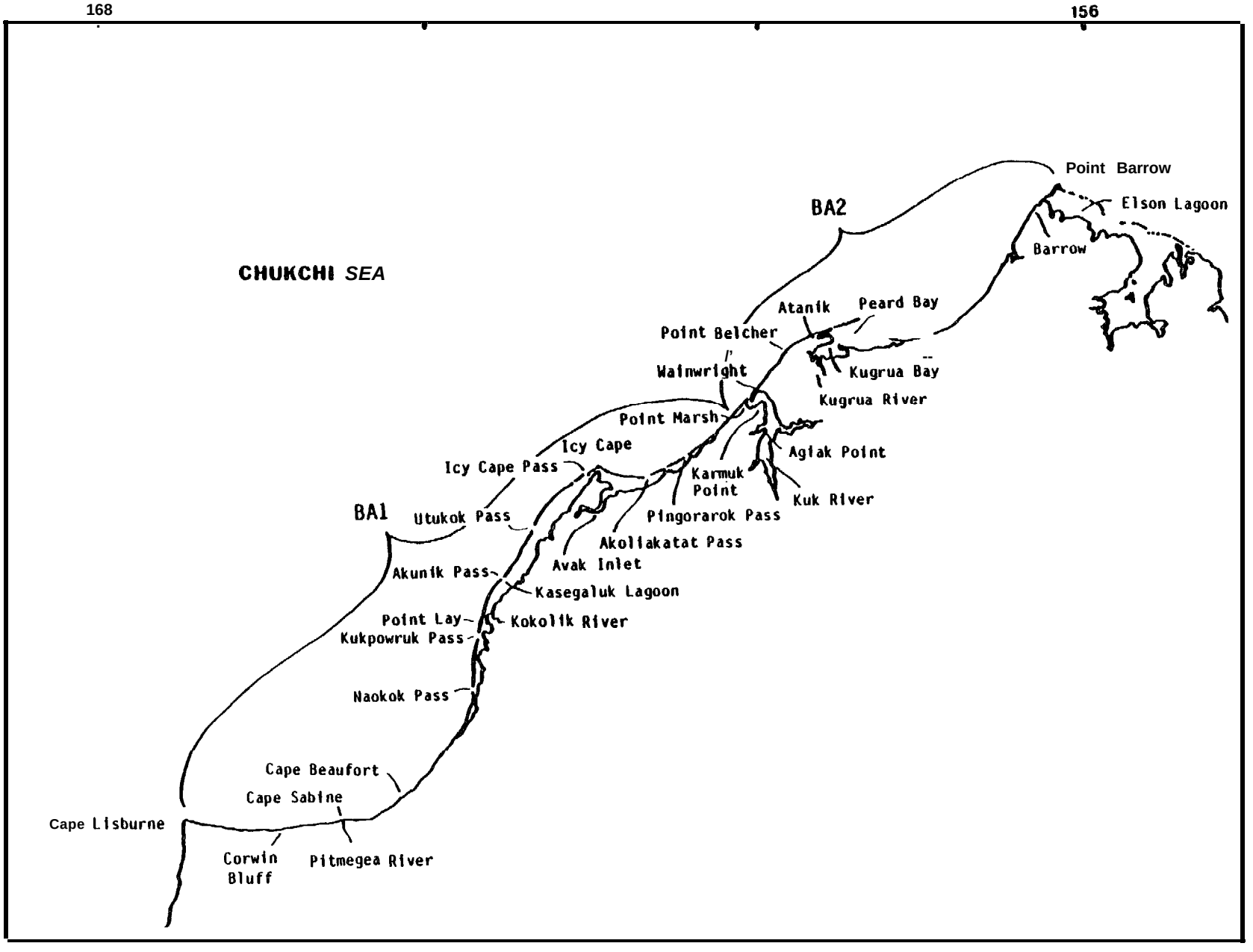

Figure 3. Map of the Barrow Arch, regions BA 1 and BA 2.

Table 6. Sightings of coastal marine mammals from Cape Lisburne to Wainwright, Barrow Arch, region BA 1.

Location	Date	Number	Comments	Source
SPOTTED SEAL				
Cape Lisburne	summer	present	in water, but this is not a good haul ing area	J. Burns
	14 Aug 80	4-1o	in water about 1/4 m i offshore of Ayugatak Lagoon	B. Kelly
Cape Lisburne area	19 Aug 80	numerous		"
Kasegaluk Lagoon	summer-autumn 70's	numerous	1st became common in mid- to late Jul; moving N at this time	G. Seaman
Kasegaluk Lagoon, near Pt. Lay	Jul 78, 79	smal l number	mostly moving N along outside of islands; some haul out occasionally on N side of Kukpowruk Pass	"
	8 Jul 78	+ 50	in lagoon	D. Strickland
	18 Sep 74	2500-3000 est.	aerial survey; single group of 500-700; ubiquitous from N end to S end of of lagoon; haulouts were on insides of islands near entrances	J. Burns
Kukpowruk Pass	summer 78	sma l l numbers	occasional ly haul out	G. Seaman
Pt. Lay, Kokolik R.	summer-autumn	present	feed in river mouth on salmon, smelt, etc.	North Slope Planning Document
Utukok Pass, sandbar just E of the pass	10 Jul 78	700-900 est.	hauled out; "probably most predictable haul out area in Kasegaluk Lagoon area . . . hot spot al l years there. . ."	G. Seaman
	19 & 20 Jul 79	400-500 each day	"	"
Utukok Pass	15 Aug 81	1000	2 haulout sites--1 N side of pass, l on inside of island; many in water in pass and lagoon	R. Nelson
	17 Sep 81	300	some (about 60) had been hauled out at the N side of the pass--many moving into lagoon; 5 collected, stomachs empty	L. Lowry
Icy Cape lagoons	summers	present		Bailey and Hendee 1926

Table 6., continued

Location	Date	Number	Comments	Source
WALRUS, cent.				
Cape Lisburne, cont.	11 Aug 80	6	hauled out; 3 bulls, 2 immatures, 1 adult of unknown sex	B. Kelly
	18 Aug 80	2	1 bull, 1 immature	"
	24 Aug 80	4	bulls; hauled out; 4 others offshore	"
	26 Aug 80	7	in water	"
	28 Aug 80	30-40	hauled out; mostly bulls with a few immatures	"
Cape Lisburne, about 10 miles S	25 Aug - 3 Sep 76	4	old COW, immature and 1 cow, 1 bull; old cow was pro bably 1st seen at site that year	A. Springer
Cape Lisburne	approx. 10 Aug 77	+ 25	hauled out; did not arrive before 10 Aug; remained until early Sep	"
	8 Sep 75	30	in water immediately off-shore; aerial survey	J. Burns
Cape Lisburne, S of	21 Sep 78	100	aerial survey for waterfowl	R. King
Cape Lisburne	last week Ott 78	± 500	hauled out	R. Pegau, from Cape Lisburne personnel
Kukpowruk Pass, S of	Jun or Jul, late 70's	1	hauled out; another sighting several days later of 1 walrus in same area but on lagoon side of the island	G. Seaman
Icy Cape	spring and autumn	present	infrequently haul out on seaward beaches of barrier islands near Icy Cape during spring and autumn migrations	North Slope Planning Document
off Icy Cape	10 Jun 81	500-1000	some (100+) in water; most hauled out on ice	K. Frost
Icy Cape to Barrow	Jul - Sep	present	on ice, several thousand	Fay 1982
Icy Cape	23 Aug 80	present	small animal in water; small number seen going by on ice earlier in season but no date	Lehnhausen and Quinlan 1981

Table 6., continued

Location	Date	Number	Comments	Source
BELUKHA WHALE, cont.				
Kasegaluk Lagoon	late Jun or Jul until late Jul or mid-Aug	many	usually appear Ist at southern end of lagoon; depart to the N, occasionally following coast by Wainwright	Pt. Lay residents through G. Seaman
Pt. Lay, old town site	24 Jun 79	many groups for 3/4 to 1 hr	moving S	G. Agnassagga
	28 or 29 Jun 79	many groups - probably 100's +	heading N	"
	4-7 Jul 78	groups of 50's - 100's	moving both N and S; inside and outside lagoon	Pt. Lay people through G. Seaman
Pt. Lay, near old village site	5 Jul 81	> 100	moving S; "chased" by killer whales; very shallow water	villagers through G. Seaman
Pt. Lay, old town site	8 Jul 78	50-75	inside lagoon; moving N	G. Seaman
	8 Jul 78	some	Eskimos witnessed birth of calf; Seaman saw cow with newborn calf	"
	8 Jul 78	20 +	1 pod	"
	9 Jul 78	100-150	moving S, ocean side	"
	10 Jul 79	350 +	steady flow of whales nearshore for ± 5 hr	"
	13 Jul 79	100 +	heading N nearshore, 0200-0300	"
	15 Jul 79	3-5	pursued by killer whale	"
Pt. Lay to Icy Cape	16 May 81	present	aerial survey	Ljungbladet al. 1982
Akunik Pass (Kokolik Pass)	8 Jul 81	60-70 +	moving N, within 200 yd of shore	G. Seaman
Akunik Pass	9 Jul 79	300-500+	moving S; headed out to open water	B. Neakok
near Akunik Pass	10 Jul 78	2	cow with newborn calf in lagoon	G. Seaman
Utukok R., shallows of	genera 1	present	frequently use shallows of Utukok R.	W. Bodfish
Utukok Pass, 3-4 mi N of	3 Jul 79	25 +	many with calves; at least 2 were newborns	G. Seaman

Table 6., continued

Location	Date	Number	Comments	Source
KILLER WHALE, cont.				
Pt. Lay, old town sits, cont.	15 Jul 79	1	chasing 3-5 belukhas; killed belukha calf < 100 yd offshore	G. Seaman
NUtukok Pass	11 Jul 81		about 50 yd offshore	"
MINKE WHALE				
Cape Lisburne area	19 Aug 80		< 1 mi offshore; off Ayugatak Lagoon	B. Kelly
GRAY WHALE				
Cape Lisburne	8 Jul 81	prasent		Ljungb lad et al. 1982
Cape Lisburne, S of	20 Jul 80	2	feeding and social behavior; within 12 km of beach	Ljungb lad 1981
Cape Lisburne, E of	summer-autumn	present		Marquette and Braham 1982
Cape Lisburne	11 Aug 80	1	adult; swimming W in the surf zone	B. Kelly
Cape Lisburne to Cerush Bluff	19 Aug 80	many	close to shore (< 1 mi off); included cow with calf	"
Cape Sabine	3-5 Aug 59	"a few"	moving SW	Maher 1960
Cape Sabine, off mouth of Pitmegea River	5 Aug 59	10-12	feeding; 3 calves with females, plus 4-6 other adults; gone the fol lowing day	"
Cape Beaufort, NW of	Jul 79	4 +	offshore	G. Seaman
Naokok Pass, 5-7 mi N of	10 Jul 78	3	moving N along outside of islands; 100-150 yd from shore	"
near Pt. Lay	8Jul 81	3	swimming N about 3 mi offshore; seen from shore	"
	11 Jul 81		about 3 mi out	"
Utukok Pass, S of	11Jul 81	10	3/4-1 mi offshore; some 2 mi off	"
Utukok Pass, N of	22 Jul 81	3	about 3/4 mi off beach	R. Nelson
Icy Cape, S of	8Jul 81			G. Seaman

Table 7. Sightings of coastal marine mammals from Wainwright to Barrow, Barrow Arch, region BA 2.

Location	Date	Number	Comments	Source
SPOTTED SEAL				
Kuk River area	summer-autumn	present	present all summer; enter river and haul out more in autumn	J. Burns
	summers	present	occasionally, used haulouts at Pt. Marsh, Karmuk Pt., and S of Agiak Pt.	G. Seaman
Wainwright	15-21 Jul 67	none		C. Shanahan
	28 Jul 75	1 shot, 2 others seen	1st of season; drifting pack ice	J. Burns
	1 Aug 65	present	hunted	"
	4 & 11 Aug 75	present	"	"
	4, 7, & 16 Aug 64	present	"	"
	late summer-autumn	present	small numbers most years; 1st ones arrive mid-Aug	"
Kugrua R. area	summer	present	haul out on land	Wainwright villagers through J. Burns in 1964
Peard 'day, including Kugrua R.	summer	present	haul out but not as many as in Kasegaluk Lagoon	J. Burns
WALRUS				
Wainwright area	Jul 67	very few	bad hunting year	J. Burns
Wainwright	31 Jul 66	30		ADF&G, Nome files
Wainwright to Barrow	8 Jul 78	5000-10,000	on ice	T. Brewer through D. Strickland
near Barrow	12 Mar 78	2		H. Melchior
Barrow	1st week of Aug 66	1		ADF&G, Nome files
BELUKHA WHALE				
Wainwright and Barrow	spring	common	1st ones seen in March, most in Apr and May on northward migration	Nelson 1969; ADF&G files
Wainwright	spring 52	2		Bee and Hall 1956

Table 7., continued

Location	Date	Number	Comments	Source
BELUKHA WHALE, cont.				
off Barrow	28 May 78	15	aerial survey for birds	R. King
	20 Jul 80		feeding in 5/10 ice coverage, less than 1 km of f beach	Ljungblad* 1981
Barrow	summer 1881-83	large groups	passed by as soon as there was open water off the beach and again 7-10 days I ater	Murdoch 1885
	every summer	once common	once commonly seen near vi l lage every summer before so much noise from boats and the town	Barrow residents through G. Seaman
	28 Sep 1881	100 +	within 20 yd of beach; Sep sightings uncommon	Murdoch 1885
Barrow	unspecified	present		Bee and Hall 1956
HARBOR PORPOISE				
Pt. Franklin, NW part Kugrua Lagoon	1 Aug 37	2	young (about 1-1/3 m long); chasing fish in shal low water 3 m from shore	Bee and Hall 1956
	1930	2	1 large, 1 small; same part of lagoon as those seen in 1937	"
Wainwright, 11 mi NE	I Sep 33	1	dead on beach	"
Wainwright	every year	present	seen every year at Pt. Barrow and Wainwright as long as Eskimos can recall, only 5or 6each each season; from Pete Sovalik and Adam Levitt	"
Atari ik	1Sep 33	I	dead on beach	"
Barrow	every year	present	seen every year at Pt. Barrow and Wainwright as long as Eskimos can recall, only 5or 6 each season; from Pete Soval ik and Adam Levitt	"
	"in last few years" (1952)	present	seen on several occasions by pete Soval ik	"

Table 7., continued

Location	Date	Number	Comments	Source
GRAY WHALE, cont.				
Wainwright, cont.	9-15 Aug 54	1	killed	Maher 1960
	24 Aug 81	6		Ljungblad et al. 1982
Wainwright to Peard Bay	10 Jun 81	13		K. Frost
	20 Jul 80	4	aerial survey for bowheads	Hobbs and Goebel 1982
Wainwright and Barrow	late Jun - early Jul	present	1st arrive	Maher 1960
Wainwright to Pt. Barrow	18 Jul - 13 Sep 54-59	9	taken by residents	Maher 1960
Wainwright, + 15 mi NE of	22 Jul 81	3	**breaching and feeding; cow with calf and another, about 1/2 mi** off beach	R. Nelson
Pt. Belcher	6 Jul 81	3	about 3/4 mi offshore; less than 1 octa ice	G. Seaman
Pt. Franklin	25 Jul 81	present		Ljungblad et al. 1982
Pt. Franklin to about 20 mi SW of Barrow	Jul 81	many	Polar Star cruise; "hot spot" for many things--many seals, walruses, heavy phytoplankton and zooplankton blooms	F. Fay
	Jul-Aug 82	300	Entuziast cruise, between shore and ice edge; "hot spot"	Fay and Kelly 1982
Barrow	summer	common	appear "settled"	Maher 1960
Pt. Barrow	summer	present	frequently seen	Durham 1979
	general	uncommon	reported by Pete Sovalik	Bee and Hall 1956
Barrow, SW of	20 Jul 80	1	aerial survey for bowheads	Hobbs and Goebel 1982
Pt. Barrow	Jul-Aug 78	16	in a 40-day period	Marquette and Braham 1982
	18, 19 Jul 59	3	hunted; calf and lactating female, plus calf	Maher 1960
	Aug 78 or 79	6 +	moving W	H. Melchior
	Aug - mid-Sep 1950's	present	may begin moving southward in early Aug	Maher 1960
	Aug 54	1	playing in surf	"
	10 Aug 54	2	calf associated with an adult	"

Table 7., continued

Location	Date	Number	Comments	Source
GRAY WHALE, cont.				
Pt. Barrow, cont.	mid-Sep 58	present	2 killed	Maher 1960
	mid-Sep 59	some	3 killed, including lactating cow with calf and another calf	"
Barrow, 20-30 mi SW of (71°08'N, 158°00'W)	12 Sep 81	20-25	feeding; kittiwakes active in area	L. Lowry
Pt. Barrow	Sep 78	2	very close to beach	Durham 1979
	late autumn 78	20	migrating westward; information from T. Brewer	"

Spotted seals are less abundant to the north of Kasegaluk Lagoon. However, they are present during summer and autumn in and around the Kuk River near Wainwright and the Kugrua River in southern Peard Bay. As along the rest of the Bering and Chukchi sea coasts, they enter the rivers and haul out more often in autumn. In the Kuk River, occasionally used haulouts include Point Marsh, Karmuk Point, and south of Agiak Point. Seals also haul out near the mouth of the Kugrua River.

Walrus

There are no major terrestrial walrus haulouts along the coast of the Barrow Arch planning area, although many walruses are seen from June through September hauled out on the drifting offshore pack ice. Cape Lisburne was historically used as a haulout prior to construction of the DEW-line station there, with a sighting of "hundreds" in July 1938. Since 1975 some walruses have hauled out near Cape Lisburne every year, usually in August or September. The largest reported sightings were during summer 1978, when about 200 animals were hauled out in July and August, 100 in late September, and 500 during the last week in October. In other years, sightings did not exceed 30-40 animals. Lone walruses have occasionally been seen hauled out on the barrier islands of Kasegaluk Lagoon.

Belukha Whale

Belukhas are very abundant in the Kasegaluk Lagoon region of the Barrow Arch planning area. They are first seen south of the lagoon at Cape Sabine and Cape Beaufort and in the southernmost passes (Naokok Pass and Kukpowruk Pass) in late June or early July. They usually appear from north of Point Lay to Icy Cape in the first or second week of July and from Icy Cape to Wainwright slightly later, usually during the third week of July. The whales are frequently seen concentrated in or near the passes into the lagoons and sometimes in the deeper channels of the lagoons themselves. Calving has been observed on several occasions. The largest single sightings in the Kasegaluk Lagoon area were on 3 July 1982, when 2,000-2,500 belukhas were seen swimming north along the coast between Cape Sabine and Cape Beaufort, and on 15 July 1979, when over 2,000 belukhas were concentrated in or near Akoliakatat Pass. That group was reported to be present from 13 July until 18 July, when they moved north. A group of over 1,000 was seen at Pingorarok Pass on 19 July 1979, and on 19 and 20 July over 1,000 were seen moving north by Wainwright. Sightings of 300 or more whales have been made at all major passes in Kasegaluk Lagoon, including Naokok, Kukpowruk, Akunik, Utukok, Ice Cape, Akoliakatat, and Pingorarok passes. In the 3 years (1978, 1979, 1981) when aerial surveys were conducted, major sightings occurred from late June through the third week in July. In some years the whales are present in this region until mid-August. Near Wainwright, belukhas may be present in July and August and are considered rare in September. In 1978-1980, most sightings were in

the third week of July. Few belukhas are seen during summer nearshore between Wainwright and Barrow.

Harbor Porpoise

We located no sightings of harbor porpoises along the coast from Cape Lisburne to Wainwright. However, they are reported to be present in smal I numbers every year at Wainwright and Barrow. In the 1930's, two were found dead on the beaches near Wainwright, and several were seen at the south end of Peard Bay in Kugrua Lagoon. In summer 1952, one was reported off Barrow, and in August of the same year a cow and calf were caught in the northwestern portion of Elson Lagoon.

Killer Whale

Killer whales are probably present during most summers along this section of the coast. They were seen chasing belukhas very close to shore near Point Lay in July 1979 and 1981. On 11 July 1981, a single killer whale was seen within 50 m of the beach north of Utukok Pass. They are sighted regularly at Wainwright, where they have been seen in pursuit of gray whales, and occasional ly at Barrow.

Minke Whale

We are aware of a single minke whale sighting in the Barrow Arch planning area. One whale was seen close to shore near Cape Lisburne on 19 August 1980.

Grav Whale

Gray whales are regularly seen all along the coast from Cape Lisburne to Barrow during summer. Most sightings are in July and August, although a few whales are seen in June and September. They are often seen within 1-2 km of the beach, sometimes feeding. In July most whales for which directional swimming is reported are moving northward, whereas in August they are moving southward. The largest reported sightings were of 50-100 whales seen off Wainwright on 9-10 August 1953 and of over 200 seen near Point Franklin in July and August 1982.

VII. Discussion

A. Spotted Seal

In late winter and spring, spotted seals are distributed in and near the ice front of the Bering Sea, where they have their pups, breed, and molt from March through May or June. As the ice disintegrates and

recedes north in spring, these seals move generally northward and toward the coast, where they spend the ice-free months feeding mainly in near-shore waters and hauling out on land. Some remain in the Bering Sea throughout the summer (see Frost et al. 1982), while others move farther north to the Chukchi Sea (Fig. 4). Spotted seals remain in the coastal zone until late autumn when the shorefast ice begins to form.

Spotted seals are present in coastal areas of Hope Basin from the time the ice breaks up in spring until freeze-up. They are found along the entire northern coast of the Seward Peninsula and may be present in any of the bays, lagoons, or estuaries, including Lopp, Ikpek, and Arctic lagoons and Shishmaref Inlet. They haul out, particularly in autumn, on the low sandy beaches characteristic of this section of the coast, in areas that are relatively free from human activity. The largest haulout in Hope Basin is at Cape Espenberg, where over 1,000 seals have been seen hauled out in August. Although they do not haul out in large numbers elsewhere, they are abundant, particularly in late summer and autumn, in Eschscholtz Bay, particularly at the mouth of the Buck land River; in Hotham Inlet and at the mouth of the Noatak River; and in the Kukpuk River estuary. They congregate in these areas to feed on locally abundant fishes such as salmon, herring (Clupea harengus), smelt, or saffron cod (Eleginus gracilis).

Spotted seals are present along virtually the entire northern Chukchi coast but are most abundant in three areas: Kasegaluk Lagoon, the mouth of the Kuk River near Wainwright, and the mouth of the Kugrua River in southern Peard Bay. Over 2,000 seals seasonally utilize Kasegaluk Lagoon, with major haul outs near Utukok Pass and Akoliakatat Pass. Fewer seals are present in the Kuk and Kugrua rivers, but there are no estimates of actual numbers. As in other areas of the Bering and Chukchi seas, spotted seals congregate near rivers and haul out more in late summer and autumn.

B. Walrus

As the ice breaks up in spring, walruses leave their wintering grounds in the Bering Sea and move north to the Chukchi Sea, where most spend the summer feeding on the shallow Chukchi platform. Subadults and females with young summer primarily in the pack ice in the northern Chukchi Sea (Estes and Gilbert 1978), while adult males form large herds on hauling grounds in Bristol Bay, Bering Strait, and along the Chukchi Peninsula.

A substantial proportion of the walrus population is concentrated in the ice off the Alaskan coast from Icy Cape to Barrow from June or July through September (Krogman et al. 1976, Fay 1982). However, there are no large, regularly used haul outs along the Alaskan Chukchi coast. In the 1930's, walrus herds were present on hauling grounds at Cape Thompson, Cape Lisburne, and Icy Cape, but by the 1950's those haulouts were no longer used (Fay 1957). Since 1975 some walruses have again begun to haul out near Cape Lisburne every year (Fig. 5). Sightings

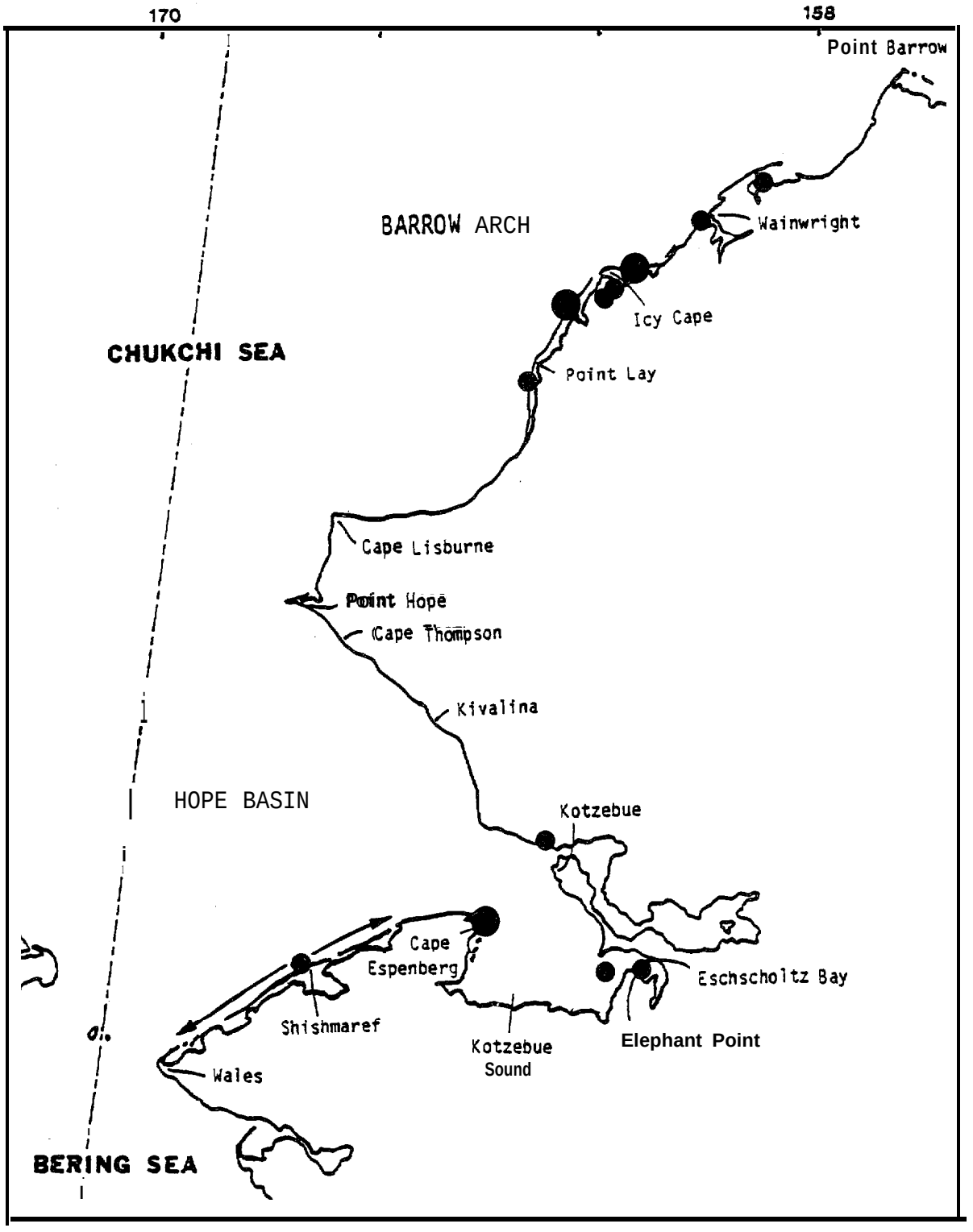

Figure 4. Map of the eastern Chukchi Sea showing major haulouts used by spotted seals. Large dots represent areas with maximum reported numbers of greater than 500 seals. Small dots represent haulouts of less than 500 seals.

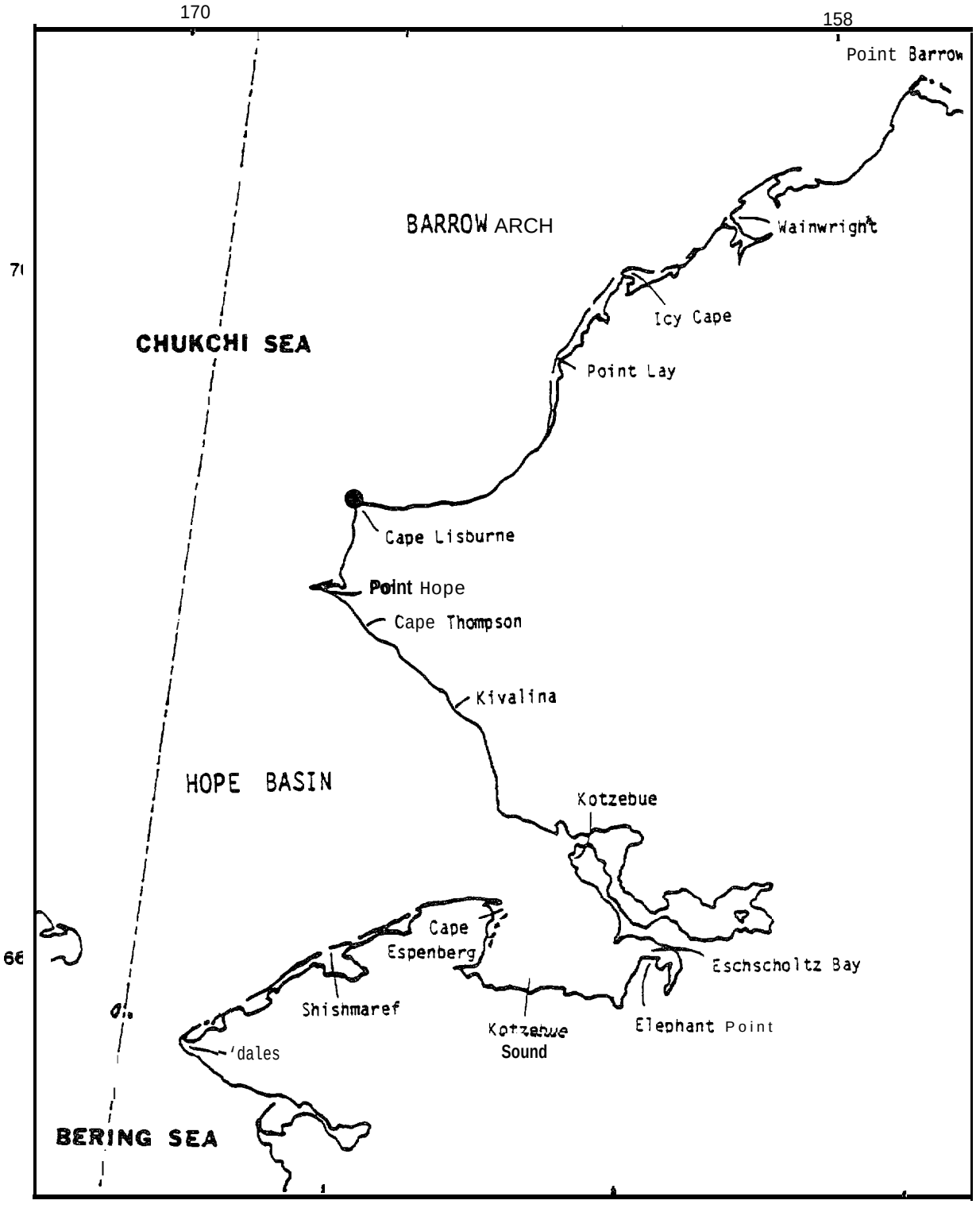

Figure 5. Map of the eastern Chukchi Sea showing the only regularly used walrus haul out in the coastal zone.

have ranged from 30-40 in some years to approximately 500 in late October 1978. Single animals or small groups have been seen hauled out on the beach from Cape Krusenstern to Cape Lewis and on the barrier islands of Kasegaluk Lagoon.

C* Belukha Whale

Belukhas spend the winter months offshore in the pack ice of the Bering Sea. In spring, as the ice begins to melt and recede northward, they move toward the coast. Some remain in the Bering Sea throughout the summer. Others travel north through Bering Strait to spend the summer in Kotzebue Sound, along the Chukchi coast north to Barrow, or in the eastern Beaufort Sea near the Mackenzie delta. Of an estimated population of 12-16,000, about 2,500-4,800, depending on the year, spend parts of the summer in coastal regions of the Chukchi Sea.

There are two main concentration areas for belukhas in the Chukchi Sea: Kotzebue Sound, particularly Eschscholtz Bay in Hope Basin; and in and adjacent to Kasegaluk Lagoon in the Barrow Arch (Fig. 6). Belukhas appear in northern Kotzebue Sound from Sheshalik to Cape Blossom in late May to mid-June, usually during or shortly after breakup. They appear slightly later in Eschscholtz Bay, usually in mid-June. There appears to be considerable movement of belukhas in Kotzebue Sound, with the whales seen near Sheshalik, Kotzebue, and Cape Blossom almost certainly part of the same group seen in Eschscholtz Bay. Some whales remain in the Sound until autumn; however, most sightings are in June and July.

The largest sightings of belukhas have been of over 1,000 whales in and near Eschscholtz Bay in June and July. Considering all observations, we estimate that the peak number of whales in Kotzebue Sound/ Eschscholtz Bay during summer ranges from 500 to 1,800, with considerable year-to-year variability which cannot at present be explained.

Belukhas feed in Kotzebue Sound, probably following local movements of fish and feeding on species which are particularly abundant at certain times (Seaman et al. 1982). In Eschscholtz Bay there are sizable runs of herring, smelt, char (Salvelinus alpinus), and salmon, in addition to large numbers of saffron cod (Barton 1979; Burns, Frost, and Seaman, pers. observations). Calving has been reported in coastal regions of the Sound in June and July. Most observations are from near Sheshalik and from the eastern end of Eschscholtz Bay, particularly the latter in recent years. Local residents indicate that belukhas are less common in nearshore areas near Sheshalik and Kotzebue than they once were but remain common offshore. This change has been attributed to increased boat traffic and perhaps other noises associated with modernization.

Historically, belukhas were also common along the northern Seward Peninsula from Ikpek to Cape Espenberg during breakup and throughout

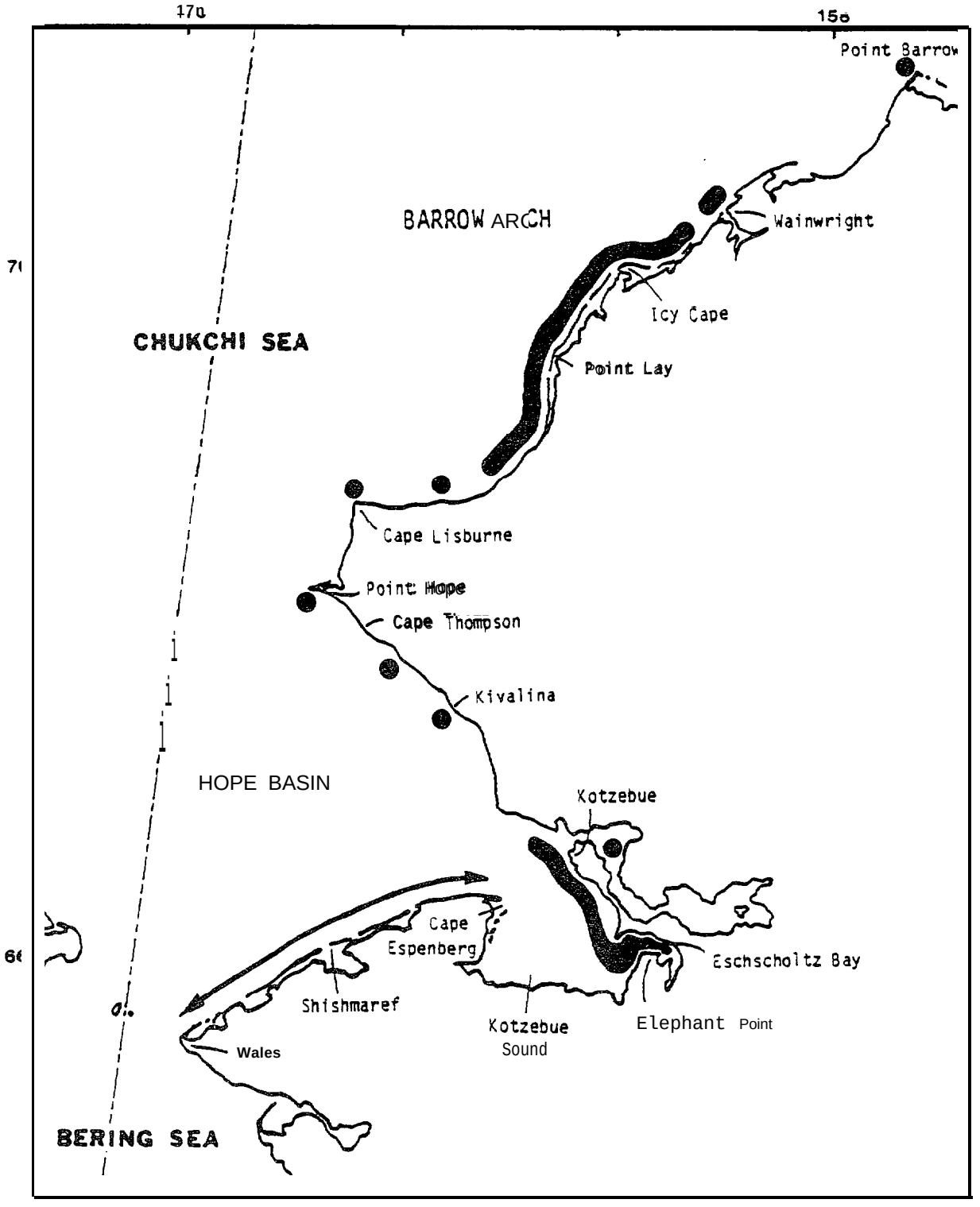

Figure 6. Map of the eastern Chukchi Sea showing sightings of belukha whales in the coastal zone. Dark bands represent concentration areas.

summer but in recent years have been sighted infrequently. As in the Kotzebue area, this change has been attributed to increased boat traffic.

Belukhas are present in the Kasegaluk Lagoon area from late June until late July or mid-August. They characteristically appear in the southern part of the region near Ledyard Bay in mid- to late June and move gradual ly northward fol lowing the retreat of seasonal ice. They may be found both outside the barrier islands and in deeper portions of Kasegaluk Lagoon, although nearshore waters outside the lagoon are used' most extensively. They are usually concentrated in and outside of major passes, particularly Kukpowruk, Utukok, Icy Cape, and Akoliakatat, and to a lesser extent Akunik, and within 1/2-3/4 km from shore. The whales usually depart to the north, moving offshore or occasionally following the coast where they are seen at Wainwright and less commonly at Barrow. We estimate that 2,000-3,000 belukhas may occur near Kasegaluk Lagoon in most years, although in some years the abundance of whales in the area may be considerably less.

Belukha whales calve in and near Kasegaluk Lagoon. Although little is known about their food habits or the local fish fauna in this area, they probably feed on fishes such as salmon, char, or saffron cod.

Belukhas are now seen less frequently at Wainwright and Barrow during the ice-free period. Historically, they sometimes congregated at the mouth of Wainwright Inlet and the Kuk River, but they no longer do so.

D. Harbor Porpoise

Harbor porpoises probably occur occasionally during summer along the entire Chukchi coast, but because they are difficult to see and identify there are relatively few reported observations (Fig. 7). Most sightings were of one or two individuals. In several instances, females with small calves were seen. Sightings were usually made in August; the latest were on 18 September off Cape Thompson and Cape Dyer. In Kotzebue Sound and near Barrow, harbor porpoises are sometimes caught in gillnets.

E. Killer Whale

Sighting records suggest that killer whales are quite widely distributed in low numbers in the coastal zone of the Chukchi Sea (Fig. 8). Residents of Shishmaref report seeing them every summer. Hunters from Eschscholtz Bay, Kivalina, Point Hope, Point Lay, and Wainwright relate that killer whales regularly occur in those areas in summer. The whales are often seen chasing belukha or gray whales, sometimes stranding gray whales in shal low water or driving belukhas nearshore or into bays or lagoons where they can be easily hunted.

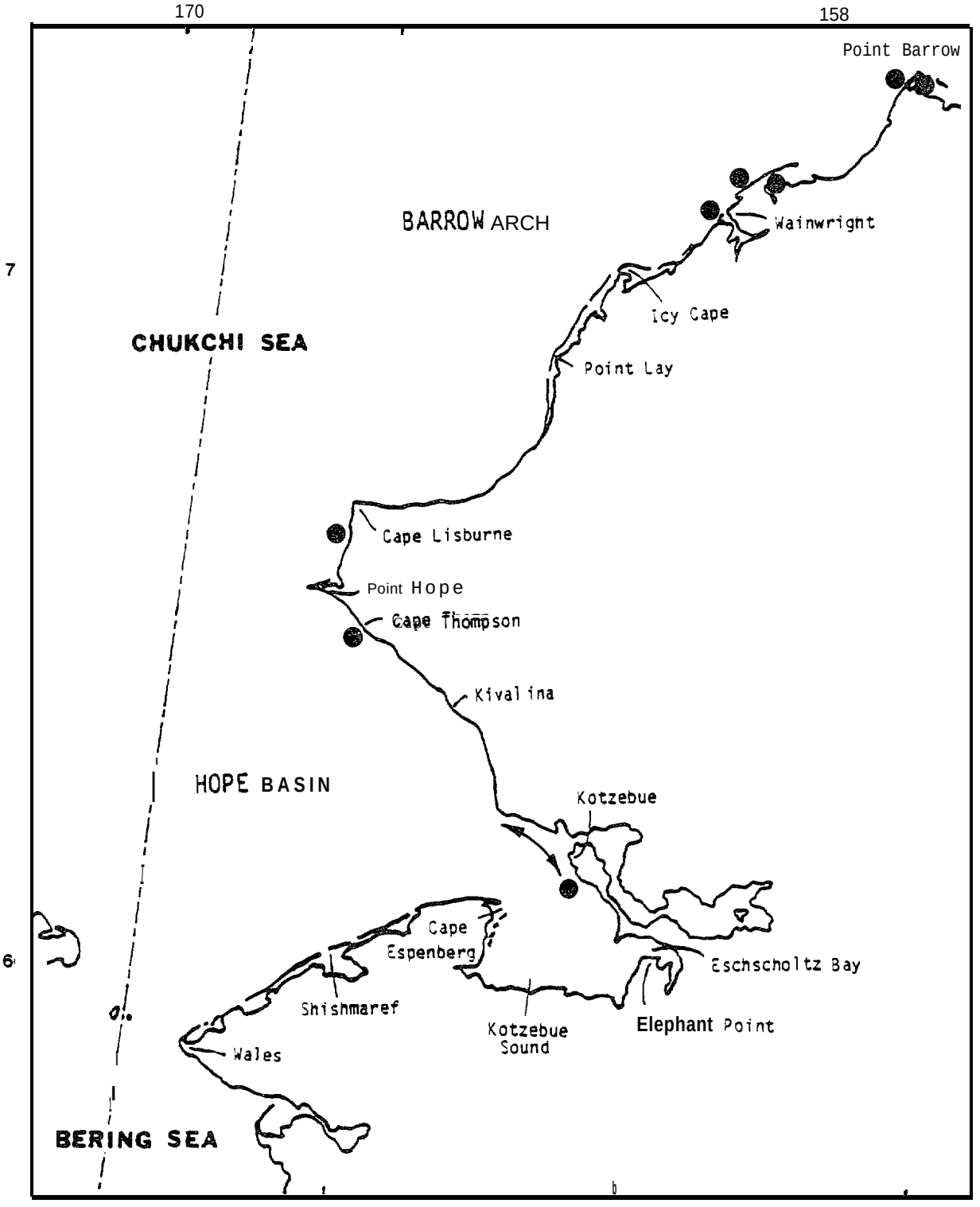

Figure 7. Map of the eastern Chukchi Sea showing sightings of harbor porpoises in the coastal zone.

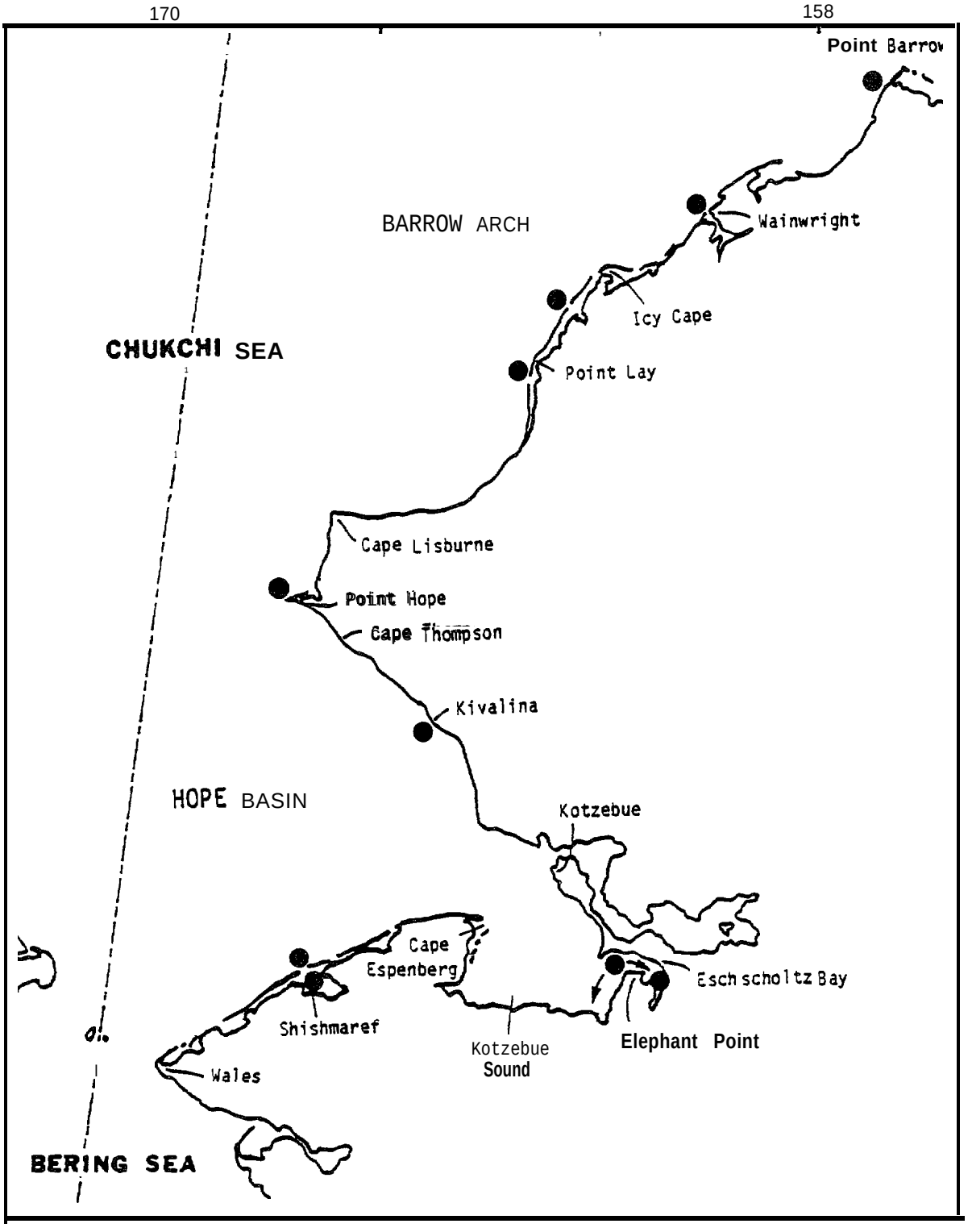

Figure 8. Map of the eastern Chukchi Sea showing sightings of killer whales in the coastal zone.

F. Minke Whale

We are aware of only three sightings of minke whales in the coastal zone of the Chukchi Sea. Two were from Kotzebue Sound in summer and autumn, and the third was from Cape Lisburne in August (Fig. 9). One of the Kotzebue Sound reports was of two whales that beached themselves at the mouth of the Buck land River.

G. Gray Whale

Gray whales migrate annually from the coastal waters of Baja California and the southern Gulf of California to the northern Bering and Chukchi seas. They follow the coast closely as they move north, entering the Bering Sea mostly through Unimak Pass in Apri I through June, thence north toward the Chirikof Basin and Bering Strait. Most gray whales spend the summer feeding in the Chirikof Basin and Chukchi Sea. Those entering the Chukchi Sea move through Bering Strait in May through early July and are seen along the coast from Wales to Barrow (Fig. 10) in June through September, with most sightings in July and August. Sightings, many within 1-2 km of the beach, are usually of smal I groups, often including cows with calves. Feeding animals trailing visible mud plumes are often seen. Through July most traveling gray whales move northward whereas after early August most are swimming southward. Few are seen in the Chukchi Sea after mid-September. There are no obvious concentration areas for gray whales in the coastal zone of the Chukchi Sea; however, they are apparently somewhat more common from Icy Cape to Barrow. The largest reported sightings anywhere along the Chukchi coast were near Wainwright and Point Franklin.

VI I I. Conclusions

A. Adequacy of Sighting Data

The portion of the Alaska coastline included in this study is approximately 1,200 km in length. This is a large and relatively remote area over which to document al I localities used by marine mammals. Nonetheless, the combined observations of persons who have worked onshore, at sea, and in the air provide considerable information on where and when marine mammals occur. The inherent interest of local residents in the natural resources which surround them has been encouraged and supplemented by the work supported by OCSEAP, as well as other federal agencies, and the State of Alaska.

This has been the first attempt to compile all existing data on coastal marine mammal distribution and abundance in the Chukchi Sea during the ice-free season in a comprehensive manner. We generally did not attempt to collect new data nor did we have the funds necessary to interview coastal residents in the manner which would be necessary to maximize the value of existing local knowledge. However, through

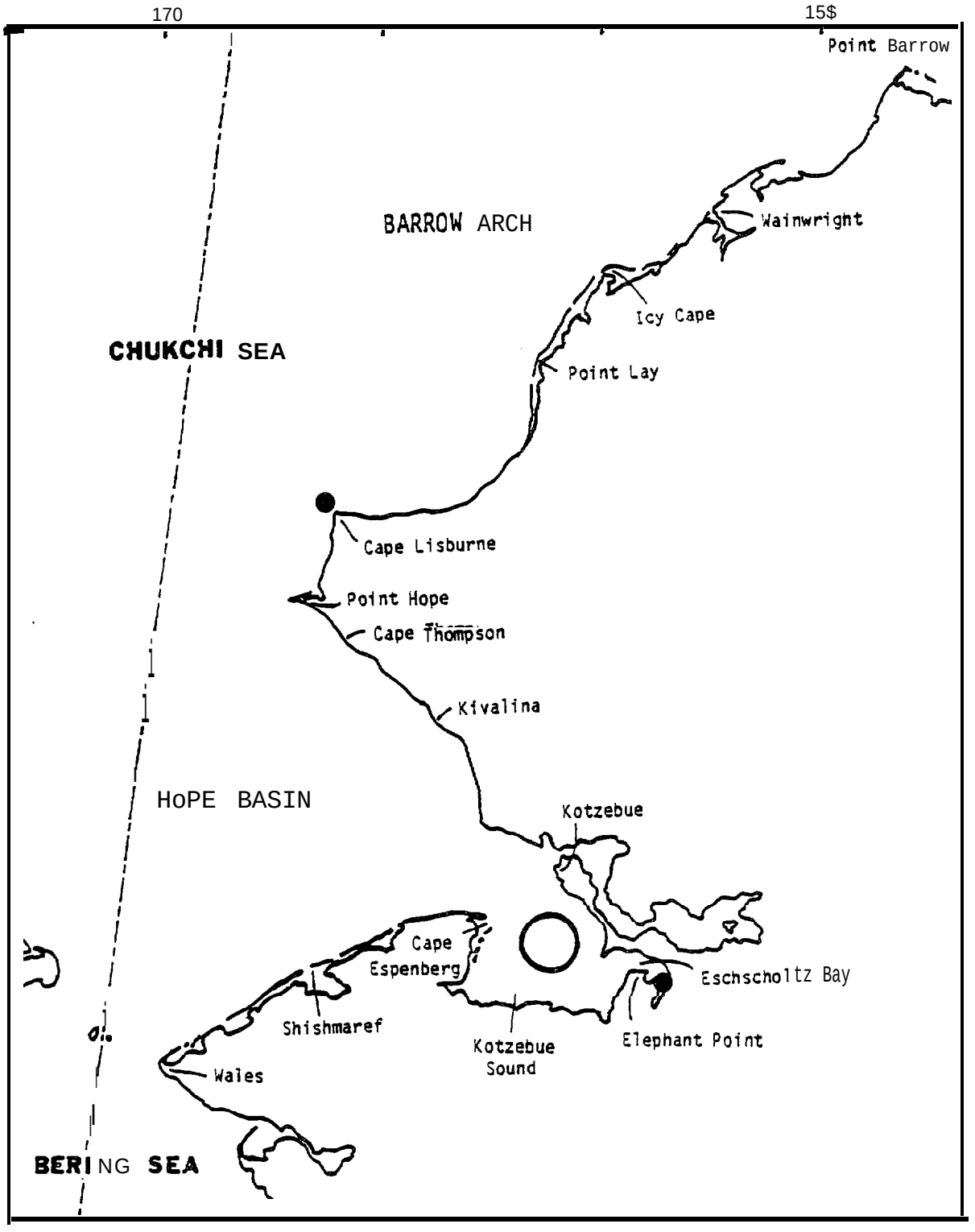

Figure 9, Map of the eastern Chukchi Sea showing sightings of minke whales in the coastal zone.

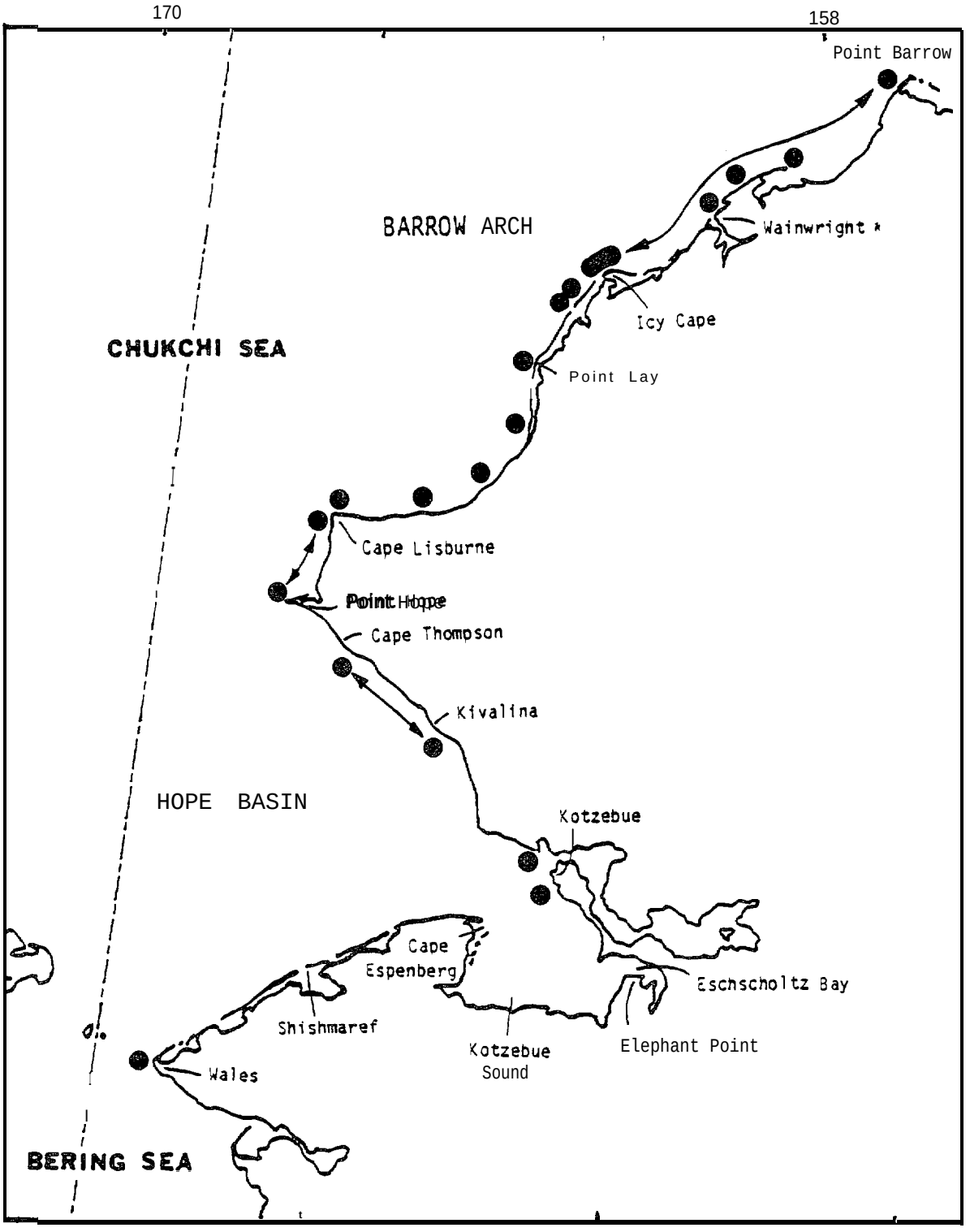

Figure 10. Map of the eastern Chukchi Sea showing sightings of gray whales in the coastal zone.

the research projects conducted by ADF&G over the past 23 years, several investigators have had the opportunity to spend time in most of the villages along the Chukchi coast and to discuss marine mammal distribution and abundance with residents. ADF&G employees visited Wales, Shishmaref, Wainwright, and Barrow in the course of pinniped and polar bear studies and Elephant Point, Kotzebue, Point Hope, and Point Lay while studying belukhas. Since much of the data available has been collected on an opportunistic basis, it was sometimes difficult to evaluate whether the composite picture derived from sightings accurately reflects the pattern of marine mammal distribution and abundance. This was particularly true when data were derived from informants who were present in or made observations of an area for only part of the ice-free season. In some cases, such as Eschscholtz Bay and Kasegaluk Lagoon, specific studies of belukha whales have been conducted, but information on other species in those areas, such as spotted seals, has not been collected in a systematic manner. Few studies have been done along the remainder of the Chukchi coast. Several site-specific studies of seabird colonies have been conducted over the past 10 years, and marine mammal observations made in the course of those studies have been included in this report. In 1976-77, ADF&G personnel conducted annual surveys of herring spawning concentrations along most of the coast from Bering Strait to northern Kotzebue Sound, and marine mammal observations were recorded on those flights.

We are confident that most major coastal areas utilized by marine mammals in summer and autumn have been identified in this report and that data are adequate to describe, in a general sense, the use of various regions of the coast by marine mammals. This information should be of considerable value for planning and, where necessary, perhaps regulating the development of OCS hydrocarbon reserves. However, without exception, available data on the numbers and activities of marine mammals at specific locations are not sufficient to estimate total numbers of animals or to measure or monitor the impacts of OCS activities or other factors on them.

B. Importance of Coastal Regions to Marine Mammals

Marine mammals inhabit virtually the entire coastal zone of the eastern Chukchi Sea during summer and autumn. However, their distribution is not uniform. In Hope Basin the greatest concentration of marine mammals occurs in Kotzebue Sound, which is inhabited by up to 2,000 + belukhas and an unknown but large number of spotted seals. Belukhas are most concentrated and predictably present offshore from Sheshalik, west of the Baldwin Peninsula, and particularly in Eschscholtz Bay. In Kotzebue Sound, spotted seals are most numerous in Eschscholtz Bay, Hotham Inlet, and at the mouth of the Noatak River. They are also present and haul out at locations along the coast from Wales to Cape Espenberg. Cape Espenberg and the string of islands extending south of it are the largest known spotted seal haul outs in Hope Basin. Harbor porpoises, killer whales, minke whales, and gray whales occur

in Hope Basin. Gray whales are most frequently seen from Kivalina to Cape Lisburne. There are no regularly used walrus haulouts in Hope Basin.

In the Barrow Arch, the greatest concentration of marine mammals occurs in and near Kasegaluk Lagoon, which is used by 2,000-3,000 belukhas and at least 2,000-3,000 spotted seals. Belukhas are usually concentrated near the major passes, particularly Kukpowruk, Utukok, Icy Cape, and Akoliakatat. Spotted seals are abundant throughout Kasegaluk Lagoon and haul out in large numbers at Utukok and Akoliakatat passes. They are less numerous but still abundant near the mouth of the Kuk River near Wainwright and the Kugrua River in southern Peard Pay.

There are no major, regularly used haulouts for walruses in the northeastern Chukchi Sea, although some have hauled out at Cape Lisburne each summer since 1975.

Killer whales are seen off Point Lay and Wainwright in most years, and minke whales have been sighted at Cape Lisburne. Harbor porpoises have been seen near Wainwright, in Peard Bay, and near Barrow, and probably pass along all of the coast. Gray whales are present and feed along the entire northeastern Chukchi coast during summer and autumn. They are most common between Icy Cape and Barrow, particularly off Wainwright and Point Franklin.

C. Potential Effects of OCS Activities

The possible effects of OCS exploration and development in the Chukchi Sea are of two principal types: 1) those associated with hydrocarbons which are released into the environment, and 2) those related to disturbances which may affect the behavior and distribution of animals. Possible direct impacts of oil pollution have been discussed by Davis and Anderson (1976), Geraci and Smith (1976, 1977), Costa and Kooyman (1980), Geraci and St. Aubin (1980, 1982), and Cowles et al. (1981). Generally speaking, direct effects of oil are expected to be greatest on animals which rely on fur for insulation, which includes polar bears and the newborn young of ice-inhabiting seals. Effects of oil which may be ingested in the process of feeding or growing were discussed by Geraci and Smith (1976, 1977) and Cowles et al. (1981). Results available to date are inconclusive, although some physiological effects have been documented. Effects of oil on foods of marine mammals in the Chukchi Sea were discussed in detail in Lowry et al. (1981). In the remainder of this section we will discuss only the possible effects of disturbance on the abundance, distribution, and behavior of marine mammals in the coastal zone of the eastern Chukchi Sea.

There can be little question that air- and water-borne noise will in many cases be audible to marine mammals (e.g., see Myrberg 1978). The possible effects of such disturbances caused by noise or the physical

presence of humans, vessels, or equipment are poorly known since very few studies have systematically addressed the question. Terhune et al. (1979) documented a decrease in vocalizations of harp seals (Phoca groenlandicus) in the presence of an operating vessel, which they attributed primarily to motor noise. It has been suggested that an increase in "water tourism" has caused a decrease in abundance of harbor seals (Phoca vitulina) in the Netherlands (Bonner 1978). Disturbance by humans has caused an elevated mortality in recently born Hawaiian monk seals (Monachus schauinslandi) (Rice 1964) and reduced productivity of Mediterranean monk seals (Monachus monachus) (Sergeant et al. 1978). Salter (1979) has documented a number of behavioral responses of walruses to over-flying aircraft, and we have noted that seals, sea lions (Eumetopias jubatus), and walruses almost invariably flee into the water when approached by humans or low-flying aircraft." Fay (pers. commun.) observed instances when walruses at Cape Seniavin were stampeded into the water by low-flying aircraft. When animals flee from the hauling areas, some mortality, especially of recently born young, will occur through injury or abandonment and subsequent starvation. The magnitude of this problem will vary by species, location, and time of year. In the case of walruses, regular human disturbance has prevented the long-term use of haulouts at Cape Newenham, Sledge Island, and to some extent King Island in the Bering Sea (ADF&G, unpubl.). Salter (1979) suggested that disturbances associated with the establishment of permanent bases in the Arctic may have caused changes in the summer distribution patterns of walruses, and, in fact, construction of the DEW-line station at Cape Lisburne did alter haulout patterns of walruses there (ADF&G, unpubl.).

Disturbance responses of cetaceans are more difficult to observe and quantify. Nishiwaki and Sasao (1977) are of the opinion that human activities, principally vessel traffic, have altered the migration routes of Baird's beaked whales (Berardius bairdii) and minke whales off the coast of Japan. In the case of minke whales, the greatest effect may have been on females with calves which avoided traditionally used coastal areas. Fraker (1977) discussed the effects of disturbance on belukha whales in the Mackenzie delta area. We have observed that outboard-powered boats affect belukha movements in rivers and bays. When a boat approached whales moving up the Snake River, they changed direction and moved downstream. When boats approached a large group of whales in shallow areas of western Nushagak Bay, they all turned and headed eastward toward deeper water. Changes in the summer distribution pattern of belukhas in Kotzebue Sound are closely correlated with changes in human activities and associated boat traffic (Burns et al., in prep.).

The actual results of responses to disturbances such as those discussed above are even less well known than the responses themselves. Mortality and injury of animals, particularly newborn or nursing young, will definitely occur in some circumstances, as has been documented for walruses and monk seals. More subtle effects on animal condition may also occur when disturbances interfere with normal activities such as

nursing, resting, breeding, and molting. Perhaps most significant is the long-term displacement of animals that will be caused by continuous or regular and frequent disturbance. Since feeding is a major activity for marine mammals during summer and autumn, it is reasonable to assume that concentration areas of most marine mammals occur mainly in locations where they can obtain their food most efficiently. Pinnipeds require hauling areas on which to rest between feeding forays, and some species of cetaceans may likewise need protected areas in which to rest, care for young, and socialize. These coastal concentration areas occur at specific locations and are limited in number. Displacement from these areas will mean that those feeding grounds are abandoned or that animals will have to travel greater distances to reach them from the nearest resting area, either of which would be detrimental in energetic terms. One might speculate that such displacement would have the greatest effect on a species such as walrus, which feed on sessile organisms that occur abundantly only in limited areas. However, the principal prey of many other marine mammal species such as capelin (Mallotus villosus), herring, and salmon are equally concentrated at specific areas and times of year. Changes in distribution and abundance which prevent a species from exploiting its potential food resources in the most efficient manner will result in long-term changes in productivity, survival, and abundance.

IX. Needs for Further Study

This study covered the portion of the Alaska coastline from Bering Strait to Point Barrow and included several locations which are important marine mammal habitats during spring and autumn. A similar report dealing with the Bering Sea coast was submitted in September 1982. Many coastal areas of the Aleutian Islands and the Gulf of Alaska are also important habitat for marine mammals, particularly sea lions, sea otters, and harbor seals. A review of available data on distribution and abundance of marine mammals in the coastal zone would be very useful for planning OCS activities in those areas.

This report includes all sighting data available to us up to the end of 1981. Some significant observations made in summer 1982 are also included. Undoubtedly, we have missed some past observations which should have been included. In addition, with the present intensity of field research in western Alaska, much new information will be generated each year. We consider this report to be a working document which will be of greatest value if it can encourage researchers to record their sightings of marine mammals and make them available to others. A single sighting which seems of little value in itself may be of substantial significance when considered in combination with all the other data available. Consideration should be given to updating and revising this report on a regular basis, perhaps every 2 years.

Although we have been able to describe general features of the distribution and abundance of marine mammals in the coastal areas of

the eastern Chukchi Sea using the existing data base, with few if any exceptions the available data are not adequate to predict or monitor the effects of OCS development or other human activities on marine mammals. There have been no systematic studies which have described the distribution, abundance, and activities of marine mammals at a particular location throughout the time they occur there and for a series of years. The available data show quite conclusively that the number of animals using particular areas has changed over time, and we predict that such fluctuations will continue to occur during OCS exploration and development. Without some additional research on the biology of marine mammals in the coastal zone, it will be difficult to detect and measure the fluctuations and impossible to identify the causes.

We suggest that OCSEAP initiate studies that will deal with representative species and habitats in areas that are likely to be impacted by OCS activities in the near future. Some potential species and areas are as fol lows:

Spotted seals - Kasegaluk Lagoon, Cape Espenberg

Walruses - Cape Lisburne

Belukha whales - Kotzebue Sound, Kasegaluk Lagoon

Of principal interest at each location is documental on of the seasonal cycle in numbers of animals using the area. Act vity patterns should be examined as they relate to enumeration of anima s as well as for documentation of "normal" activity. Present levels of disturbance and their effects, if any, should be monitored. Information should be gathered on the relationships among groups of animals at various locations; i.e., what is the rate of interchange among areas and what degree of fidelity do individuals have to particular locations. Research should include, as possible, observations of group composition, birth and survival rates, and present causes of mortality. Finally, the significance of the area to the animals should be determined; i.e., is it used principal ly for feeding, birthing, breeding, or some combination of purposes.

More specifically, the distribution and movements of belukha whales along the Chukchi coast should be studied through application of tagging techniques being developed in Bristol Bay and should be conducted in conjunction with aerial surveys during times of peak abundance. Large aggregations of belukhas occur in two known locations in the eastern Chukchi Sea: Kotzebue Sound and the Kasegaluk Lagoon area. It is unknown whether these aggregations are two separate groups of animals or the same group moving up the coast as the season progresses. Food habits of belukhas in the Kasegaluk Lagoon area are unknown, as are the availability of prey and the probable importance of this section of the coast as a feeding area.

Relatively little is known about the use of Chukchi coastal areas by spotted seals. In late summer, large aggregations are known to occur at Cape Espenberg and Kasegaluk Lagoon. The actual number of seals using those areas, the duration of their stay, and their activity patterns while there are unknown. However, these are clearly two of the largest documented spotted seal aggregations along the entire coastline of northwest Alaska.

If such studies are begun prior to OCS leasing and continued at intervals after exploration and development begin, it should be possible to make some definitive statements regarding the effects of OCS activities.

X. Literature Cited

Bailey, A. M. and R. W. Hendee. 1926. Notes on the mammals of northwestern Alaska. J. Mammal. 7:9-28.

Barton, L. H. 1979. Finfish resource surveys in Norton Sound and Kotzebue Sound. Pages 75-313 in Environmental Assessment of the Alaskan Continental Shelf, Final Reports of Principal Investigators, vol. 4. Biological Studies. Outer Continental Shelf Environmental Assessment Program, Boulder, Colo.

Bee, J. W. and E.R. Hall. 1956. Mammals of northern Alaska on the Arctic Slope. Misc. Publ. No. 8, Univ. Kans. Publ. Mus. Nat. Hist. 309 pp.

Bigg, M. A. 1981. Harbor seal - Phoca vitulina and P. largha. Pages 1-28 in S. H. Ridgway and R. J. Harrison, eds. Handbook of Marine Mammals, Vol. 2. Academic Press, London and New York.

Blokhin, S. A. 1979. On the status of gray whale stocks in the coastal waters of the Chukotka Peninsula. Rep. Int. Whaling Comm. 29:335-336, SC/30/Doc 54.

Bonner, W. N. 1978. Mans impact on seals. Mammal Rev. 8:3-13.

Braham, H. W. and B. D. Krogman. 1977. Population biology of the bowhead (Balaena mysticetus) and beluga (Delphinapterus leucas) whales in the Bering, Chukchi, and Beaufort seas. Processed rep., Northwest and Alaska Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Seattle. 29 pp.

Braham, H. W., R. D. Everitt, B. D. Krogman, D. J. Rugh, and D. E. Withrow. 1977. Marine mammals of the Bering Sea: a preliminary report on distribution and abundance. Northwest and Alaska Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Seattle. 90 pp.

Braham, H. W., M. A. Fraker, and B. D. Krogman. 1980. Spring migration of the western arctic population of bowhead whales. Mar. Fish. Rev. 42(9-10):36-46.

Braham, H. W., J. J. Burns, and G. A. Fedoseev. In press a. Distribution and density of ice-associated pinnipeds in the Bering Sea, April 1976. Mar. Fish. Rev.

Braham, H. W., B. D. Krogman, and G. M. Carroll. In press b. Bowhead whale (Balaenamysticetus) migration, distribution, and abundance in the Bering, Chukchi, and Beaufort seas, 1975-1978, with notes on the distribution and life history of white whales (Delphinapterus leucas). NOAA Tech. Memo NMFS SSRF-000.

Burns, J. J. 1970. Remarks on the distribution and natural history of pagophilicpinnipeds in the Bering and Chukchi seas. J. Mammal. 51:445-454.

Burns, J. J. 1978. Ice seals. Pages 193-205 in D. Haley, ed. Marine Mammals of Eastern North Pacific and Arctic Waters. Pacific Search Press, Seattle.

Burns, J. J. and S. J. Harbo, Jr. 1977. An aerial census of spotted seals, Phocavitulinalargha, and walruses, Odobenusrosmarus, in the ice front of Bering Sea. Pages 58-132 in Environmental Assessment of the Alaskan Continental Shelf, Quarterly Reports, April-June, Vol. 1. Outer Continental Shelf Environmental Assessment Program, Boulder, Colo.

Burns, J. J. and J. E. Morrow. 1975. The Alaskan arctic marine mammals and fisheries. Pages 561-582 in J. Malaurie, ed. Arctic Oil and Gas Problems and Possibilities. Mouton and Co., Paris.

Burns, J. J., K. J. Frost, G. A. Seaman, and L. F. Lowry. In prep. Biological investigations of belukha whales in waters of western and northern Alaska. Final Rep. Res. Unit 612, Outer Continental Shelf Environmental Assessment Program, Boulder, Colo.

Childs, H. E., Jr. 1969. Birds and mammals of the Pitmegea River region, Cape Sabine, northwestern Alaska. Biol. Pap. No. 10, Univ. Alaska, Fairbanks. 76 pp.

Costa, D. P. and G. L. Kooyman. 1980. Effects of oil contamination in the sea otter, Enhydra lutris. Pages 65-107 in Environmental Assessment of the Alaskan Continental Shelf, Final Reports of Principal Investigators, Vol. 10. Outer Continental Shelf Environmental Assessment Program, Boulder, Colo.

Cowles, C. J., D. J. Hansen, and J. D. Hubbard. 1981. Types of potential effects of offshore oil and gas development on marine mammals and endangered species of the northern Bering Sea and

Arctic Ocean. U.S. Dep. Interior, Bur. Land Manage., Alaska Outer Continental Shelf Office, Tech. Pap. No. 9, BLM-YK-ES-82-011-1792. 23 pp.

Dahlheim, M. E. 1981. A review of the biology and exploitation of the killer whale, Orcinus orca, with comments on recent sightings from Antarctica. Rep. Int. Whaling Comm. 31:541-546, SC/32/SM9.

Davis, J. E. and S. S. Anderson. 1976. Effects of oil pollution on breeding grey seals. Mar. Pollut. Bull. 7(6):115-118.

Dunbar, M. J. 1949. The pinnipedia of the Arctic and Subarctic. Bull. Fish. Res. Board Can. 85:1-22.

Durham, F. E. 1979. Personal comments on harvesting gray whales for subsistence living and on better utilization of marine mammal products in arctic Alaska. Unpubl. ms. presented to the Panel Meeting (NMFS-IWC) in Seattle, 5-9 February 1979, and revised 24 March 1979. 3 pp.

Estes, J. A. and J. R. Gilbert. 1978. Evaluation of an aerial survey of Pacific walruses (Odobenus rosmarus divergent). J. Fish. Res. Board Can. 34:1130-1140.

Fay, F. H. 1957. History and present status of the Pacific walrus population, Pages 431-455 in Trans. 22nd N. Am. Wildl. Conf. Wildl. Manage. Inst., Washington, D.C.

Fay, F. H. 1974. The role of ice in the ecology of marine mammals of the Bering Sea. Pages 383-399 in D. W. Hood and E. J. Kelly, eds. Oceanography of the Bering Sea with Emphasis on Renewable Resources. Occas. Publ. No. 2, Inst. Mar. Sci., Univ. Alaska, Fairbanks.

Fay, F. H. 1982. Ecology and biology of the Pacific walrus, Odobenus rosmarus divergens Illiger. U.S. Fish Wildl. Serv. N. Am. Fauna. No. 74. 279 pp.

Fay, F. H. and B. P. Kelly. 1982. Herd composition and response to disturbance of walruses in the Chukchi Sea. Cruise report for KS Entuziast, 25 July-23 August 1982, NOAA OCSEAP RU #611. Unpubl. ms. 13 pp.

Fedoseev, G. A. 1962. On the state of the stock and the distribution of the Pacific walrus. Zool. Zh. 41(7):1083-1089. In Russian. (Transl. by F. H. Fay, Univ. Alaska, Fairbanks, October 1962. 12 pp.)

Fiscus, C. H. and W. M. Marquette. 1975. National Marine Fisheries Service field studies relating to the bowhead whale harvest in Alaska, 1974. Processed rep. Natl. Mar. Fish. Serv., NOAA, Seattle. 23 pp.

Fiscus, C. H., W. M. Marquette, and H. W. Braham. 1976. Abundance and seasonal distribution of bowhead and belukha whales - Beaufort Sea, northeastern Chukchi Sea. Pages 159-182 in Environmental Assessment of the Alaskan Continental Shelf, Annual Reports of Principal Investigators, Vol. 1. Environ. Res. Lab., Boulder, Colo.

Foote, D. C. 1960. The Eskimo hunter at Point Hope, Alaska, September, 1959 to May, 1960. Report submitted to the U.S. Atomic Energy Comm., Contract No. AT (04-3)-315.

Foote, D. C. and H. A. Williamson. 1966. A human geographical study. Pages 1041-1107 in N. J. Willimovsky and J. N. Wolfe, eds. Environment of the Cape Thompson Region, Alaska. U.S. Atomic Energy Comm., Oak Ridge, Term. (NTIS No. PNE-481).

Fraker, M. A. 1977. The 1977 whale monitoring program Mackenzie estuary, NWT. F. F. Slaney and Co., Ltd., Vancouver, Canada. 53 PP*

Fraker, M. A. 1979. Spring migration of bowhead (Balaenamysticetus) and white whales (Delphinapterus leucas) in the Beaufort Sea. Fish. Mar. Serv. Tech. Rep. No. 859, Dep. Fish. and Environ. Canada. 36 pp.

Fraker, M. A., D. E. Sergeant, and W. Hock. 1978. Bowhead and white whales in the southern Beau fort Sea. Beaufort Sea Proj. Tech. Rep. No. 4. 114 pp.

Frost, K. J., L. F. Lowry, and J. J. Burns. 1982. Distribution of marine mammals in the coastal zone of the Bering Sea during summer and autumn. Final Rep., NOAA, Outer Continental Shelf Environmental Assessment Program, Contract NA-81-RAC-OO050. 166 pp.

Geraci, J. R. and T. G. Smith. 1976. Direct and indirect effects of oil on ringed seals (Phocahispida) of the Beau fort Sea. J. Fish. Res. Board Can. 33:1976-1984.

Geraci, J. R. and T. G. Smith. 1977. Consequences of oil fouling on marine mammals. Pages 399-410 in D. C. Malins, ed. Effects of Petroleum on Arctic and Subarctic Marine Environments and Organisms. Vol. II. Biological Effects. Academic Press, New York.

Geraci, J. R. and D. J. St. Aubin. 1980. Offshore petroleum resource development and marine mammals: a review and research recommendations. Mar. Fish. Rev. Nov. 1980:1-11.

Geraci, J. R. and D. J. St. Aubin. 1982. Study of the effects of oil on cetaceans. Final report prepared for U.S. Dep. Interior, Bur. Land Manage., Washington, D.C. Contract No. AA 551-CT9-29.

Gol'tsev, V. N. 1972. Distribution and assessment of the numbers of the Pacific walrus in the autumn of 1970. Pages 146-148 in 5th All-Union Conference Study of Marine Mammals, 19-21 September 1972, Makhachkala. Akad. Nauk SSR. In Russian. (Transl. by F. H. Fay and B. A. Fay, Univ. Alaska, Fairbanks, 1974. 3 pp.)

Gol'tsev, V. N. 1976. (Aerial surveys of Pacific walrus in the Soviet sector during fal 1, 1975). Processed rep., TINRO, Magadan, USSR. (Transl. by J. J. Burns, Alaska Dep. Fish and Game, Fairbanks, 18 pp.)

Gurevich, V. S. 1980. Worldwide distribution and migration patterns of the white whale (beluga), Delphinapterus leucas. Rep. Int. Whaling Comm. 30:465-480, SC/31/SM 14.

Hall, E. R. and J. A. Bee. 1954. Occurrence of the harbour porpoise at Point Barrow, Alaska. J. Mammal. 35:122-123.

Harington, C. R. 1966. Extralimital occurrences of walruses in the Canadian Arctic. J. Mammal. 47:506-513.

Harrison, C. S. and J. D. Hall. 1978. Alaskan distribution of the beluga whale, Delphinapterus leucas. Can. Field-Nat. 92:235-241.

Herzing, D. L. and B. R. Mate. 1981. California gray whale migration along the Oregon coast. Page 54 in Abstr. 4th Biennial Conf. Biol. Mar. Mammals, 14-18 December 1981, San Francisco, Calif.

Hobbs, L. J. and M. E. Goebel. 1982. Bowhead whale radio tagging feasibility study and review of large cetacean tagging. NOAA Tech. Memo. NMFS F/NWC-21. 68 pp.

Ivashin, M. V. and L. M. Votrogov. 1981a. Killer whales, Orcinus orca, inhabiting inshore waters of the Chukotka coast. Rep. Int. Whaling Comm. 31:521, SC/32/SM2.

Ivashin, M. V. and L. M. Votrogov. 1981b. Minke whales, Balaenoptera acutorostrata davidsoni, inhabiting inshore waters of the Chukotka coast. Rep. Int. Whaling Comm. 31:231, SC/32/Mi1.

Johnson, M. L., C. H. Fiscus, B. T. Ostenson, and M. L. Barbour. 1966. Marine mammals. Pages 877-924 in N. J. Wilimovsky and J. N. Wolfe, eds. Environment of the Cape Thompson Region, Alaska. U.S. Atomic Energy Comm., Oak Ridge, Term. (NTIS No. PNE-481).

Johnson, S. R. 1979. Fall observations of westward migrating white whales (Delphinapterus leucas) along the central Alaskan Beaufort Sea coast. Arctic 32:275-276.

Kenyon, K. W. 1960. Aerial survey of walruses in northern Bering Sea, 23 February to 2 March 1960. Unpubl. rep., Bur. Sport Fish. Wild l., U.S. Fish Wildl. Serv., Seattle. 23 pp.

Kenyon, K. W. 1972. Aerial surveys of marine mammals in the Bering Sea, 6-16 April 1972. Unpubl. rep., Bur. Sport Fish. Wild l., U.S. Fish Wildl. Serv., Seattle. 79 pp.

Kleinenberg, S. E., A. V. Yablokov, B. M. Bel'kovich, and M. N. Tarasevich. 1964. Beluga (Delphinapterus leucas) - Investigation of the species. Akad Nauk SSSR, Moscow. In Russian. (Transl. by Israel Program Sci. Transl., Jerusalem, 1969. 376 pp.)

Krogman, B. D., H. W. Braham, R. M. Sonntag, and R. G. Punsly. 1979. Early spring distribution, density, and abundance of the Pacific walrus (Odobenus rosmarus) in 1976. Final Rep. Subcontract R 7120804, Res. Unit 14, Outer Continental Shelf Environmental Assessment Program, Boulder, Colo. 47 pp.

Leatherwood, S. and R. R. Reeves. 1978. Porpoises and dolphins. Pages 97-111 in D. Haley, ed. Marine Mammals of Eastern North Pacific and Arctic Waters. Pacific Search Press, Seattle.

Lehnhausen, W. A. and S. E. Quinlan. 1981. Bird migration and habitat use at Icy Cape, Alaska. Unpubl. rep., U.S. Fish Wildl. Serv., Speci a Studies Off., Anchorage, Alaska.

Lensink, C. J. 1961. Status report: beluga studies. Unpubl. ins., Div. B 01. Res., Alaska Dep. Fish and Game, Juneau. 20 pp.

Ljungblad, D. K. 1981. Aerial surveys of endangered whales in the Beaufort Sea, Chukchi Sea and northern Bering Sea. NOSC TD 449, June 1981, Naval Oceans Systems Cent., San Diego, Cal if.

Ljungblad, D. K., S. E. Moore, D. R. Van Schoik, and C. S. Winchell. 1982. Aerial surveys of endangered whales in the Beaufort, Chukchi and northern Bering seas. Draft Rep. NOSC TD No. 486, Naval Oceans Systems Cent., San Diego, Cal if.

Lowry, L. F., K. J. Frost, and J. J. Burns. 1981. Trophic relationships among ice-inhabiting phocid seals and functional ly related marine mammals in the Chukchi Sea. Pages 37-95 in Environmental Assessment of the Alaskan Continental Shelf, Final Reports of Principal Investigators, Vol. 11. Outer Continental Shelf Environmental Assessment Program, Boulder, Colo.

Lowry, L. F., K. J. Frost, and J. J. Burns. 1982a. Investigations of marine mammals in the coastal zone of western Alaska during summer and autumn. Annu. Rep. Contract #NA 81 RAC 000 50, Outer Continental Shelf Environmental Assessment Program, Boulder, Colo. 37 pp.

Lowry, L. F., K. J. Frost, D. G. Calkins, G. L. Swartzman, and S. Hills. 1982b. Feeding habits, food requirements, and status of Bering Sea marine mammals, Vols. I and II. Draft final rep. to N. Pac. Fish. Manage. Count., Anchorage, Alaska. 676 pp.

Maher, W.J. 1960. Recent records of the California grey whale (Eschrichtius glaucus) along the north coast of Alaska. Arctic 13: 257-265.

Marquette, W. M. 1977. The 1976 catch of bowhead whales (Balaena mysticetus) by Alaskan Eskimos, with a review of the fishery, 1973-1976, and a biological summary of the species. Processed rep., Mar. Mammal Div., Natl. Mar. Fish. Serv., NOAA, Seattle. 80 pp.

Marquette, W. M. and H. W. Braham. 1982. Gray whale distribution and catch by Alaskan Eskimos: a replacement for the bowhead whale? Arctic 35:386-394.

Mitchell, E. D. 1973. The status of the world's whales. Nat. Can. 2(4):9-27.

Murdoch, J. 1885. Report of the International Polar Expedition to Point Barrow, Alaska. Gov. Printing Off., Washington, D.C.

Myrberg, A. A., Jr. 1978. Ocean noise and the behavior of marine animals: relationships and implications. Pages 169-208 in J. L. Fletcheur and R. G. Busnel, eds. Effect of Noise on Wildlife. Academic Press, New York.

Nelson, E. W. 1887. Report upon natural history collections of Alaska between the years 1877 and 1881. Pages 227-293 in Part II, Arctic Ser. Publ., No. 3, U.S. Army.

Nelson, R. R. 1969. Hunters of the Northern Ice. Univ. Chicago Press, Chicago. 429 pp.

Nishiwaki, M. and A. Sasao. 1977. Human activit es disturbing natural migration routes of whale's. Sci. Rep. Whales Res. Inst. 29:113-120.

Ohsumi, S. 1975. Population assessment of the California gray whale. Rep. Int. Whaling Comm. 27:350-359, SC/27/Dot 19. "

Omura, H. and H. Sakiura. 1956. Studies on the little piked whale from the coast of Japan. Sci. Rep. Whales Res. Inst. 11:1-37.

Pike, G. C. 1962. Migration and feeding of the gray whale. J. Fish. Res. Board Can. 19:815-838.

Prescott, J. H. and P. M. F ore li. 1980. Review of the harbor porpoise (Phocoena phocoena) in the U.S. Northwest Atlantic. Final Rep. MMC Contract MM8AC016, U.S Mar. Mammal Comm., Washington, D.C. 64 pp.

Reilly, S., D. Rice, and A. Wolman. 1980. Preliminary population estimate for the Cal ifornia gray whale based upon"Monterey shore censuses, 1967/68 to 1978/79. Rep. Int. Whaling Comm.30:359-368.

Rice, D. W. 1964. The Hawaiian monk seal. Nat. Hist.73:48-55.

Rice, D. W. and A. A. Wolman. 1971. The life history and ecology of the gray whale (Eschrichtiusrobustus). Am. Sot. Mammal. Spec. Pub . No. 3. 142 pp.

Rugh, D. 1981. Fal l gray whale census at Unimak Pass, Alaska 1977-79. Pag 100 in Abstr. 4th Biennial Conf.Biol. Mar. Mammals, 14-18 December 1981, San Francisco, Cal if.

Rugh, D. J. and H. W. Braham. 1979. California gray whale (Eschrichtius robustus)fall migration through Unimak Pass, Alaska, 1977: a preliminary report. Rep. Int. Whaling Comm.29:315-320, SC/30\ Doc 46.

Saario, D. J. and B. Kessel. 1966. Human ecological investigations at Kivalina. Pages 969-1039 in N. J. Wilimovsky and J. N. Wolfe, eds. Environment of the Cape Thompson Region, Alaska. U.S. Atomic Energy Comm., Oak Ridge, Term. (NTIS No. PNE-481).

Salter, R. E. 1979. Site utilization, activity budgets, and disturbance responses of Atlantic walruses during terrestrial haul-out. Can. J. Zool. 57:1169-1180.

Scheffer, V. B. 1976. The status of whales. Pac. Discovery 29:2-8.

Seaman, G. A. and J. J. Burns. 1981. Preliminary results of recent studies of belukhas in Alaskan waters. Rep. Int. Whaling Comm. 31:567-574, SC/32/SM13.

Seaman, G. A., L. F. Lowry, and K. J. Frost. 1982. Foods of belukha whales (Delphinapterus leucas) in western Alaska. Cetology 44: 1-19.

Sergeant, D., K. Ronald, J. Boulva, and F. Berkes. 1978. The recent status of Monachus monachus, the Mediterranean monk seal. Biol. Conserv. 14:259-287.

Shaughnessy, P. D. and F. H. Fay. 1977. A review of the taxonomy and nomenclature of North Pacific harbour seals. J. Zool. (Lend.) 182:385-419.

Springer, A. M. and D. G. Roseneau. 1977. A comparative sea-cliff bird inventory of the Cape Thompson vicinity, Alaska. Pages 206-262 in Environmental Assessment of the Alaskan Continental Shelf, Annual Reports of Principal Investigators, Vol. V. Outer Continental Shelf Environmental Assessment Program, Boulder, Colo.

Terhune, J. M., R. E. A. Stewart, and K. Ronald. 1979. Influence of vessel noises on underwater vocal activity of harp seals. Can. J. Zool. 57:1337-1338.

Tomilin, A. G. 1957. Cetacea. Vol. 9 of Zveri SSSR i prilezhashokikh stran. Ized. Akad. Nauk SSSR, Moscow. 756 pp. In Russian. (Transl. by Israel Program Sci. Transl., 1967, 717 pp, NTIS No. TT 65-50086.)

Van Bree, P. J. H., D. E. Sergeant, and W. Hock. 1977. A harbour porpoise, Phocoena phocoena (Linnaeus, 1758), from the Mackenzie River delta, Northwest Territories, Canada. Beaufortia 26(333): 99-105.

Van Valin, W. B. 1941. Eskimoland Speaks. The Caxton Printers, Ltd., Caldwell, Idaho. 242 pp.

Wilke, F. and C. H. Fiscus. 1961. Gray whale observations. J. Mammal. 42:108-109.

APPENDIX 1.

Geographical Coordinates of Locations Referred to in Text

Name	Region	Latitude	Longitude
Agiak Point	BA 2	70°29'05"N	159°54'15"W
Akoliakatat Pass	BA 1	70°18'N	161°18'W
Akoviknak Lagoon	HB 3	68°12'N	166°02'W
Akunik Pass (Kokolik Pass)	BA 1	69°53'45"N	162°49'30"W
Arctic Lagoon	HB 1	66°12'N	166°09'W
Atanik	BA 2	70°50'N	159°21'W
Avak Inlet	BA 1	70°15'N	161°38'W
Baldwin Peninsula	HB 2	66°45'N	162°20'W
Barrow	BA 2	71°17'30"N	156°47'15"W
Barrow, Point	BA 2	71°23'29"N	156°28'30"W
Beaufort, Cape	BA 1	69°02'N	163°50'W
Belcher, Point	BA 2	70°47'40"N	159°39'02"W
Blossom, Cape	HB 2	66°44'N	162°30'W
Buck land River	HB 2	66°14'N	161°01'W
Chamisso Island	HB 2	66°13'N	161°50'W
Choris Peninsula	HB 2	66°17'N	161°53'W
Corwin Bluff	BA 1	68°52'40"N	165°03'15"W
Crowbill Point	HB 3	68°06'05"N	165°48'07"W
Deering	HB 2	66"04'N	162°42'W
Dyer, Cape	HB 3	68°39'08"N	166°13'50"W

Appendix I

Name	Region	Latitude	Longitude
Elephant Point	HB 2	66°16'N	161°20'W
Elson Lagoon	BA 2	71°15'N	155°51'W
Eschscholtz Bay	HB 2	66°20'N	161°30'W
Espenberg, Cape	HB 1	66°33'N	163°36'W
Franklin, Point	BA 2	70°54'28"N	158°47'50"W
Hope, Point	HB 3	68°20'20"N	166°50'40"W
Hotham Inlet	HB 2	67°00'N	162°00'W
Icy Cape	BA 1	70°20'N	161°52'W
Icy Cape Pass	BA 1	70°18'N	161°57'W
Ikpek	HB 1	65°54'N	167°17'W
Ikpek Lagoon	HB 1	65°56'N	167°00'W
Karmuk Point	BA 2	70°35'10"N	159°53'45"W
Kasegaluk Lagoon	BA 1	70°28'N to 69°16'N	160°29'W to 163°18'W
Kivalik Channel (Inlet)	HB 3	67°47'N	164°41'W
Kivalina	HB 3	67°43'40"N	164°32'30"W
Kokolik Pass (Akunik Pass)	BA 1	69°53'45"N	162°49'30"W
Kokolik River	BA 1	69°45'15"N	163°00'W
Kotzebue	HB 2	66°54'N	162°35'W
Kotzebue Sound	HB 2	66°45'N	163°00'W

Name	Reg ion	Latitude	Longitude
Krusenstern, Cape	HB 2	67°08'N	163°44'45"W
Kugrua Bay	BA 2	70°47'N	159°08'W
Kugrua River	BA 2	70°46'30"N	159°17'W
Kuk River	BA 2	70°35'N	159°53'W
Kukpowruk Pass	BA 1	69°40'30"N	163°06'W
Kukpuk River	HB 3	68°25'N	166°22'W
Lay, Point	BA 1	69°45'45"N	163°03'05"W
Lewis, Cape	HB 3	68°42'50"N	166°12'01"W
Lisburne, Cape	BA 1	68°53'N	166°13'W
Lopp Lagoon	HB 1	65°45'N	167°45'W
Marryat Inlet	HB 3	68°22'N	166°33'W
Marsh, Point	BA 2	70°36'25"N	160°07'W
Naokok Pass	BA 1	69°27'30"N	163°08'30"W
Noatak River delta	HB 2	67°00'N	162°30'W
Ogotoruk Creek	HB 3	68°05'52"N	165°45'15"W
Peard Bay	BA 2	70°51 'N	158°48'W
Pingorarok Pass	BA 1	70°22'N	160°49'W
Pitmegea River	BA 1	68°54'40"N	164°37'W
Prince of Wales, Cape	HB 1	65°36'N	168°05'W

Name	Reg ion	Latitude	Longitude
Sabine, Cape	BA 1	68°55'N	164°36'15"W
Selawik Lake	HB 2	66°30 'N	160°45'W
Seppings, Cape	HB 3	68°58'N	165°11'W
Sheshalik	HB 2	66°59'30"N	162°49'45"W
Shishmaref	HB 1	66°15'N	166°04'W
Shishmaref Inlet	HB 1	66°15'N	166°05'W
Spafarief Bay	HB 2	66°08'N	161 °51'W
Thompson, Cape	HB 3	68°08'40"N	165°58'40"W
Utukok Pass	BA 1	70°05'N	162°31'W
Wainwright	BA 2	70°38'15"N	160°01'45"W
Wales	HB 1	65°37'N	168°05'W

APPENDIX II.

Source Names Index

ADF&G (Alaska Department of Fish and Game) files - HB 3

ADF&G Files, Nome - HB 1, 6A 2

ADF&G Herring Survey - HB 2

Adams, J. - BA 2
Barrow resident; pers.commun. to H. Melchior, ADF&G, Barrow

Agnassagga, A. - BA 1
Point Lay resident; pers.commun. to G. Seaman, ADF&G, Anchorage

Agnassagga, C. - 6A 1
Point Lay resident; pers.commun. to G. Seaman, ADF&G, Anchorage

Agnassagga, G. - 6A 1
Point Lay resident; pers.commun. to G. Seaman, ADF&G, Anchorage

Alaska Planning Group (no date) - HB 1
unpubl. ADF&G report, Habitat Division, Anchorage

Bailey and Hendee 1926 - HB 1, BA 1, 6A 2

Barr, G. - HB 2
Ko- zebue resident; pers. commun. to G. Seaman, ADF&G, Anchorage

Bee and Hall 1956 - HB 3, 6A , BA 2

Bodfish W. - B A 1
Po nt Lay resident; pers commun. to G. Seaman, ADF&G, Anchorage

Braham et al. 1980 - HB 3, 6A 2

Braham et al., in press b - HB 3, 6A 1

Brewer, T. - BA 2
Barrow resident; pers. commun. to D. Strickland, ADF&G, Fairbanks

Burns, J. -HB1, HB2, HB3, BA1,BA 2
ADF&G, Nome, 1962-1969; Fairbanks, 1969-present, Marine Mammals Research Coordinator

Burns and Morrow 1975 - HB 1

Childs 1969 - BA 1

Collins, G. - BA 1
from files of F. H. Fay, Univ. Alaska, Fairbanks

Craighead, D. - HB 3
ADF&G, Kotzebue

Degange, A. - HB 2
seabird observer, Seabird Colony Status Program, USFWS, Anchorage

Durham 1979 - HB 3, BA 2

Fay, F. H. -HB 1, HB3, BA 1, BA 2
walrus researcher, Inst. Mar ne Science, Univ. Alaska, Fairbanks

Fay 1982 - BA 1

Fay and Kelly 1982 - HB 3, BA 2

Field, P. - HB 3
ADF&G seasonal emp oyee (mar ne mamma s)

Fields, A. - HB 2
Kotzebue resident; pers.commun. to J. Burns, ADF&G, Fairbanks

Fiscus and Marquette 1975 - HB 3

Fiscus et al. 1976 - BA 2

Foote 1960 - HB 2, HB 3

Foote and Williamson 1966 - HB 2

Frankson, D. - HB 3
Point Hope resident

Frost, K. - HB1, HB2, BA 1, BA2
marine mammal researcher, ADF&G, Fairbanks

Goodhope, F. - HB 1
Shishmaref resident; pers.commun. to J. Burns, ADF&G, Fairbanks

Goodwin, W. - HB 2
employee of NANA Corp., Kotzebue;pers.commun.to J. Burns, ADF&G, Fairbanks

Hills, S. - HB 1
seabird observer, Univ. Washington; pers. commun. to K. Frost, ADF&G, Fairbanks

Hobbs and Goebel 1982 - HB 3, BA 2

Jacobson, J. - HB 2
Kotzebue resident; pers.commun. to J. Burns, ADF&G, Fairbanks

Johnson et al. 1966 - HB 3

Kelly, B. - HB 3, BA 1
marine mammal researcher, ADF&G and Inst. Marine Science, Univ. Alaska, Fairbanks

King, R. - BA 1, BA 2
aerial surveys for waterfowl, USFWS, Fairbanks

Krammer, D. - HB 2
Kotzebue resident; pers.commun. to G. Seaman, ADF&G, Anchorage

Lee, N. - HB 2
Buck land resident; pers. commun. to G. Seaman, ADF&G, Anchorage

Lehnhausen and Quinlan 1981 - BA 1

Lensink 1961 - HB 1, HB 2

Ljungblad 1981 - HB 3, BA 1, BA 2

Ljungblad et al. 1982 - HB1, HB2, HB3, BA 1, BA2

Lowry, L. - HB1, HB3, BA1, BA2
marine mammal researcher, ADF&G, Fairbanks

Maher 1960 - BA 1, BA 2

Marquette 1977 - HB 3

Marquette and Braham 1982 - HB 3, BA 1, BA 2

Melchior, H. - HB 3, BA 2
ADF&G, Area Biologist, Barrow

Merrit, P. - HB 2
ADF&G, FRED Division, Kotzebue

Murdoch 1885 - BA 2

Murphy, E. - HB 3
seabird researcher, Univ. Alaska, Fairbanks

Neakok, B. - BA 1
Point Lay resident; pers. commun. to G. Seaman, ADF&G, Anchorage

Neakok, W. - BA 1
Point Lay resident; pers. commun. to G. Seaman, ADF&G, Anchorage

Negovanna, W. - BA 1
Wainwright resident; pers. commun. to G. Seaman, ADF&G, Anchorage

Ne son 1887 - HB 2, HB 3

Ne son 1969 - BA 2

Ne son, R. - BA 1, BA 2
marine mammal researcher, ADF&G, Nome

North Slope Planning Document 1982 - HB 3, 6A 1
unpublished report prepared by Maynard and Parch, Woodward-Clyde Consultants. Alaska Coastal Management Program.

Oktollik, J. - HB 3
Point Hope resident; pers. commun. to P. Field, ADF&G, Fairbanks

Pegau, R. - 6A 1
ADF&G, Nome

Persons, K. - HB 2
pers. commun. to J. Burns, ADF&G, Fairbanks

Pike 1962 - HB 1, HB 2, HB 3

Quimby, R. - BA 1
pers. commun. to J. Burns, ADF&G, Fairbanks

Ray, G. - HB 1, BA 2
marine mammal researcher, Univ. Virginia, Charlottesville

Robus, M. - HB 3
ADF&G, Fairbanks

Rudd, J. - BA 1
pilot, Kotzebue

Saario and Kessel 1966 - HB 3

Seaman and Burns 1981 - HB 2

Seaman, G. - HB1, HB2, HB3, BA1, BA 2
ADF&G, Anchorage

Shanahan, C. - BA 2
pers. commun. to J. Burns, ADF&G, Fairbanks

Smith, T. - BA 1
ADF&G, Nome

Smullen, D. - HB 3
bowhead whale program, National Marine Fisheries Service, Seattle

Sowls, A. - HB 2
seabird observer and coordinator, Seabird Colony Status Program, USFNS, Anchorage

Springer, A. - BA 1
seabird researcher, LGL Ltd., Fairbanks

Springer and Roseneau 1977 - HB 3

Stewart, D. - HB 1
NMFS, Anchorage; pers. commun. to J. Burns, ADF&G, Fairbanks

Strickland, D. - BA 1, BA 2
ADF&G seasonal employee (marine mammals), Fairbanks

Thomas, L. - HB 2
Buckland resident; pers. commun. to G. Seaman, ADF&G, Anchorage

Tounai, E. - 6A 1
Point Lay resident; pers. commun. to G. Seaman, ADF&G, Anchorage

Tremaine, R. - HB 1, BA 2
ADF&G seasonal employee (marine mammals), Fairbanks

USFWS (U.S. Fish and Wildlife Service) walrus harvest report, 1981 - HB 1

USFWS 1969 - HB 2

USFWS/SBCS Reports - HB 2, HB 3
Seabird Colony Status Reports, USFWS, Anchorage

Van Valin 1941 - 6A 2

Walker, J. - HB 2
pilot, Walker Air, Kotzebue; pers. commun. to J. Burns, ADF&G, Fairbanks

Weyiouanna, C. - HB 1
Shishmaref resident; pers. commun. to R. Tremaine, ADF&G, Fairbanks

Wilke and Fiscus 1961 - HB 1, HB 2

Wilson, G. - BA 1
pers. commun. to F.H. Fay, Univ. Alaska, Fairbanks

Wilson, Y. - HB 2, HB 3
pers. commun. to G. Seaman, ADF&G, Anchorage