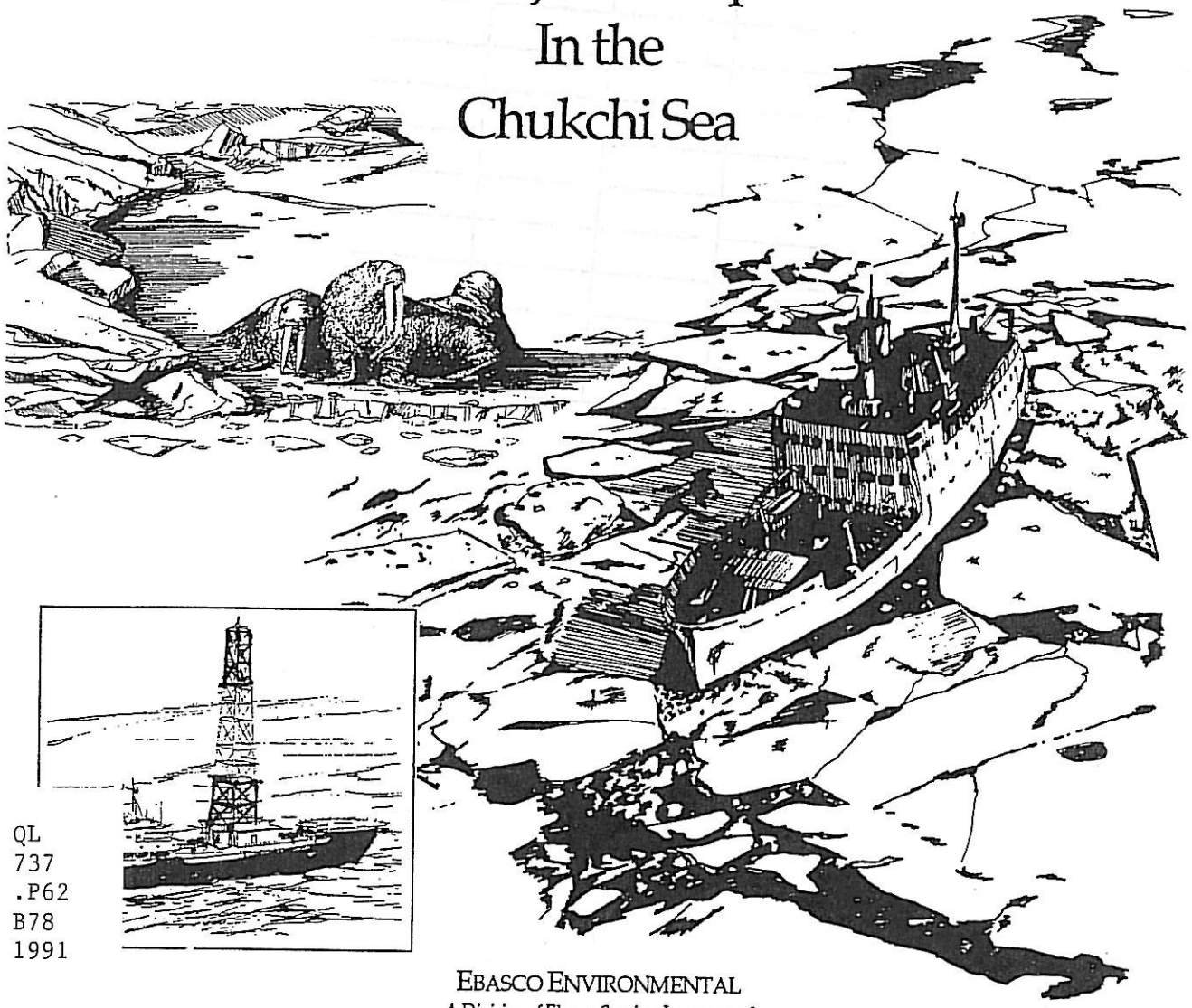
FINAL REPORT

SHELL WESTERN E&P INC.

1990 Walrus Monitoring Program

The Popcorn, Burger and Crackerjack Prospects In the Chukchi Sea



EBASCO ENVIRONMENTAL
A Division of Ebasco Services Incorporated

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SHELL WESTERN E&P INC.

1990 WALRUS MONITORING PROGRAM

The Popcorn, Burger and Crackerjack Prospects in the Chukchi Sea

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February 1991

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ABSTRACT

In 1989, SWEPI implemented a monitoring program in the Chukchi Sea to determine the effects of exploratory oil drilling operations on walrus and polar bears. The results of the program were presented in a report that was submitted to SWEPI and the regulatory agencies in 1990. This program was continued into the 1990 drilling season, and the results are presented in the current report.

In 1990, aerial surveys and vessel-based observations were conducted between June 29 and October 11 at the Popcorn, Burger, and Crackerjack prospects. Nine aerial surveys were flown between June 29 and July 15 to compare the distribution patterns of walruses at the prospects before and during drilling operations as the animals migrated northward. Five surveys were flown at Popcorn, two at Burger, and one at Crackerjack, and there was one reconnaissance flight of the general region. All but one survey occurred before drilling operations began at Popcorn on July 12. The July 15 survey was aborted because of poor weather conditions. Subsequent surveys were not flown during the period coinciding with the northward migration because the pack ice and associated walruses moved considerably north of the prospects during the remainder of the drilling season except for a short time in early August when pack ice impinged on Burger. Three additional aerial surveys were conducted outside of the prospects between October 1-5 to determine the distribution of walruses during the period coinciding with the southward migration. Two flights were conducted to locate walruses in the pack ice which was approximately 185 km (100 nmi) from the prospects, and one flight was conducted in the nearshore waters between Barrow and Cape Lisburne to determine walrus occurrence in open water and at haul-out sites on land. The number of surveys flown during the two survey periods was limited by weather conditions. Observations were also conducted from one of the five vessels comprising the drilling fleet from July 3, while the drilling fleet was enroute to Popcorn, until operations ended on October 11.

There were 1,641 groups for a total of 24,889 walruses observed during 8,060 km (4,352 nmi) of aerial survey effort and 1,129 hr of vessel-based observations. Approximately 2% (571) of the walruses were encountered within 18.5 km (10 nmi) of active prospects, which included 28 walruses at Popcorn, 534 at Burger, and 9 at Crackerjack. Most (98%) of these animals occurred in the marginal ice front, and the remainder (2%) were in open water. The front was over 9 km (5 nmi) north of Popcorn by the third day of operations. At Burger the front was intermittently within 9 km (5 nmi) of the drillsite for 6 of the 15 days it was in the vicinity of the prospect before moving northeast. The pack ice remained considerably north of the prospects for the remainder of the drilling season, and it never impinged on Crackerjack during active drilling. Consequently, the number of walruses near active drillsites was relatively small and the time of exposure was relatively short.

Approximately 98% (23,671) of the walruses were observed outside of the prospects during the period coinciding with northward migration. These animals were primarily observed north of the prospects between Popcorn (165°48'W) and Burger (163°11'W). Most of the animals were in the marginal ice front, within 9 km (5 nmi) of the southern boundary. Approximately 96%

were concentrated in a 86 km (47 nmi) stretch of the front between longitudes 164°30'W and 162°40'W during the first drilling operations at Popcorn, between July 3 - 29. These concentrations of animals were no closer than 59 km (32 nmi) from Popcorn and 45 km (24 nmi) from Burger. The remaining walruses were primarily observed in the ice front located 18.5-37 km (10-20 nmi) from Burger, and also in an isolated mass of ice detached from the main pack located 70 km (38 nmi) from Popcorn. The movement patterns of these animals through the latitudes of the prospects was unclear, especially since large numbers of walruses were not observed earlier in the season from vessel or aerial reconnaissances of the prospects or surveys of the region bracketing the prospects. Consequently, while large numbers of walruses passed through the region of the prospects during the northward migration, there was no indication that they passed close to an active prospect.

Few walruses were observed near the drilling operations during the period coinciding with the southward fall migration. Only 9 walruses were recorded during vessel-based observations at Crackerjack, which included a 280 km (150 nmi) open water survey north of the prospect. All of the animals were swimming in open water, since the pack ice was over 185 km (100 nmi) north of the prospects. The two flights conducted in the pack ice identified that the ice was too dispersed to support aggregations of walruses. Six walruses were observed in the pack ice. Suitable ice was found north of the continental shelf by a U. S. Fish and Wildlife survey team, but the water was too deep for walrus to forage on the bottom. One additional flight, conducted within 18.5 km (<10 nmi) of the coast between Barrow and Wainwright, encountered over 400 walruses hauled out at Cape Lisburne. These findings, combined with reports by a Soviet survey team of large numbers of walruses hauled out on land in the western Chukchi Sea during this same time suggest that most walruses actively swam well ahead of the pack ice. Consequently, most walruses abandoned the pack ice before drilling operations ceased but they did not appear to pass near Crackerjack.

The response of walruses to the drilling and icebreaking operations was evaluated from the Robert LeMeur. Detailed comparisons made during the 1989 monitoring program of walrus density, distribution, and habitat use patterns before and during drilling operations could not be duplicated in 1990 because of unsuitable weather. The primary source of disturbance in 1989 was the icebreaker during ice management. In 1990, ice management was limited to 4 days in areas of the prospects where there were no walruses. At the request of Ebasco, the icebreaker did, however, pass through areas of dispersed ice that contained walruses beyond the prospects during reconnaissances. Most walruses were sufficiently far from the icebreaker to avoid disturbance. Of 99 groups of walruses encountered in the pack ice during icebreaking, 25% responded by diving off an ice floe while 75% did not respond. Walruses responded over a wide range of distances, but most reacted (14 of 15 groups) within 0.23 km (1/8 nmi) of the icebreaker. Proportionally fewer walrus groups reacted with increasing distances from icebreaking, which included 60% of 5 groups at 0.23-0.46 km (1/8-1/4 nmi), 50% of 12 groups at 0.46-0.93 km (1/4-1/2 nmi), and 3% of 67 groups at >0.93 km (>1/2 nmi). Some of these groups reoccupied the abandoned floe after the icebreaker passed. A similar pattern of response was observed during the 1989 monitoring program.

In addition to walruses, 25 polar bears were observed in the pack ice between June 29 and August 11. Seventeen bears were encountered by the Robert LeMeur during ice reconnaissances before drilling began at the prospects. During drilling operations, 4 bears occurred near (<9 km or 5 nmi) active prospects and the remainder were considerably beyond (15-40 km or 8-22 nmi). These bears responded to the drilling or icebreaking operations by approaching (2), watching (9), slowly moving away (7), or ignoring (5) the activities; response was not evaluated for 2 bears. The period of exposure to the operations was generally short because precautions were taken to minimize disturbances, including adjusting cruise courses away from bears. Similar precautions were followed in 1989 when 18 bears were encountered in the pack ice during the monitoring program.

The results of the 1990 monitoring program show that: (1) the walrus and polar bear distributions were closely linked to the pack ice; (2) the pack ice was near the active prospects for a relatively brief time; and (3) the ice passing near active prospects contained relatively few animals. Consequently, the effects of the drilling operations on walruses and polar bears were limited in time, geographic scale, and proportion of the populations. Less than 1% of the Pacific walrus population passed near an active prospect during the 1990 monitoring program compared to approximately 2.5% during the 1989 program.

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1.0 INTRODUCTION

1.1 PURPOSE AND OBJECTIVES

Shell Western E&P Inc. (SWEPI) conducted exploratory drilling operations at the Burger, Popcorn, and Crackerjack prospects in the Chukchi Sea during the summer and fall of 1990. This was a continuation of a drilling program that began in 1989 at the Klondike, Burger, and Popcorn prospects. As a part of the 1989 and 1990 drilling programs, SWEPI sponsored a monitoring program aimed at evaluating the responses of walruses and other marine mammals to the drilling operations. A report on the seals and whales was prepared in December 1990, and a copy is provided in Appendix A. Walruses and secondarily polar bears are the subjects of the present report. Walruses were the primary subject for study because most of the females, calves, and subadults in the Pacific walrus population occur in the Chukchi Sea within or near the pack ice during this period. A proportion of the walrus and polar bear populations could be exposed to drilling operations as they move through the prospects. In order to address these concerns, the 1990 monitoring program focused on the following objectives:

- determine the acoustical profile of the icebreaker, Robert LeMeur, during ice management activities in the vicinity of the drillship operations,
- determine, by aerial and vessel observations, the distribution, density, and behavioral response of walruses as related to the drilling operations,
- document the occurrence of polar bears in the vicinity of the drilling operations, and
- compare the results of the 1990 monitoring program with those of the 1989 program.

The results of the 1989 monitoring program were reported by Brueggeman et al. (1990) and are summarized in section 1.3. The objectives of the two programs were identical except in the following areas. The scope of the acoustic studies was reduced from characterizing noise levels of full drilling operations (1989) to characterizing noise levels of only the icebreaking operations (1990). In addition, only the 1990 program involved using sonobuoys or a hydrophone system to acoustically monitor for bowhead whales near the drilling operations. These modifications represent a refinement or expansion to the 1989 program and they were approved by the National Marine Fisheries Service (NMFS).

The program and objectives were developed in consultation with the Alaska Department of Fish and Game and the NMFS. In addition, the program was coordinated with the USFWS in compliance with the conditions of the "Marine Mammals and Native Endangered and Threatened Species Permit" issued to Ebasco Environmental by the USFWS.

1.2 LITERATURE REVIEW

Approximately 230,000 Pacific walruses (*Odobenus rosmarus*) inhabit the Bering, Chukchi, and Beaufort seas; these represent about 80% of the world population (Gilbert 1989, Fay et al. 1989). Although it is believed to be at its pre-exploitation level, the Pacific walrus population may have reached its carrying capacity. Fay et al. (1989) documented a significant change in the population status since the late 1970s as evidenced by decreased fatness, change in diet, increased natural mortality, decreased productivity and calf survival, increased age at first pregnancy, and change in age composition. These features of the population suggest that walruses have begun to have an adverse effect on the food supply and subsequently the health of the population. Fay et al. (1989) further reported that the magnitude of the decline may be exacerbated by the annual harvest of over 10,000 animals by Soviet and American Eskimos. This in combination with natural mortality exceeds the rate of recruitment. Consequently, while the population size is high, it may be on the threshold of a decline.

The Pacific walrus population is found primarily on the outer continental shelf, mainly in waters less than 100 m (328 ft) deep. It is presumed that they cannot feed efficiently or are not capable of diving to the bottom of waters much deeper than this (Fay 1982, Fay and Burns 1988). The entire population winters in the pack ice of the Bering Sea from approximately December to May-June, depending on ice conditions. Calves are born mainly in May. During break-up of the pack ice, females, calves, and subadults migrate into the Chukchi Sea while most adult males remain in the Bering Sea (Fay 1982). The migration into the Chukchi Sea is in two broad directions (Fay 1982). Some animals advance northeastward along the eastern Chukchi toward Barrow, while other animals travel northwestward toward Wrangell Island. Although animals may actively swim while migrating northward, they are also carried by the northward drifting ice when they haul-out to rest. The southward fall migration is believed to be the reverse of the northward migration; however, the animals usually swim ahead of the pack ice because the ice is too thin to support the herds (Fay 1982). Between these migration periods walruses occur across the pack ice in the Chukchi Sea between Alaska and the Soviet Union (Gilbert 1989), though there are concentrations in the northeastern and northwestern Chukchi Sea.

Distribution of cows, calves, and subadults in the Chukchi Sea is closely associated with the pack ice. The ice provides a platform for resting, feeding, molting, and nursing during the summer to fall period. Estes and Gilbert (1978) and Gilbert (1989) reported that walruses observed during fall aerial surveys were primarily within 37 km (20 nmi) of the ice edge; most of them were associated with small floes near the southern boundary of the pack ice. Similar findings were reported by Fay (1982) who found that walruses occurred almost entirely in areas of less than 80% ice cover. Areas deep in the pack ice typically feature extensive ice cover which reduces the amount of open water available for walruses to forage. Estes and Gilbert (1978) and Gilbert (1989) also found that walrus use of the open ocean was considerably less than in the pack ice and highest near the ice edge. Their surveys, however, did not account for high sea state and poor visibility, which may have underestimated walrus in the open ocean. Incidental observations (Ljungblad et al. 1988) of walruses during the summer period show patterns of use similar to these reported by Estes and Gilbert (1978).

Expected walrus use of the areas associated with the SWEPI prospects can be generally determined by examining data published by Estes and Gilbert (1978), Johnson et al. (1982), and Gilbert (1989). These studies involved aerial surveys that broadly overlapped the region of the prospects, bounded by 162° and 165°W longitude. In 1975, Estes and Gilbert censused the open water and pack ice between 156° and 174°W in early September and found the highest density between 162° and 165°W. In 1980, Johnson et al. surveyed the pack ice near the ice edge from 153° to 172°30'W in mid-September. Walruses were encountered throughout the area, but the density was highest between 160°30' and 166°30'W. In 1985, Gilbert and colleagues censused the pack ice near the ice edge between 156°30' and 174°W in late September and early October. Walruses were widespread in this area, but the density was generally highest between 165° and 174°W. The ice edge during these three surveys was generally between 70° and 73°N latitude. These surveys combined with several vessel surveys summarized by Johnson et al. (1982) showed that walruses were widespread across the southern margin of the pack ice during the fall and, more specifically, they occurred in the region of the prospects (162°- 165°W) which at times contained relatively high but variable densities. Gilbert (1989) suggested that this spatial variability may reflect a westward movement of walruses in September. Aerial surveys were conducted in late June and early July 1989 demonstrated that walruses were also widespread along the ice edge between 160° and 165°30'W as the ice moved northward above 73° (Brueggeman et al. 1990).

While there is a substantial body of information on the relative abundance, distribution, and habitat use patterns of walruses, information on their response to industrial noise and activities is meager but growing (Brueggeman et al. 1990). Information is derived largely from incidental observations recorded during studies of other aspects of walrus biology. Furthermore, the reaction of walruses varies according to the distance, mechanical source, movement pattern, age-sex of the animals, and possibly weather conditions. Reactions range from mild responses such as head raising and orienting toward the water to more extreme responses such as retreating into the water, or complete abandonment of a haul-out site. Sudden disturbances can cause adults to trample calves (Loughrey 1959) or force calves into the water when they need to remain hauled out to maintain thermal neutrality (Ray and Fay 1963, Salter 1979) This primarily occurs where larger numbers of walrus concentrate on land. This is generally not a problem in the pack ice during summer and fall since group sizes are relatively small and the animals are widespread. Adult females, calves, and subadults are more likely to escape into the water than adult males (Salter 1979).

In general, low flying aircraft (60-150 m or 200-500 ft ASL) within 1 km (0.5 nmi) of walruses cause them to orient toward (Salter 1979) or escape into the water (Loughrey 1959, Brooks 1954, Fay 1981, Fay et al. 1986, Frost et al. 1986.). Reactions typically are most severe when aircraft overfly hauled-out animals, or changes in the flight path are sudden; they are least severe when aircraft fly above 305 m (1000 ft) or are 2.5 km (1.3 nmi) lateral to the walruses (Salter 1979). Fay et al. (1986) reported that about 1,000 walruses raised their heads but fewer than 100 went into the water when a twin engine aircraft made three passes at an altitude of about 60 m (200 ft) over 4,500 animals. Burns and Harbo (1977) reported that walruses in the

marginal ice front appeared to be more sensitive to aircraft disturbance during cold, overcast days.

Few observations of walrus response to boats have been documented. Salter (1979) observed no detectable reactions to six approaches by outboard-powered boats at distances of 1.8-7.7 km (1-4 nmi) from walruses hauled out on land. Correspondingly, Brooks (cited in Fay 1981) reported no obvious reaction to outboard motors on small boats at distances of 400 m (1,312 ft) from walruses hauled out on ice floes. While these observations suggest that walruses don't respond to small boat traffic some distance from haul-out locations, the only study documenting the response of these animals to icebreaker in association with drilling activities was conducted by Brueggeman et al. (1990) in the Chukchi Sea during exploratory drilling operation in 1989. The results are summarized in section 1.3 of this report, and show that 70% of 35 walrus groups reacted (dove off ice into water) to icebreaker activities at distances of 500 m and 30% at distances of 1,000 m from the ship. Furthermore, walruses temporarily modified their distribution in areas of concentrated icebreaking by initially moving beyond the area of activity and then redistributing themselves back into that area upon termination of icebreaking activities. While these results and others are based on limited observations, they show that walruses react to icebreaking activities associated with drilling operations, but the effects of these activities appear to be temporary, limited in spatial scale, and largely confined to the period when the southern margin of the pack ice is in contact with the drilling operations. Moreover, walrus behavior (e.g., feeding, socializing, etc.) and investigator-caused activities may have influenced the observed distribution patterns.

Although the primary study species for the 1990 monitoring program was the walrus, other marine mammals which seasonally and regularly inhabit the Chukchi Sea include bowhead (*Balaena mysticetus*), gray (*Eschrichtius robustus*), and belukha whales (*Delphinapterus leucus*); bearded (*Erignathus barbatus*), ringed (*Phoca hispida*), spotted (*Phoca largha*) and ribbon seals (*Phoca fasciata*); and polar bears (*Ursus maritimus*). Narwhals (*Monodon monoceros*), killer whales (*Orcinus orca*), and minke whales (*Balaenoptera acutorostrata*) occasionally occur in the Chukchi Sea, but it is the extreme limit of their seasonal ranges.

1.3 SUMMARY OF 1989 WALRUS MONITORING PROGRAM

Aerial surveys, vessel-based observations, and acoustic studies were conducted to determine the response of walruses to drilling operations at three prospects in the northern Chukchi Sea between June 25 and October 19, 1989. Aerial surveys were only conducted when the pack ice or isolated large floes were near the prospects, since walruses are generally associated with the southern edge of the pack ice, and they are difficult to accurately survey in open water. Seven aerial surveys were flown between June 26 and July 3 at Klondike, four of which occurred before drilling operations began at the Klondike Prospect on July 1. A single survey was conducted at the Burger Prospect on September 14, 2 days before drilling operations began there. Subsequent surveys were not flown at Burger because the pack ice and associated walruses were considerably north of the prospect throughout the drilling period. No surveys were flown at the Popcorn Prospect, because it also was ice-free until the southward advance of the pack ice

forced operations to end on October 19. Additional observations were conducted from one of the five vessels comprising the drilling fleet, from July 2 to October 19. In conjunction with the surveys and observations, acoustic measurements were made to characterize the sound levels of the drilling operations and ambient conditions.

There were 389 groups of a total 4,571 walruses observed in the prospects during 4,634 km (2,502 nmi) of aerial survey effort. Over 98% of the animals were observed in the pack ice and the remainder in the open ocean south of the ice edge. Approximately 65% of the effort was in the pack ice. Walrus density, mean group size, association with ice cover, distance from the ice edge, and distance from the prospect were compared between periods before and during drilling operations, to evaluate the response of walruses to the operations. Densities and mean group size varied among survey days and showed no pattern of change between pre-operation and operation periods. Consequently, these two variables did not indicate any recognizable response of the walruses to drilling operations. The distribution of walruses in the pack ice, however, did change between the two periods as indicated by their association with ice cover, distance from the ice edge, and distance from the prospect. Walruses showed no preference for a particular amount of ice cover before operations but preferred areas of moderate ice cover during operations, particularly icebreaking activities. In addition, the distances of walruses from the ice edge and prospect were somewhat evenly and continuously distributed into the pack ice, but they changed to being more distant and clumped during icebreaking operations. Distributional changes moderated once icebreaking activities stopped. The walrus distribution observed during icebreaking activities, however, may also have been influenced by daily ice movement or walrus activity patterns.

An additional 35 groups of 101 walruses were observed in the prospects during 979 hr of observation from the icebreaker, Robert LeMeur. Relatively small numbers of walruses occurred at each of the three prospects, particularly during ice-free periods. Behavioral response was evaluated for 90 groups of walruses including animals encountered outside the prospects during ice reconnaissances. Avoidance reactions were recorded for about 69% of the walrus groups observed when the icebreaker was maneuvering, jogging, or running; 65% when it was breaking ice; and no animals reacted when it was stationary or drifting. Most (72%) of the reactions occurred within 0.46 km (0.25 nmi) of the Robert LeMeur. Beyond this distance, some walrus groups still exhibited an avoidance reaction, but most groups observed during icebreaking showed no reaction. Consequently, walruses generally reacted to the Robert LeMeur when it was moving under power, including icebreaking.

The results of these studies show that many walruses passed through the prospects in association with the movement of pack ice, while low numbers occurred within the prospects during the ice free period. The period of walrus occurrence in the vicinity of the drilling operations during the northward migration was short, since the pack ice quickly retreated to over 20 km (11 nmi) north of the Klondike Prospect four days after drilling began. Drilling operations were terminated in the fall when the southward advancing pack ice was within 20 km (11 nmi) of the Popcorn Prospect. Walruses responded to icebreaking activities by moving deeper into the pack ice, but the animals began to reoccupy areas used prior to drilling operations shortly (1 day)

after icebreaking activities stopped. During icebreaking activities, animals moved 20-25 km (11-13 nmi) from the operations, where noise levels from the ship were 11-19% above ambient. This relationship suggests that the animals were displaced by icebreaking activity to areas where noise levels approached ambient levels. Moreover, the animals appeared to adjust to or not be affected by the drilling operation noises once icebreaking activity ceased. This latter interpretation is supported by shipboard observations of walrus near the drilling operations at each prospect. The proportion of the total Pacific walrus population exposed to the drilling operations was estimated to be less than 5% and probably closer to 2%.

Other marine mammals observed in the study area were 53 bearded, ringed, and spotted seals; 6 gray whales; 1 belukha; 16 polar bears; 57 unidentified pinnipeds; and 7 unidentified cetaceans. There were no bowhead whales or narwhals observed near the prospects or while transiting between the prospects and the base-of-operations at Barrow or Wainwright.

The results of the 1989 monitoring program should be viewed with caution for the following reasons: 1) the aerial observations were based on seven flights of which only three occurred during the drilling operations; 2) the vessel observations were largely hampered by marginal viewing conditions; 3) the influence of the haul-out cycle, social interactions, and other behavioral characteristics on the walrus distribution were not known; 4) the effect of the survey aircraft on the walrus distribution was not known; and 5) the size of the study area was small relative to the overall area of walrus use. Consequently, the results provide a snapshot of walrus use in a relatively small area. Moreover, behavior and investigator-caused activities may have influenced the observed distribution patterns. These factors, therefore, may have individually or collectively contributed to the interpretation of data.

1.4 1990 STUDY PERIOD AND CONCEPTUAL FRAMEWORK

Field studies commenced on June 29, five days before the icebreaker and 14 days before the drillship arrived on site, and continued until the drilling operations ended on October 11. The icebreaker conducted a series of ice reconnaissances of the prospects before the arrival of the drillship, which could not reach any of the prospects until July 12 because of heavy pack ice. The first prospect accessible to the drillship was Popcorn. Drilling occurred here on July 12-29, followed by Burger on July 29 to August 22, again at Popcorn on August 22 to September 22, and lastly at Crackerjack on September 22 to October 11. The southern margin of the pack ice was approximately 100 km (54 nmi) north of the Crackerjack Prospect when operations terminated on October 11.

Aerial surveys were conducted between June 29 and July 11 to first determine the numbers and distribution of walruses prior to the arrival of the icebreaker or drillship at the Popcorn Prospect, and then between July 12-15 to monitor walrus responses to icebreaking and drilling operations. During this time frame, the Burger and Crackerjack prospects were surveyed when fog precluded flights at Popcorn or SWEPI was evaluating its drilling location options relative to the ice cover. These aerial surveys coincided with the northward movement of the southern margin of the pack ice through the prospects. No other aerial surveys were conducted in the

immediate vicinity of the prospects because, except for a brief period when ice impinged on Burger, the pack was north of the prospects during the remainder of the drilling season. However, three flights were flown near the end of the drilling season to confirm that walruses were either in the distant pack ice or open water. Flights occurred on October 1 and 5 along the southern margin of the pack ice and on October 3 in the open water and along the shoreline between Point Barrow and Cape Lisburne. Although aerial surveys had been planned for each time the pack ice and associated walrus population were near a prospect, weather and ice conditions limited the number of survey opportunities.

Walruses also were monitored from the icebreaker by one or two trained observers during each day from July 3 through October 11. Observers initially boarded the icebreaker at Port Clarence, near Nome, on July 2 and maintained daily sighting records of marine mammals encountered during the transit to the Popcorn Prospect and throughout the remainder of the drilling season. Observers had planned to use a small boat, launched from one of the drillship support vessels, to approach walruses on the ice and obtain detailed information about herd composition. The absence of ice near drilling operations did not permit that phase of the work. Similarly, the planned effort to measure water-borne noise levels emanating from the icebreaker, particularly when active ice management was in progress, was not accomplished because of unfavorable ice and weather conditions that prevailed.

1.5 DESCRIPTION OF STUDY AREA AND DRILLING OPERATIONS

The three prospects comprising the study area are located in the northeastern Chukchi Sea (Figure 1-1). The Popcorn Prospect, the most remote of the three, is at 71°51'16.28"N latitude and 165°48'23.57"W longitude. It is about 352 km (190 nmi) northwest of Barrow in 44 m (144 ft) of water. The Burger Prospect is located at 71°15'4.91"N and 163°11' 40.78"W. The site is about 241 km (130 nmi) southwest of Barrow in 46 m (151 ft) of water. The Crackerjack Prospect is located at 71°25'07.71"N and 165°32'29.51"W. The site is located approximately 324 km (175 nmi) west of Barrow in 42 m (138 ft) of water.

The location of the southern margin of the pack ice relative to each prospect throughout the period of drilling operations is shown in Figure 1-2. The prospects were essentially ice-free except for the initial period of operations from July 12-15 when the southern margin of the pack ice moved through the Popcorn Prospect. Prior to July 12, the prospects were relatively deep into the pack ice. After July 15, the pack ice generally occurred well north of the prospects except on several occasions when fringe ice or isolated floes drifted near a prospect.. These events primarily occurred during the first two weeks of August at Burger. The fall or southward advance of the pack ice did not reach the prospects until early November, approximately 20 days after drilling operations had ended.

The distribution pattern of the pack ice during the study period was substantially different from an "average" year but similar to the 1989 drilling season. In most years, the southern boundary of the pack ice would have moved to the vicinity of the Burger Prospect by mid-July to early August and reached its northernmost point by mid-September. The seasonal northernmost

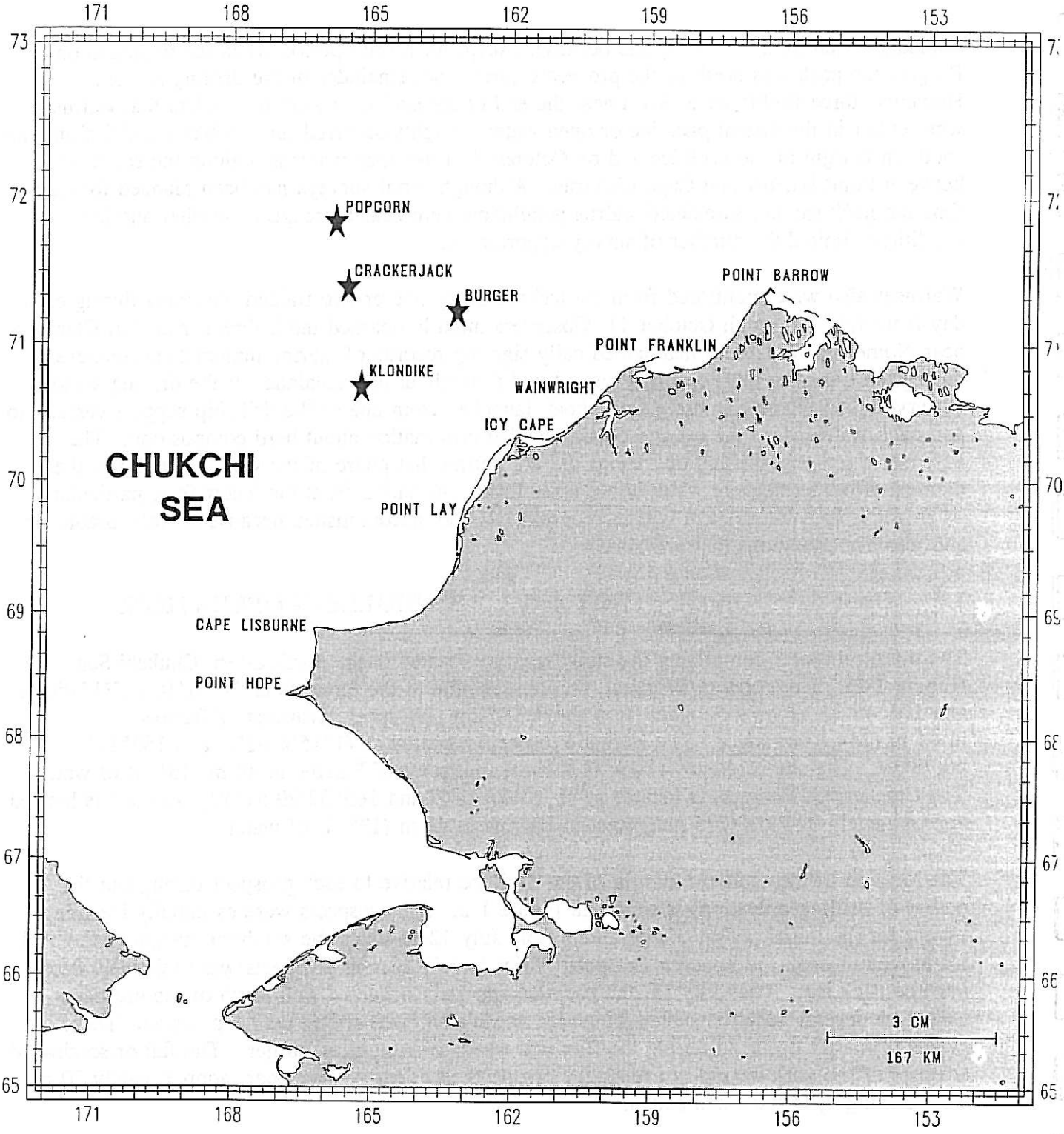

Figure 1-1. Location of the Popcorn, Burger, Crackerjack, and Klondike prospects.

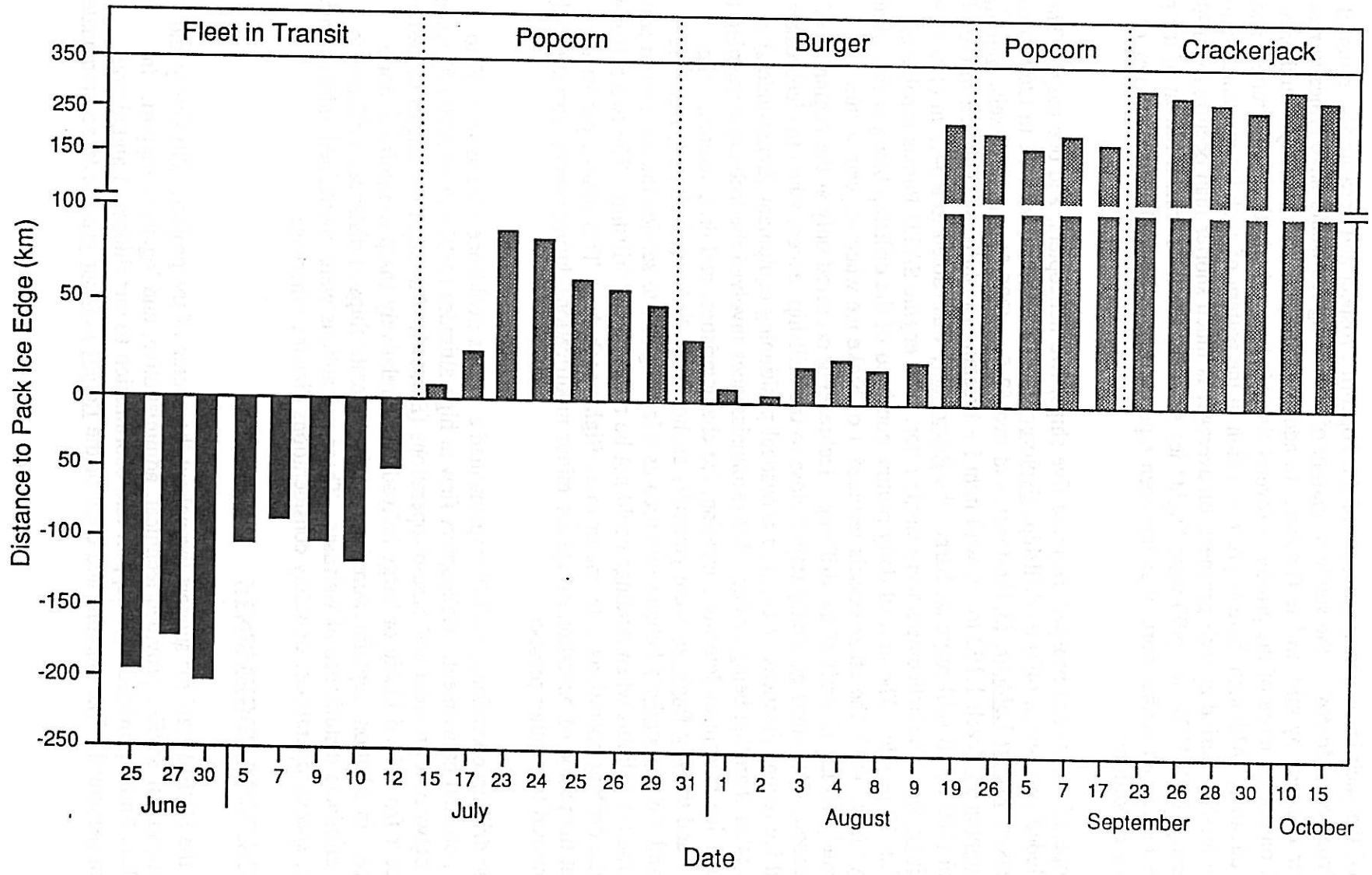

Figure 1-2. Distance between prospect and nearest pack ice edge during drilling operations, 1990.

location of the pack ice is generally south of the Popcorn Prospect and occasionally south of the Burger Prospect. Moreover, the southern margin of advancing ice would have typically reached the Burger Prospect by mid- to late October. In addition, the pack ice normally would have impinged on one or more of the prospects several times between the initial spring retreat and final fall advance. Although there is great variation in the pattern of pack ice movement among years, the ice-free period at each prospect, on average, is much shorter than occurred in 1990. Consequently, both 1989 and 1990 were "light" ice seasons, and the northern retreat of the pack ice in 1990 extended farther north than has been reported for 30 years (J. Burns, review of historic ice conditions).

Drilling operations at each prospect required five ships, two helicopters, and one barge. The ships included one 149 m (490 ft) drillship, Explorer III, (16,260 tons), one 82 m (269 ft) class III icebreaker, Robert LeMeur, (3,186 tons), and two 62.5 m (205 ft) supply vessels, Supplier III and Supplier IV (each 1,190 tons), with light ice breaking capabilities. The 122 m (400 ft) by 30.5 m (100 ft) oil spill response barge, the Responder, was cabled to a 54.9 m (180 ft) tug, the Rig Engineer. The helicopters were single rotor, twin engine SA33J Pumas capable of transporting 12 people. The normal daily routine consisted of the drillship being anchored above the "glory" hole, while the other vessels serviced it or broke ice when ice was within approximately 10 km (5 nmi) of the drillship. Icebreaking occurred only at the beginning of the drilling season. The ships generally stayed close to the drillship, except when the icebreaker conducted ice reconnaissances or checked acoustical positioning equipment (transponders) at prospects other than that being drilled. Ice reconnaissances involved the icebreaker running to the irregular ice margin to determine location, ice characteristics, and drift vectors. The Responder and the Rig Engineer were generally anchored 28-37 km (15-20 nmi) from the drillship and the Responder's helipad was used as a landing site to service the crew or to serve as an alternative heliport when landings could not be made on the drillship. The two helicopters serviced the drilling operations with one or more flights each day. This routine persisted throughout the period of operation except for minor modifications during severe storms or when the fleet moved to another prospect.

During the drilling operations, SWEPI implemented a walrus avoidance plan as in 1989 to minimize potential harassment. Helicopters flew at high altitudes (>914 m or 3,000 ft) when transiting between a prospect and base-of-operations (Barrow). Furthermore, angles of descent to and ascent from the drillship or barge helipads were relatively sharp to minimize noise disturbance. In addition, captains were instructed to operate ships at distances sufficient to reduce or eliminate disturbance of walruses. These precautions were maintained unless weather conditions, special operations, or safety considerations dictated otherwise.

1.6 ACKNOWLEDGEMENTS

We thank the SWEPI staff for support throughout the course of the project. Bill Gusey and Wayne Simpson of SWEPI provided technical, administrative, and logistical support. In addition, Bob Smith provided field support and coordination to our shipboard and aircraft observation personnel. The captains and crew of the Robert LeMeur graciously accommodated

our field personnel and made their stay on the vessel seem considerably less remote and isolated. Empire Airways provided the aircraft and pilots, who made every effort to help us safely and fully complete the aerial surveys. We also thank the field personnel, including E. Bowlby, D. Glass, and C. McShane. Constructive comments on the draft report were provided by Messrs. Gusey, Simpson, and M. Savit. Jan Vulk was responsible for the production of the report, administration of the contract, and many other key elements of the project. D. Lehtinen made travel and lodging arrangements for the field personnel.

2.0 METHODS

2.1 APPROACH

Aerial surveys and vessel-based observations were conducted during the walrus monitoring program. Aerial surveys were used to describe walrus density, distribution, and association with sea ice in the drilling area. Vessel-based observations were conducted from the icebreaker to describe walrus occurrence and behavior near the drillsite. Aerial surveys occurred when pack ice impinged on or was near the drillsite; vessel surveys occurred every day of the drilling operation. Data obtained from these two observation platforms formed the basis for describing walrus use of, and behavior within, the project area and for determining their response to drilling activities. Other marine mammals encountered were noted.

2.2 AERIAL SURVEYS

2.2.1 Survey Design

Aerial surveys were conducted in an approximately 100 km x 45 km (54 nmi x 24 nmi) area of the pack ice in the vicinity of the drilling location (Figure 2-1). Surveys were flown along transect lines systematically distributed within the area and oriented in a north-south direction. Nine transect lines, each 45 km (24 nmi) long, were spaced equidistantly at 11.1 km (6 nmi), beginning at the center of the grid and extending outward to the east and west. Spacing of the transect lines was designed to compensate for the long flight distance (231-334 km or 125-180 nmi) between the prospects and Barrow. The center of the grid corresponded to the longitude of the drillsite. Because pack ice is very mobile, the north-south orientation of the grid was adjusted during each survey to reflect changes in the location of the ice margin and suitability of the pack ice for use by walruses.

Originally, surveys were designed to bracket the ice edge or marginal ice front as it approached and passed through the prospect. Transect lines were planned to extend north from the ice edge into the pack ice until ice cover exceed 90% or a maximum of 45 km (24 nmi) from the ice edge was reached. Walruses usually do not inhabit areas of extensive ice cover (>90%). However, because the edge of the pack ice was considerably south of the prospects when the drilling fleet arrived on site, transect lines were established within the pack ice associated with the prospect. The lines extended south of the latitude of the prospect in order to optimize the opportunity to intercept walruses as they moved northward. As the pack ice approached and passed through the prospects low clouds prevented any aerial surveys of the southern boundary (although vessel-based observers were able to see and record sightings).

The 1990 aerial survey design differed from the 1989 design in several ways. In 1990, the east-west span of the box was increased 55 km (30 nmi) to better account for walrus response to drilling operations over a broader range of distances from the noise sources. In addition, the

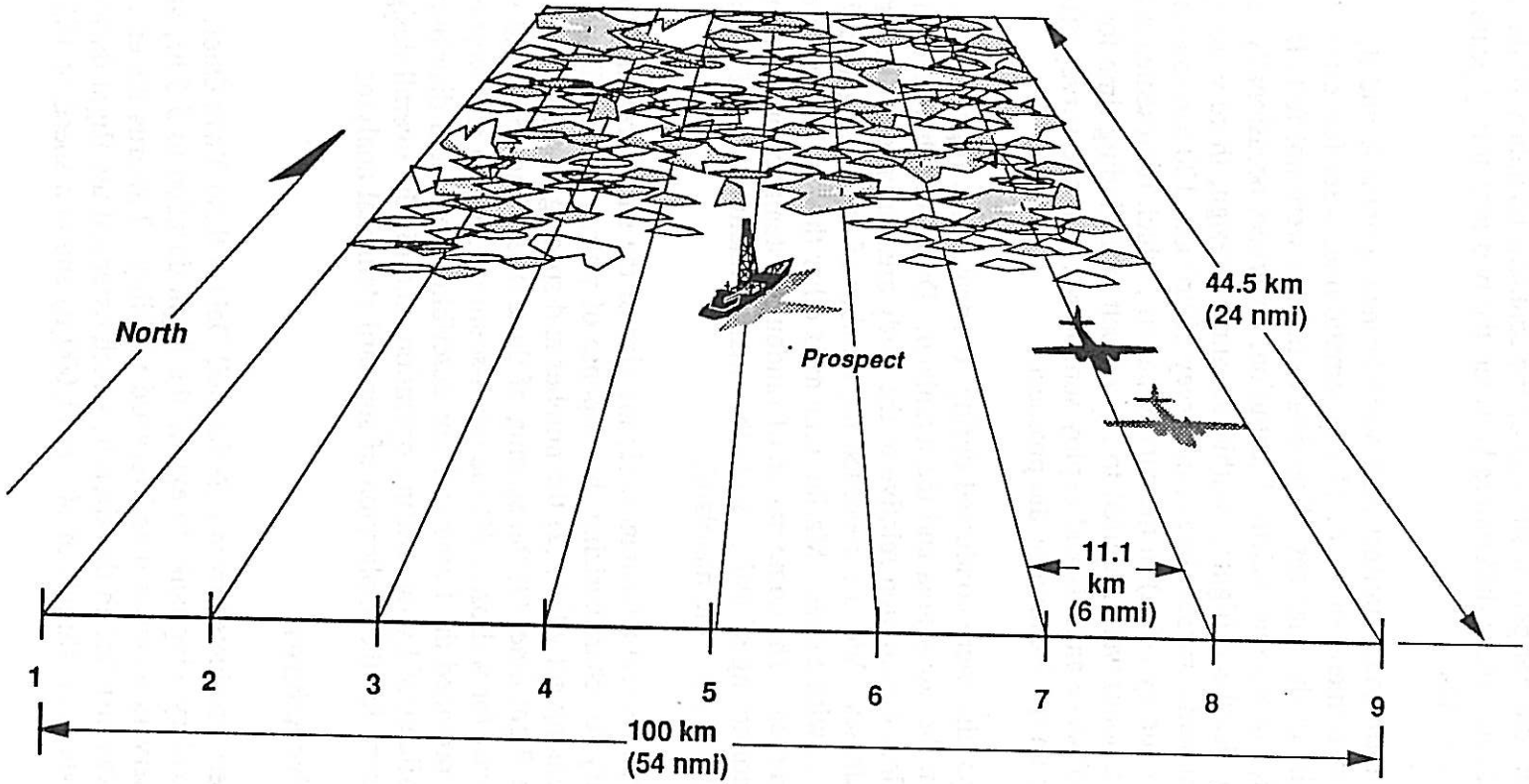

Figure 2-1 Survey design and trackline configuration.

1990 spacing between transect lines was increased four times to provide broader survey coverage and minimize aircraft-caused disturbance of walruses on adjacent lines. Lastly, the 1990 ice and weather conditions did not permit surveys of the southern boundary of the pack ice as it passed through the prospect. These differences between the two monitoring years did not affect the comparability of the data.

As in 1989, the north-south transect lines were termed systematic and the connecting east-west transect lines were termed deadhead. The systematic lines were full effort surveys, and they provided the basis for the analyses. The deadhead lines were not full effort, therefore, they were used only for describing walrus distribution; observers occasionally rested or adjusted equipment during deadhead flights. Within the survey design, there were approximately 405 km (218 nmi) of systematic transect lines (on-survey effort) and 100 km (54 nmi) of deadhead transect lines (off-survey effort) in the survey pattern, which represented a 80% survey efficiency. Three hours were required to fly the pattern including time for deviating from the transect lines to observe animals and deploy sonobuoys. On-site survey effort or coverage varied depending on the location of the prospect.

Full effort surveys also were conducted during reconnaissance flights of the ice edge and while transiting between the study area and the mainland. Data from this random type of survey were used to show walrus distribution relative to the study area in order to better define use of the study area by walruses. We also recorded the number of calves to gauge the relative use of the study area by cows with calves. Marine mammals other than walruses were recorded whenever they were encountered. The combination of random, systematic, and deadhead surveys provided comprehensive monitoring of walrus and other marine mammal use of the study area and regions between the study area and the mainland.

This design offered several advantages: (1) the size of the study area enveloped the range of distances necessary for characterizing the response of walrus to the drilling operation and associated ice breaking activities, (2) the number and spacing of transect lines provided efficient use of the on-site flight time, (3) the spacing of the transect lines provided uniform survey coverage of the area for walruses, (4) the north-south orientation and west-east arrangement of the transect lines provided the framework for describing the spatial distribution of walruses within the area influenced by the drilling operation, and (5) the overall design conformed to procedures necessary for the application of standard statistical analyses.

2.2.2 Survey Procedures

Aerial surveys were conducted from a Series 300 DeHavilland Twin Otter. The aircraft was equipped with auxiliary wing tanks to extend the flight duration to 5.5 hr, and bubble windows for providing observers downward and forward visibility. Towards the end of the study period, an internal tank was installed in the aircraft, which extended the flight duration to 7.5 hr. Surveys were flown at an altitude of 305 m (1,000 ft) and at a speed of 185 km/hr (100 kt).

This altitude was adequate for obtaining accurate counts of all marine mammals except seals which were not consistently distinguishable. However, it minimized disturbance to walruses.

Aerial surveys were conducted by two observers and one data recorder. One observer was seated behind the pilot and the other observer occupied the copilot's seat (Figure 2-2). The aft observer viewed the survey area through a bubble window while the forward observer looked through a flat window. The data recorder was in a right-side seat behind the observers. The pilots reported sightings of marine mammals to the observers, who confirmed each observation and logged it with the data recorder.

Observers censused walruses according to the strip transect procedure (Eberhardt et al. 1979). This procedure is the standard technique for surveying walruses and other pinnipeds, since it allows recording large numbers of sightings at high rates unlike the alternative line transect procedure. Two different transect widths were used for surveys of pack ice and open water. The strip width was 1.85 km ((1.0 nmi) or 0.93 km (0.5 nmi) per side of transect line) for surveys of the pack ice and 0.46 km ((0.25 nmi) or 0.23 km (0.125 nmi) per side of transect line) for surveys of the open water. Toward the end of the drilling season, open-water surveys were limited to reconnaissance flights to locate ice edge. Estes and Gilbert (1978) and Gilbert (1989) found that the probability of detecting a group of walrus was lower in the water than on the ice but constant within the two respective strip widths. Consequently, they recommended these strip widths should be used for surveying the two different conditions. Strip widths were defined for the observers by use of clinometers and marks placed on the windows. The marks were calibrated for accuracy before each survey and adjusted for each observer. Incidental observations of cetaceans were recorded according to the line transect procedure (Burnham et al. 1980).

Data were recorded both manually on field forms and automatically into a computer. Observers communicated sighting and environmental data to the recorder, who entered the data onto a form. A computer was programmed to accept data on the time, altitude, and location (lat./long.) directly from the aircraft systems. The two data sets were linked based on time and eventually merged into one database. Sighting data included number of animals in and out of a strip, group size, number of calves, reaction to aircraft, and whether an animal was on the ice or in the water. A group was defined as all animals within four body lengths of each other. Reactions were broadly classified as escape dive, escape off ice into the water, or no reaction, since more subtle reactions (such as head raising) could not be consistently detected from the aircraft. Visibility, glare, wind speed and direction, sea state, and ice conditions were evaluated at the start of each transect line and whenever conditions changed. Each observer evaluated visibility and glare for their respective side, but the observer positioned in the copilot seat evaluated sea state in open water and ice conditions for the entire survey strip. The front position provided the best view for judging these two environmental variables. Ice was classified according to the

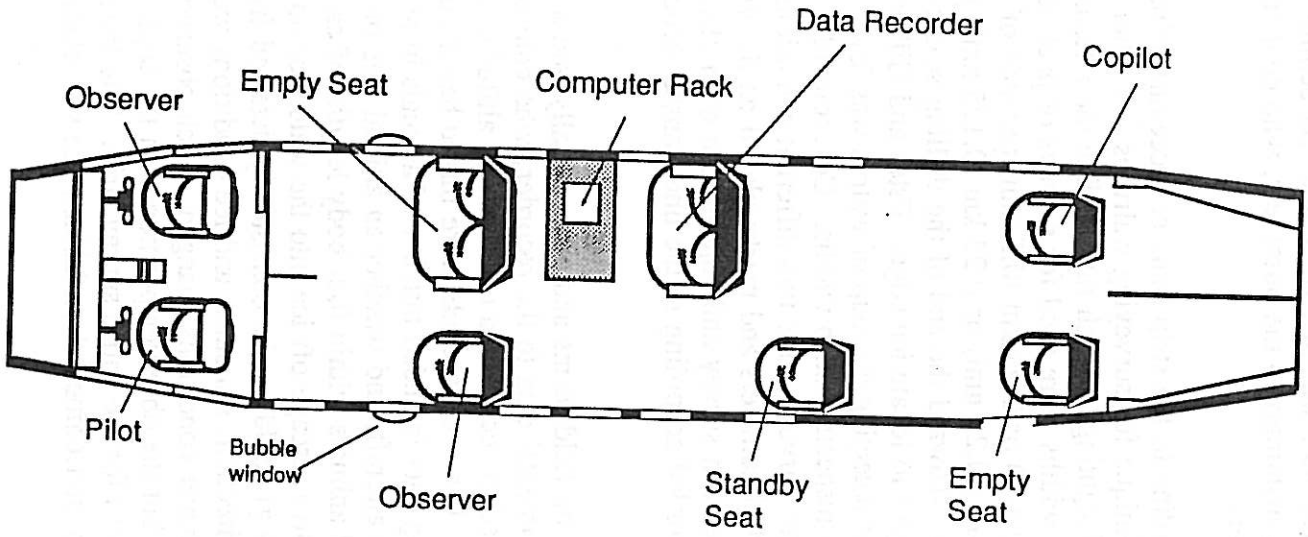

Figure 2 - 2. Seating arrangement within the survey aircraft.

percent of area in the survey strip covered with ice. The definitions for visibility and sea state are given in Appendix Tables B-1 and B-2.

2.3 SHIP-BASED OBSERVATIONS

Observations were conducted by one or two observers from the bridge of the icebreaker Robert LeMeur during each day of the drilling operations. The observer viewed an area forward of the icebreaker while it moved under power, but kept a full 360° watch when stationary or drifting. Data were recorded on a field form that included information on environmental conditions, animal sightings, and drilling activities. Environmental conditions corresponded to those defined for the aerial surveys. Animal sighting information was also similar to the aerial surveys except locations were determined by using a distance sighting gauge in combination with obtaining a radial angle. The sighting gauge was calibrated relative to the horizon and divided into the following four categories: 0-0.23, 0.23-0.46, 0.46-0.93, and >0.93 km (0-1/8, 1/8-1/4, 1/4-1/2, and >1/2 nmi) from the ship. The radial angle was obtained from a navigation protractor that was read by using the bow of the ship as the zero degree mark. All angles were recorded to the nearest degree. When no horizon was visible, distances of animals from the ship was estimated by the observer(s).

Data collection procedures varied somewhat according to the three primary categories of icebreaker activities: (1) anchored, drifting, slowly maneuvering, or jogging in open water; (2) running, and (3) icebreaking. In general, ship activity in the prospects was dominated by the first category, while icebreaking and running occurred considerably less frequent. Descriptions and procedures for each activity are briefly provided below.

Anchored, drifting, maneuvering, or jogging: This activity occurred when the pack ice was considerably distant (>18.5 km or >10 nmi) from the drilling operations and the icebreaker was required to remain close to the drillship for logistic support.

During this activity, one observer conducted observations during most daylight hour. Observations were continuous except when interrupted for meals and brief rests to reduce fatigue. The frequency of rest periods was at the discretion of the observer, but the observer seldom took more than four, one-half hour rest periods each day. When an Ebasco observer was not on watch, the officer-on-duty on the bridge of the ship recorded any marine mammals observed near the ship.

The intensity of the 1990 observation schedule differed from that in 1989. In 1989, 10-minute observation periods were conducted during each hour of daylight. This schedule was modified to provide longer and more continuous periods of observation. During both years, observations were not conducted when sea states exceeded Beaufort 6 or fog enshrouded the ship, since animals could not be detected under these conditions. This restriction was applied to all open water observations. In addition, the position (lat./long.) was recorded hourly, except when the ship was anchored; then it was recorded once at the beginning of the day.

Running: This activity occurred when the icebreaker left the vicinity of the drillship to locate the edge of the pack ice or check the operation of transponders at another prospect. During these forays, the ship usually cruised the open ocean to the prospect, pack ice, or along the southern boundary of the ice edge. The foray destinations were generally 18.5-56 km (10-30 nmi) north of the drilling operations.

During this activity, one to two observers conducted continuous observations throughout the entire period of daylight. During the beginning of the drilling season, two observers conducted alternating 4-hour watches. Once the ice moved away from the prospect and, correspondingly, the likelihood of encountering walruses decreased, observations were conducted by one observer. The observation schedule for these surveys was identical to that described for ice-free periods, except breaks were only taken when absolutely necessary.

During the reconnaissance cruises the observer(s) conducted a strip transect survey for walruses and other pinnipeds and a line transect survey for cetaceans. In addition to sighting and environmental data described earlier, data were also collected on the response of walruses to passage of the ship. Response was classified as 'escape dive' or 'no response' relative to estimated distance of a group of walruses from the ship.

Icebreaking: This activity occurred when the ship was traveling through pack ice or repeatedly ramming heavy ice to break up the larger floes as they approached the drillship. The former type occurred when the icebreaker made forays away from a prospect to locate the ice edge and survey for walruses as requested by Ebasco scientists. The ramming type of icebreaking was normally confined to a sector within 9 km (<5 nmi), "upstream" of the drillship, in order to break up and disperse large floes drifting on a vector that would likely affect the drillship or its anchor cables. This type of icebreaking was essentially confined to a brief period at the start of the drilling operations at Popcorn and Burger, since the prospects were ice-free most of the time.

During this activity, continuous observations were conducted throughout the entire daylight hours. Two observers maintained alternating 4-hour observation periods. The procedure involved locating walrus groups in the vicinity of the icebreaker, determining the size and composition (when possible) of each group, and evaluating the reaction of each group to the approaching icebreaker. Reaction was monitored relative to distance of the icebreaker from each group. Distance was estimated by the sighting gauge or visually estimated by the observer as the ship approached or moved away from a group. Reaction of the walruses was judged according to the following categories: approach toward the ship, escape into the water, and no noticeable reaction. In addition to monitoring walrus activities, ice conditions in the area of operations were described according to the classification system followed for the aerial surveys.

3.0 RESULTS

3.1 SUMMARY OF RESULTS

More than 25,000 marine mammals, consisting of nine species, were recorded from the aerial and vessel observations during the study period (Table 3-1). Pacific walruses comprised over 98% of the observations. Other animals recorded included 146 ringed, 79 bearded, 4 spotted, and 1 ribbon seals; 8 gray, 3 belukha, and 1 minke whales; and 25 polar bears. There were an additional 94 marine mammal sightings that could not be identified to species. The gray whale was the only federally listed endangered or threatened species recorded during the study period. Species not observed but that occur seasonally in the Chukchi Sea include the bowhead and killer whale, and possibly the narwhal.

Approximately 700 of the total observations of marine mammals were made in the vicinity of the prospects, and the remainder were recorded primarily while flying between the prospects and the mainland or while cruising outside (>18.5 km (>10 nmi)) of the prospect to locate the ice edge (Table 3-1). The number of walruses observed at each prospect was highest at Burger, intermediate at Popcorn, and lowest at Crackerjack. These differences, however, were partly associated with the presence of the pack ice occupied by walruses, which occurred at or near Popcorn and Burger but not at Crackerjack during their respective drilling periods. Ringed and bearded seals were observed at all three prospects, spotted seals and polar bears at two of the prospects, and a minke whale at one prospect. Gray whales, belukha whales, and a ribbon seal were entirely observed outside the prospect areas. Species diversity and relative abundances in the prospects were highest when pack ice was present. All of the polar bears, most of the walruses, and many of the other species were associated with the pack ice.

A more detailed presentation and analysis of the walrus and polar bear data are provided in the following sections of the report. Section 3.2 addresses the results of the aerial surveys, Section 3.3 gives the results of the vessel-based observations, and Section 3.4 addresses the polar bear results. The results are presented separately in these sections for clarity, but they are examined together in Section 4.0 of the discussion. Appendix Table B-3 contains a listing of the number, location, and date of each marine mammal recorded during the study period. Appendix Figures B-1 through B-5 show the distribution of each species of marine mammal observed during the aerial surveys and vessel-based observations, except for walruses and polar bears which are presented in the body of the report. Appendix Table B-4 lists 15 walruses and other pinnipeds that were recorded by drilling operation personnel. These sightings were not reported in the text, since many of the sightings were probably duplicates of animals observed by Ebasco Environmental observers.

3.2 AERIAL SURVEYS

A total of 40 groups of 647 total walruses were observed in the study area during nine aerial surveys flown between June 29 and July 15 (Table 3-2). All walruses were observed before drilling operations began on July 12. There were 5 groups of 18 total walruses recorded within

Table 3-1. Summary of marine mammals sighted from the Robert LeMeur and during aerial surveys, 1990.[a/]

SPECIES	POPCORN		BURGER		CRACKERJACK		OTHER[b/]		TOTAL	
	Indiv.	Groups	Indiv.	Groups	Indiv.	Groups	Indiv.	Groups	Indiv.	Groups
Pacific walrus	33	20	534	67	22	10	24,300	1,544	24,889	1,641
Ringed seal	22	21	8	8	8	8	108	68	146	105
Bearded seal	12	12	11	11	4	4	52	47	79	74
Spotted seal	1	1	3	3	-	-	-	-	4	4
Ribbon seal	-	-	-	-	-	-	1	1	1	1
Gray whale	-	-	-	-	-	-	8	7	8	7
Belukha whale	-	-	-	-	-	-	3	2	3	2
Minke whale	1	1	-	-	-	-	-	-	1	1
Polar bear	1	1	6	3	-	-	18	12	25	16
Unidentified pinniped	6	6	8	8	-	-	79	59	93	73
Unidentified cetacean	1	1	-	-	-	-	-	-	1	1
TOTAL	**77**	**63**	**570**	**100**	**34**	**22**	**24,569**	**1,740**	**25,250[c/]**	**1,925**

[a/] There were no observations of bowhead whales, killer whales, or narwhals.

[b/] Numbers observed while Robert LeMeur in transit between prospects, on a reconnaissance outside (> 18.5 km) of the prospect area, or during aerial surveys outside the prospect survey grid (100 km x 45 km).

[c/] An additional 34 groups of 803 total marine mammals were sighted considerably beyond the prospects and near Cape Lisburne during three reconnaissance flights on October 1 - October 4, 1990. These animals were not included in the table because they were over 62 km (100 nmi) from the prospect.

Table 3-2. Number of individuals and groups of walruses observed in the project area during aerial surveys, 1990. [a/]

SURVEY DATES	POPCORN		BURGER		CRACKERJACK		OTHER[b/]		TOTAL	
	Indiv.	Groups	Indiv.	Groups	Indiv.	Groups	Indiv.	Groups	Indiv.	Groups
June 29	-	-	-	-	-	-	581	14	581	14
July 1	-	-	0	0	-	-	0	0	0	0
July 3	-	-	0	0	-	-	0	0	0	0
July 4	0	0	-	-	-	-	0	0	0	0
July 5	-	-	-	-	-	-	1	1	1	1
July 9	-	-	-	-	-	-	47	20	47	20
July 10	5	2	-	-	-	-	0	0	5	2
July 11	-	-	-	-	13	3	0	0	13	3
July 15	-	-	-	-	-	-	0	0	0	0
TOTAL	**5**	**2**	**0**	**0**	**13**	**3**	**629**	**35**	**647**	**40**

[a/] Dash indicates that a prospect was not surveyed. The specific prospect surveyed depended on weather conditions and the drilling plan. Although the plan identified the sequence SWEPI intended to drill each prospect, ice conditions required daily re-evaluation of the sequence once the Robert LeMeur entered the Chukchi Sea and contacted the pack ice 111-250 km south of the prospects on July 3. Because of the uncertainty created by this condition, surveys were conducted at all three prospects before drilling operations began at Popcorn on July 12.

[b/] Other indicates survey results of areas outside of the prospects, including flights to locate the ice edge and traveling between the prospects and the mainland.

the three prospects and 35 groups of 629 total walruses recorded outside of the prospects. Walruses were observed at the Crackerjack (13 animals) and Popcorn (5 animals) prospects, but not at the Burger Prospect. These walruses were encountered toward the end of the June/July survey period, when the pack ice was breaking up and its southern margin was closest to the prospects. Prior to this time, the prospects were deep in the pack where ice cover typically exceeded 80% of the surface area. Walruses generally avoid such areas of high ice cover and prefer the more open water of the southern margin of the pack ice where they can move and feed more freely (Fay 1982). Most of the other walruses observed during the surveys were southeast of the prospects, in the southern margin of the pack ice near Icy Cape. One survey was conducted on July 15 after the drillship arrived at Popcorn, but it was aborted at the prospect because of poor weather conditions. There were no additional flights because fog covered the Popcorn prospect until the pack ice was considerably north of the drillsite; aerial surveys were scheduled to occur only when ice was in or near (< 18.5 km or < 10 nmi) a drillsite. Aerial surveys were not conducted at the other prospects during drilling opeations because weather conditions were unsuitable or the pack ice was absent.

3.2.1 Effort

A total of 8,060 km (4,347 nmi) of effort was flown in the study area (Table 3-3). Approximately 25% of the total effort was in the prospects, while the remainder was outside of the prospects. In the prospects, there were 982 km (530 nmi) flown during two flights at Burger, 730 km (394 nmi) flown during five flights at Popcorn, and 251 km (135 nmi) flown during one flight at Crackerjack. The daily flight tracks and associated walrus sightings are shown in Appendix B Figures 6-14. Approximately 80% of the survey effort in the prospects occurred along systematic transect lines (i.e., full effort survey) and 20% along deadhead transect lines (i.e., partial effort surveys). Daily effort on systematic lines in the prospects ranged from 32-427 km (17-231 nmi) per day and averaged 191 km (103 nmi). The effort and flight pattern varied each day because of weather conditions and the limited fuel capacity of the survey aircraft. Surveys outside the prospects were conducted along random transect lines, and they ranged from 350-885 km (189-478 nmi) and averaged 677 km (366 nmi) each day. The effort was relatively high because of the long travel distance to the prospects from the mainland. In addition, flights were conducted outside of the prospects along the ice front when the prospects were covered in fog.

3.2.2 Viewing Conditions

Aerial surveys were attempted during 9 of 17 days between June 29 and July 15, 1990 (Table 3-4). No surveys were attempted during the remaining 8 days because of fog or high winds. During the 9 flight days, visibility conditions in the prospects were excellent during 62% of the time, fair during 25% of the time, and unacceptable during 13% of the time. Survey conditions were dominated by excellent visibility on 5 flight days, fair visibility on 2 days, and unacceptable visibility on 2 days. Low fog prevented surveys from being conducted at the prospects on June 29 and also caused the July 15 survey to be terminated early. Although weather conditions hampered the surveys, relatively complete censuses were conducted of

Table 3-3. Aerial survey effort (km) by transect type for the study area, 1990.

SURVEY DATE	POPCORN			BURGER			CRACKERJACK			OTHER[a/]	TOTAL
	SYSTEMATIC	DEADHEAD	TOTAL	SYSTEMATIC	DEADHEAD	TOTAL	SYSTEMATIC	DEADHEAD	TOTAL	RANDOM	
JUNE 29	-	-	-	-	-	-	-	-	-	826	826
JULY 1	-	-	-	427	99	526	-	-	-	513	1,039
JULY 3	-	-	-	376	80	456	-	-	-	350	806
JULY 4	192	71	263	-	-	-	-	-	-	740	1,003
JULY 5[b/]	116	-	116	-	-	-	-	-	-	795	911
JULY 9[c/]	55	-	55	-	-	-	-	-	-	885	940
JULY 10	153	111	264	-	-	-	-	-	-	704	968
JULY 11[d/]	-	-	-	-	-	-	176	75	251	646	897
JULY 15	32	-	32	-	-	-	-	-	-	638	670
TOTAL	548	182	730	803	179	982	176	75	251	6,097	8,060

[a/] Effort transiting between prospects and base-of-operations or in the pack ice when fog covered the prospects.

[b/] Systematic lines partially extended into Crackerjack Prospect.

[c/] Systematic line extended through all three prospects.

[d/] Systematic lines partially extended into Popcorn Prospect.

Table 3-4. Aerial survey conditions in the vicinity of the three prospects, 1990.

SURVEY DATE	PROSPECT	EFFORT (km)	VISIBILITY (%)[a]					
			EXCELLENT	VERY GOOD	GOOD	FAIR	POOR	UNACCEPTABLE
June 29[b]	-	-	-	-	-	-	-	-
July 1	Burger	526	80	0	0	20	0	0
July 3	Burger	456	9	0	0	52	1	38
July 4	Popcorn	263	100	0	0	0	0	0
July 5[c]	Popcorn	116	100	0	0	0	0	0
July 9	Popcorn	55	0	0	0	0	0	100
July 10	Popcorn	264	92	0	0	8	0	0
July 11	Crackerjack	251	64	0	0	26	0	10
July 15	Popcorn	32	0	0	0	56	0	44
TOTAL		1,963	62	0	0	25	0	13

[a] See Appendix Table 2 for definitions of visibility conditions.

[b] Prospects were not surveyed because of fog. Reconnaissance flight was made of the pack ice outside of the prospects.

[c] Survey was used to locate ice edge, since prospects were ice-covered and no walruses were previously observed or expected to occur in these ice conditions.

Popcorn during 2 days, Burger 2 days, and Crackerjack 1 day. Visibility conditions outside of the prospects, particularly in the southern margin of the pack ice, were sufficient for surveying walruses during all but one day. Winds during the surveys were generally below 10-15 kt.

3.2.3 Distribution

The distribution of walruses observed during the aerial surveys (and also vessel-based observations) is shown in Figure 3-1. Most animals observed during the aerial surveys were considerably south and east of the prospects before drilling operations began. Ninety-seven percent of the animals were over 100 km (54 nmi) from the prospects. They largely occurred within 55 km (30 nmi) of the Alaska coastline. These walruses were encountered near the southern boundary of the pack ice in 10-50% ice cover, although most were in ice concentrations below 30%. The remaining 3% (18) of the walruses were recorded in the Popcorn and Crackerjack prospects in about 80% ice cover, but at the time of these observations (July 10 and 11) a part of the marginal ice front was approaching the prospect from the west, creating suitable walrus habitat. These results show that very few walruses were observed in the vicinity of Popcorn or the other prospects before drilling operations began because of the extensive ice cover.

During drilling operations, three flights were made between October 1-5 to determine the extent and location of the southward migration of walruses relative to the prospects. Two flights were flown in the southern margin of the pack ice and one flight in the nearshore waters (0-18.5 km or 0-10 nmi) between Barrow and Cape Lisburne. The pack ice was encountered at latitude 73°N, approximately 185 km (100 nmi) from the nearest active prospect. Flights revealed that the pack was very dispersed and consisted of small floes unsuitable for use by large aggregations of walruses. Only 3 groups of 6 total walruses were encountered (Figure 3-1). Flights conducted by the USFWS in the eastern Chukchi Sea and the Soviet Union in the western Chukchi Sea during the same period found that this ice pattern extended 37-185 km (20-100 nmi) beyond the outer continental shelf, where the water is too deep for walruses to feed (Fay 1982, Fay and Burns 1988). These surveys also found relatively small numbers of walruses, which caused the USFWS to terminate their survey considerably earlier than planned. Investigators involved in these surveys (L. Lowry and K. Frost of Alaska Department of Fish and Game, D. Siegers of USFWS, and J. Burns of Living Resources) believed that most walruses had abandoned the pack ice in mid-September to early October and were migrating southward in the open ocean.

Accordingly, we conducted one open water flight on October 3 to confirm that walruses were migrating ahead of the pack ice. No walruses were encountered in the open water traversed to Cape Lisburne, but 429 walruses were observed hauled out at Cape Lisburne. Correspondingly, an investigator (J. Burns) on the Soviet-run survey reported walruses were observed at all the traditional haul-out sites along the western Chukchi Sea coast and Wrangell Island, and several new sites. Consequently, these results suggest that walruses did not wait for the southward advance of the pack ice, but migrated south in the open ocean.

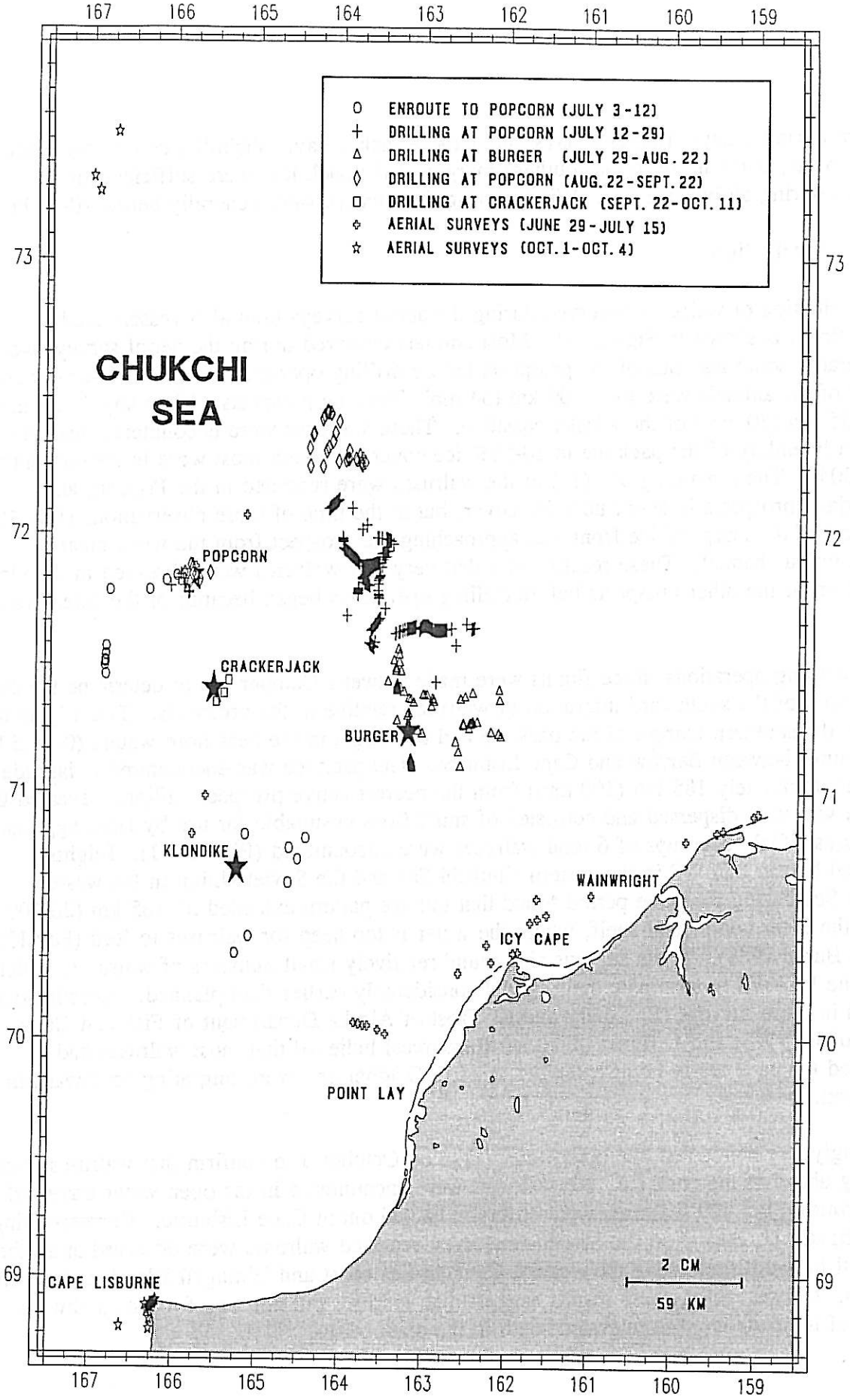

Figure 3-1. Location of 1,641 groups, totaling 24,889 walruses, observed in the study area, 1990. An additional 25 groups, totaling 429 walruses, are shown outside the prospects and at Cape Lisburne during aerial surveys on October 1-5, 1990.

3.2.4 Reaction to Survey Aircraft

Walrus reactions to the survey aircraft were evaluated for 49 groups observed hauled out on the pack ice and on land at Cape Lisburne. Approximately 17% of 24 groups observed on the pack ice and none of 25 groups observed on land reacted to the aircraft. Reaction was defined as more than a few (>10%) walruses leaving a haul-out site for the water. Consequently, less than 10% of the 49 total walrus groups reacted to the aircraft, which maintained a flight altitude of 305 m (1,000 ft) over the pack ice and 152 m (500 ft) over the land during the surveys. In 1989, approximately twice (38% of 229 groups) as many walrus groups encounter in the pack ice reacted to the same aircraft when flying at the same altitude; there were no comparable data for walruses on land. The reasons for these differences between years are unclear.

3.3 VESSEL-BASED OBSERVATION

A total of 1,601 groups of 24,242 walruses was observed from the Robert LeMeur in the prospects and other areas between July 3, when the drilling fleet began to transit to the first prospect, until the drilling season ended on October 11 (Table 3-5). Approximately 2% (571) of these animals were recorded within 18.5 km (10 nmi) of the drillsites with the remainder found beyond in the drifting pack ice. At the Popcorn Prospect, 18 groups of 28 total animals were observed during the July 3-29 and August 22 to September 22 drilling operations. Most (68%) of these animals were recorded in early July, when the pack ice passed northward through the prospect. At the Burger Prospect, 67 groups of 534 total animals were observed between July 29 and August 22 during drilling operations. All of these animals were recorded in the first half of August, when a long and narrow tongue of the pack ice occurred along the northern and eastern sides of the prospect. At the Crackerjack Prospect, 7 groups of 9 total animals were observed between September 22 and October 11 during drilling operations. These animals were recorded in the open water, since the pack ice was over 185 km (100 nmi) north of the drillsite. Most of the walruses observed in the vicinity of the prospects were near or in the pack ice, which occurred at Popcorn for approximately 3 days and Burger for approximately 15 days during active drilling operations. In addition to the animals in the prospects, there were 1,509 groups of 23,671 total walruses observed when the icebreaker left the prospects to locate and define the southern boundary of the pack ice or ice edge. Most of these animals were recorded in the pack ice during July and August, 18.5-50 km (10-27 nmi) from the drilling operations. While walruses were encountered during all four categories of ship activity, most were seen while the icebreaker was conducting reconnaissances along the ice edge.

3.3.1 Effort

There were 1,129 hr of observation recorded from the Robert LeMeur in the study area (Table 3-5), which represented approximately 65% of the total available observation time. Approximately 72% of the effort was in the prospects, which included 494 hr at Popcorn, 179 hr at Burger, and 142 hr at Crackerjack. The remaining 314 hr of effort occurred outside the prospects during ice reconnaissances or while in-transit between prospects. In the prospects, effort was generally greatest when the vessel was stationary, maneuvering, or jogging (77%) and

Table 3-5. Effort (hr), number of individual walruses, and number of walrus groups recorded from the Robert LeMeur at each prospect, 1990.

Month	Ship Activity	Popcorn			Burger			Crackerjack			Other[a]			Total		
		Effort	Indiv.	Groups	Effort	Indiv.	Groups	Effort	Indiv.	Groups	Effort	Indiv.	Groups	Effort	Indiv.	Groups
July 3 - July 29	Stationary[b]	72	4	2	-	-	-	-	-	-	94	906	118	166	910	120
	Man/Jog[c]	83	7	4	-	-	-	-	-	-	10	0	0	93	7	4
	Running	2	0	0	-	-	-	-	-	-	22	7	3	24	7	3
	Ice Breaking	50	8	4	-	-	-	-	-	-	104	21,796	1,273	154	21,804	1,277
	Total	**207**	**19**	**10**	**-**	**-**	**-**	**-**	**-**	**-**	**230**	**22,709[d]**	**1,394[d]**	**437**	**22,728**	**1,404**
July 29 - August 22	Stationary	-	-	-	94	2	2	-	-	-	3	39	4	97	41	6
	Man/Jog	-	-	-	11	0	0	-	-	-	0	0	0	11	0	0
	Running	-	-	-	26	0	0	-	-	-	12	0	0	38	0	0
	Ice Breaking	-	-	-	48	532	65	-	-	-	36	473	56	84	1005	121
	Total	**-**	**-**	**-**	**179**	**534**	**67**	**-**	**-**	**-**	**51**	**512**	**60**	**230**	**1,046**	**127**
August 22 - Sept. 22	Stationary	123	5	4	-	-	-	-	-	-	0	0	0	123	5	4
	Man/Jog	111	4	4	-	-	-	-	-	-	11	450	55	122	454	59
	Running	53	0	0	-	-	-	-	-	-	1	0	0	54	0	0
	Ice Breaking	0	0	0	-	-	-	-	-	-	0	0	0	0	0	0
	Total	**287**	**9**	**8**	**-**	**-**	**-**	**-**	**-**	**-**	**12**	**450**	**55**	**299**	**459**	**63**
Sept. 22 - Oct. 11	Stationary	-	-	-	-	-	-	54	6	5	5	0	0	59	6	5
	Man/Jog	-	-	-	-	-	-	78	3	2	0	0	0	78	3	2
	Running	-	-	-	-	-	-	10	0	0	16	0	0	26	0	0
	Ice Breaking	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0
	Total	**-**	**-**	**-**	**-**	**-**	**-**	**142**	**9**	**7**	**21**	**0**	**0**	**163**	**9**	**7**
Total	Stationary	195	9	6	94	2	2	54	6	5	102	945	122	445	962	135
	Man/Jog	194	11	8	11	0	0	78	3	2	21	450	55	304	464	65
	Running	55	0	0	26	0	0	10	0	0	51	7	3	142	7	3
	Ice Breaking	50	8	4	48	532	65	0	0	0	140	22,269	1,329	238	22,809	1,398
	Total	**494**	**28**	**18**	**179**	**534**	**67**	**142**	**9**	**7**	**314**	**23,671**	**1,509**	**1,129**	**24,242**	**1,601**

a/ Numbers observed while Robert LeMeur in transit between prospects and/or on a reconnaissance outside (>18.5km) the prospect area.
b/ Stationary=anchored or drifting.
c/ Man/Jog=maneuvering or jogging.
d/ There were 22 groups totaling 98 walruses seen in transit to the Popcorn Prospect between July 3 - July 12, and 1382 groups totaling 22630 walruses during the remainder of the drilling period.

lowest when icebreaking (12%) and running (11%) (Figure 3-2). Since observations were conducted every day that weather conditions permitted, this distribution of effort reflects the activity pattern of the Robert LeMeur throughout the drilling season except for the icebreaking category. Icebreaking did not occur after mid-August because the pack ice was considerably north of the prospects. Effort outside of the prospects included higher proportions of icebreaking (44%) and running (16%), and lower proportions of the other categories (39%). This distribution of effort corresponded to the vessel's primary purpose when leaving the prospects, which was to locate and define the ice edge. During the drilling season, the icebreaker conducted four 1-3 day ice reconnaissances outside the prospects. Three of the reconnaissances were requested by Ebasco to characterize the ice edge relative to the prospects and/or determine the presence of walruses, and one was directed by SWEPI to define the location and direction of drift of the pack ice from the drilling operations.

3.3.2 Viewing Conditions

Viewing conditions at the prospects were moderate for observing walruses and other marine mammals. Sea states were a Beaufort 0-4 (< 16 kt) for approximately 50% of the observation effort at Crackerjack, 60% at Popcorn, and 70% at Burger (Figure 3-3a). Animals are difficult to detect in higher sea states. Good to excellent visibility conditions occurred during 50% of the observation effort at Crackerjack and Burger, and 55% at Popcorn (Figure 3-3b). Viewing conditions were generally worse at Crackerjack, because the effort occurred during the fall when storms were more common. Outside of the prospects, visibility conditions and sea states were generally better because vessel reconnaissances were usually only conducted during good weather or near the ice where surface winds were diminished. Observations were usually terminated or the intensity of the effort was reduced when sea states exceeded a Beaufort 6 (> 28 kt) or heavy fog covered the prospects. High sea states and heavy fog occurred during approximately 35% of the time available to conduct observations during the 92-day drilling season.

3.3.3 Distribution

The distribution of walruses observed from the icebreaker is shown in Figure 3-1. Ninety-nine percent of the walruses were within the pack ice. Because the location of the pack ice varied at each prospect, the following discussion describes the observed distribution of walruses at each active prospect and during the beginning season transit to the prospects. A more quantitative analysis was not possible, because the data were collected on an opportunistic basis rather than by a systematic design.

3.3.3.1 Transit to Prospects

The drillfleet arrived at the southern margin of the pack ice on July 3, which was approximately 111-250 km (60-135 nmi) south of the prospects. While the drillship and support vessels stayed near the ice edge, the Robert LeMeur traversed to Popcorn and Crackerjack to determine ice conditions and drift (Figure 3-4). During the transit, 42 walruses were observed in the ice

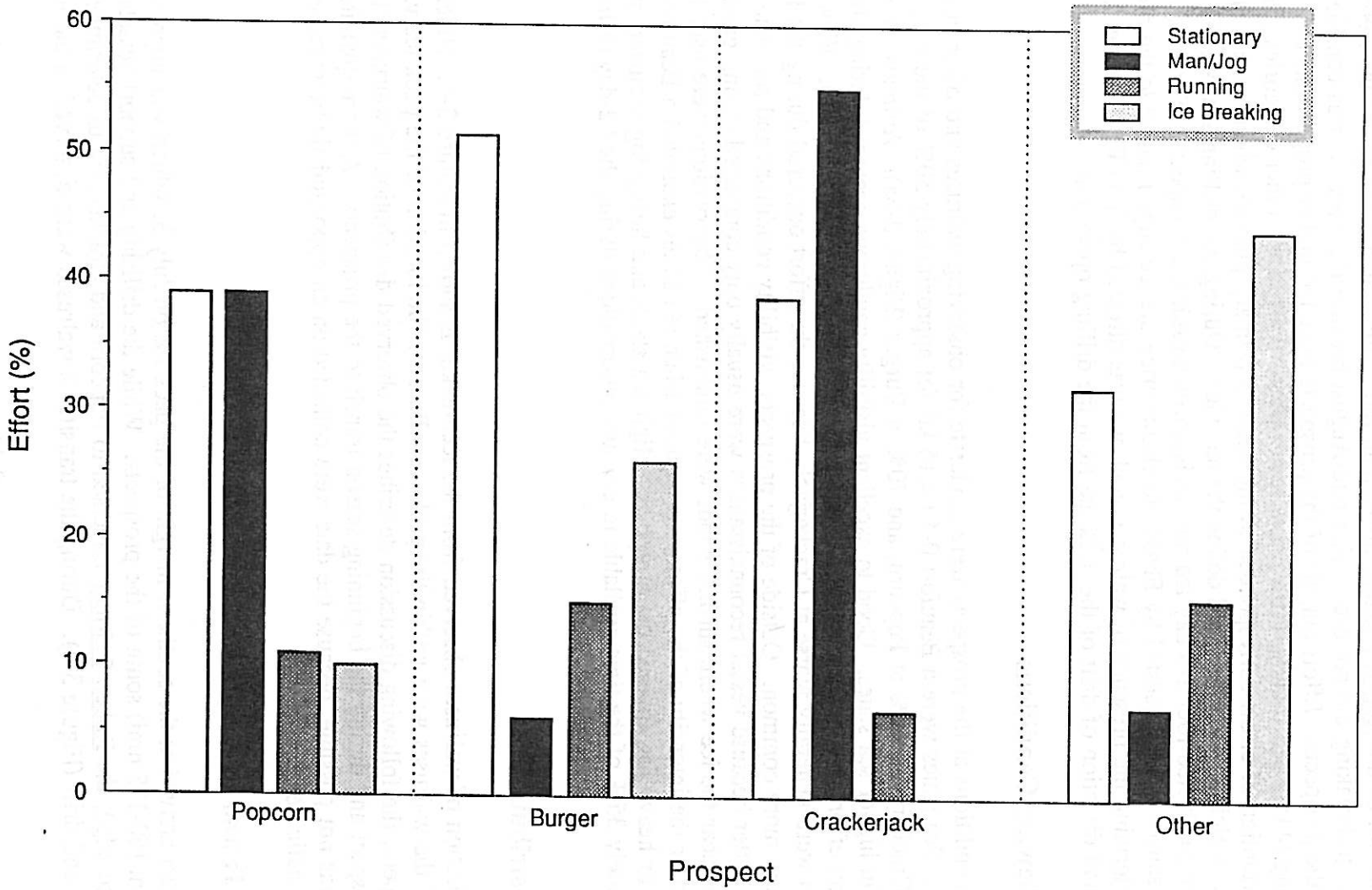

Figure 3-2. Distribution of observation effort by activity for the Robert LeMeur in and outside of the prospects.

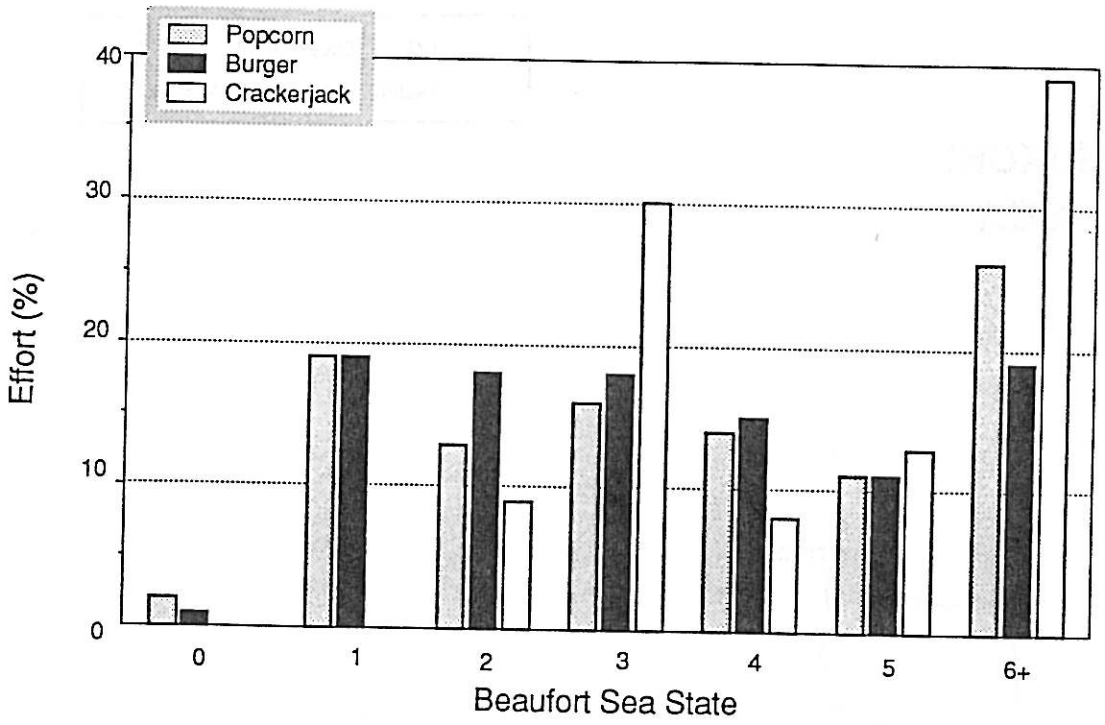

Figure 3-3a. Beaufort sea state conditions recorded during vessel observations, 1990.

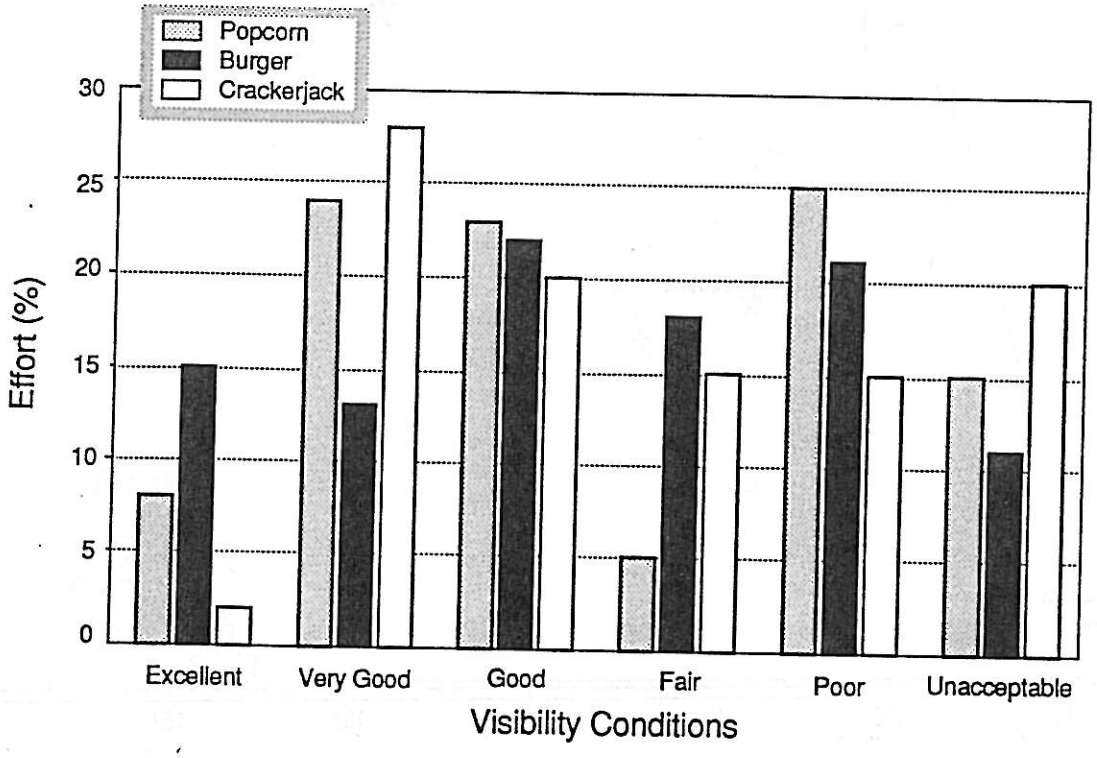

Figure 3-3b. Visibility conditions recorded during vessel observations, 1990.

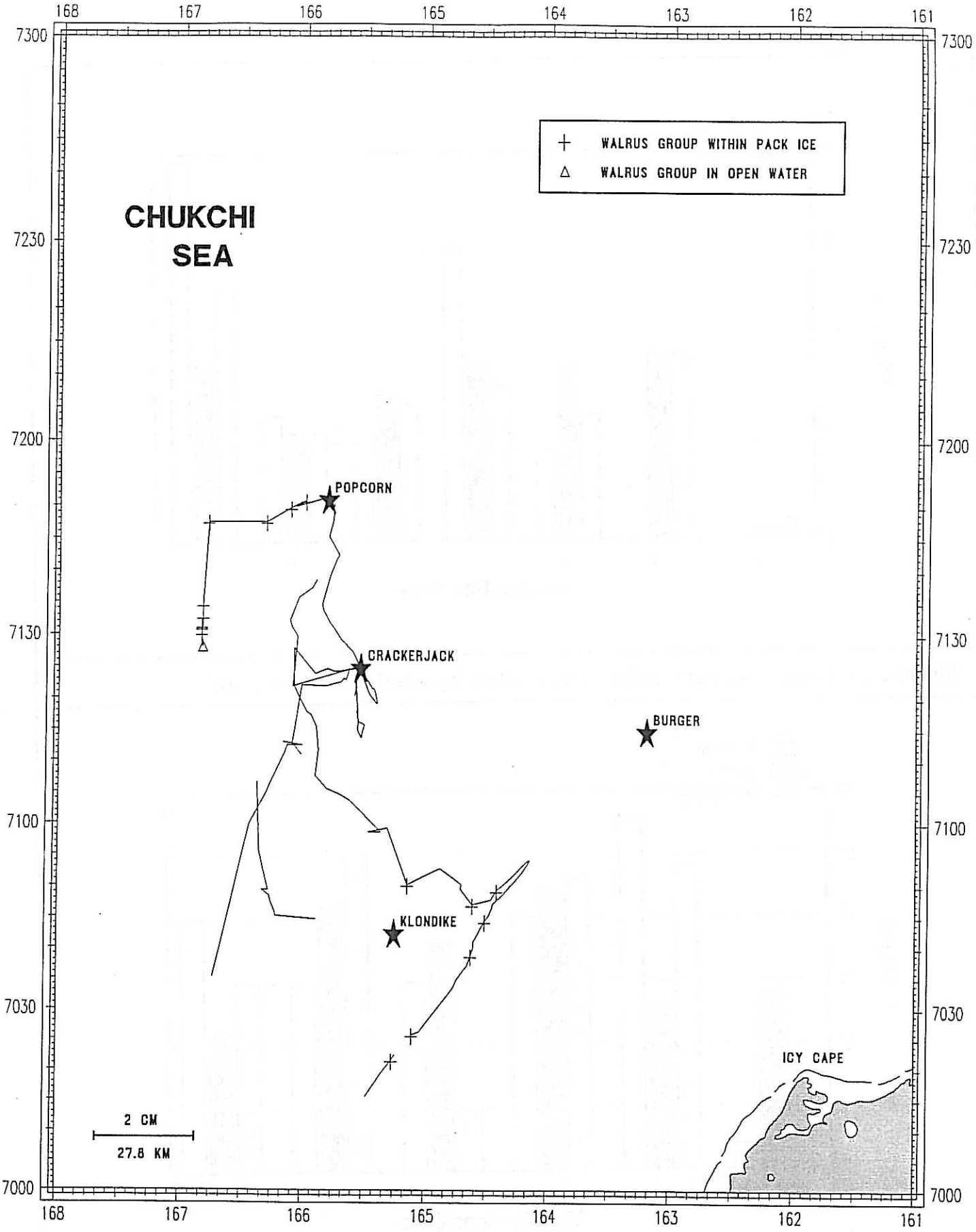

Figure 3-4. Location of 22 groups, totaling 98 walruses, recorded within the pack ice (+) and in open water (△), and tracklines of the Robert LeMeur during transit from the pack ice edge to the Crackerjack and Popcorn prospects, July 3-12, 1990.

margin on July 3 and 4. Once the icebreaker moved from the 10-50% ice cover in the margin to areas deeper in the pack ice, no walruses were encountered. At this time the prospects and surrounding vicinity featured high concentrations of ice (>80% ice cover), which are generally unsuitable for use by walruses (Fay 1982) (Figure 3-5). The icebreaker remained at Popcorn on July 5, then traveled to Crackerjack where it stayed until returning to the drillship on July 9. No walruses were observed during this period. By July 11, the pack ice was sufficiently open to the west of Popcorn and Crackerjack for the drillfleet to continue north and subsequently arrived at Popcorn on July 12. Fifty-six walruses were observed during the transit to Popcorn on July 12. They were found in very broken ice (10-20% ice concentrations), associated with the ice margin which had moved near Popcorn's western border.

3.3.3.2 Popcorn

The drillship arrived at Popcorn on July 12. By the evening of July 14, the last remnants of pack ice had drifted northeast of the drillsite, moving at 0.5-1.5 km/hr (0.3-0.8 kt) (Figure 3-5). The Popcorn prospect was ice free for the remainder of the drilling period. Between July 12-24, 19 walruses were observed swimming in a northeasterly direction through the prospect. These movements suggested that walruses may have been returning from feeding forays to walrus aggregations that may have formed on the distant pack. Accordingly, at the request of Ebasco, the icebreaker was deployed on July 24-26 to determine the locations of these walrus aggregations between Popcorn and Burger (Figure 3-6). No walruses were observed enroute to the ice margin, which was approximately 86 km (47 nmi) from Popcorn. Walruses were numerous at the ice margin and for about 6-8 km (3-4.5 nmi) into the dispersed front zone between longitudes 162°40' and 164°30'. An estimated 2,366 walruses were observed in the pack ice between July 24-25 during a traverse by the icebreaker to Burger. In addition, an estimated 20,245 walruses were observed in the pack between July 25-26 during the return trip to Popcorn. No walruses were observed in the open water during the 59 km (32 nmi) traversed between the ice margin and Popcorn. Some proportion of the 22,611 total walruses recorded in the pack ice may have been double counted, because the same ice was probably traversed during the return trip to Popcorn. However, some number of walruses were missed because they were below the surface of the water. No other walruses were observed during the remainder of the first drilling period at the Popcorn Prospect, which ended on July 29. Consequently, few walruses were seen at Popcorn, none at Burger, and aggregations of walruses occurring in the pack ice were no closer than 59 km (32 nmi) from Popcorn and 45 km (24 nmi) from Burger.

3.3.3.3 Burger

The drillship and support vessels arrived at Burger on July 29. Between July 29 and August 16, a tongue of loosely concentrated ice occurred primarily along the eastern half of the prospect (Figure 3-7). The ice was connected to the main pack ice, which was north of the prospect, while the area west of the prospect was open water. Frequent forays into the ice, made with the icebreaker, identified that the edge was very irregular and located between 4-37 km (2-20 nmi) from the drillship. Although the ice was generally not in contact with the drillship, floes from the pack ice drifted past the drillship on two days (August 10 and 11). The icebreaker broke up

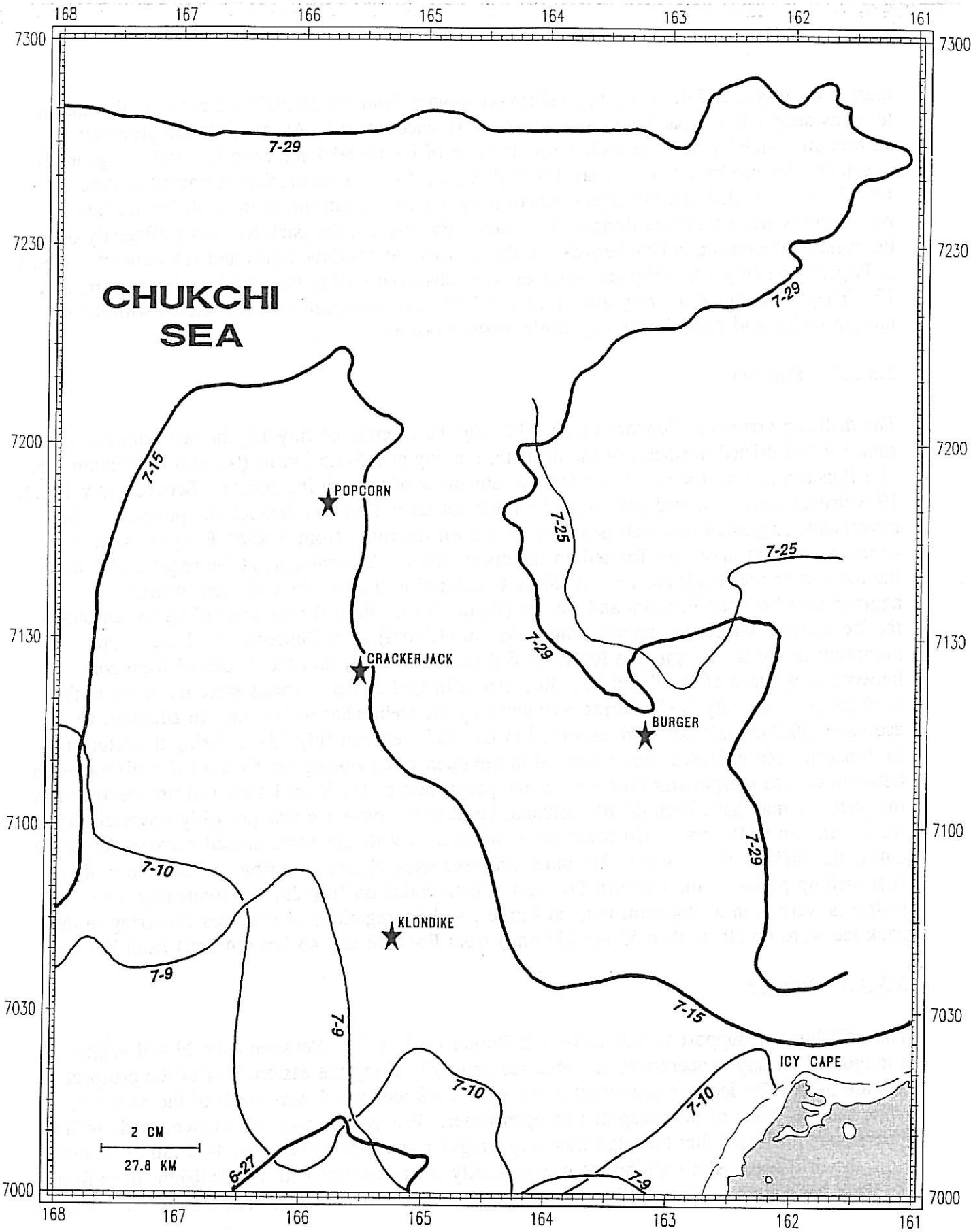

Figure 3-5. Location of the ice edge prior to and during drilling operations at the Popcorn Prospect, June 27 - July 29, 1990. Drilling operations occurred at the Popcorn Prospect on July 3-12, 1990.

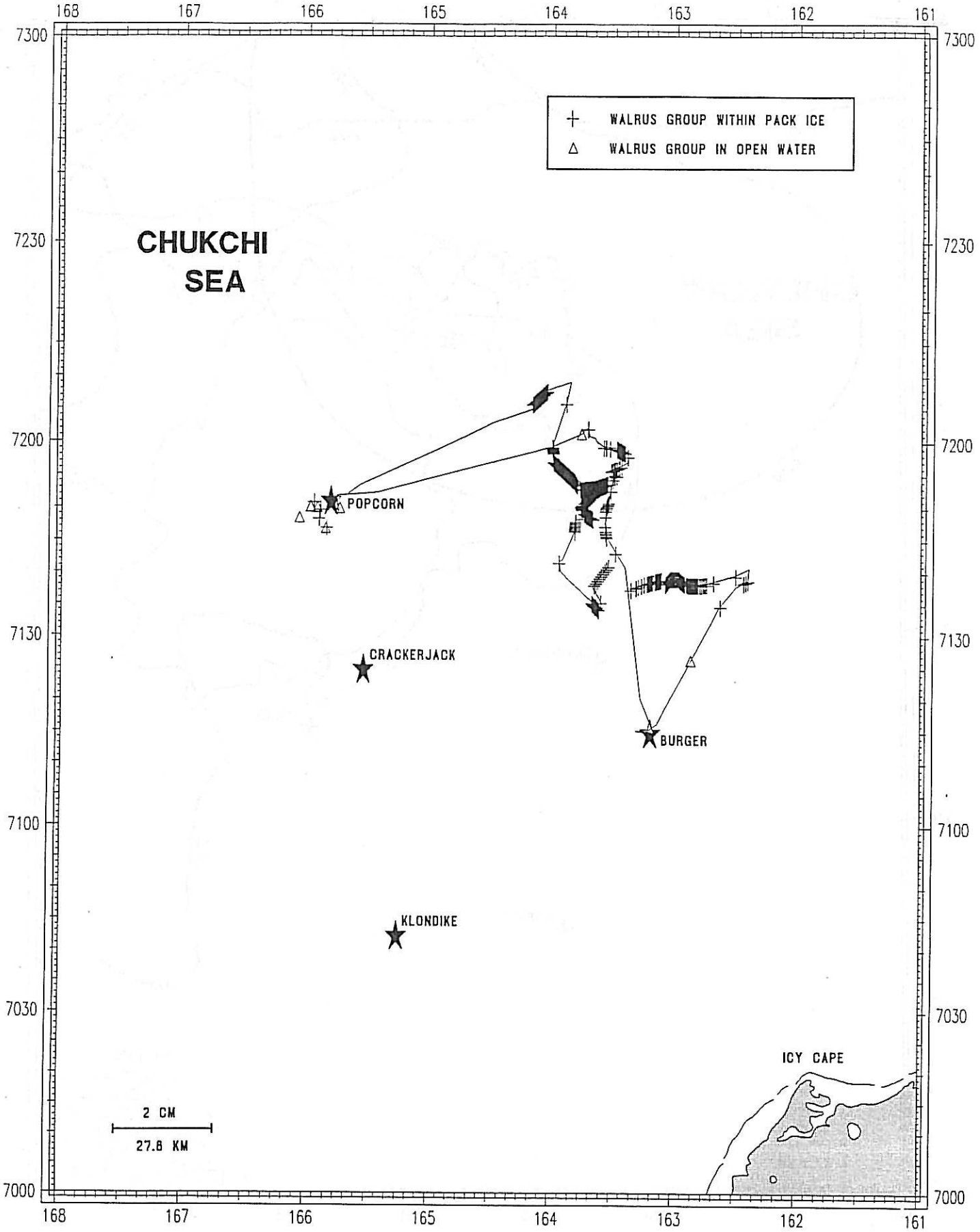

Figure 3-6. Location of 1382 groups, totaling 22,630 walruses, recorded within the pack ice (+) and in open water (▵) during drilling operations at the Popcorn Prospect, July 12-29, 1990. Tracklines are displayed for a reconnaissance by the Robert LeMeur, July 24-26, 1990.

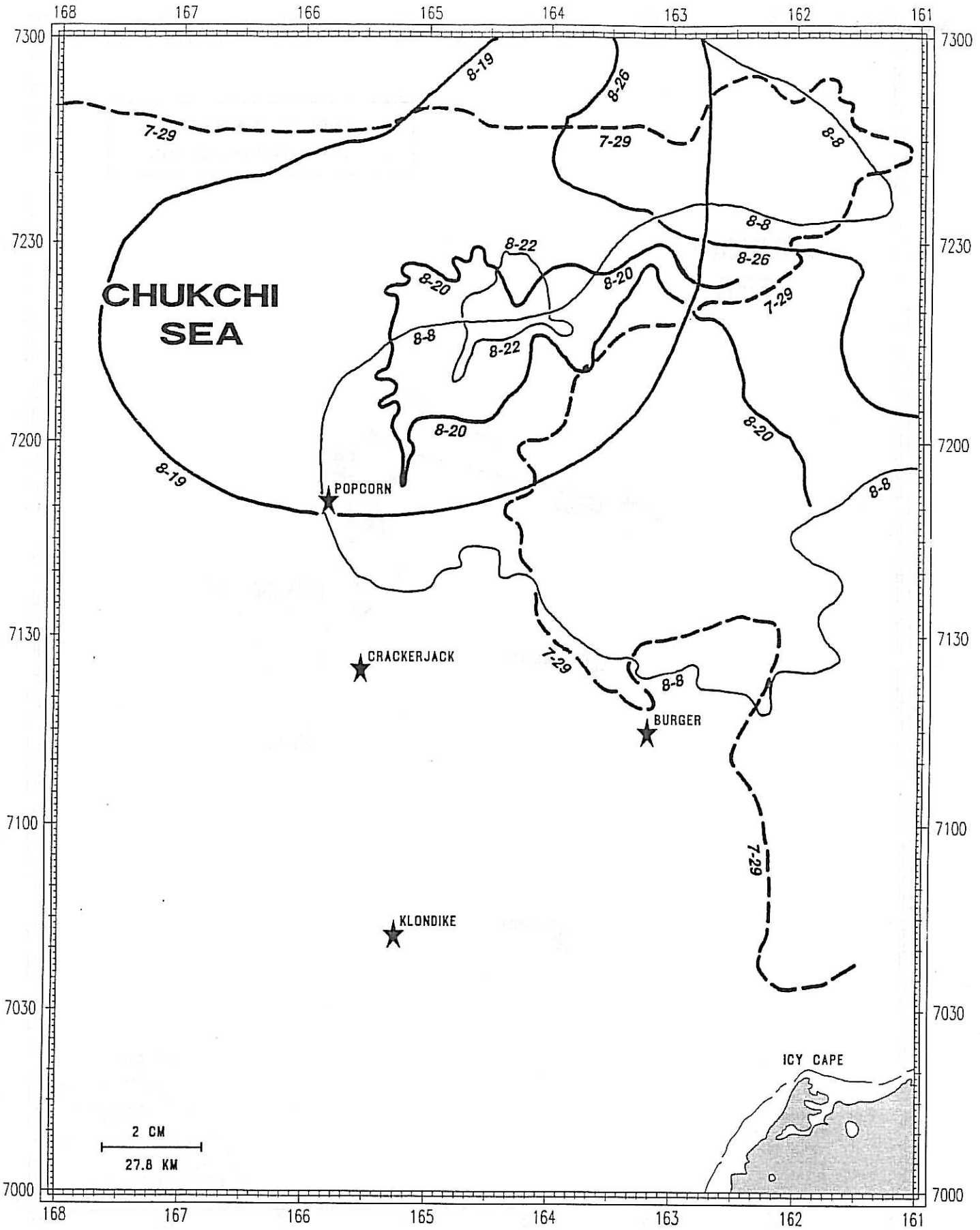

Figure 3-7. Location of the ice edge during drilling operations at the Burger Prospect, July 29 - August 26, 1990. Drilling operations occured at the Burger Prospect on July 29 - August 22, and at the Popcorn Prospect on August 22 - September 22, 1990.

the larger floes as they approached the drillship. No walruses were recorded in the vicinity of this activity. The pack ice drifted back and forth in a southwest-northeast direction until August 16, when gale force winds pushed the ice northeast of the prospect for the rest of the drilling period. During the period that the pack ice was in the vicinity (0-30 km or 0-16 nmi) of the prospect, 1,046 walruses were recorded in the ice margin, about 6-9 km (3-5 nmi) into the dispersed ice mass (Figure 3-8). Walruses were widely distributed along the ice margin throughout the entire tongue of pack ice. Accordingly, the distance of walruses from the drillship varied and included 534 walruses within 18.5 km (10 nmi) and 512 walruses beyond. Once the ice moved out of the prospect, no walruses were observed during the remaining drilling period which ended on August 22. Consequently, walruses occurred in the vicinity of Burger, but they were widely dispersed in the pack ice, and their locations relative to the drillship were directly influenced by the movement and configuration of the pack ice.

3.3.3.4 Popcorn

The drillship and support vessels returned to Popcorn on August 21. The prospect was ice free except for an isolated patch of ice located approximately 20 km (11 nmi) north of the drillsite (Figure 3-7). This patch was approximately 56-83 km (30-45 nmi) wide by 20 km (11 nmi) deep, and it contained small floes of loosely concentrated ice (10-30% ice cover). The main pack ice was >150 km (80 nmi) north of the prospect. Upon request by Ebasco, the icebreaker was deployed on August 21 to conduct a 2-day survey of walruses along the entire perimeter and through the center of the patch. Precautions (see methods sections) were taken to minimize disturbance to walruses encountered in this area. A total of 450 walruses were observed along the northeastern perimeter of the patch, which was over 70 km (38 nmi) from the drillship (Figure 3-9). Walruses were only encountered in this location of the patch, which was on the leeward side. The calm waters at this location apparently provided a more stable platform of ice for walruses to haul out on as compared to areas exposed to the wind. No walruses were observed during the open water transit back to the prospect on August 22. During the remaining 31 days of the drilling period at Popcorn, 9 walruses were observed swimming near the drillship and support vessels. Drilling operations ended at Popcorn on September 22. Consequently, few walruses were observed at Popcorn and concentrations of walruses in the pack ice were no closer than 75 km (38 nmi) from the drillsite.

3.3.3.5 Crackerjack

The drillship arrived at Crackerjack on September 22. Pack ice was over 185 km (100 nmi) north of the prospect, which is where it stayed for the remainder of the drilling season (Figure 3-10). Only 7 groups of 9 total walruses were observed in the prospect (Figure 3-11). The groups were briefly seen on separate days, spaced throughout the drilling period. Because few walrus were observed in the prospect, Ebasco requested that the icebreaker be deployed to conduct a more extensive open water survey north of the prospect. The survey was aimed at intercepting southward migrating walruses. Four east-west transect lines spaced 9 km (5 nmi) apart and 9-56 km (5-30 nmi) long were surveyed on October 2 and 3. Viewing conditions were mostly acceptable, but no walruses were recorded during the almost 278 km (150 nmi) survey.

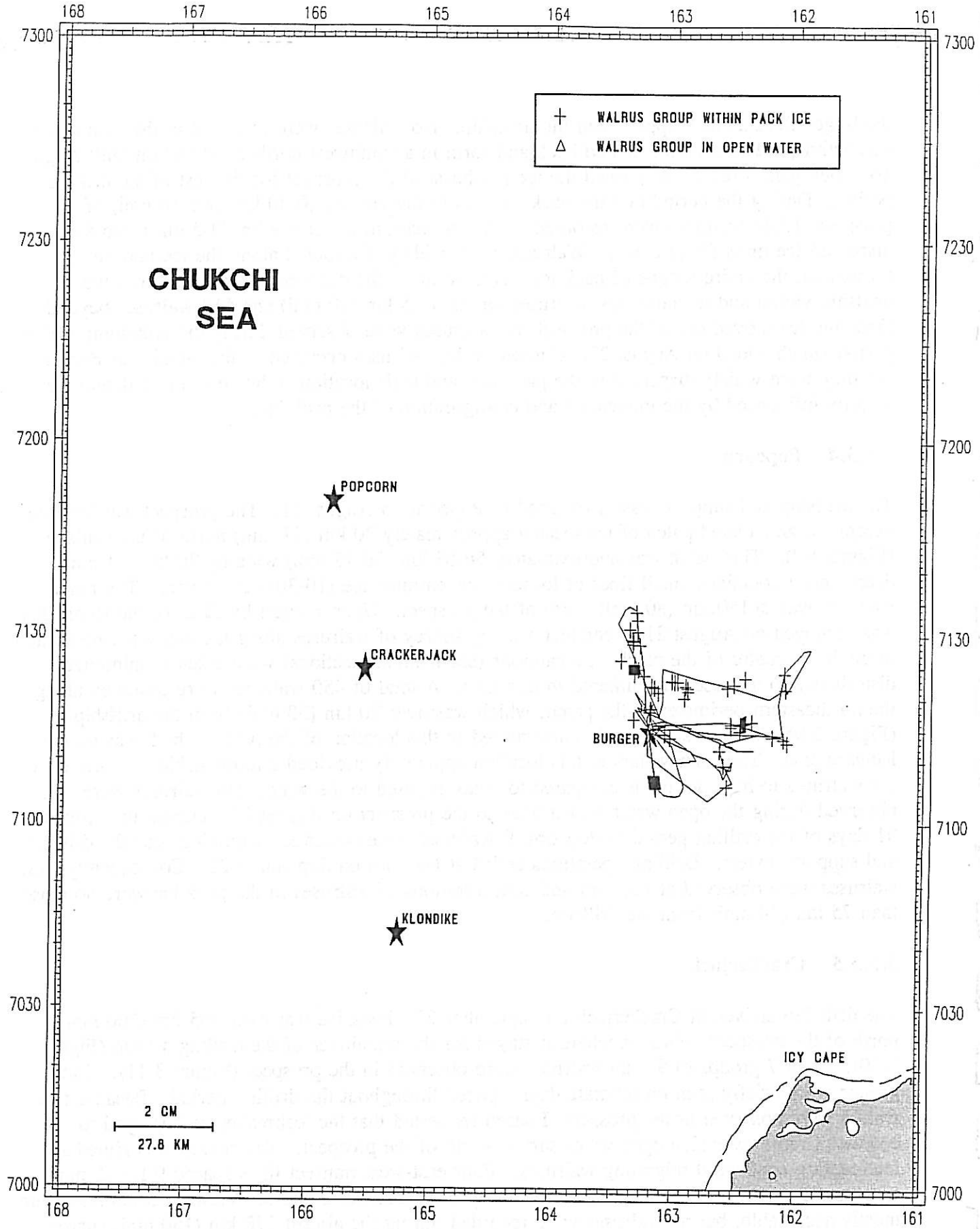

Figure 3-8. Location of 127 groups, totaling 1,046 walruses, recorded within the pack ice (+) and in open water (△) during drilling operations at the Burger Prospect, July 29- 22, 1990. Tracklines are displayed for a reconnaissance by the Robert LeMeur, July 29 - August 22, 1990.

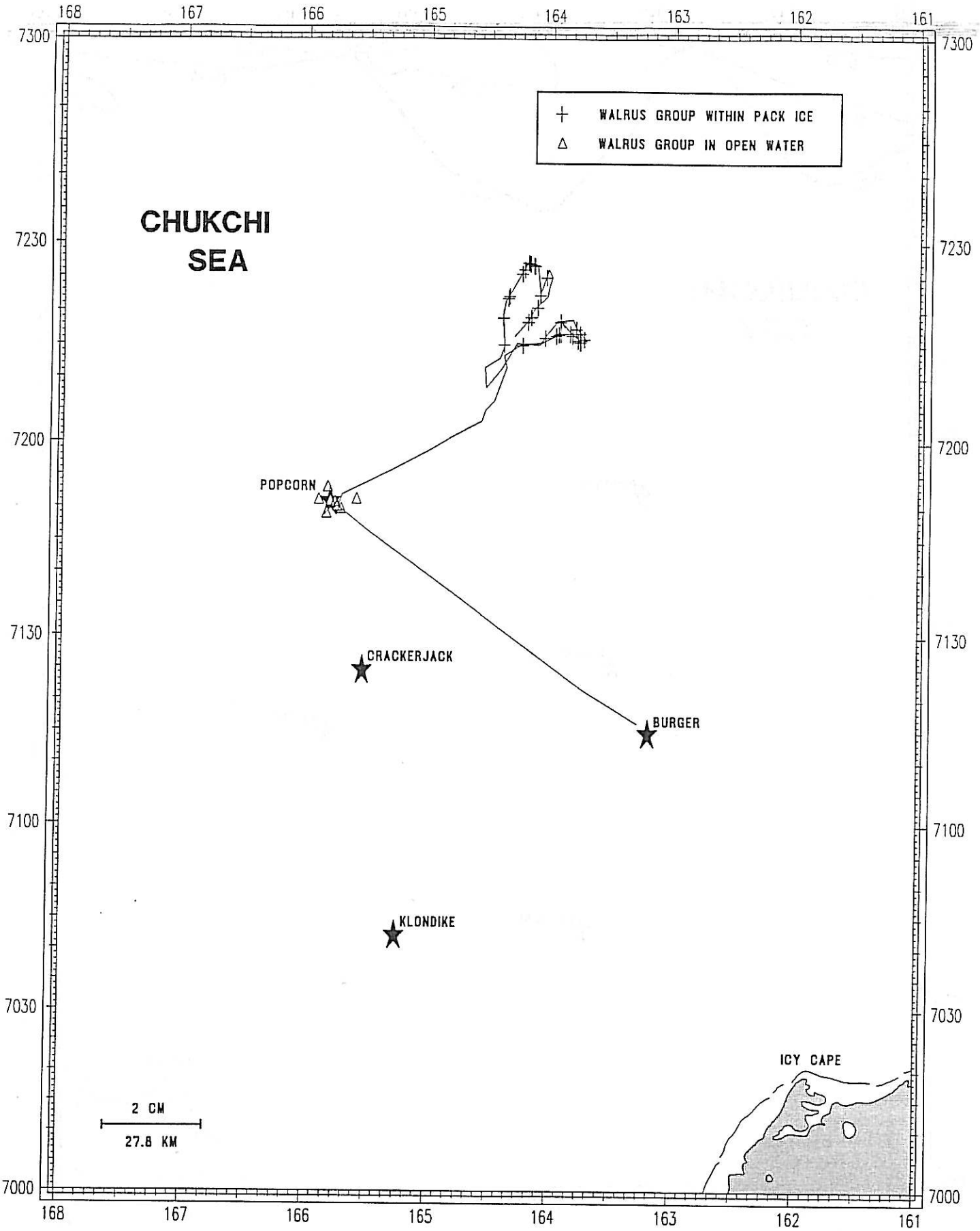

Figure 3-9. Location of 63 groups, totaling 459 walruses, recorded within the pack ice (+) and in open water (△) during drilling operations at the Popcorn Prospect, August 22 - September 22, 1990. Tracklines are displayed for a reconnaissance by the Robert LeMeur, August 21-22, 1990.

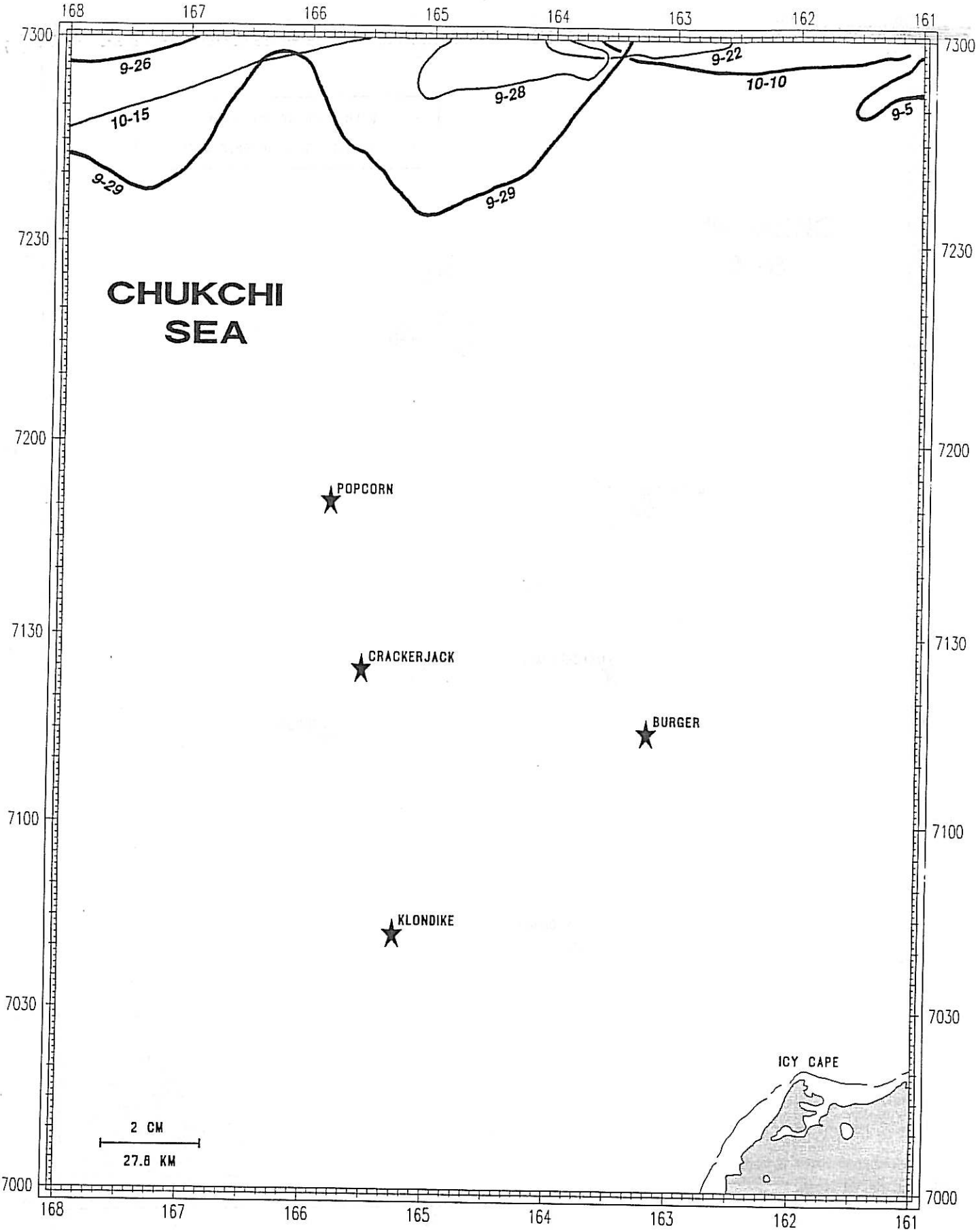

Figure 3-10. Location of the ice edge during drilling operations at the Crackerjack Prospect, September 26 - October 15, 1990. Drilling operations occurred at the Crackerjack Prospect on September 22 - October 11, 1990.

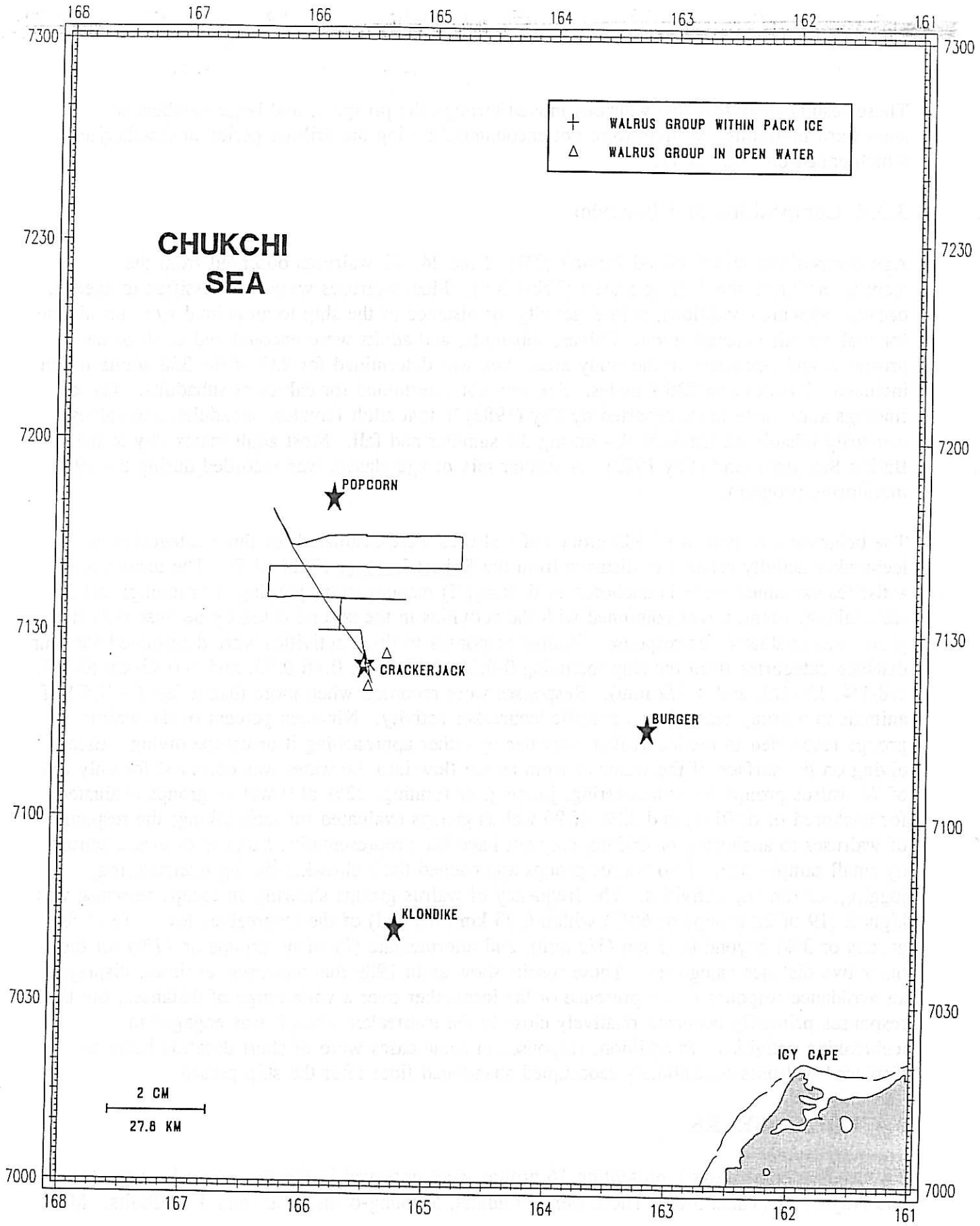

Figure 3-11. Location of 7 groups, totaling 9 walruses, recorded within the pack ice (+) and in open water (△) during drilling operations at the Crackerjack Prospect, September 22 - October 11, 1990. Tracklines are displayed for open water surveys by the Robert LeMeur, October 2-3, 1990.

These results show that few walruses moved through the prospect, and large numbers of southward migrating walruses were not encountered during the drilling period at Crackerjack, which ended on October 11.

3.3.4 Composition and Behavior

Age composition was obtained for 467 (2%) of the 24,242 walruses observed from the icebreaker during the drilling season (Table 3-6). Most walruses were not classified to age/sex because viewing conditions, animal activity, or distance of the ship to an animal were unsuitable for making this determination. Calves, subadults, and adults were encountered at all of the prospects and elsewhere in the study area. Sex was determined for 237 of the 338 adults which included 11 males and 226 females. Sex was not determined for calves or subadults. These findings agree with those reported by Fay (1982) in that adult females, subadults, and calves primarily inhabit the Chukchi Sea during the summer and fall. Most adult males stay in the Bering Sea yearround (Fay 1982). A similar mix of age classes was recorded during the 1989 monitoring program.

The behavioral responses of 182 groups of walruses were evaluated for three categories of icebreaker activity relative to distance from the Robert LeMeur (Table 3-7). The icebreaker activities examined were 1) anchored or drifting; 2) maneuvering, jogging, or running; and 3) icebreaking: running was combined with the activities in the second category because only one group was evaluated for response. Walrus responses to these activities were determined for four distance categories from the ship including 0-0.23, 0.23-0.46, 0.46-0.93, and >0.93 km (0-1/8, 1/8-1/4, 1/4-1/2, and >1/2 nmi). Responses were recorded when more than a few (>10%) of animals in a group reacted to a specific icebreaker activity. Nineteen percent of the walrus groups responded to the icebreaker activities by either approaching it or escape diving. Escape diving on the surface of the water or from an ice flow into the water was observed for only 8% of 74 walrus groups for maneuvering, jogging, or running, 22% of 9 walrus groups evaluated for anchored or drifting, and 32% of 99 walrus groups evaluated for icebreaking; the response of walruses to anchoring or drifting may not have been representative because of biases caused by small sample size. Two walrus groups approached the icebreaker during maneuvering, jogging, or running activities. The frequency of walrus groups showing an escape response was highest (19 of 28 groups or 68%) within 0.23 km (1/8 nmi) of the icebreaker, lowest (3 of 89 groups or 3%) beyond 0.93 km (1/2 nmi), and intermediate (11 of 65 groups or 17%) for the other two distance categories. These results show as in 1989 that walruses, at times, displayed an avoidance response to the presence of the icebreaker over a wide range of distances, but these responses primarily occurred relatively close to the icebreaker when it was engaged in icebreaking activities. In addition, responses in some cases were of short duration because displaced walruses occasionally reoccupied abandoned floes after the ship passed.

3.4 POLAR BEARS

Twenty-five polar bears representing 16 groups were observed in the study area between June 29 and August 11 (Table 3-8). There were 17 adults, 5 young-of-the-year, and 3 subadults. Most

Table 3-6. Number of walruses recorded by age class for each prospect from the Robert LeMeur, 1990.

PROSPECT	AGE				TOTAL
	ADULT	SUBADULT[a/]	CALF	UNKNOWN	
POPCORN	13	8	1	6	28
BURGER	33	2	7	621	663
CRACKERJACK	4	1	2	0	7
OTHER[b/]	338	78	30	23,098	23,544
TOTALS	**388**	**89**	**40**	**23,725**	**24,242**

[a/] Subadult includes ages 1-5 years.

[b/] Area beyond 18.5 km (10 nmi) of an active prospect.

Table 3-7. Reaction of walruses to ship activities at varying distance from the Robert LeMeur.

Distance (km)	ANCHORED OR DRIFTING			RUNNING, MANEUVERING OR JOGGING			ICE BREAKING			TOTALS		
	No Reaction	Approach	Escape	No Reaction	Approach	Escape	No Reaction	Approach	Escape	No Reaction	Approach	Escape
0-0.23	3	-	2	4	1	3	1	-	14	8	1	19
0.23-0.46	1	-	-	11	-	1	2	-	3	14	-	4
0.46-0.93	-	-	-	33	1	1	6	-	6	39	1	7
>0.93	3	-	-	18	-	1	65	-	2	86	-	3
TOTAL	7	-	2	66	2	6	74	-	25	147	2	33

Table 3-8. Polar bears recorded during Chukchi Sea marine mammal monitoring program, 1990.

DATE[a]	TIME	POSITION (LAT/LONG)	NUMBER	ICE COVER (%)	KILL SITE	BEHAVIOR	ADULT	SUBADULT	YOUNG OF YEAR
JUNE 29	1416	70°14'N 164°21'W	1	80	YES[b]	NOT DETERMINED	1	-	-
JULY 4	0142	70°40'N 164°36'W	1	10	NO	WALKED AWAY	1	-	-
JULY 4	0613	70°50'N 164°42'W	2	20	YES[b]	ALERT	2	-	-
JULY 4	0909	71°05'N 165°42'W	1	10	YES[b]	FEEDING	1	-	-
JULY 4	2118	71°38'N 165°54'W	3	90	NO	WALKED AWAY	1[c]	2	-
JULY 5	1416	71°29'N 165°42'W	1	80	NO	ALERT	1	-	-
JULY 5	1500	71°27'N 165°35'W	2	70	NO	ALERT	2	-	-
JULY 6	1905	71°21'N 165°28'W	1	70	NO	SWIMMING	1	-	-
JULY 7	1626	71°20'N 165°35'W	1	80	NO	ATTRACTED		1	-
JULY 8	2103	71°23'N 165°33'W	3	70	NO	ALERT	1[c]	-	2
JULY 10	0630	71°13'N 166°10'W	1	50	NO	NOT DETERMINED	1	-	-
JULY 12	1137	71°50'N 165°46'W	1	50	NO	ATTRACTED	1	-	-
JULY 26	1325	71°54'N 163°35'W	1	30	YES[d]	FEEDING	1	-	-
AUGUST 5	1145	71°19'N 162°15'W	1	50	NO	ALERT	1	-	-
AUGUST 8	2112	71°30'N 162°39'W	2	20	NO	RESTING	1[c]	-	1
AUGUST 11	1258	71°16'N 163°12'W	3	30	NO	SWIMMING AWAY	1[c]	-	2
TOTAL			25				17	3	5

[a] Drillship and support vessels arrived at Popcorn on July 12 at 1005. Drilling operations occurred at Popcorn from July 12-29 and at Burger from July 29 - August 22.
[b] Site of seal kill.
[c] Adult female.
[d] Site of walrus calf kill.

(9) of the adults were alone, except for three adult females with 1-2 young-of-the-year, one adult with two subadults, and two pairs of adults. In addition, there was one single subadult. All of the bears were observed from the Robert LeMeur, except for one that was seen on June 29 from the survey aircraft. There appeared to be no duplicate counts of bears based on the time, location, and travel pattern of the icebreaker.

Most of the bears were observed before drilling began on July 12 (Table 3-8). During this time, 17 bears were observed from the Robert LeMeur as it traversed to Crackerjack and Popcorn from the ice edge (Figure 3-12). The bears were widespread and somewhat evenly spaced in this region. After drilling began, 8 bears were observed over a broad area encompassing Popcorn and Burger. Two of these bears were recorded during drilling operations at Popcorn, which included one bear near the drillsite and one over 74 km (40 nmi) beyond it. Six bears were recorded during drilling operations at Burger, which included 1 group of 3 bears at approximately 1 mile from the drillsite and the remainder at approximately 28 km (15 nmi) beyond it. All of the bears were observed in the pack ice, where they were apparently hunting seals and walruses. Ice cover at the bear locations was between 10-90%

The response of bears to the icebreaker was variable (Table 3-8). Response was defined as the observed behavior of bears while in view of the icebreaker. Bears were encountered at 30-1,000 m (90-3,000 ft) from the icebreaker, which moved along a particular course. The course was adjusted when necessary to minimize disturbing a bear. Responses were evaluated for 23 of the 25 bears; response was not evaluated for 2 bears including 1 bear observed from the aircraft, which was a considerable distance from the flight path.

A total of 18 bears responded to the icebreaker which included:

9 bears stopping their activity and watching (alerted) the icebreaker pass them,
7 bears slowly walking or swimming away from the ship, and
2 bears walking toward the icebreaker.

Five bears did not respond, but continued to feed, rest, or swim as the icebreaker passed. Although a high proportion of bears responded to the icebreaker, the amount of time they were exposed to disturbance was short, since the icebreaker was generally moving along a course.

These results show that polar bears occurred in the vicinity of the prospects when ice was present. Moreover, they responded to the icebreaker, but the period of direct exposure to the icebreaker was generally brief. Lastly, only 4 bears including 1 sow with 2 cubs occurred near an active drilling site.

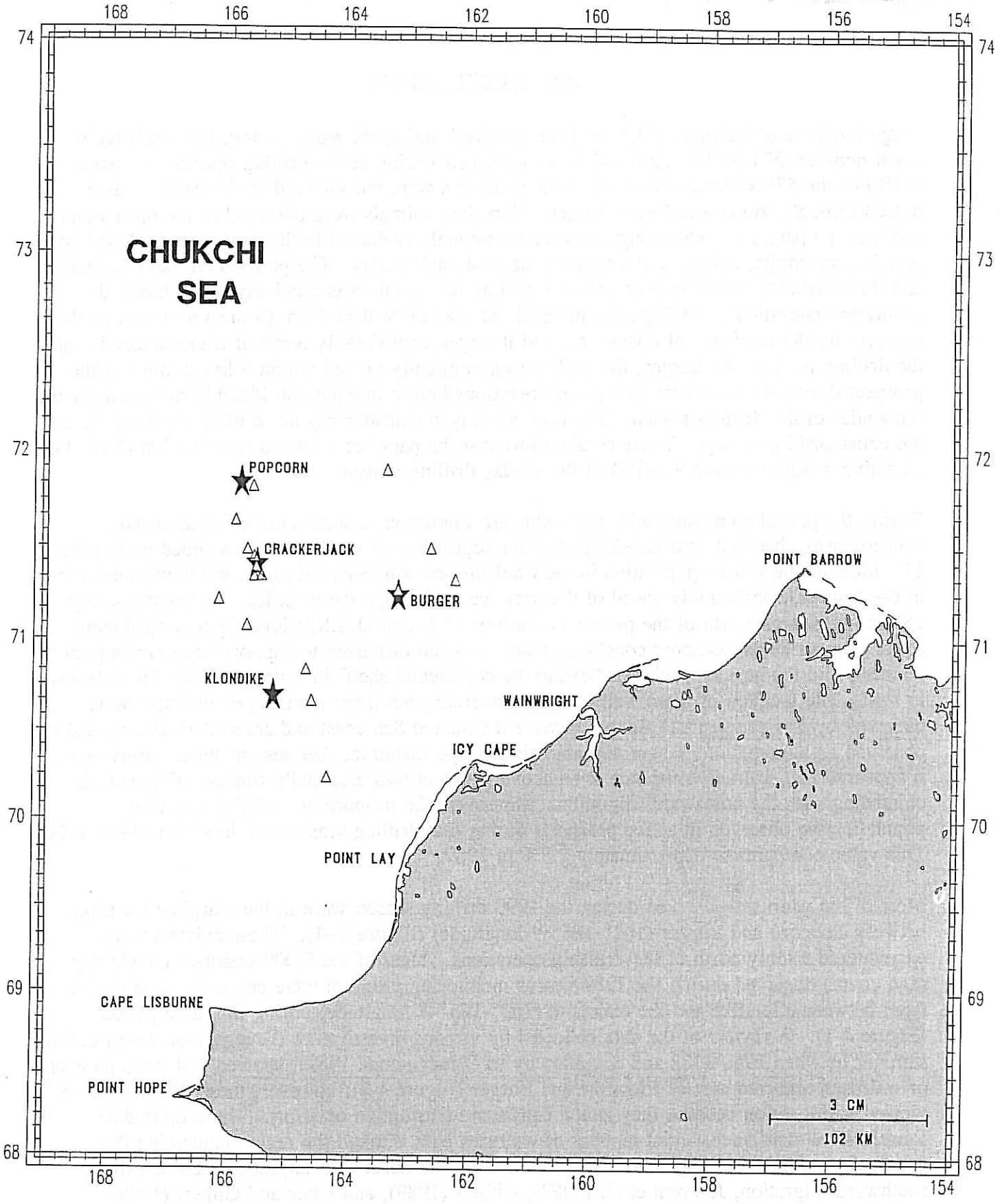

Figure 3-12. Location of 16 groups (△), totaling 25 polar bears, observed in the pack ice of the Chukchi Sea during the drilling season, 1990.

4.0 DISCUSSION

Large numbers of walruses (24,889) were observed during the study period, but a relatively small number (571 or 2%) occurred in the prospects during active drilling operations. Most (98%) of the 571 walruses observed in the prospects were encountered in the pack ice as it passed through Popcorn and near Burger. Very few animals were observed in the open water, south of the pack ice. The composition of the animals evaluated in the study area included adult females, subadults, calves, and a small number of adult males. The period that these animals and the associated pack ice were near the drilling operations was relatively short during the northward migrations. At Popcorn, the pack ice was more than 9 km (5 nmi) northeast of the prospect by the third day of operations, and it stayed considerably north of it the remainder of the drilling period. At Burger, the pack ice intermittently moved within 9 km (5 nmi) of the prospect during 6 of the first 15 days of operations before moving considerably northeast for the remainder of the drilling season. The pack ice stayed considerably north of Crackerjack during the entire drilling season. These results show that the pack ice occurred within 9 km (5 nmi) of an active prospect during 9 (10%) of the 92-day drilling season.

During the period coinciding with the southward migration, a small number (9 animals) of walruses was observed near Crackerjack from September 22 until operations ended on October 11. Most of the walrus population in the Chukchi Sea was believed to be swimming southward in open water, considerably ahead of the pack ice. Although the pack ice was approximately 185 km (100 nmi) north of the prospects, various U.S. and U.S.S.R investigators conducting aerial surveys during October concluded that it was too dispersed to support large numbers of walruses and the heavier pack was beyond the continental shelf, in water too deep for walruses to feed. The location of these walruses was uncertain, but large numbers of walruses were observed by Soviet scientists along the western Chukchi Sea coast and associated islands, and we observed an aggregation of over 400 animals at Cape Lisburne. Because of these observations, it appeared that walrus occurrence at an active prospect was essentially limited to the period coinciding with the northward migration. Moreover, the proportion of the total walrus population we observed in active prospects during that drilling season was less than 1% in 1990. This value compares to approximately 2.5% in 1989.

Most of the walruses observed during the 1990 drilling season were in the marginal ice front between Popcorn and Burger (162°-165°W longitude) (Figure 3-1). These animals were encountered mainly north of the drillship operations. Most of the 5,000 walruses (single day high count) observed during the 1989 walrus monitoring program were encountered in the ice front between Klondike and the mainland (160°-166°W longitude) during the same period (Figure 4-1). A review of the data collected by various investigators (Brueggeman 1989) during summer between 1950-1988 and compiled by us (Brueggeman 1989), showed that large numbers of walruses occurred east of Klondike and Burger (Figure 4-2); however, these data should be viewed with caution because they lack a consistent distribution of effort. These three data sources show that a substantial number of walruses pass through the region containing the prospects, particularly Burger and Klondike, during the northward migration. During the southward migration, Johnson et al. (1982), Gilbert (1989), and Estes and Gilbert (1978)

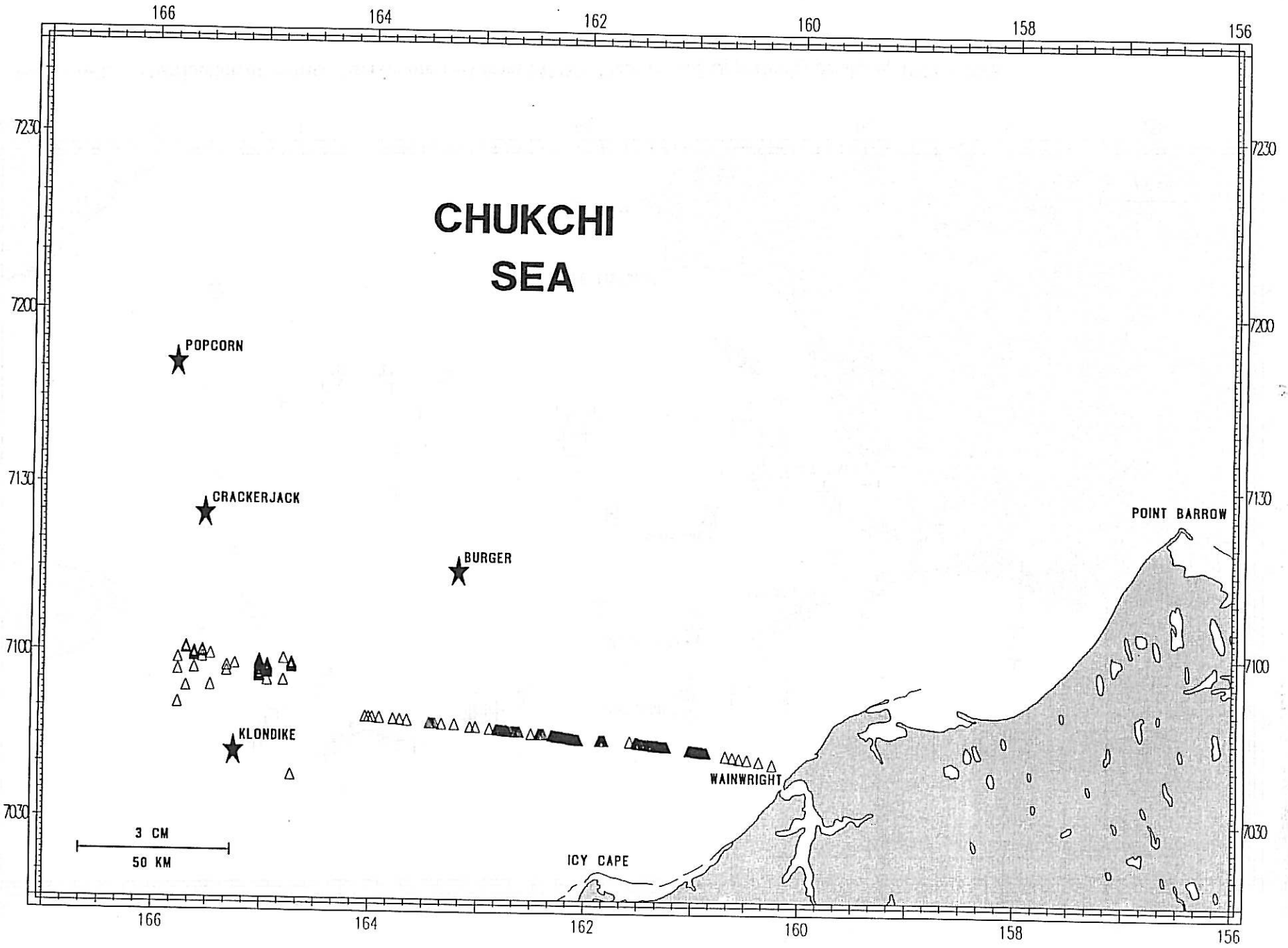

Figure 4-1. Distribution of walrus groups (▵) observed on July 2, 1989, when the highest single day count of the season was recorded.

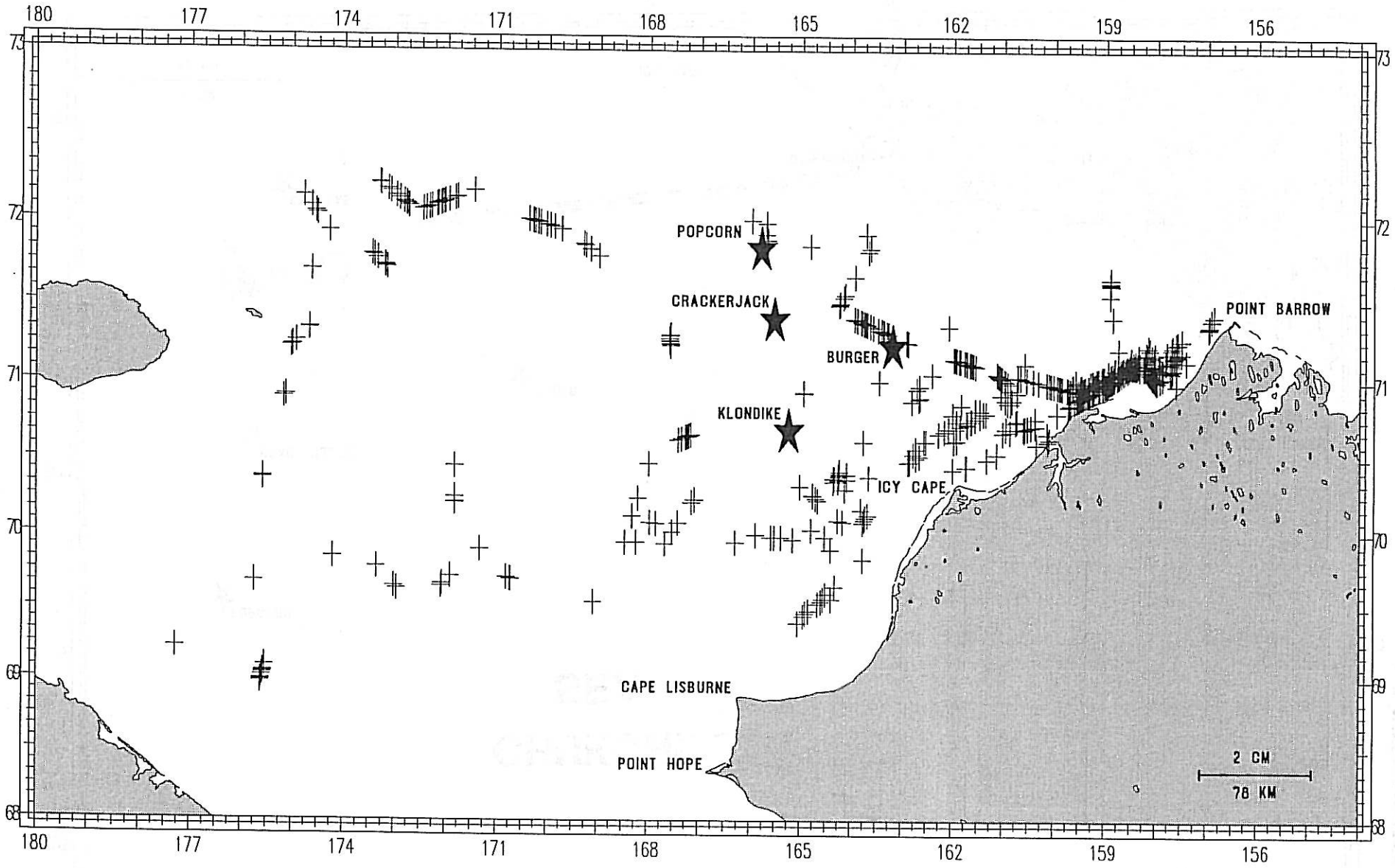

Figure 4-2. Distribution of walrus observations (+) from MMS's Platforms of Opportunity database, 1977 - 1983.

reported that walruses were widespread across the marginal ice front in the region of the prospects (162°-166°W longitude), which at times contained relatively high but variable densities. Because of the variable densities, Gilbert (1989) suggested that there may be a westward shift toward the western Chukchi Sea by walrus during the fall migration, which could account for the lack of walruses seen near the prospects at that time. Few walruses were encoutered during the 1989 monitoring program in the fall, which ended when pack ice approached the drilling operations.

The response of walruses to the drilling operations was evaluated relative to the activities of the Robert LeMeur. Detailed comparisons made in 1989 of walrus density, distribution, and habitat use patterns before and during drilling operations could not be duplicated in 1990 because of unsuitable weather conditions for surveys. The primary source of disturbance to walruses at the drilling operations in 1989 was the icebreaker when engaged in ice management. Ice management in 1990 was restricted to breaking up pack ice at Popcorn during two consecutive days in July and large isolated floes drifting toward Burger during two consecutive days in August. The immediate and adjacent areas of ice management contained no walruses. Walrus aggregations were confined to the marginal ice front, which never came into contact with the drillship at Burger but did pass through Popcorn during the first three days of drilling operations. However, no aggregations of walruses were observed in that location of the marginal ice front. Fewer than 15 walruses were encountered within 4 km (2 nmi) of the prospects, 6 of which were observed when no ice was present. Consequently, there was no apparent effect of ice management on walruses.

Most (>90%) of the 571 walruses observed within 18.5 km (10 nmi) of the drillsites during active drilling operations were encountered when the icebreaker was dispatched to locate the ice edge or determine the location of walruses. The ice and most (528 or 92%) of these walruses were 11-18.5 km (6-10 nmi) from the prospect. During these reconnaissances the icebreaker coursed the ice margin while maintaining a distance sufficient to minimize disturbance of walruses. The location of these animals was associated with the location of the marginal ice front rather than caused by any apparent disturbance from drilling operations. Correspondingly, the location of the remaining 23,573 walruses observed between 18.5-93 km (10-50 nmi) from the prospects was associated with the location of the marginal ice front at the time of active drilling operations. Consequently, there was no indication that drilling operations displaced these walruses from the prospects.

The direct effect of icebreaker activities on walruses appeared to be relatively small and localized. Reactions recorded by observers on the icebreaker, showed that only 19% of the 182 walrus groups sampled responded to the icebreaker. Walruses responded to the icebreaker over a wide range of distances but most reactions occurred relatively close (<0.23 km or 1/8 nmi) to the icebreaker primarily during ice breaking activities. Proportionately fewer walruses reacted to the icebreaker at increasing distances from the ship, particularly when it was engaged in activities other than icebreaking. A similar pattern of responses was recorded in 1989.

In addition to walruses, 25 polar bears were observed in the pack ice between June 29 and August 11. Seventeen bears were encountered by the Robert LeMeur during ice reconnaissances before drilling began at the prospects. During drilling operations, 4 bears occurred near (<9 km or 5 nmi) active prospects and the remainder were considerably beyond (15-40 km or 8-22 nmi). These bears responded to the drilling or icebreaking operations by approaching (2), watching (9), slowly moving away (7), or ignoring (5) the activities; response was not evaluated for 2 bears. The period of exposure to the operations was generally short because precautions were taken to minimize disturbances, including adjusting cruise courses away from bears. Similar precautions were followed in 1989 when 18 bears were encountered in the pack ice during the monitoring program.

In summary, the results of the 1990 monitoring program show that: (1) the walrus and polar bear distributions were closely linked to the pack ice; (2) the pack ice was near the active prospects for a relatively brief time; and (3) the ice passing near active prospects contained relatively few animals. Consequently, the effects of the drilling operations on walruses and polar bears were limited in time, geographic scale, and proportion of the populations.

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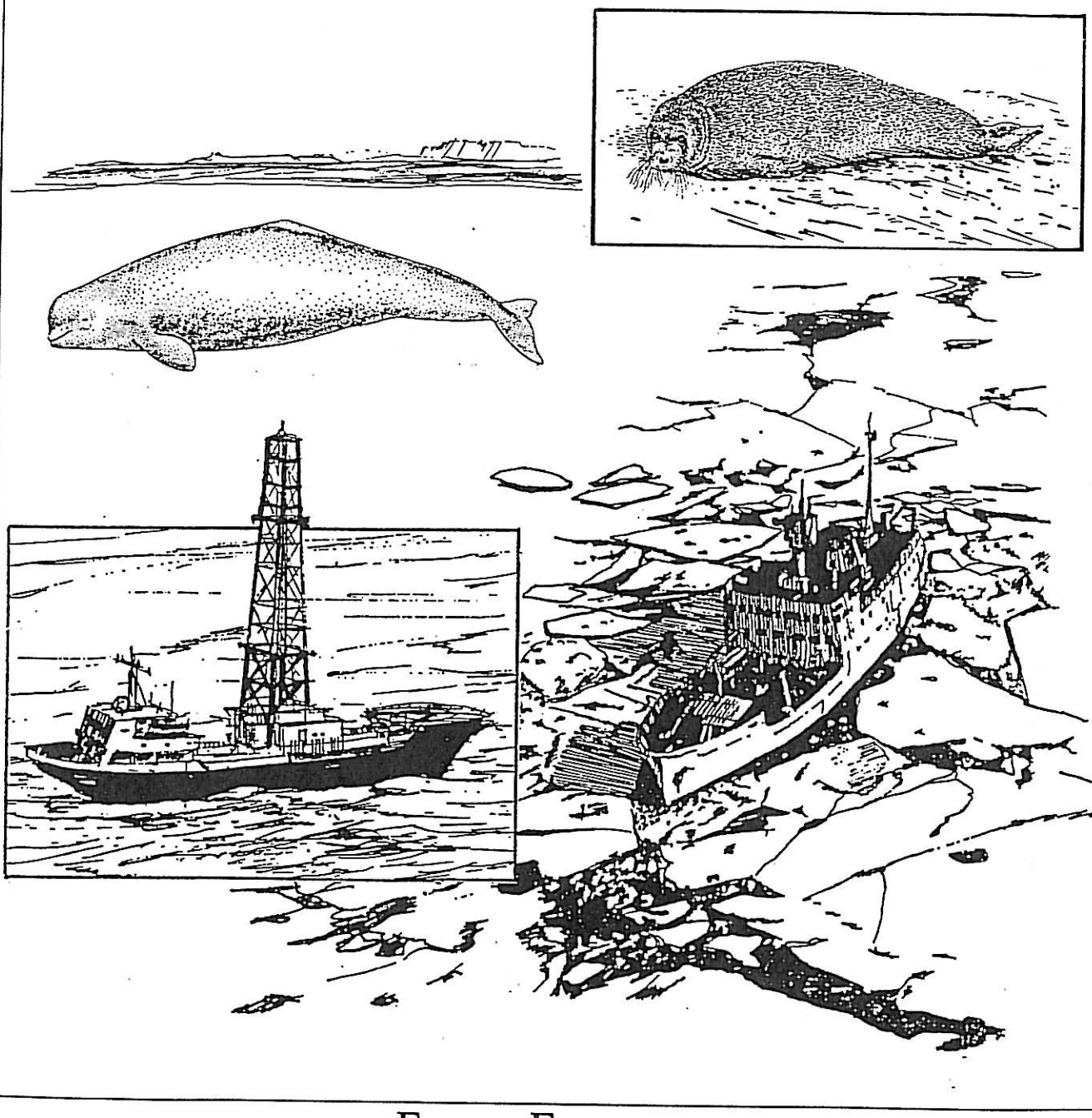
APPENDIX A

SHELL WESTERN E&P INC.

CHUKCHI SEA 1990

MARINE MAMMAL MONITORING PROGRAM
(WHALES and SEALS)



EBASCO ENVIRONMENTAL
A Division of Ebasco Services Incorporated

SHELL WESTERN E & P INC.

CHUKCHI SEA 1990

MARINE MAMMAL MONITORING PROGRAM

(Whales and Seals)

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December 1990

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INTRODUCTION

Shell Western E&P Inc. (SWEPI) conducted exploratory drilling operations at the Burger, Popcorn, and Crackerjack prospects in the Chukchi Sea during the summer and fall of 1990. As part of this drilling program, SWEPI sponsored a monitoring program to evaluate the responses of marine mammals to the drilling operations. The monitoring program was initiated in accordance with the Marine Mammal Protection Act of 1972 and was developed in consultation with the National Marine Fisheries Service (NMFS), the Alaska Department of Fish and Game, and the U.S. Fish and Wildlife Service (USFWS). This report addresses the NMFS Letter-of-Authorization (LOA) dated August 24, 1990, to SWEPI. Species addressed in this report are managed by the NMFS, and they include all seals and whales in the Chukchi Sea.[1] Because walruses and polar bears are managed by the USFWS, results addressing these species are treated in the base report for the 1990 monitoring program (Brueggeman et al. 1991).

The terms of the NMFS LOA were to provide a report which included the following:

- the dates and types of activities conducted,
- the dates and location of any activities performed related to monitoring the effects of exploration on marine mammals,
- the results of behavioral, feeding, or population studies, and
- the results of the monitoring activities including an estimate of the actual level of take.

DESCRIPTION OF STUDY AREA AND DRILLING OPERATIONS

The three prospects are located in the northeastern Chukchi Sea (Figure 1). The Popcorn Prospect, the most remote of the three prospects, is located at 71°51'16.28"N, 165°48'23.57"W, while the Burger Prospect is at 71°15'4.91"N, 163°11'40.78"W, and the Crackerjack Prospect is at 71°25'07.71"N, 165°32'29.51"W. The prospects were essentially ice-free except for the initial period of operations from July 12-15 when the southern margin of the pack ice moved through the Popcorn Prospect (Figure 2). Prior to July 15, the prospects were relatively deep into the pack ice. After July 15, the pack ice was generally north of the prospects except on several occasions when fringe ice or isolated floes drifted near a prospect. The fall or southward advance of the pack ice reached the prospects in early November, approximately 20 days after drilling operation ended.

[1] This report slightly differs from the original report submitted to SWEPI in December of 1990, because of refinements in the analysis. The interpretation and conclusions, however, are identical between the two reports.

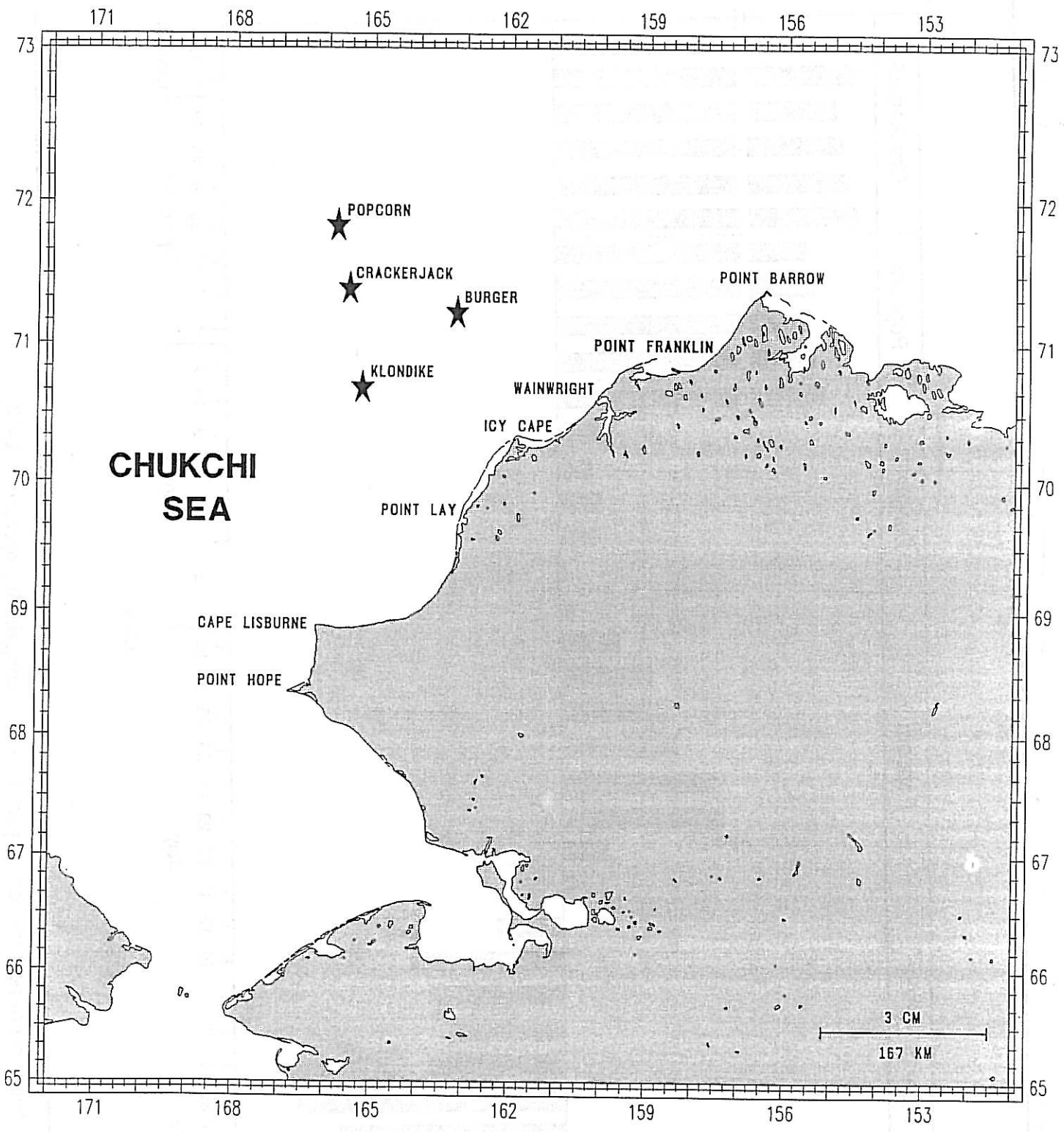

Figure 1. Location of the Popcorn, Burger, Crackerjack, and Klondike Prospects.

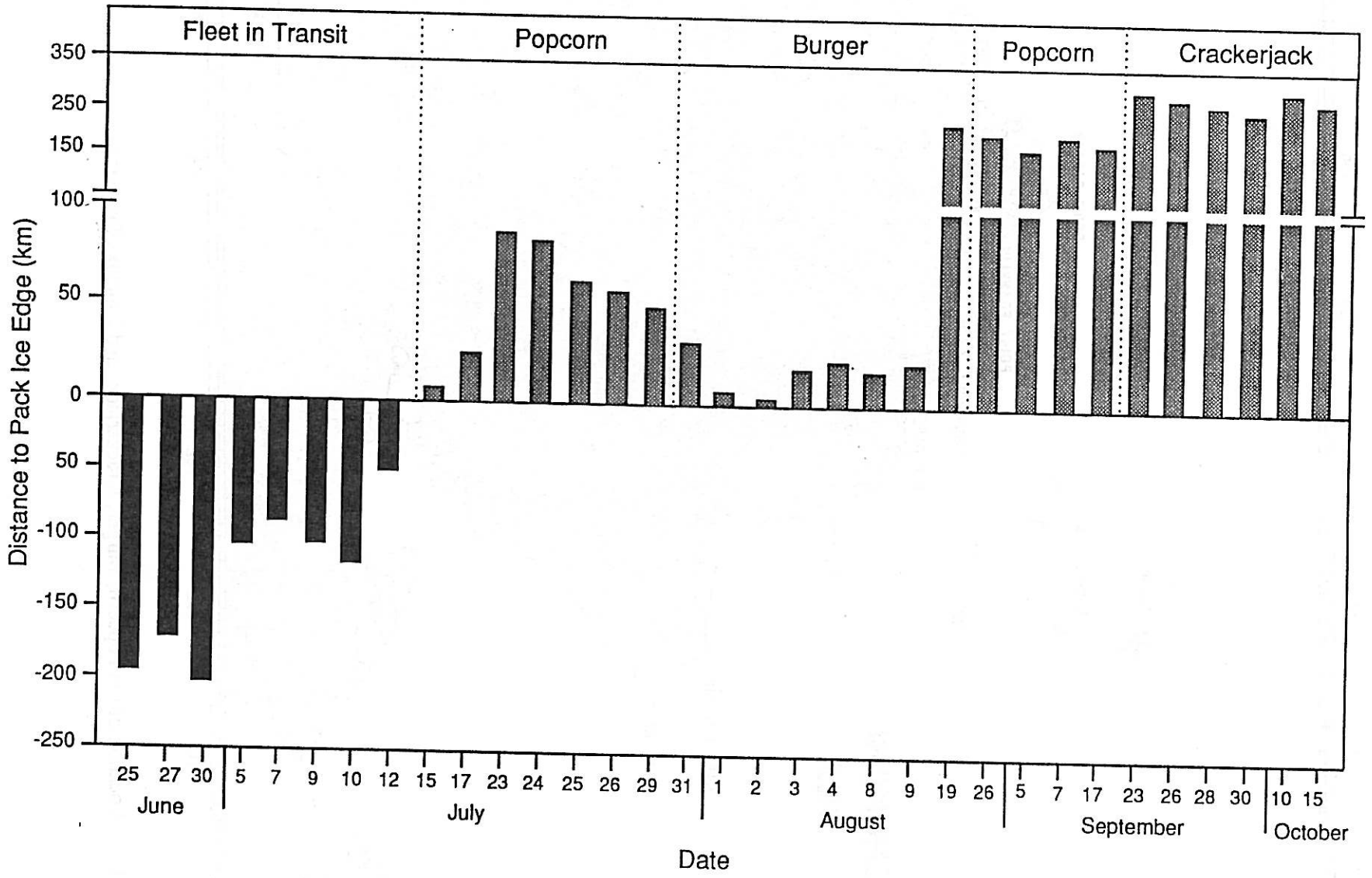

Figure 2. Distance between prospect and nearest pack ice edge during drilling operations, 1990.

SWEP 2/28 II

Drilling operations at each prospect required the drillship, Explorer III, the class III icebreaker Robert LeMeur, two supply vessels with some icebreaking capabilities, and a supply/spill response barge with tug. The activities were also supported by two SA33J Puma helicopters based at Barrow. The daily routine consisted of the drillship being anchored above the glory hole, while the other vessels serviced it, or broke ice located within 5-10 km (3-5 nmi) of the drillship. Icebreaking occurred only at the beginning of the drilling season, although an occasional rogue floe was broken up. In addition, the icebreaker conducted ice reconnaissances by running north to determine the southern boundary of the pack ice. The two helicopters serviced the drilling operations with one or more flights each day. This routine persisted throughout the period of operation except for minor modifications during severe storms or when moving between prospects.

Drilling operations began on July 12 and ended on October 11 (Table 1). The icebreaker conducted a series of ice reconnaissances of the prospects 9 days before the arrival of the drillship, which could not reach any of the prospects until July 12 because of heavy pack ice. Drilling occurred at Popcorn between July 12 and 29, then at Burger on July 29 to August 22, again at Popcorn on August 22 to September 22, and lastly at Crackerjack on September 22 to October 11. During the drilling season, the icebreaker conducted four 1-3 day reconnaissances outside of the prospects. Three of the reconnaissances were requested by Ebasco to characterize the ice edge relative to the prospects and/or determine the presence of marine mammals, and one was directed by SWEPI to define the location and direction of drift of the pack ice from the drilling operations. Operations terminated when the southern margin of the pack ice was still approximately 185 km (100 nmi) north of the Crackerjack Prospect.

During the drilling operations, SWEPI instituted precautions to minimize potential harassment of marine mammals. Helicopters flew at high altitudes (>900 m or 3,000 ft) when in transit between a prospect and base of operations (Barrow), and they ascended or descended sharply from the drillship and barge helipads to minimize noise disturbance to marine mammals. In addition, captains were instructed to operate away from marine mammals to reduce or eliminate disturbance. These precautions were maintained unless weather conditions or safety considerations dictated otherwise.

MONITORING METHODS

Aerial surveys and vessel observations were conducted during the monitoring program. Aerial surveys were used to broadly describe marine mammal use in the drilling area. Vessel observations, conducted from the icebreaker, were made to more precisely describe marine mammal use near the drillsite. Aerial surveys occurred when pack ice impinged on or was near the drillsite; vessel surveys occurred every day of the drilling operation. In addition, sonobuoys were deployed from the icebreaker to specifically monitor for the presence of bowhead whales near the prospects. The procedures for the 1990 surveys are fully described in Brueggeman et al. (1991), and are briefly summarized below.

Table 1. Schedule of activities for the SWEPI drilling fleet during 1990 Chukchi Sea operations.

.2 July 90 - 3 July 90	Robert LeMeur moved north from Port Clarence to the prospects
4 July 90	Robert LeMeur made contact with southern margin of pack ice
4 July 90 - 9 July 90	Robert LeMeur set transponders at prospects and mapped ice drift
10 July 90 - 11 July 90	Drilling fleet stationed south of pack ice
12 July 90	Drilling fleet arrived at Popcorn Prospect
12 July 90 - 23 July 90	Exploratory drilling occurred at Popcorn Prospect
24 July 90 - 26 July 90	Robert LeMeur conducted marine mammal survey along pack ice edge
27 July 90 - 29 July 90	Exploratory drilling occurred at Popcorn Prospect
29 July 90	Drilling fleet was in transit to Burger Prospect
30 July 90 - 2 August 90	Robert LeMeur conducted marine mammal survey along pack ice edge
29 July 90 - 22 August 90	Exploratory drilling occurred at Burger Prospect
21 August 90	Robert LeMeur conducted marine mammal survey along pack ice edge
22 August 90	Drilling fleet was in transit to Popcorn Prospect
22 August 90 - 22 September 90	Exploratory drilling occurred at Popcorn Prospect
22 September 90	Drilling fleet was in transit to Crackerjack Prospect
22 September 90 - 11 October 90	Exploratory drilling occurred at Crackerjack Prospect
2 October 90 - 3 October 90	Robert LeMeur conducted marine mammal survey north of prospect
11 October 90	End 1990 operations

Aerial surveys were conducted by two observers and a data recorder from a series 300 Twin Otter flown at an altitude of 305 m (1,500 ft) and a speed of 185 km/hr. Surveys were flown in an approximately 100 km x 45 km (54 nmi x 24 nmi) area of the pack ice at the drilling locations. Transect lines were systematically distributed within this area and oriented in a north-south direction. Nine transect lines, each 45.5 km (24 nmi) long, were spaced equidistantly at 11.1 km (6 nmi), beginning at the center of the box and extending outward to the sides (Figure 3). The spacing between transect lines was chosen to compensate for the long flight distance between Barrow or Wainwright and the prospects. The center of the box corresponded to the longitude of the drillsite. Because pack ice is very mobile, the north-south location of the box was adjusted during each survey to reflect changes in the suitability of the pack ice for use by ice-associated marine mammals.

Vessel observations were conducted by one or two observers from the bridge of the icebreaker during each of the 92 days of the drilling operations. The observer viewed an area forward of the icebreaker while it moved under power, but kept a full 360° watch when stationary or drifting. Observations were continuously conducted when pack ice was at or near the prospect and during most daylight hours when the prospects were ice free. The observation schedule was interrupted for meals, brief rests to reduce fatigue, or when survey conditions were unacceptable (>6 Beaufort sea state). During these breaks, the officers on the bridge recorded marine mammal sightings, and the Ebasco observer verified the species identification whenever possible.

An acoustic monitoring system was used to passively listen for potential bowhead whale and other marine mammal presence in the drilling area. The system was operated from the Robert LeMeur, and it involved deploying SSQ 57-A or AGC 41-A sonobuoys connected to a receiver and associated recording system that included a base VHF antenna, preamplifier, tape recorder, headset, and two power sources. Before deployment, each sonobuoy was set for a duration time of 8 hr, attenuation of 20 dB, and depth of 18 m (60 ft). One sonobuoy was deployed each day that the sea states were below a Beaufort 4 and the icebreaker was not required for other activities. The wave action caused by sea states above a Beaufort 3 interfere with the sound transmission. Transmitted sounds were recorded onto 90-min cassette tapes over each 8-hr period of sonobuoy operation. All tapes were initially reviewed by a technician for possible marine mammal sounds that were later verified by D. Ljungblad. Acoustic monitoring was limited to 28.5 hr during 8 days between July 20 and October 10 because of high sea states, equipment malfunction, and availability of the Robert LeMeur.

RESULTS

A total of 8,060 km (4,347 nmi) of aerial surveys and 1,129 hours of vessel observations were accomplished during the study period. Eight aerial surveys were conducted between June 29 and July 11. One additional survey was conducted on July 15 but was aborted at the prospect because of bad weather. Approximately 20% of the effort was in the prospects and the remainder occurred during flights between the prospects and base of operations or during reconnaissance flights of the pack ice. A large proportion of time was spent outside the prospects because of the long flight time required to access the prospects, fog at the prospects,

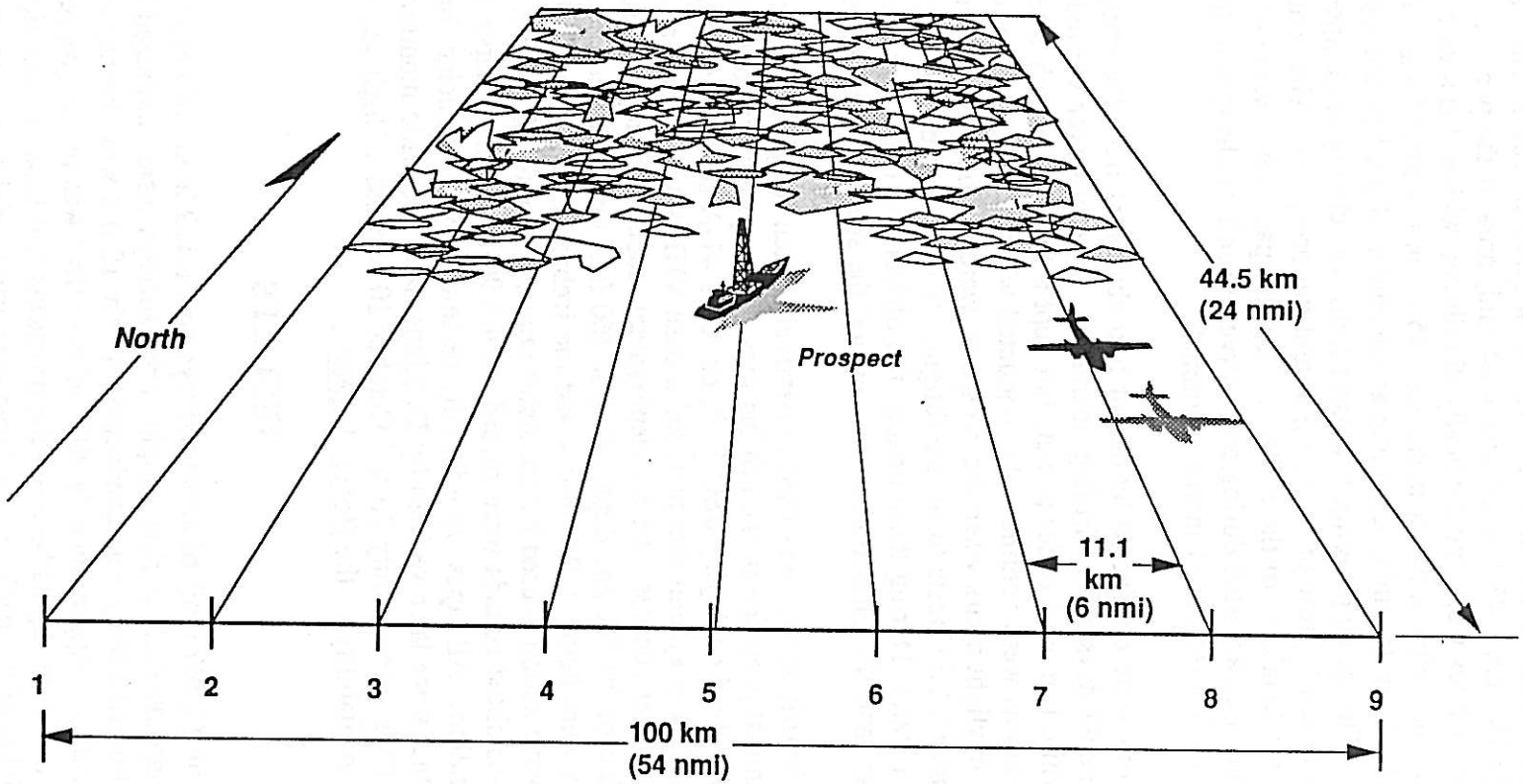

Figure 3. Survey design and trackline configuration.

or extensive ice coverage at the prospects. All of the aerial survey effort occurred before the drillship was on site. Subsequent flights were not conducted because of weather or the ice moved and stayed north of the prospects. Vessel observations were conducted between July 3 and 12 while the drilling fleet was in transit to the first prospect and from then on until October 11 when drilling operations terminated. Approximately 72% of the vessel-related effort was in the prospects, which included 494 hr at Burger, 179 hr at Popcorn, and 142 hr at Crackerjack. The remaining 314 hr of effort occurred beyond (>18.5 km or 10 nmi) the prospects during ice reconnaissances or while transiting between prospects. Vessel observations were usually not conducted when sea states exceeded a Beaufort 6 (50 km/hr or 27 kt winds) or fog enveloped the survey area.

Three hundred and thirty-seven (337) whales and seals, consisting of seven species, were recorded from aerial and vessel observations during the study period (Table 2). Seals comprised 96% of the observations, which included 146 ringed, 79 bearded, 4 spotted, and 1 ribbon seal. Whales represented 4% of the total observations, which included 8 gray, 3 belukha, and 1 minke whale. There were an additional 94 sightings of pinnipeds and 1 sighting of a whale that could not be identified to species. The gray whale was the only federally listed endangered or threatened species recorded during the study period. The majority (88%) of the sightings were made from the vessel, because seals were difficult to detect from the aerial survey altitude. Species not observed or detected from hydrophones but that occur seasonally in the Chukchi Sea included the bowhead and killer whale, and possibly the narwhal.

Eighty-five (22%) of the total observations of seals and whales were made in the vicinity of the prospects, and the remainder were recorded primarily during flights between the prospects and Barrow or Wainwright or while cruising beyond (18.5 km or 10 nmi) the prospect to locate the ice edge (Table 2). The number and species diversity of marine mammals observed at each prospect were highest at Popcorn, intermediate at Burger, and lowest at Crackerjack. These differences were partly associated with the presence of the pack ice, which was briefly at or near Popcorn and Burger but absent at Crackerjack during their respective periods of drilling activity. Ringed and bearded seals were observed at all three prospects, spotted seals at two of the prospects, and a minke whale at one prospect. Gray whales, belukha whales, and a ribbon seal were observed beyond (>18.5 km or 10 nmi) the prospect areas. No pups or calves were observed during the study period.

A small proportion of the marine mammals encountered in the prospects occurred near the immediate vicinity of the drillship during operations (Table 3). There were 33 animals within 0-2 km (0-1 nmi) of the drillship, 22 within 2-4 km (1-2 nmi), 13 within 4-6 km (2-3 nmi), 8 within 6-8 km (3-4 nmi), 20 within 8-10 km (4-5 nmi), and 241 beyond 10 km (5 nmi). Only seals were observed within 10 km (5 nmi) of the drillship, except for one unidentified cetacean that was probably a gray or minke whale. The distribution of animals beyond 10 km (5 nmi) of the drillship did not reflect a response to the drilling operations, because the position of these animals was almost entirely associated with the location and movement of the pack ice.

Table 2. Number of seals and whales recorded during aerial surveys and vessel observations, 1990.

SPECIES	POPCORN		BURGER		CRACKERJACK		OTHER[1/]		GRAND TOTAL
	Ship (494)[2/]	Aerial (730)[3/]	Ship (179)	Aerial (982)	Ship (142)	Aerial (251)	Ship (314)	Aerial (6,097)	
Ringed seal	22	--	8	--	7	1	103	5	146
Bearded seal	12	--	11	--	3	1	48	4	79
Spotted seal	1	--	3	--	--	--	--	--	4
Ribbon seal	--	--	--	--	--	--	1	--	1
Gray whale	--	--	--	--	--	--	1	7	8
Belukha whale	--	--	--	--	--	--	--	3	3
Minke whale	1	--	--	--	--	--	--	--	1
Unidentified pinniped	5	1	4	4	--	--	65	15	94
Unidentified cetacean	1	--	--	--	--	--	--	--	1
TOTAL	42	1	26	4	10	2	218	34	337

1/ Numbers observed while Robert LeMeur in transit between prospects or on a reconnaissance outside the prospect area, or during aerial surveys outside the prospect areas.
2/ Ship (vessel) effort in hours, grand total 1,129 hr.
3/ Aerial survey effort in kilometers, grand total 8,060 km.

Table 3. Distance (km) of seal and whale sightings to the active prospect. [1/]

SPECIES	DISTANCE (km)[2/]							
	0-2	2-4	4-6	6-8	8-10	10-20	20-75	TOTAL
Ringed seal	14	7	8	6	7	33	71	146
Bearded seal	8	4	5	1	6	25	30	79
Spotted seal	1	3	--	--	--	--	--	4
Ribbon seal	--	--	--	--	--	--	1	1
Gray whale	--	--	--	--	--	--	8	8
Belukha whale	--	--	--	--	--	--	3	3
Minke whale	--	--	--	--	--	1	--	1
Unidentified pinniped	9	8	--	1	7	42	27	94
Unidentified cetacean	1	--	--	--	--	--	--	1
TOTAL	33	22	13	8	20	101	140	337

[1/] Active prospect is defined as the prospect at which the Explorer III was operating.

[2/] The distribution of animals beyond 10 km of the drillship did not reflect a response to the drilling operations, because the position of these animals was almost entirely associated with the location and movement of the pack ice.

The distribution of marine mammals was closely associated with the pack ice, which occurred within 9 km (5 nmi) of the prospects during less than 10% of the 92-day period of drilling operations (Table 4). Approximately 85% of the animals were observed within the pack ice and 15% outside of the pack ice in the open water. Within the pack ice, the composition included 275 of 324 seals and 11 of 13 whales. Over 80% of the animals recorded for each species occurred in the pack ice, except for the spotted seal. All 4 spotted seals were encountered in open water. The association of these marine mammals with the pack ice, particularly the southern boundary or marginal ice front, has been extensively documented by various researchers (Burns 1970, Burns et al. 1980, Brueggeman and Grotefendt 1986).

DISCUSSION OF TAKE

The definition of "take" as stated in the NMFS Regulations is as follows: *"Take means to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill, any marine mammal, including, without limitation, any of the following: The collection of dead animals, or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal; or the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional acts which result in the disturbing or molesting of a marine mammal."*

There was no detectable take of seals or whales by harassment resulting from the drilling operations at the three prospects. No marine mammals were physically handled or injured during the course of the operations.

There was no take of bowhead whales. The drilling operation occurred between the bowhead whale spring and fall migration periods in the Chukchi Sea. Drilling operations commenced on 12 July, at least one month after the April-May spring migration period of bowheads in the Chukchi Sea (Brueggeman 1982, George et al. 1990). Furthermore, the spring migration route follows a nearshore lead system that is considerably east of the prospects (Braham et al. 1980, Ljungblad et al. 1986). Drilling operations terminated on 11 October, when surveys conducted by the Minerals Management Service and Western Geophysical Company (Brueggeman et al. 1990) indicated that the fall migration of bowheads was occurring in the Beaufort Sea. Moreover, we did not observe or hydroacoustically detect bowheads in the vicinity of the drilling operations, which were approximately 370 km (200 nmi) west of Barrow during the fall. Since bowheads summer in the Canadian Beaufort Sea (Fraker and Bockstoce 1980), they would not be expected to occur in the vicinity of the drillsites during this period.

There was no detectable take of the other species of whales or seals. This conclusion is based on the degree of contact between these animals and the drilling operations at the prospects. Seals were primarily near the prospects when the pack ice was present. Pack ice was within 9 km (5 nmi) of an active prospect for only 9 of the 92 days and in direct contact with the drilling operations at the prospects for only 4 days. Furthermore, the proportion of seals close to the prospects was relatively small, and a number of these animals occurred when the area was ice free and their movement was unrestricted. The whales were all encountered at a considerable

Table 4. Number and percent of seal and whale sightings in pack ice vs. open ocean. [1/]

SPECIES	PACK ICE		OPEN OCEAN	
	%	#	%	#
Ringed seal	84	122	16	24
Bearded seal	91	72	9	7
Spotted seal	--	--	100	4
Ribbon seal	100	1	--	--
Gray whale	88	7	12	1
Belukha whale	100	3	--	--
Minke whale	100	1	--	--
Unidentified pinniped	85	80	15	14
Unidentified cetacean	--	--	100	1
TOTAL	85	286	15	51

[1/] Open ocean is limited to the area south of the pack ice.

distance (>40 km or 22 nmi) from the drillship operations, except for one minke whale and one unidentified whale. The minke whale was over 14-16 km (8-9 nmi) from the drillsite, and the other whale was 1-2 km (0.5-1 nmi) from the drillsite. Since there were no additional sightings of whales near the prospects, their time in the area was apparently brief.

Consequently, the results of the 1990 monitoring programs show that the potential for take was very low because: (1) SWEPI implemented precautions to avoid disturbance of marine mammals, (2) certain marine mammals (i.e., bowheads) did not occur in the prospects during the period of drilling operations, (3) the pack ice and associated marine mammals were north of the drilling operations most of the season, (4) the number of marine mammals in close contact with the drilling operations was relatively small, and (5) the species diversity of marine mammals close to the drilling operations was relatively low.

ACKNOWLEDGEMENTS

We thank E. Bowlby, D. Glass, and M.C. McShane for their contribution to our vessel and aerial survey efforts. Special thanks to J. Burns for his enthusiasm and insight into working in the Chukchi Sea. J. Vulk coordinated the preparation of this report.

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APPENDIX B

Table B-1. Criteria used to determine visibility conditions.

Visibility	Highest Allowed Beaufort Sea State	Descriptors [a/]
Excellent	1	Calm, clear, unlimited viewing
Very Good	2	Surface ripple, some glare, 5-10 km viewing distance
Good	3	Light chop, glare, fog, 2-5 km viewing distance
Fair	4	Chop, glare, shadows, fog but all animals on line visible, 1-2 km viewing distance
Poor	5	Same as fair only, some animals on line obscured, < 1 km viewing distance
Unacceptable	--	Survey tract obscured

[a/] Corresponds to National Ocean Data Center, NOAA, visibility definitions and incorporates Ljungblad et al. (1980-88) criteria.

Table B-2. Beaufort sea state descriptions.

Beaufort Scale	Sea Condition	Wave Height (ft)	Wind Speed (kt)
0	Smooth and mirrorlike.	0	0-1
1	Scale-like ripples, no foam crests.	1	1-3
2	Small short wavelets. Crests appear glassy and not breaking.	2	4-6
3	Large wavelets. Some crest break. Occasional white foam crests with glassy appearance.	3	7-10
4	Small waves become longer. Fairly frequent white foam crests	4	11-16
5	Moderate waves more pronounced; long form. Many white foam crests. May be some spray.	6	17-21
6	Large waves formed. Extensive white foam crests. May be spray.	10	22-27
7	Sea heaves. White foam blown in streaks.	14	28-33
8	Moderately high waves of greater lengths; edges of crests break into spin drifts; foam blown in well-marked streaks.	18	34-40
9	High waves; dense streaks of foam; wave crests begin to roll; spray may reduce visibility.	22	41-47

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
Aerial sightings:				
06/29/90	US	1	70175N	164352W
06/29/90	UM	1	70142N	164209W
06/29/90	OR	80	70045N	163494W
06/29/90	OR	35	70042N	163461W
06/29/90	OR	10	70038N	163428W
06/29/90	OR	30	70037N	163397W
06/29/90	OR	10	70037N	163397W
06/29/90	OR	15	70027N	163320W
06/29/90	OR	45	70027N	163320W
06/29/90	OR	80	70027N	163320W
06/29/90	OR	70	70027N	163320W
06/29/90	OR	10	70027N	163320W
06/29/90	OR	150	70027N	163320W
06/29/90	OR	10	70027N	163320W
06/29/90	OR	30	70027N	163320W
06/29/90	OR	6	70016N	163265W
07/01/90	US	1	71063N	162540W
07/01/90	US	1	71055N	162538W
07/01/90	US	1	70594N	162172W
07/04/90	US	1	71269N	165102W
07/04/90	US	1	71586N	164180W
07/04/90	US	1	71446N	163537W
07/04/90	US	1	71411N	162430W
07/04/90	US	1	71403N	162261W
07/04/90	US	2	71377N	161429W
07/04/90	US	2	71365N	161297W
07/04/90	DL	1	71257N	159397W
07/05/90	US	1	71176N	164455W
07/05/90	OR	1	70348N	161377W
07/05/90	UP	1	70345N	161110W
07/05/90	EB	3	70358N	160320W
07/09/90	OR	1	70218N	161511W
07/09/90	OR	1	70215N	161547W
07/09/90	OR	1	70215N	161547W
07/09/90	OR	1	70215N	161547W
07/09/90	DL	2	70199N	162055W
07/09/90	OR	1	70193N	162105W
07/09/90	OR	2	70167N	162344W
07/09/90	OR	1	70167N	162344W
07/09/90	OR	2	70167N	162344W
07/09/90	OR	2	70236N	162140W
07/09/90	OR	2	70236N	162140W
07/09/90	ER	2	70283N	161474W

• BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/09/90	OR	1	70291N	161424W
07/09/90	OR	1	70299N	161370W
07/09/90	OR	1	70309N	161306W
07/09/90	ER	1	70346N	161059W
07/09/90	OR	1	70357N	160582W
07/09/90	OR	1	70488N	159499W
07/09/90	ER	1	70510N	159280W
07/09/90	OR	1	70510N	159280W
07/09/90	OR	1	70515N	159234W
07/09/90	OR	1	70515N	159234W
07/09/90	OR	12	70550N	159015W
07/09/90	OR	13	70555N	158586W
07/09/90	ER	1	71009N	158255W
07/09/90	ER	1	71015N	158214W
07/09/90	ER	1	71020N	158184W
07/09/90	US	1	71165N	156480W
07/10/90	OR	3	71529N	165460W
07/10/90	OR	2	72044N	165091W
07/10/90	US	1	71589N	161316W
07/10/90	PH	1	71546N	160418W
07/10/90	PH	1	71540N	160365W
07/10/90	US	1	71479N	159511W
07/10/90	US	1	71470N	159439W
07/10/90	US	1	71452N	159261W
07/10/90	PH	1	71442N	159160W
07/11/90	PH	1	71234N	157486W
07/11/90	EB	1	71411N	164357W
07/11/90	PH	1	71014N	164348W
07/11/90	OR	1	70502N	165471W
07/11/90	OR	11	70593N	165378W
07/11/90	OR	1	70593N	165378W
07/11/90	EB	1	71031N	164276W
07/15/90	US	1	71593N	165114W
10/01/90	DL	1	72271N	156562W
10/01/90	DL	1	72242N	156575W
10/03/90	PL	300	69543N	162476W
10/03/90	PL	60	69543N	162476W
10/03/90	OR	200	68528N	166138W
10/03/90	OR	70	68528N	166138W
10/03/90	OR	1	68511N	166164W
10/03/90	OR	1	68511N	166164W
10/03/90	OR	1	68521N	166153W
10/03/90	OR	3	68529N	166143W
10/03/90	OR	12	68530N	166131W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
10/03/90	OR	8	68532N	166120W
10/03/90	OR	2	68534N	166111W
10/03/90	OR	5	68537N	166101W
10/03/90	OR	3	68539N	166102W
10/03/90	OR	1	68540N	166103W
10/03/90	OR	3	68529N	166118W
10/03/90	OR	14	68529N	166118W
10/03/90	OR	2	68529N	166118W
10/03/90	OR	2	68529N	166118W
10/03/90	OR	3	68529N	166118W
10/03/90	OR	85	68521N	166140W
10/03/90	OR	5	68504N	166134W
10/03/90	OR	1	68490N	166149W
10/03/90	OR	2	68527N	166178W
10/03/90	OR	1	68527N	166178W
10/03/90	OR	1	68472N	166363W
10/03/90	OR	1	68472N	166363W
10/03/90	OR	2	68464N	166152W
10/03/90	US	4	68520N	165551W
10/04/90	OR	1	73144N	166561W
10/04/90	OR	4	73173N	167004W
10/04/90	OR	1	73265N	166431W
10/04/90	DL	2	73344N	164180W
Shipboard sightings				
07/03/90	OR	2	70215N	165160W
07/03/90	US	2	70224N	165143W
07/04/90	OR	2	70257N	165062W
07/04/90	PH	1	70257N	165062W
07/04/90	PF	1	70262N	165026W
07/04/90	OR	4	70387N	164377W
07/04/90	UM	1	70399N	164365W
07/04/90	PH	1	70409N	164364W
07/04/90	PH	1	70436N	164321W
07/04/90	PH	1	70436N	164321W
07/04/90	OR	12	70443N	164309W
07/04/90	OR	16	70443N	164309W
07/04/90	EB	1	70451N	164291W
07/04/90	PH	1	70464N	164275W
07/04/90	PH	1	70487N	164219W
07/04/90	OR	2	70493N	164252W
07/04/90	OR	1	70470N	164371W
07/04/90	UM	2	70503N	164425W
07/04/90	OR	2	70502N	165089W
07/04/90	PH	1	71037N	165374W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/04/90	UM	1	71046N	165419W
07/04/90	EB	1	71055N	165485W
07/04/90	PH	1	71297N	166032W
07/04/90	EB	1	71310N	166059W
07/04/90	PH	4	71358N	166027W
07/04/90	PH	1	71373N	165562W
07/04/90	EB	1	71373N	165562W
07/04/90	PH	2	71377N	165555W
07/04/90	UM	3	71385N	165540W
07/05/90	EB	1	71478N	165463W
07/05/90	PH	1	71452N	165482W
07/05/90	US	1	71424N	165432W
07/05/90	PH	1	71418N	165444W
07/05/90	PH	2	71366N	165497W
07/05/90	EB	1	71366N	165497W
07/05/90	PH	1	71366N	165497W
07/05/90	EB	1	71347N	165513W
07/05/90	PH	1	71347N	165513W
07/05/90	PH	2	71337N	165507W
07/05/90	PH	3	71331N	165495W
07/05/90	PH	4	71320N	165479W
07/05/90	PH	1	71320N	165479W
07/05/90	PH	1	71313N	165463W
07/05/90	PH	5	71313N	165463W
07/05/90	EB	1	71300N	165435W
07/05/90	PH	3	71300N	165435W
07/05/90	UM	1	71292N	165419W
07/05/90	PH	4	71292N	165419W
07/05/90	PH	1	71274N	165363W
07/05/90	PH	2	71274N	165363W
07/05/90	UM	2	71268N	165352W
07/05/90	PH	3	71253N	165330W
07/05/90	EB	2	71253N	165330W
07/06/90	PH	5	71225N	165282W
07/06/90	PH	4	71216N	165266W
07/06/90	PH	5	71215N	165258W
07/06/90	PH	5	71208N	165250W
07/06/90	PH	1	71206N	165278W
07/06/90	UM	1	71206N	165278W
07/06/90	PH	1	71232N	165309W
07/06/90	PH	1	71253N	165322W
07/07/90	PH	1	71242N	165340W
07/07/90	UM	1	71205N	165351W
07/08/90	PH	1	71179N	165341W

BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/08/90	PH	1	71144N	165315W
07/08/90	EB	1	71149N	165337W
07/08/90	PH	1	71152N	165337W
07/08/90	PH	1	71152N	165337W
07/08/90	EB	1	71159N	165335W
07/08/90	PH	1	71217N	165342W
07/08/90	PH	1	71221N	165343W
07/08/90	EB	3	71225N	165351W
07/08/90	UM	3	71232N	165332W
07/08/90	PH	2	71242N	165328W
07/08/90	EB	1	71250N	165329W
07/08/90	PH	1	71256N	165339W
07/09/90	EB	1	71247N	165379W
07/09/90	PH	1	71232N	165405W
07/09/90	PH	1	71226N	165419W
07/09/90	PH	1	71222N	165467W
07/09/90	EB	1	71219N	165490W
07/09/90	EB	1	71128N	166057W
07/09/90	EB	1	71110N	166013W
07/10/90	UM	1	71130N	166100W
07/10/90	EB	1	71113N	166094W
07/10/90	EB	1	71049N	166182W
07/11/90	PH	1	70457N	166136W
07/11/90	PH	1	70475N	166158W
07/11/90	PH	2	70484N	166164W
07/11/90	EB	1	70493N	166171W
07/11/90	PH	1	70532N	166199W
07/11/90	PH	1	70547N	166209W
07/11/90	PH	1	70554N	166216W
07/12/90	OR	12	71280N	166500W
07/12/90	OR	1	71301N	166507W
07/12/90	OR	9	71309N	166506W
07/12/90	OR	2	71312N	166505W
07/12/90	OR	3	71326N	166500W
07/12/90	OR	5	71326N	166500W
07/12/90	OR	5	71326N	166500W
07/12/90	OR	5	71326N	166500W
07/12/90	OR	5	71326N	166500W
07/12/90	EB	1	71359N	166499W
07/12/90	OR	1	71345N	166499W
07/12/90	OR	1	71474N	166474W
07/12/90	OR	3	71475N	166190W
07/12/90	OR	4	71497N	166070W
07/12/90	OR	1	71508N	165595W

BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/12/90	EB	1	71513N	165492W
07/12/90	UM	1	71502N	165456W
07/12/90	PH	1	71511N	165450W
07/12/90	EB	1	71513N	165468W
07/13/90	OR	2	71510N	165567W
07/13/90	PH	1	71510N	165569W
07/13/90	EB	1	71510N	165410W
07/13/90	OR	5	71471N	165505W
07/13/90	OR	1	71485N	165542W
07/13/90	OR	1	71499N	165536W
07/13/90	EB	1	71505N	165515W
07/13/90	PH	1	71501N	165522W
07/14/90	PH	1	71474N	165532W
07/14/90	PH	1	71465N	165533W
07/14/90	PH	1	71473N	165503W
07/14/90	EB	1	71465N	165530W
07/14/90	EB	1	71465N	165530W
07/14/90	PH	1	71493N	165502W
07/14/90	EB	1	71493N	165470W
07/14/90	PH	1	71504N	165506W
07/14/90	EB	1	71505N	165483W
07/14/90	PH	1	71505N	165483W
07/14/90	PH	1	71502N	165521W
07/14/90	EB	1	71513N	165484W
07/15/90	PH	2	71419N	165471W
07/15/90	PH	1	71409N	165217W
07/15/90	EB	1	71411N	165164W
07/15/90	EB	1	71406N	165152W
07/15/90	BA	1	71405N	165141W
07/15/90	PH	1	71404N	165132W
07/16/90	PH	1	71518N	165535W
07/18/90	OR	1	71468N	165510W
07/18/90	OR	2	71484N	166037W
07/18/90	PH	1	71504N	165570W
07/19/90	OR	2	71501N	165583W
07/21/90	OR	1	71500N	165550W
07/23/90	PH	1	71499N	165440W
07/23/90	PH	1	71499N	165440W
07/23/90	PH	1	71499N	165441W
07/23/90	OR	1	71499N	165441W
07/23/90	OR	3	71499N	165441W
07/23/90	PH	1	71499N	165441W
07/23/90	EB	1	71499N	165441W
07/23/90	UZ	1	71499N	165441W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/24/90	PH	1	71499N	165441W
07/24/90	OR	1	72012N	163458W
07/24/90	OR	4	72012N	163458W
07/24/90	OR	4	72022N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	4	72 22N	163425W
07/24/90	OR	15	72 22N	163425W
07/24/90	OR	12	72 22N	163425W
07/24/90	OR	12	72 22N	163425W
07/24/90	OR	2	72 22N	163425W
07/24/90	OR	2	72 22N	163425W
07/24/90	OR	3	72 22N	163425W
07/24/90	OR	5	72 22N	163425W
07/24/90	OR	25	72 22N	163425W
07/24/90	OR	5	72 22N	163425W
07/24/90	OR	15	72 22N	163425W
07/24/90	OR	3	72 22N	163425W
07/24/90	OR	5	72 22N	163425W
07/24/90	OR	2	72 22N	163426W
07/24/90	OR	6	72 22N	163426W
07/24/90	OR	25	72 22N	163426W
07/24/90	OR	30	72 22N	163426W
07/24/90	OR	4	72 22N	163426W
07/24/90	OR	15	72 22N	163426W
07/24/90	OR	25	72 22N	163426W
07/24/90	OR	15	72 22N	163426W
07/24/90	OR	2	72 22N	163426W
07/24/90	OR	2	72 22N	163426W
07/24/90	OR	7	72 22N	163426W

[a] BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/24/90	OR	2	72 22N	163426W
07/24/90	OR	3	72 22N	163426W
07/24/90	OR	7	72 22N	163426W
07/24/90	OR	3	72 22N	163426W
07/24/90	OR	5	72 22N	163426W
07/24/90	OR	2	72 22N	163426W
07/24/90	OR	3	72 22N	163426W
07/24/90	OR	1	72 22N	163426W
07/24/90	OR	6	72 22N	163426W
07/24/90	OR	4	72 22N	163426W
07/24/90	OR	4	72 22N	163426W
07/24/90	OR	3	72 22N	163426W
07/24/90	OR	4	72 22N	163426W
07/24/90	OR	6	72 22N	163426W
07/24/90	OR	2	72 22N	163426W
07/24/90	OR	4	72 22N	163426W
07/24/90	OR	5	72 22N	163426W
07/24/90	OR	1	72 22N	163426W
07/24/90	OR	2	72 21N	163426W
07/24/90	OR	5	72 21N	163426W
07/24/90	OR	17	72 21N	163426W
07/24/90	OR	18	72 21N	163426W
07/24/90	OR	35	72 21N	163426W
07/24/90	OR	7	72 21N	163426W
07/24/90	OR	17	72 21N	163426W
07/24/90	OR	15	72 21N	163426W
07/24/90	OR	20	72 21N	163426W
07/24/90	OR	6	72 21N	163426W
07/24/90	OR	2	72 21N	163426W
07/24/90	OR	3	72 21N	163426W
07/24/90	OR	4	72 21N	163426W
07/24/90	OR	17	72 21N	163426W
07/24/90	OR	3	72 21N	163426W
07/24/90	OR	3	72 21N	163426W
07/24/90	OR	6	72 21N	163426W
07/24/90	OR	2	72 21N	163426W
07/24/90	OR	4	72 21N	163426W
07/24/90	OR	7	72 21N	163426W
07/24/90	OR	6	72 21N	163426W
07/24/90	OR	3	72 21N	163426W
07/24/90	OR	25	72 21N	163426W
07/24/90	OR	15	72 21N	163426W
07/24/90	OR	15	72 21N	163426W
07/24/90	OR	12	72 21N	163426W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/24/90	OR	5	72 21N	163426W
07/24/90	OR	7	72 21N	163426W
07/24/90	OR	4	72 21N	163426W
07/24/90	OR	2	72 21N	163427W
07/24/90	OR	14	72 21N	163427W
07/24/90	OR	15	72 21N	163427W
07/24/90	OR	35	72 21N	163427W
07/24/90	OR	6	72 21N	163427W
07/24/90	OR	7	72 21N	163427W
07/24/90	OR	15	72 21N	163427W
07/24/90	OR	15	72 21N	163427W
07/24/90	OR	20	72 21N	163427W
07/24/90	OR	6	72 21N	163427W
07/24/90	OR	2	72 21N	163427W
07/24/90	OR	2	72 21N	163427W
07/24/90	OR	2	72 21N	163427W
07/24/90	OR	9	72 21N	163427W
07/24/90	OR	5	72 21N	163427W
07/24/90	OR	9	72 21N	163427W
07/24/90	OR	6	72 21N	163427W
07/24/90	OR	7	72 21N	163427W
07/24/90	OR	3	72 21N	163427W
07/24/90	OR	7	72 21N	163427W
07/24/90	OR	4	72 21N	163427W
07/24/90	OR	6	72 21N	163427W
07/24/90	OR	10	72 21N	163427W
07/24/90	OR	3	72 21N	163427W
07/24/90	OR	25	72 21N	163427W
07/24/90	OR	3	72 21N	163427W
07/24/90	OR	2	72 21N	163427W
07/24/90	OR	2	72 21N	163427W
07/24/90	OR	3	72 21N	163427W
07/25/90	OR	9	71593N	163349W
07/25/90	OR	3	71593N	163349W
07/25/90	OR	30	71593N	163341W
07/25/90	OR	40	71593N	163340W
07/25/90	OR	8	71593N	163339W
07/25/90	OR	25	71593N	163338W
07/25/90	OR	11	71592N	163318W
07/25/90	OR	2	71591N	163285W
07/25/90	OR	2	71591N	163284W
07/25/90	OR	2	71591N	163283W
07/25/90	OR	7	71591N	163281W
07/25/90	OR	5	71590N	163280W

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Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/25/90	OR	15	71590N	163279W
07/25/90	OR	8	71590N	163278W
07/25/90	OR	35	71590N	163276W
07/25/90	OR	2	71590N	163275W
07/25/90	OR	2	71589N	163274W
07/25/90	OR	1	71589N	163272W
07/25/90	OR	2	71589N	163271W
07/25/90	OR	3	71589N	163270W
07/25/90	OR	12	71589N	163268W
07/25/90	OR	15	71588N	163266W
07/25/90	OR	3	71588N	163264W
07/25/90	OR	40	71588N	163262W
07/25/90	OR	5	71587N	163260W
07/25/90	OR	15	71587N	163258W
07/25/90	OR	1	71586N	163256W
07/25/90	OR	4	71586N	163254W
07/25/90	OR	50	71586N	163251W
07/25/90	OR	7	71585N	163248W
07/25/90	OR	40	71585N	163245W
07/25/90	OR	4	71579N	163232W
07/25/90	OR	2	71564N	163264W
07/25/90	OR	25	71563N	163272W
07/25/90	OR	20	71562N	163278W
07/25/90	OR	15	71561N	163284W
07/25/90	OR	4	71560N	163290W
07/25/90	OR	12	71560N	163295W
07/25/90	OR	3	71559N	163301W
07/25/90	OR	18	71558N	163307W
07/25/90	OR	28	71557N	163313W
07/25/90	OR	15	71551N	163297W
07/25/90	OR	12	71550N	163295W
07/25/90	OR	3	71549N	163293W
07/25/90	OR	30	71550N	163285W
07/25/90	OR	2	71544N	163304W
07/25/90	OR	7	71527N	163314W
07/25/90	OR	1	71509N	163324W
07/25/90	OR	3	71509N	163324W
07/25/90	OR	20	71509N	163324W
07/25/90	OR	20	71509N	163324W
07/25/90	OR	4	71507N	163326W
07/25/90	OR	5	71506N	163328W
07/25/90	OR	2	71505N	163330W
07/25/90	OR	1	71503N	163333W
07/25/90	OR	26	71502N	163335W

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Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/25/90	OR	8	71500N	163337W
07/25/90	OR	20	71497N	163338W
07/25/90	OR	12	71488N	163340W
07/25/90	OR	12	71473N	163342W
07/25/90	OR	25	71465N	163339W
07/25/90	OR	60	71463N	163338W
07/25/90	OR	20	71461N	163337W
07/25/90	OR	90	71458N	163336W
07/25/90	OR	35	71456N	163335W
07/25/90	OR	30	71432N	163289W
07/25/90	OR	2	71263N	162519W
07/25/90	ER	1	71332N	162406W
07/25/90	OR	2	71349N	162378W
07/25/90	OR	3	71386N	162265W
07/25/90	OR	2	71387N	162254W
07/25/90	OR	2	71397N	162303W
07/25/90	OR	3	71387N	162411W
07/25/90	EB	1	71386N	162427W
07/25/90	OR	7	71384N	162443W
07/25/90	OR	3	71384N	162449W
07/25/90	OR	2	71384N	162455W
07/25/90	OR	2	71384N	162461W
07/25/90	OR	2	71383N	162468W
07/25/90	OR	1	71383N	162474W
07/25/90	OR	2	71383N	162480W
07/25/90	OR	1	71383N	162486W
07/25/90	OR	2	71383N	162489W
07/25/90	OR	2	71383N	162491W
07/25/90	OR	3	71383N	162494W
07/25/90	OR	1	71383N	162496W
07/25/90	OR	2	71383N	162499W
07/25/90	OR	1	71383N	162501W
07/25/90	OR	2	71383N	162504W
07/25/90	OR	1	71383N	162506W
07/25/90	OR	5	71383N	162509W
07/25/90	OR	7	71383N	162512W
07/25/90	OR	1	71383N	162514W
07/25/90	OR	5	71383N	162517W
07/25/90	OR	4	71383N	162520W
07/25/90	OR	4	71383N	162523W
07/25/90	OR	1	71383N	162525W
07/25/90	OR	2	71383N	162528W
07/25/90	OR	1	71383N	162531W
07/25/90	OR	2	71384N	162536W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/25/90	OR	3	71384N	162540W
07/25/90	OR	4	71385N	162545W
07/25/90	OR	8	71385N	162550W
07/25/90	OR	2	71385N	162552W
07/25/90	OR	5	71386N	162553W
07/25/90	OR	5	71386N	162555W
07/25/90	OR	2	71386N	162557W
07/25/90	OR	3	71387N	162558W
07/25/90	OR	5	71387N	162560W
07/25/90	OR	2	71388N	162561W
07/25/90	OR	3	71388N	162563W
07/25/90	OR	6	71388N	162564W
07/25/90	OR	4	71389N	162566W
07/25/90	OR	2	71389N	162567W
07/25/90	OR	3	71389N	162568W
07/25/90	OR	2	71390N	162570W
07/25/90	OR	3	71390N	162571W
07/25/90	OR	2	71390N	162573W
07/25/90	OR	2	71391N	162574W
07/25/90	OR	2	71391N	162576W
07/25/90	OR	1	71392N	162577W
07/25/90	OR	2	71392N	162579W
07/25/90	OR	8	71393N	162580W
07/25/90	OR	3	71393N	162582W
07/25/90	OR	3	71393N	162585W
07/25/90	OR	2	71393N	162588W
07/25/90	OR	4	71393N	162591W
07/25/90	OR	3	71393N	162594W
07/25/90	OR	2	71393N	162597W
07/25/90	OR	3	71393N	162598W
07/25/90	OR	7	71393N	162599W
07/25/90	OR	2	71393N	163 00W
07/25/90	OR	8	71393N	163 02W
07/25/90	OR	1	71393N	163 03W
07/25/90	OR	2	71393N	163 04W
07/25/90	OR	2	71393N	163005W
07/25/90	OR	2	71393N	163 07W
07/25/90	OR	1	71393N	163 08W
07/25/90	OR	3	71393N	163 09W
07/25/90	OR	2	71393N	163011W
07/25/90	OR	3	71393N	163 13W
07/25/90	OR	7	71393N	163 15W
07/25/90	OR	2	71393N	163 18W
07/25/90	OR	2	71393N	163020W

[a] BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/25/90	OR	2	71392N	163 23W
07/25/90	OR	4	71391N	163 26W
07/25/90	OR	3	71389N	163 30W
07/25/90	OR	4	71388N	163 33W
07/25/90	OR	6	71387N	163036W
07/25/90	OR	4	71386N	163 38W
07/25/90	OR	4	71386N	163 40W
07/25/90	OR	3	71385N	163 41W
07/25/90	OR	5	71385N	163 43W
07/25/90	OR	2	71384N	163045W
07/25/90	OR	3	71384N	163045W
07/25/90	OR	5	71391N	163065W
07/25/90	OR	9	71391N	163 67W
07/25/90	OR	3	71391N	163 69W
07/25/90	OR	4	71390N	163 72W
07/25/90	OR	2	71390N	163 74W
07/25/90	OR	4	71390N	163 76W
07/25/90	OR	4	71390N	163078W
07/25/90	OR	2	71390N	163 80W
07/25/90	OR	17	71390N	163 82W
07/25/90	OR	1	71390N	163 84W
07/25/90	OR	20	71389N	163 85W
07/25/90	OR	1	71389N	163 87W
07/25/90	OR	15	71389N	163 89W
07/25/90	OR	6	71389N	163091W
07/25/90	OR	20	71389N	163 92W
07/25/90	OR	2	71389N	163 93W
07/25/90	OR	2	71389N	163 94W
07/25/90	OR	1	71388N	163 94W
07/25/90	OR	2	71388N	163 95W
07/25/90	OR	6	71388N	163 96W
07/25/90	OR	2	71388N	163097W
07/25/90	OR	4	71388N	163102W
07/25/90	OR	1	71387N	163108W
07/25/90	OR	2	71387N	163113W
07/25/90	OR	3	71387N	163117W
07/25/90	OR	1	71386N	163121W
07/25/90	OR	1	71386N	163125W
07/25/90	OR	2	71386N	163128W
07/25/90	OR	2	71385N	163132W
07/25/90	OR	4	71385N	163136W
07/25/90	OR	1	71384N	163149W
07/25/90	OR	1	71384N	163149W
07/25/90	OR	3	71382N	163163W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/25/90	OR	1	71380N	163179W
07/25/90	OR	2	71379N	163186W
07/25/90	OR	3	71378N	163192W
07/25/90	OR	35	71375N	163213W
07/25/90	OR	1	71375N	163214W
07/26/90	OR	2	71411N	163324W
07/26/90	OR	3	71407N	163333W
07/26/90	OR	5	71404N	163341W
07/26/90	OR	3	71400N	163350W
07/26/90	OR	2	71396N	163359W
07/26/90	OR	5	71393N	163367W
07/26/90	OR	7	71389N	163376W
07/26/90	OR	4	71385N	163385W
07/26/90	OR	2	71382N	163393W
07/26/90	OR	30	71355N	163361W
07/26/90	OR	1	71355N	163361W
07/26/90	OR	2	71355N	163361W
07/26/90	OR	20	71355N	163361W
07/26/90	OR	4	71355N	163361W
07/26/90	OR	15	71355N	163361W
07/26/90	OR	3	71355N	163361W
07/26/90	OR	18	71355N	163361W
07/26/90	OR	9	71355N	163361W
07/26/90	OR	14	71355N	163361W
07/26/90	OR	15	71355N	163361W
07/26/90	OR	7	71355N	163361W
07/26/90	OR	12	71355N	163361W
07/26/90	OR	5	71355N	163361W
07/26/90	OR	4	71355N	163361W
07/26/90	OR	1	71355N	163361W
07/26/90	OR	11	71355N	163361W
07/26/90	OR	4	71355N	163361W
07/26/90	OR	1	71355N	163361W
07/26/90	OR	1	71355N	163361W
07/26/90	OR	2	71343N	163370W
07/26/90	OR	5	71344N	163373W
07/26/90	OR	2	71345N	163376W
07/26/90	OR	17	71346N	163379W
07/26/90	OR	11	71347N	163382W
07/26/90	OR	8	71348N	163385W
07/26/90	OR	2	71349N	163388W
07/26/90	OR	2	71349N	163390W
07/26/90	OR	8	71350N	163393W
07/26/90	OR	4	71351N	163396W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	28	71352N	163399W
07/26/90	OR	1	71353N	163402W
07/26/90	OR	6	71354N	163405W
07/26/90	PH	1	71355N	163408W
07/26/90	EB	1	71364N	163438W
07/26/90	US	2	71372N	163463W
07/26/90	EB	1	71386N	163510W
07/26/90	OR	1	71417N	163565W
07/26/90	US	1	71422N	163548W
07/26/90	OR	25	71465N	163490W
07/26/90	OR	2	71467N	163490W
07/26/90	OR	3	71469N	163489W
07/26/90	OR	5	71471N	163489W
07/26/90	OR	2	71473N	163488W
07/26/90	OR	1	71474N	163488W
07/26/90	OR	15	71476N	163487W
07/26/90	OR	22	71478N	163487W
07/26/90	OR	17	71480N	163486W
07/26/90	OR	3	71484N	163400W
07/26/90	OR	1	71484N	163401W
07/26/90	OR	1	71484N	163401W
07/26/90	OR	3	71484N	163402W
07/26/90	OR	4	71484N	163402W
07/26/90	OR	1	71485N	163403W
07/26/90	OR	4	71485N	163404W
07/26/90	OR	2	71485N	163404W
07/26/90	OR	1	71485N	163405W
07/26/90	OR	3	71485N	163405W
07/26/90	OR	4	71485N	163406W
07/26/90	OR	3	71485N	163406W
07/26/90	OR	24	71485N	163407W
07/26/90	OR	6	71486N	163408W
07/26/90	OR	3	71486N	163408W
07/26/90	OR	4	71486N	163409W
07/26/90	OR	2	71486N	163409W
07/26/90	OR	10	71486N	163410W
07/26/90	OR	1	71486N	163410W
07/26/90	OR	47	71486N	163410W
07/26/90	OR	1	71486N	163411W
07/26/90	OR	8	71486N	163411W
07/26/90	OR	10	71486N	163411W
07/26/90	OR	9	71486N	163411W
07/26/90	OR	27	71486N	163412W
07/26/90	OR	1	71487N	163412W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	35	71487N	163412W
07/26/90	OR	3	71487N	163412W
07/26/90	OR	33	71487N	163413W
07/26/90	OR	2	71487N	163413W
07/26/90	OR	35	71487N	163413W
07/26/90	OR	30	71487N	163413W
07/26/90	OR	13	71487N	163414W
07/26/90	OR	4	71487N	163414W
07/26/90	OR	19	71487N	163414W
07/26/90	OR	6	71487N	163414W
07/26/90	OR	12	71487N	163414W
07/26/90	OR	21	71487N	163415W
07/26/90	OR	9	71487N	163415W
07/26/90	OR	2	71487N	163415W
07/26/90	OR	20	71488N	163415W
07/26/90	OR	2	71488N	163416W
07/26/90	OR	5	71488N	163416W
07/26/90	OR	3	71488N	163416W
07/26/90	OR	1	71488N	163416W
07/26/90	OR	24	71488N	163417W
07/26/90	OR	1	71488N	163417W
07/26/90	OR	2	71488N	163417W
07/26/90	OR	5	71488N	163419W
07/26/90	OR	4	71488N	163421W
07/26/90	OR	4	71488N	163423W
07/26/90	OR	20	71489N	163424W
07/26/90	OR	6	71489N	163426W
07/26/90	OR	7	71489N	163428W
07/26/90	OR	6	71489N	163429W
07/26/90	OR	5	71490N	163430W
07/26/90	OR	1	71490N	163432W
07/26/90	OR	2	71490N	163433W
07/26/90	OR	3	71491N	163434W
07/26/90	OR	5	71491N	163435W
07/26/90	OR	4	71491N	163436W
07/26/90	OR	2	71492N	163438W
07/26/90	OR	1	71492N	163439W
07/26/90	OR	35	71492N	163441W
07/26/90	OR	9	71492N	163442W
07/26/90	OR	15	71493N	163444W
07/26/90	OR	300	71499N	163454W
07/26/90	OR	150	71500N	163456W
07/26/90	OR	250	71501N	163457W
07/26/90	OR	50	71502N	163458W

BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	1	71503N	163460W
07/26/90	OR	2	71504N	163457W
07/26/90	OR	1	71505N	163455W
07/26/90	OR	1	71506N	163452W
07/26/90	OR	2	71506N	163449W
07/26/90	EB	1	71507N	163447W
07/26/90	OR	3	71508N	163444W
07/26/90	OR	2	71509N	163442W
07/26/90	OR	2	71510N	163439W
07/26/90	OR	2	71511N	163436W
07/26/90	OR	2	71511N	163434W
07/26/90	OR	1	71512N	163431W
07/26/90	OR	2	71513N	163428W
07/26/90	OR	5	71514N	163426W
07/26/90	OR	2	71515N	163423W
07/26/90	OR	12	71516N	163420W
07/26/90	OR	8	71517N	163418W
07/26/90	OR	2	71517N	163415W
07/26/90	OR	6	71518N	163413W
07/26/90	OR	9	71519N	163410W
07/26/90	OR	2	71520N	163407W
07/26/90	OR	3	71521N	163405W
07/26/90	OR	2	71522N	163402W
07/26/90	OR	1	71523N	163399W
07/26/90	OR	2	71523N	163397W
07/26/90	OR	70	71524N	163394W
07/26/90	OR	6	71525N	163391W
07/26/90	OR	4	71526N	163389W
07/26/90	OR	4	71527N	163386W
07/26/90	OR	1	71528N	163384W
07/26/90	OR	4	71528N	163381W
07/26/90	OR	1	71529N	163378W
07/26/90	OR	3	71530N	163376W
07/26/90	OR	2	71531N	163373W
07/26/90	OR	5	71531N	163372W
07/26/90	OR	3	71531N	163370W
07/26/90	OR	1	71532N	163369W
07/26/90	OR	4	71532N	163367W
07/26/90	OR	1	71532N	163366W
07/26/90	OR	2	71532N	163365W
07/26/90	OR	2	71533N	163363W
07/26/90	OR	3	71533N	163362W
07/26/90	OR	2	71533N	163360W
07/26/90	OR	1	71533N	163359W

[a] BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	3	71533N	163358W
07/26/90	OR	7	71534N	163356W
07/26/90	OR	5	71534N	163355W
07/26/90	OR	4	71534N	163353W
07/26/90	OR	6	71534N	163352W
07/26/90	OR	3	71535N	163351W
07/26/90	OR	3	71535N	163349W
07/26/90	OR	2	71535N	163348W
07/26/90	OR	2	71535N	163346W
07/26/90	OR	6	71535N	163345W
07/26/90	OR	2	71536N	163343W
07/26/90	OR	3	71536N	163342W
07/26/90	OR	2	71536N	163341W
07/26/90	OR	2	71536N	163339W
07/26/90	OR	4	71536N	163338W
07/26/90	OR	2	71537N	163336W
07/26/90	OR	2	71537N	163335W
07/26/90	OR	2	71537N	163334W
07/26/90	OR	2	71537N	163332W
07/26/90	OR	2	71538N	163331W
07/26/90	OR	7	71538N	163329W
07/26/90	OR	3	71538N	163328W
07/26/90	OR	2	71538N	163328W
07/26/90	OR	2	71538N	163328W
07/26/90	OR	3	71538N	163329W
07/26/90	OR	2	71538N	163329W
07/26/90	OR	1	71538N	163329W
07/26/90	OR	3	71538N	163329W
07/26/90	OR	1	71538N	163329W
07/26/90	OR	2	71538N	163330W
07/26/90	OR	2	71538N	163330W
07/26/90	OR	65	71538N	163330W
07/26/90	OR	30	71538N	163330W
07/26/90	OR	4	71538N	163330W
07/26/90	OR	4	71538N	163331W
07/26/90	OR	6	71538N	163331W
07/26/90	OR	2	71538N	163331W
07/26/90	OR	3	71538N	163331W
07/26/90	OR	2	71538N	163331W
07/26/90	OR	2	71538N	163332W
07/26/90	OR	7	71538N	163332W
07/26/90	OR	12	71538N	163332W
07/26/90	OR	8	71538N	163332W
07/26/90	OR	5	71537N	163332W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	3	71537N	163333W
07/26/90	OR	1	71537N	163333W
07/26/90	OR	24	71537N	163333W
07/26/90	OR	31	71537N	163333W
07/26/90	OR	110	71537N	163333W
07/26/90	OR	9	71537N	163334W
07/26/90	OR	2	71537N	163334W
07/26/90	OR	2	71537N	163334W
07/26/90	OR	5	71537N	163334W
07/26/90	OR	7	71537N	163334W
07/26/90	OR	4	71537N	163335W
07/26/90	OR	3	71537N	163335W
07/26/90	OR	2	71537N	163335W
07/26/90	OR	8	71537N	163335W
07/26/90	OR	17	71537N	163335W
07/26/90	OR	30	71537N	163336W
07/26/90	OR	2	71537N	163336W
07/26/90	OR	3	71537N	163336W
07/26/90	OR	6	71537N	163336W
07/26/90	OR	5	71537N	163336W
07/26/90	OR	7	71537N	163337W
07/26/90	OR	5	71537N	163337W
07/26/90	OR	5	71537N	163337W
07/26/90	OR	2	71537N	163337W
07/26/90	OR	65	71537N	163337W
07/26/90	OR	20	71537N	163337W
07/26/90	OR	2	71537N	163338W
07/26/90	OR	2	71537N	163338W
07/26/90	OR	7	71537N	163338W
07/26/90	OR	2	71537N	163338W
07/26/90	OR	30	71537N	163338W
07/26/90	OR	12	71537N	163339W
07/26/90	OR	2	71537N	163339W
07/26/90	OR	13	71537N	163339W
07/26/90	OR	30	71537N	163339W
07/26/90	OR	3	71537N	163339W
07/26/90	OR	2	71537N	163340W
07/26/90	OR	12	71537N	163340W
07/26/90	OR	10	71537N	163340W
07/26/90	OR	6	71537N	163340W
07/26/90	OR	3	71537N	163340W
07/26/90	OR	3	71537N	163341W
07/26/90	OR	4	71536N	163341W
07/26/90	OR	5	71536N	163341W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	8	71536N	163341W
07/26/90	OR	45	71536N	163341W
07/26/90	OR	3	71536N	163342W
07/26/90	OR	7	71536N	163342W
07/26/90	OR	5	71536N	163342W
07/26/90	OR	11	71536N	163342W
07/26/90	OR	4	71536N	163342W
07/26/90	OR	2	71536N	163343W
07/26/90	OR	6	71536N	163343W
07/26/90	OR	3	71536N	163343W
07/26/90	OR	5	71536N	163343W
07/26/90	OR	65	71536N	163343W
07/26/90	OR	5	71536N	163344W
07/26/90	OR	22	71536N	163344W
07/26/90	OR	12	71536N	163344W
07/26/90	OR	3	71536N	163344W
07/26/90	OR	3	71536N	163344W
07/26/90	OR	30	71536N	163345W
07/26/90	OR	25	71536N	163345W
07/26/90	OR	2	71536N	163345W
07/26/90	OR	15	71536N	163345W
07/26/90	UM	1	71536N	163346W
07/26/90	OR	6	71536N	163346W
07/26/90	OR	15	71536N	163346W
07/26/90	OR	3	71536N	163346W
07/26/90	OR	18	71536N	163347W
07/26/90	OR	3	71536N	163347W
07/26/90	OR	7	71536N	163347W
07/26/90	OR	5	71536N	163347W
07/26/90	OR	8	71536N	163347W
07/26/90	OR	5	71536N	163348W
07/26/90	OR	12	71536N	163348W
07/26/90	OR	17	71536N	163348W
07/26/90	OR	45	71536N	163348W
07/26/90	OR	7	71536N	163349W
07/26/90	OR	9	71536N	163349W
07/26/90	OR	5	71536N	163349W
07/26/90	OR	50	71536N	163349W
07/26/90	OR	2	71536N	163350W
07/26/90	OR	5	71535N	163350W
07/26/90	OR	4	71535N	163350W
07/26/90	OR	10	71535N	163350W
07/26/90	OR	13	71535N	163350W
07/26/90	OR	3	71535N	163351W

BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	10	71535N	163351W
07/26/90	OR	40	71535N	163351W
07/26/90	OR	9	71535N	163351W
07/26/90	OR	3	71535N	163352W
07/26/90	OR	11	71535N	163352W
07/26/90	OR	31	71535N	163352W
07/26/90	OR	14	71535N	163352W
07/26/90	OR	8	71535N	163352W
07/26/90	OR	6	71535N	163353W
07/26/90	OR	2	71535N	163353W
07/26/90	OR	2	71535N	163353W
07/26/90	OR	4	71535N	163353W
07/26/90	OR	8	71535N	163354W
07/26/90	OR	9	71535N	163354W
07/26/90	OR	5	71535N	163354W
07/26/90	OR	12	71535N	163354W
07/26/90	OR	2	71535N	163355W
07/26/90	OR	3	71535N	163355W
07/26/90	OR	2	71535N	163355W
07/26/90	OR	7	71535N	163355W
07/26/90	OR	6	71535N	163355W
07/26/90	OR	4	71535N	163356W
07/26/90	OR	40	71535N	163356W
07/26/90	OR	20	71535N	163356W
07/26/90	OR	8	71535N	163356W
07/26/90	OR	6	71535N	163357W
07/26/90	OR	25	71535N	163357W
07/26/90	OR	9	71535N	163357W
07/26/90	OR	17	71535N	163357W
07/26/90	OR	70	71535N	163357W
07/26/90	OR	3	71535N	163358W
07/26/90	OR	5	71535N	163358W
07/26/90	OR	3	71535N	163358W
07/26/90	OR	14	71535N	163358W
07/26/90	OR	6	71535N	163359W
07/26/90	OR	4	71535N	163359W
07/26/90	OR	6	71534N	163359W
07/26/90	OR	21	71534N	163359W
07/26/90	OR	14	71534N	163360W
07/26/90	OR	25	71534N	163360W
07/26/90	OR	14	71534N	163360W
07/26/90	OR	3	71534N	163360W
07/26/90	OR	3	71534N	163360W
07/26/90	OR	2	71534N	163361W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	20	71534N	163361W
07/26/90	OR	4	71534N	163361W
07/26/90	OR	1	71534N	163361W
07/26/90	OR	6	71534N	163362W
07/26/90	OR	5	71534N	163362W
07/26/90	OR	1	71534N	163362W
07/26/90	OR	4	71534N	163362W
07/26/90	OR	2	71534N	163362W
07/26/90	OR	70	71534N	163363W
07/26/90	OR	5	71534N	163363W
07/26/90	OR	7	71534N	163363W
07/26/90	OR	60	71534N	163363W
07/26/90	OR	3	71534N	163364W
07/26/90	OR	6	71534N	163364W
07/26/90	OR	2	71534N	163364W
07/26/90	OR	5	71534N	163364W
07/26/90	OR	3	71534N	163365W
07/26/90	OR	230	71534N	163365W
07/26/90	OR	2	71534N	163365W
07/26/90	OR	3	71534N	163365W
07/26/90	OR	21	71534N	163365W
07/26/90	OR	7	71534N	163366W
07/26/90	OR	3	71534N	163366W
07/26/90	OR	18	71534N	163366W
07/26/90	OR	22	71534N	163366W
07/26/90	OR	15	71534N	163367W
07/26/90	OR	5	71534N	163367W
07/26/90	OR	14	71534N	163367W
07/26/90	OR	5	71534N	163367W
07/26/90	OR	4	71534N	163367W
07/26/90	OR	4	71534N	163368W
07/26/90	OR	3	71534N	163368W
07/26/90	OR	7	71533N	163368W
07/26/90	OR	45	71533N	163368W
07/26/90	OR	200	71533N	163369W
07/26/90	OR	180	71533N	163369W
07/26/90	OR	40	71533N	163369W
07/26/90	OR	4	71533N	163369W
07/26/90	OR	5	71533N	163370W
07/26/90	OR	7	71533N	163370W
07/26/90	OR	200	71533N	163370W
07/26/90	OR	20	71533N	163370W
07/26/90	OR	1	71533N	163370W
07/26/90	OR	4	71533N	163371W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	2	71533N	163371W
07/26/90	OR	6	71533N	163371W
07/26/90	OR	250	71533N	163371W
07/26/90	OR	200	71533N	163372W
07/26/90	OR	80	71533N	163372W
07/26/90	OR	175	71533N	163372W
07/26/90	OR	3	71533N	163372W
07/26/90	OR	175	71533N	163372W
07/26/90	OR	225	71533N	163373W
07/26/90	OR	205	71533N	163373W
07/26/90	OR	11	71533N	163373W
07/26/90	OR	5	71533N	163373W
07/26/90	OR	30	71533N	163374W
07/26/90	OR	22	71533N	163374W
07/26/90	OR	180	71533N	163374W
07/26/90	OR	4	71533N	163374W
07/26/90	OR	15	71533N	163375W
07/26/90	OR	3	71533N	163375W
07/26/90	OR	3	71533N	163375W
07/26/90	OR	2	71533N	163375W
07/26/90	OR	3	71533N	163375W
07/26/90	OR	1	71533N	163376W
07/26/90	OR	5	71533N	163376W
07/26/90	OR	7	71533N	163376W
07/26/90	OR	15	71533N	163376W
07/26/90	OR	30	71533N	163377W
07/26/90	OR	7	71533N	163377W
07/26/90	OR	300	71533N	163377W
07/26/90	OR	200	71533N	163377W
07/26/90	OR	2	71532N	163377W
07/26/90	OR	3	71532N	163378W
07/26/90	OR	5	71532N	163378W
07/26/90	OR	80	71532N	163378W
07/26/90	OR	4	71532N	163378W
07/26/90	OR	10	71532N	163379W
07/26/90	OR	13	71532N	163379W
07/26/90	OR	55	71532N	163379W
07/26/90	OR	8	71532N	163379W
07/26/90	OR	12	71532N	163380W
07/26/90	OR	11	71532N	163380W
07/26/90	OR	13	71532N	163380W
07/26/90	OR	7	71532N	163380W
07/26/90	OR	11	71532N	163380W
07/26/90	OR	3	71532N	163381W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	10	71532N	163381W
07/26/90	OR	16	71532N	163381W
07/26/90	OR	9	71532N	163381W
07/26/90	OR	160	71532N	163382W
07/26/90	OR	55	71532N	163382W
07/26/90	OR	7	71532N	163382W
07/26/90	OR	22	71532N	163382W
07/26/90	OR	1	71532N	163382W
07/26/90	OR	2	71532N	163383W
07/26/90	OR	7	71532N	163383W
07/26/90	OR	8	71532N	163383W
07/26/90	OR	35	71532N	163383W
07/26/90	OR	250	71532N	163383W
07/26/90	OR	270	71532N	163383W
07/26/90	OR	240	71532N	163384W
07/26/90	OR	8	71532N	163384W
07/26/90	OR	12	71532N	163384W
07/26/90	OR	3	71532N	163384W
07/26/90	OR	180	71532N	163384W
07/26/90	OR	2	71532N	163384W
07/26/90	OR	2	71532N	163385W
07/26/90	OR	15	71532N	163385W
07/26/90	OR	1000	71532N	163385W
07/26/90	OR	22	71532N	163385W
07/26/90	OR	3	71532N	163385W
07/26/90	OR	9	71532N	163385W
07/26/90	OR	6	71532N	163386W
07/26/90	OR	5	71532N	163386W
07/26/90	OR	2	71532N	163386W
07/26/90	OR	6	71532N	163386W
07/26/90	OR	40	71532N	163386W
07/26/90	OR	5	71532N	163386W
07/26/90	OR	17	71532N	163387W
07/26/90	OR	7	71532N	163387W
07/26/90	OR	3	71532N	163387W
07/26/90	OR	9	71532N	163387W
07/26/90	OR	4	71532N	163387W
07/26/90	OR	7	71532N	163387W
07/26/90	OR	6	71532N	163388W
07/26/90	OR	15	71532N	163388W
07/26/90	OR	1	71532N	163388W
07/26/90	OR	20	71531N	163388W
07/26/90	OR	35	71531N	163388W
07/26/90	OR	4	71531N	163389W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	32	71531N	163389W
07/26/90	OR	3	71531N	163389W
07/26/90	OR	45	71531N	163389W
07/26/90	OR	30	71531N	163389W
07/26/90	OR	5	71531N	163389W
07/26/90	OR	12	71531N	163390W
07/26/90	OR	9	71531N	163390W
07/26/90	OR	2	71531N	163390W
07/26/90	OR	6	71531N	163390W
07/26/90	OR	5	71531N	163390W
07/26/90	OR	1	71531N	163390W
07/26/90	OR	16	71531N	163391W
07/26/90	OR	3	71531N	163391W
07/26/90	OR	4	71531N	163391W
07/26/90	OR	8	71531N	163391W
07/26/90	OR	12	71531N	163391W
07/26/90	OR	15	71531N	163391W
07/26/90	OR	250	71531N	163392W
07/26/90	OR	200	71531N	163392W
07/26/90	OR	350	71531N	163392W
07/26/90	OR	7	71531N	163392W
07/26/90	OR	3	71531N	163392W
07/26/90	OR	5	71531N	163392W
07/26/90	OR	4	71531N	163393W
07/26/90	OR	7	71531N	163393W
07/26/90	OR	2	71531N	163393W
07/26/90	OR	3	71531N	163393W
07/26/90	OR	80	71531N	163393W
07/26/90	OR	55	71531N	163393W
07/26/90	OR	120	71531N	163394W
07/26/90	OR	13	71531N	163394W
07/26/90	OR	25	71531N	163394W
07/26/90	OR	5	71531N	163394W
07/26/90	OR	4	71531N	163395W
07/26/90	OR	6	71531N	163395W
07/26/90	OR	5	71531N	163395W
07/26/90	OR	7	71531N	163396W
07/26/90	OR	2	71531N	163396W
07/26/90	OR	3	71531N	163397W
07/26/90	OR	9	71531N	163397W
07/26/90	OR	30	71531N	163397W
07/26/90	OR	6	71531N	163398W
07/26/90	OR	1	71531N	163398W
07/26/90	OR	3	71531N	163398W

BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	2	71531N	163399W
07/26/90	OR	5	71531N	163399W
07/26/90	OR	3	71531N	163400W
07/26/90	OR	5	71531N	163400W
07/26/90	OR	5	71531N	163400W
07/26/90	OR	1	71531N	163401W
07/26/90	OR	4	71531N	163401W
07/26/90	OR	7	71531N	163401W
07/26/90	OR	35	71531N	163402W
07/26/90	OR	1	71531N	163402W
07/26/90	OR	11	71531N	163403W
07/26/90	OR	10	71531N	163403W
07/26/90	OR	22	71531N	163403W
07/26/90	OR	3	71531N	163404W
07/26/90	OR	7	71531N	163404W
07/26/90	OR	6	71531N	163404W
07/26/90	OR	15	71531N	163405W
07/26/90	OR	70	71531N	163405W
07/26/90	OR	300	71531N	163405W
07/26/90	OR	300	71531N	163406W
07/26/90	OR	250	71531N	163406W
07/26/90	OR	20	71531N	163407W
07/26/90	OR	10	71531N	163407W
07/26/90	OR	60	71531N	163407W
07/26/90	OR	5	71531N	163408W
07/26/90	OR	8	71531N	163408W
07/26/90	OR	4	71531N	163408W
07/26/90	OR	2	71531N	163409W
07/26/90	OR	3	71531N	163409W
07/26/90	OR	3	71531N	163410W
07/26/90	OR	6	71531N	163410W
07/26/90	OR	6	71530N	163410W
07/26/90	OR	7	71530N	163411W
07/26/90	OR	7	71530N	163411W
07/26/90	OR	15	71530N	163411W
07/26/90	OR	18	71530N	163412W
07/26/90	OR	5	71530N	163412W
07/26/90	OR	3	71530N	163413W
07/26/90	OR	1	71530N	163413W
07/26/90	OR	1	71530N	163413W
07/26/90	OR	1	71530N	163414W
07/26/90	OR	5	71530N	163414W
07/26/90	OR	6	71530N	163414W
07/26/90	OR	2	71530N	163415W

[a] BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	3	71530N	163415W
07/26/90	OR	14	71530N	163415W
07/26/90	OR	19	71530N	163416W
07/26/90	OR	2	71530N	163416W
07/26/90	OR	2	71530N	163417W
07/26/90	OR	8	71530N	163417W
07/26/90	OR	23	71530N	163417W
07/26/90	OR	12	71530N	163418W
07/26/90	OR	6	71530N	163418W
07/26/90	OR	4	71530N	163418W
07/26/90	OR	2	71530N	163419W
07/26/90	OR	4	71530N	163419W
07/26/90	OR	400	71530N	163420W
07/26/90	OR	200	71530N	163420W
07/26/90	OR	3	71530N	163420W
07/26/90	OR	30	71530N	163421W
07/26/90	OR	70	71530N	163421W
07/26/90	OR	12	71530N	163421W
07/26/90	OR	15	71530N	163422W
07/26/90	OR	120	71530N	163422W
07/26/90	OR	10	71530N	163422W
07/26/90	OR	14	71530N	163423W
07/26/90	OR	6	71530N	163423W
07/26/90	OR	6	71530N	163424W
07/26/90	OR	15	71530N	163424W
07/26/90	OR	5	71530N	163424W
07/26/90	OR	3	71530N	163425W
07/26/90	OR	2	71530N	163425W
07/26/90	OR	4	71530N	163425W
07/26/90	OR	2	71530N	163426W
07/26/90	OR	22	71530N	163426W
07/26/90	OR	5	71530N	163427W
07/26/90	OR	40	71530N	163427W
07/26/90	OR	25	71530N	163427W
07/26/90	OR	45	71530N	163428W
07/26/90	OR	15	71530N	163428W
07/26/90	OR	7	71530N	163428W
07/26/90	OR	8	71530N	163429W
07/26/90	OR	35	71530N	163429W
07/26/90	OR	40	71530N	163430W
07/26/90	OR	2	71530N	163430W
07/26/90	OR	6	71530N	163430W
07/26/90	OR	2	71530N	163431W
07/26/90	OR	7	71530N	163431W

[a] BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	60	71530N	163431W
07/26/90	OR	4	71530N	163432W
07/26/90	OR	40	71530N	163432W
07/26/90	OR	17	71530N	163432W
07/26/90	OR	16	71530N	163433W
07/26/90	OR	5	71530N	163433W
07/26/90	OR	4	71530N	163434W
07/26/90	OR	25	71530N	163434W
07/26/90	OR	90	71530N	163434W
07/26/90	OR	3	71530N	163435W
07/26/90	OR	8	71530N	163435W
07/26/90	OR	25	71530N	163435W
07/26/90	OR	3	71530N	163436W
07/26/90	OR	6	71530N	163436W
07/26/90	OR	18	71530N	163437W
07/26/90	OR	15	71530N	163437W
07/26/90	OR	5	71530N	163437W
07/26/90	OR	20	71530N	163438W
07/26/90	OR	22	71530N	163438W
07/26/90	OR	20	71530N	163438W
07/26/90	OR	7	71530N	163439W
07/26/90	OR	22	71530N	163439W
07/26/90	OR	35	71530N	163439W
07/26/90	OR	6	71530N	163440W
07/26/90	OR	7	71530N	163440W
07/26/90	OR	25	71530N	163441W
07/26/90	OR	8	71530N	163441W
07/26/90	OR	5	71530N	163441W
07/26/90	OR	19	71530N	163442W
07/26/90	OR	11	71529N	163442W
07/26/90	OR	2	71529N	163442W
07/26/90	OR	6	71529N	163443W
07/26/90	OR	5	71529N	163443W
07/26/90	OR	8	71529N	163444W
07/26/90	OR	25	71529N	163444W
07/26/90	OR	3	71529N	163444W
07/26/90	OR	7	71529N	163445W
07/26/90	OR	8	71529N	163445W
07/26/90	OR	7	71529N	163445W
07/26/90	OR	5	71529N	163446W
07/26/90	OR	5	71529N	163446W
07/26/90	OR	3	71529N	163447W
07/26/90	OR	5	71529N	163447W
07/26/90	OR	12	71529N	163447W

[a] BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	9	71529N	163448W
07/26/90	OR	35	71529N	163448W
07/26/90	OR	45	71529N	163448W
07/26/90	OR	22	71529N	163449W
07/26/90	OR	9	71529N	163449W
07/26/90	OR	2	71529N	163449W
07/26/90	OR	12	71529N	163450W
07/26/90	OR	3	71529N	163450W
07/26/90	OR	6	71529N	163451W
07/26/90	OR	11	71529N	163451W
07/26/90	OR	1	71529N	163451W
07/26/90	OR	35	71529N	163452W
07/26/90	OR	30	71529N	163452W
07/26/90	OR	11	71529N	163452W
07/26/90	OR	4	71529N	163453W
07/26/90	OR	5	71529N	163453W
07/26/90	OR	4	71529N	163454W
07/26/90	OR	18	71529N	163454W
07/26/90	OR	2	71529N	163454W
07/26/90	OR	2	71529N	163455W
07/26/90	OR	2	71529N	163455W
07/26/90	OR	4	71529N	163455W
07/26/90	OR	5	71529N	163456W
07/26/90	OR	5	71529N	163456W
07/26/90	OR	3	71529N	163457W
07/26/90	OR	4	71529N	163457W
07/26/90	OR	6	71529N	163457W
07/26/90	OR	2	71529N	163458W
07/26/90	OR	2	71529N	163458W
07/26/90	OR	7	71529N	163460W
07/26/90	OR	5	71530N	163462W
07/26/90	OR	4	71530N	163463W
07/26/90	OR	4	71531N	163465W
07/26/90	OR	5	71536N	163479W
07/26/90	OR	5	71536N	163479W
07/26/90	OR	4	71536N	163479W
07/26/90	OR	6	71536N	163479W
07/26/90	OR	1	71536N	163479W
07/26/90	OR	18	71536N	163479W
07/26/90	OR	9	71536N	163479W
07/26/90	OR	8	71536N	163479W
07/26/90	OR	7	71536N	163479W
07/26/90	OR	3	71536N	163479W
07/26/90	OR	4	71536N	163479W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	2	71537N	163480W
07/26/90	OR	3	71537N	163480W
07/26/90	OR	22	71537N	163480W
07/26/90	OR	6	71537N	163480W
07/26/90	OR	3	71537N	163480W
07/26/90	OR	4	71537N	163480W
07/26/90	OR	4	71537N	163480W
07/26/90	OR	4	71537N	163480W
07/26/90	OR	9	71537N	163480W
07/26/90	OR	60	71537N	163480W
07/26/90	OR	27	71537N	163480W
07/26/90	OR	31	71537N	163480W
07/26/90	OR	38	71537N	163480W
07/26/90	OR	7	71537N	163480W
07/26/90	OR	6	71537N	163480W
07/26/90	OR	12	71537N	163480W
07/26/90	OR	7	71537N	163481W
07/26/90	OR	10	71537N	163481W
07/26/90	OR	11	71537N	163481W
07/26/90	OR	8	71537N	163481W
07/26/90	OR	9	71537N	163481W
07/26/90	OR	17	71537N	163481W
07/26/90	OR	8	71537N	163481W
07/26/90	OR	14	71537N	163481W
07/26/90	OR	10	71537N	163481W
07/26/90	OR	28	71537N	163481W
07/26/90	OR	4	71537N	163481W
07/26/90	OR	7	71537N	163481W
07/26/90	OR	32	71537N	163482W
07/26/90	OR	45	71537N	163482W
07/26/90	OR	50	71537N	163482W
07/26/90	OR	4	71537N	163482W
07/26/90	OR	6	71537N	163482W
07/26/90	OR	8	71537N	163482W
07/26/90	OR	7	71537N	163482W
07/26/90	OR	3	71537N	163482W
07/26/90	OR	11	71537N	163482W
07/26/90	OR	2	71537N	163482W
07/26/90	OR	13	71537N	163482W
07/26/90	OR	14	71537N	163482W
07/26/90	OR	120	71537N	163482W
07/26/90	OR	45	71537N	163482W
07/26/90	OR	2	71537N	163483W
07/26/90	OR	1	71537N	163483W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	1	71537N	163483W
07/26/90	OR	2	71537N	163483W
07/26/90	OR	35	71537N	163483W
07/26/90	OR	3	71537N	163483W
07/26/90	OR	32	71537N	163483W
07/26/90	OR	5	71537N	163483W
07/26/90	OR	36	71537N	163483W
07/26/90	OR	16	71537N	163483W
07/26/90	OR	4	71537N	163483W
07/26/90	OR	3	71537N	163483W
07/26/90	OR	21	71537N	163483W
07/26/90	OR	16	71537N	163483W
07/26/90	OR	19	71537N	163483W
07/26/90	OR	1	71537N	163483W
07/26/90	OR	7	71537N	163483W
07/26/90	OR	4	71537N	163483W
07/26/90	OR	3	71537N	163483W
07/26/90	OR	23	71538N	163484W
07/26/90	OR	8	71538N	163484W
07/26/90	OR	11	71538N	163484W
07/26/90	OR	17	71538N	163484W
07/26/90	OR	4	71538N	163484W
07/26/90	OR	6	71538N	163484W
07/26/90	OR	5	71538N	163484W
07/26/90	OR	10	71538N	163484W
07/26/90	OR	30	71538N	163484W
07/26/90	OR	11	71538N	163484W
07/26/90	OR	5	71538N	163484W
07/26/90	OR	15	71538N	163484W
07/26/90	OR	200	71538N	163484W
07/26/90	OR	1	71538N	163484W
07/26/90	OR	18	71538N	163484W
07/26/90	OR	2	71538N	163484W
07/26/90	OR	5	71538N	163484W
07/26/90	OR	35	71538N	163484W
07/26/90	OR	4	71538N	163485W
07/26/90	OR	5	71538N	163485W
07/26/90	OR	35	71538N	163485W
07/26/90	OR	4	71538N	163485W
07/26/90	OR	5	71538N	163485W
07/26/90	OR	5	71538N	163485W
07/26/90	OR	45	71538N	163485W
07/26/90	OR	4	71538N	163485W
07/26/90	OR	30	71538N	163485W

[a] BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	23	71538N	163485W
07/26/90	OR	2	71538N	163485W
07/26/90	OR	25	71538N	163485W
07/26/90	OR	55	71538N	163485W
07/26/90	OR	40	71538N	163485W
07/26/90	OR	6	71538N	163486W
07/26/90	OR	9	71538N	163486W
07/26/90	OR	3	71538N	163486W
07/26/90	OR	5	71538N	163486W
07/26/90	OR	8	71538N	163486W
07/26/90	OR	10	71538N	163486W
07/26/90	OR	4	71539N	163486W
07/26/90	OR	70	71539N	163486W
07/26/90	OR	2	71539N	163486W
07/26/90	OR	5	71539N	163486W
07/26/90	OR	9	71539N	163486W
07/26/90	OR	2	71539N	163487W
07/26/90	OR	15	71539N	163487W
07/26/90	OR	17	71539N	163487W
07/26/90	OR	4	71539N	163487W
07/26/90	OR	3	71539N	163487W
07/26/90	OR	22	71539N	163487W
07/26/90	OR	5	71539N	163487W
07/26/90	OR	15	71539N	163487W
07/26/90	OR	6	71539N	163487W
07/26/90	OR	18	71539N	163487W
07/26/90	OR	2	71539N	163487W
07/26/90	OR	65	71539N	163487W
07/26/90	OR	4	71539N	163488W
07/26/90	OR	30	71539N	163488W
07/26/90	OR	80	71539N	163488W
07/26/90	OR	75	71539N	163488W
07/26/90	OR	7	71539N	163488W
07/26/90	OR	20	71540N	163488W
07/26/90	OR	2	71540N	163488W
07/26/90	OR	16	71540N	163488W
07/26/90	OR	12	71540N	163488W
07/26/90	OR	30	71540N	163488W
07/26/90	OR	90	71540N	163488W
07/26/90	OR	5	71540N	163489W
07/26/90	OR	25	71540N	163489W
07/26/90	OR	10	71540N	163489W
07/26/90	OR	2	71540N	163489W
07/26/90	OR	12	71540N	163489W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	4	71540N	163489W
07/26/90	OR	4	71540N	163489W
07/26/90	OR	6	71540N	163489W
07/26/90	OR	13	71540N	163489W
07/26/90	OR	2	71540N	163489W
07/26/90	OR	2	71540N	163489W
07/26/90	OR	5	71540N	163490W
07/26/90	OR	2	71540N	163490W
07/26/90	OR	4	71540N	163490W
07/26/90	OR	28	71540N	163490W
07/26/90	OR	10	71540N	163490W
07/26/90	OR	5	71540N	163490W
07/26/90	OR	2	71541N	163490W
07/26/90	OR	9	71541N	163490W
07/26/90	OR	11	71541N	163490W
07/26/90	OR	6	71541N	163490W
07/26/90	OR	17	71541N	163490W
07/26/90	OR	8	71541N	163491W
07/26/90	OR	6	71541N	163491W
07/26/90	OR	11	71541N	163491W
07/26/90	OR	12	71541N	163491W
07/26/90	OR	10	71541N	163491W
07/26/90	OR	7	71541N	163491W
07/26/90	OR	12	71541N	163491W
07/26/90	OR	6	71541N	163491W
07/26/90	OR	1	71541N	163491W
07/26/90	OR	4	71541N	163491W
07/26/90	OR	2	71541N	163491W
07/26/90	OR	3	71541N	163491W
07/26/90	OR	4	71541N	163492W
07/26/90	OR	2	71541N	163492W
07/26/90	OR	4	71541N	163492W
07/26/90	OR	2	71541N	163492W
07/26/90	OR	15	71541N	163492W
07/26/90	OR	12	71542N	163492W
07/26/90	OR	6	71542N	163492W
07/26/90	OR	2	71542N	163492W
07/26/90	OR	2	71542N	163492W
07/26/90	OR	5	71542N	163492W
07/26/90	OR	13	71542N	163492W
07/26/90	OR	7	71542N	163493W
07/26/90	OR	5	71542N	163493W
07/26/90	OR	3	71542N	163493W
07/26/90	OR	6	71542N	163493W

[a] BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	6	71542N	163493W
07/26/90	OR	45	71542N	163493W
07/26/90	OR	30	71542N	163494W
07/26/90	OR	2	71543N	163495W
07/26/90	OR	12	71543N	163496W
07/26/90	OR	4	71543N	163497W
07/26/90	OR	7	71543N	163497W
07/26/90	OR	4	71544N	163498W
07/26/90	OR	6	71544N	163499W
07/26/90	OR	22	71544N	163500W
07/26/90	OR	7	71544N	163501W
07/26/90	OR	12	71545N	163502W
07/26/90	OR	250	71545N	163503W
07/26/90	OR	40	71545N	163504W
07/26/90	OR	25	71545N	163505W
07/26/90	OR	20	71546N	163506W
07/26/90	OR	14	71546N	163506W
07/26/90	OR	80	71546N	163507W
07/26/90	OR	35	71546N	163508W
07/26/90	OR	7	71547N	163509W
07/26/90	OR	15	71547N	163510W
07/26/90	OR	5	71547N	163511W
07/26/90	OR	2	71547N	163512W
07/26/90	OR	2	71548N	163513W
07/26/90	OR	2	71548N	163514W
07/26/90	OR	16	71548N	163514W
07/26/90	OR	45	71548N	163515W
07/26/90	OR	2	71549N	163516W
07/26/90	OR	12	71549N	163517W
07/26/90	OR	5	71549N	163518W
07/26/90	OR	9	71549N	163519W
07/26/90	OR	3	71550N	163520W
07/26/90	OR	5	71550N	163521W
07/26/90	OR	2	71550N	163522W
07/26/90	OR	12	71550N	163523W
07/26/90	OR	9	71551N	163523W
07/26/90	OR	4	71551N	163524W
07/26/90	OR	3	71551N	163525W
07/26/90	OR	2	71551N	163526W
07/26/90	OR	2	71552N	163527W
07/26/90	OR	2	71552N	163528W
07/26/90	OR	22	71552N	163529W
07/26/90	OR	2	71553N	163530W
07/26/90	OR	2	71553N	163531W

[a] BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	15	71553N	163531W
07/26/90	OR	8	71553N	163532W
07/26/90	OR	1	71554N	163533W
07/26/90	OR	13	71554N	163534W
07/26/90	OR	5	71554N	163535W
07/26/90	OR	80	71554N	163536W
07/26/90	OR	30	71555N	163537W
07/26/90	OR	28	71555N	163538W
07/26/90	OR	35	71555N	163539W
07/26/90	OR	60	71555N	163539W
07/26/90	OR	2	71556N	163540W
07/26/90	OR	70	71556N	163541W
07/26/90	OR	5	71556N	163542W
07/26/90	OR	18	71556N	163543W
07/26/90	OR	17	71557N	163544W
07/26/90	OR	2	71557N	163545W
07/26/90	OR	7	71557N	163546W
07/26/90	OR	3	71557N	163547W
07/26/90	OR	28	71558N	163548W
07/26/90	OR	1	71558N	163548W
07/26/90	OR	1	71558N	163549W
07/26/90	OR	65	71558N	163550W
07/26/90	OR	35	71559N	163551W
07/26/90	OR	2	71559N	163552W
07/26/90	OR	14	71559N	163553W
07/26/90	OR	14	71559N	163554W
07/26/90	OR	14	71560N	163555W
07/26/90	OR	14	71560N	163556W
07/26/90	OR	14	71560N	163556W
07/26/90	OR	1	71560N	163557W
07/26/90	OR	3	71561N	163558W
07/26/90	OR	4	71561N	163559W
07/26/90	OR	8	71561N	163560W
07/26/90	OR	12	71562N	163561W
07/26/90	OR	5	71562N	163562W
07/26/90	OR	4	71562N	163563W
07/26/90	OR	7	71562N	163564W
07/26/90	OR	30	71563N	163565W
07/26/90	OR	25	71563N	163565W
07/26/90	OR	20	71563N	163566W
07/26/90	OR	4	71563N	163567W
07/26/90	OR	22	71564N	163568W
07/26/90	OR	3	71564N	163569W
07/26/90	OR	8	71564N	163570W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	12	71564N	163571W
07/26/90	OR	19	71565N	163572W
07/26/90	OR	43	71565N	163573W
07/26/90	OR	5	71565N	163573W
07/26/90	OR	20	71565N	163574W
07/26/90	OR	3	71566N	163575W
07/26/90	OR	18	71566N	163576W
07/26/90	OR	4	71566N	163577W
07/26/90	OR	3	71566N	163578W
07/26/90	OR	7	71567N	163579W
07/26/90	OR	35	71567N	163580W
07/26/90	OR	5	71567N	163581W
07/26/90	OR	2	71567N	163581W
07/26/90	OR	2	71568N	163582W
07/26/90	OR	4	71568N	163583W
07/26/90	OR	2	71568N	163584W
07/26/90	OR	35	71568N	163585W
07/26/90	OR	1	71569N	163586W
07/26/90	OR	35	71569N	163587W
07/26/90	OR	10	71569N	163588W
07/26/90	OR	17	71569N	163589W
07/26/90	OR	3	71570N	163590W
07/26/90	OR	2	71570N	163590W
07/26/90	OR	4	71570N	163591W
07/26/90	OR	14	71570N	163592W
07/26/90	OR	8	71571N	163593W
07/26/90	OR	2	71571N	163595W
07/26/90	OR	2	71584N	163595W
07/26/90	OR	4	71584N	163595W
07/26/90	OR	9	71585N	163595W
07/26/90	OR	4	71585N	163595W
07/26/90	OR	30	71585N	163596W
07/26/90	OR	4	71585N	163596W
07/26/90	OR	4	71586N	163596W
07/26/90	OR	2	71586N	163596W
07/26/90	OR	6	71586N	163596W
07/26/90	OR	9	71587N	163596W
07/26/90	OR	120	71587N	163596W
07/26/90	OR	3	71587N	163597W
07/26/90	OR	18	71587N	163597W
07/26/90	OR	2	71588N	163597W
07/26/90	OR	5	71588N	163597W
07/26/90	OR	25	71588N	163597W
07/26/90	OR	3	71589N	163597W

[a] BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	20	71589N	163597W
07/26/90	OR	25	71589N	163598W
07/26/90	OR	2	71589N	163598W
07/26/90	OR	20	71590N	163598W
07/26/90	OR	4	71590N	163598W
07/26/90	OR	23	71590N	163598W
07/26/90	OR	2	71591N	163598W
07/26/90	OR	12	71591N	163598W
07/26/90	OR	1	71591N	163599W
07/26/90	OR	1	71591N	163599W
07/26/90	OR	4	71592N	163599W
07/26/90	OR	25	71592N	163599W
07/26/90	OR	3	71592N	163599W
07/26/90	OR	2	71593N	163599W
07/26/90	OR	4	71593N	163599W
07/26/90	OR	7	71593N	164 00W
07/26/90	OR	1	71593N	164 00W
07/26/90	OR	1	71594N	164 00W
07/26/90	OR	3	71594N	164000W
07/26/90	OR	3	71594N	164000W
07/26/90	OR	4	71594N	164000W
07/26/90	OR	1	71594N	164000W
07/26/90	OR	7	71594N	164000W
07/26/90	OR	1	72060N	163532W
07/26/90	OR	2	72060N	163532W
07/26/90	OR	2	72079N	164025W
07/26/90	OR	3	72 78N	164 27W
07/26/90	OR	5	72 78N	164 29W
07/26/90	OR	30	72 77N	164 31W
07/26/90	OR	3	72 77N	164 33W
07/26/90	OR	3	72 76N	164 35W
07/26/90	OR	5	72 76N	164 37W
07/26/90	OR	2	72 75N	164 39W
07/26/90	OR	1	72 74N	164 41W
07/26/90	OR	1	72 74N	164 43W
07/26/90	OR	2	72 73N	164 46W
07/26/90	OR	3	72 73N	164 48W
07/26/90	OR	18	72 72N	164 50W
07/26/90	OR	45	72 72N	164 52W
07/26/90	OR	2	72 71N	164 54W
07/26/90	OR	40	72 70N	164 56W
07/26/90	OR	2	72 70N	164 58W
07/26/90	OR	3	72 69N	164 60W
07/26/90	OR	2	72 69N	164 62W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/26/90	OR	2	72 68N	164 64W
07/26/90	OR	5	72 68N	164 66W
07/26/90	OR	8	72 67N	164 68W
07/26/90	OR	7	72 67N	164 70W
07/26/90	OR	5	72 66N	164 72W
07/26/90	OR	3	72 65N	164 74W
07/26/90	OR	13	72 65N	164 76W
07/26/90	OR	5	72 64N	164 78W
07/26/90	OR	1	72 64N	164 80W
07/26/90	OR	6	72 63N	164 83W
07/26/90	OR	60	72 63N	164 85W
07/26/90	OR	2	72 62N	164 87W
07/26/90	OR	7	72 61N	164 89W
07/26/90	OR	2	72 61N	164 91W
07/26/90	OR	10	72 60N	164 93W
07/26/90	OR	4	72 60N	164 95W
07/26/90	OR	2	72 59N	164 97W
07/26/90	OR	2	72 59N	164 99W
07/27/90	PL	1	71497N	165444W
07/29/90	OR	1	71221N	162341W
07/29/90	OR	30	71221N	162341W
07/29/90	OR	2	71218N	162057W
07/29/90	OR	1	71243N	162062W
07/29/90	OR	1	71063N	162343W
07/29/90	OR	1	71097N	162358W
07/29/90	OR	1	71121N	162377W
07/30/90	OR	1	71133N	162049W
07/30/90	OR	2	71139N	162066W
07/30/90	EB	1	71139N	162070W
07/30/90	OR	1	71143N	162120W
07/30/90	OR	1	71163N	162323W
07/31/90	US	1	71085N	162371W
07/31/90	EB	1	71086N	162373W
07/31/90	EB	1	71087N	162374W
07/31/90	EB	1	71090N	162384W
07/31/90	EB	1	71106N	162441W
07/31/90	EB	1	71108N	162463W
07/31/90	EB	1	71111N	162486W
07/31/90	US	1	71155N	163076W
07/31/90	PH	1	71142N	162485W
07/31/90	EB	1	71141N	162432W
07/31/90	PH	1	71141N	162429W
07/31/90	EB	1	71140N	162417W
07/31/90	US	2	71140N	162417W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
07/31/90	US	1	71140N	162411W
07/31/90	US	1	71139N	162401W
07/31/90	US	1	71138N	162380W
07/31/90	EB	1	71137N	162373W
07/31/90	US	1	71131N	162349W
07/31/90	US	1	71126N	162318W
07/31/90	US	1	71124N	162311W
07/31/90	US	1	71121N	162299W
07/31/90	EB	1	71119N	162289W
07/31/90	US	1	71119N	162211W
08/01/90	EB	1	71076N	162566W
08/01/90	PH	1	71074N	162563W
08/01/90	US	1	71065N	162555W
08/01/90	US	1	71062N	162553W
08/01/90	PH	1	71060N	162552W
08/01/90	US	1	71052N	162562W
08/01/90	EB	1	71047N	162571W
08/01/90	EB	1	71047N	162571W
08/01/90	EB	1	71045N	162585W
08/01/90	EB	1	71045N	162588W
08/01/90	EB	1	71045N	162592W
08/01/90	UP	1	71046N	163027W
08/01/90	PH	1	71046N	163027W
08/01/90	PH	1	71048N	163050W
08/01/90	OR	12	71060N	163089W
08/01/90	OR	1	71 61N	163 89W
08/01/90	OR	12	71 61N	163 90W
08/01/90	OR	5	71 62N	163 90W
08/01/90	OR	6	71 62N	163 90W
08/01/90	OR	30	71 63N	163 90W
08/01/90	OR	20	71 64N	163 91W
08/01/90	OR	5	71 64N	163 91W
08/01/90	OR	4	71 65N	163 91W
08/01/90	OR	5	71 65N	163 91W
08/01/90	OR	4	71 66N	163 92W
08/01/90	OR	5	71 67N	163 92W
08/01/90	OR	3	71 67N	163 92W
08/01/90	OR	13	71 68N	163 93W
08/01/90	OR	3	71 68N	163 93W
08/01/90	OR	1	71 69N	163 93W
08/01/90	OR	25	71 70N	163 93W
08/01/90	OR	50	71 70N	163 94W
08/01/90	OR	2	71 71N	163 94W
08/01/90	OR	2	71 71N	163 94W

[a] BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
08/01/90	OR	4	71 72N	163 94W
08/01/90	OR	8	71 72N	163 95W
08/01/90	OR	16	71 73N	163 95W
08/01/90	OR	9	71 74N	163 95W
08/01/90	OR	8	71 74N	163 95W
08/01/90	OR	6	71 75N	163 96W
08/01/90	OR	12	71 75N	163 96W
08/01/90	OR	3	71 76N	163 96W
08/01/90	OR	2	71 77N	163 97W
08/01/90	OR	3	71 77N	163 97W
08/01/90	OR	2	71 78N	163 97W
08/01/90	OR	3	71 78N	163 97W
08/01/90	OR	13	71 79N	163 98W
08/01/90	OR	12	71 80N	163 98W
08/01/90	OR	6	71 80N	163 98W
08/01/90	OR	2	71 81N	163 98W
08/01/90	OR	8	71 81N	163 99W
08/01/90	OR	1	71182N	163121W
08/01/90	UP	2	71319N	163279W
08/01/90	UP	3	71336N	163252W
08/01/90	UP	2	71339N	163246W
08/01/90	UP	1	71339N	163246W
08/01/90	US	1	71342N	163235W
08/01/90	OR	4	71338N	163189W
08/01/90	UP	3	71338N	163189W
08/01/90	UP	2	71338N	163189W
08/01/90	EB	1	71338N	163189W
08/01/90	UP	2	71331N	163184W
08/01/90	UP	2	71331N	163184W
08/01/90	OR	4	71326N	163184W
08/01/90	UP	2	71326N	163184W
08/01/90	OR	4	71308N	163183W
08/01/90	UP	1	71301N	163179W
08/01/90	UP	1	71294N	163175W
08/01/90	OR	1	71287N	163171W
08/01/90	US	2	71287N	163171W
08/01/90	UP	1	71287N	163171W
08/01/90	US	1	71275N	163165W
08/01/90	UP	1	71275N	163165W
08/01/90	US	1	71182N	163140W
08/01/90	US	2	71182N	163140W
08/01/90	OR	1	71147N	163048W
08/01/90	US	1	71147N	163048W
08/01/90	US	1	71141N	163020W

• BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
08/01/90	OR	1	71141N	163020W
08/02/90	PH	1	71101N	162521W
08/02/90	US	2	71101N	162521W
08/02/90	EB	1	71194N	163143W
08/03/90	OR	1	71187N	163115W
08/03/90	OR	1	71187N	163116W
08/03/90	OR	25	71213N	163079W
08/03/90	OR	1	71213N	163079W
08/03/90	OR	70	71213N	163079W
08/03/90	OR	6	71213N	163079W
08/03/90	OR	6	71221N	163099W
08/03/90	OR	1	71223N	163113W
08/03/90	OR	1	71223N	163113W
08/03/90	OR	2	71223N	163113W
08/03/90	PH	1	71232N	163143W
08/03/90	OR	6	71239N	163149W
08/03/90	OR	10	71239N	163149W
08/03/90	OR	3	71239N	163149W
08/03/90	OR	5	71239N	163149W
08/03/90	OR	3	71257N	163198W
08/03/90	OR	7	71256N	163198W
08/03/90	OR	1	71255N	163198W
08/03/90	OR	21	71255N	163198W
08/03/90	OR	5	71254N	163198W
08/03/90	OR	30	71253N	163198W
08/03/90	OR	1	71252N	163198W
08/03/90	OR	2	71251N	163198W
08/03/90	OR	30	71251N	163198W
08/03/90	OR	6	71250N	163198W
08/03/90	OR	2	71249N	163198W
08/03/90	OR	7	71248N	163198W
08/03/90	OR	16	71247N	163198W
08/03/90	OR	2	71247N	163198W
08/03/90	OR	4	71246N	163198W
08/03/90	OR	5	71245N	163198W
08/03/90	OR	1	71244N	163198W
08/03/90	OR	1	71243N	163198W
08/03/90	OR	4	71243N	163198W
08/03/90	OR	2	71242N	163198W
08/04/90	OR	3	71159N	162321W
08/04/90	OR	4	71162N	162276W
08/04/90	OR	8	71163N	162272W
08/04/90	OR	1	71163N	162267W
08/04/90	OR	2	71164N	162263W

• BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
08/04/90	OR	20	71165N	162259W
08/04/90	OR	7	71165N	162254W
08/04/90	OR	2	71166N	162250W
08/04/90	OR	10	71167N	162221W
08/04/90	OR	3	71152N	162279W
08/04/90	OR	2	71152N	162279W
08/05/90	UM	1	71194N	162149W
08/05/90	OR	2	71236N	162253W
08/05/90	OR	1	71226N	162308W
08/05/90	OR	1	71226N	162308W
08/05/90	OR	1	71204N	162551W
08/05/90	US	1	71204N	162551W
08/08/90	EB	1	71257N	162500W
08/08/90	EB	1	71301N	162392W
08/08/90	UM	2	71301N	162392W
08/08/90	EB	1	71302N	162434W
08/08/90	EB	1	71302N	162434W
08/08/90	EB	1	71297N	162456W
08/08/90	EB	1	71296N	162465W
08/08/90	EB	1	71288N	162552W
08/08/90	EB	1	71296N	162540W
08/08/90	PH	1	71309N	162543W
08/08/90	US	1	71309N	162546W
08/08/90	US	1	71311N	162597W
08/09/90	PH	1	71203N	163155W
08/09/90	EB	1	71203N	163181W
08/09/90	PH	1	71208N	163182W
08/09/90	PH	1	71216N	163186W
08/09/90	PH	1	71222N	163194W
08/09/90	OR	4	71293N	163203W
08/09/90	OR	22	71294N	163206W
08/09/90	OR	13	71295N	163207W
08/09/90	OR	18	71295N	163207W
08/09/90	OR	3	71295N	163207W
08/09/90	OR	4	71295N	163207W
08/09/90	OR	16	71295N	163207W
08/09/90	OR	10	71295N	163207W
08/09/90	OR	1	71312N	163222W
08/09/90	EB	1	71312N	163222W
08/09/90	OR	25	71288N	163205W
08/09/90	OR	22	71288N	163205W
08/09/90	OR	40	71288N	163205W
08/09/90	OR	35	71288N	163205W
08/09/90	OR	1	71249N	163178W

[a] BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
08/09/90	OR	35	71263N	163264W
08/10/90	OR	18	71231N	163012W
08/10/90	OR	2	71230N	162598W
08/10/90	OR	7	71230N	162583W
08/10/90	OR	2	71223N	162545W
08/10/90	OR	12	71223N	162545W
08/10/90	OR	8	71220N	162536W
08/10/90	OR	7	71215N	162533W
08/10/90	PH	1	71190N	162577W
08/11/90	UM	3	71161N	163119W
08/12/90	EB	1	71160N	163266W
08/12/90	PH	1	71142N	163222W
08/13/90	PL	1	71141N	163203W
08/14/90	PL	1	71174N	163219W
08/14/90	OR	3	71170N	163199W
08/14/90	PL	1	71169N	163187W
08/20/90	US	1	71171N	163081W
08/21/90	OR	3	72152N	164145W
08/21/90	OR	15	72152N	164145W
08/21/90	OR	2	72166N	163579W
08/21/90	OR	35	72166N	163579W
08/21/90	OR	6	72166N	163579W
08/21/90	OR	1	72166N	163579W
08/21/90	OR	10	72168N	163565W
08/21/90	OR	20	72169N	163557W
08/22/90	OR	2	72187N	163557W
08/22/90	OR	2	72187N	163557W
08/22/90	OR	1	72187N	163557W
08/22/90	OR	5	72187N	163557W
08/22/90	OR	12	72187N	163557W
08/22/90	OR	13	72169N	163509W
08/22/90	OR	1	72169N	163509W
08/22/90	OR	3	72169N	163509W
08/22/90	OR	2	72169N	163509W
08/22/90	OR	1	72169N	163509W
08/22/90	OR	4	72169N	163509W
08/22/90	OR	1	72169N	163509W
08/22/90	OR	22	72169N	163509W
08/22/90	OR	1	72166N	163500W
08/22/90	OR	1	72159N	163472W
08/22/90	OR	32	72156N	163463W
08/22/90	OR	45	72156N	163463W
08/22/90	OR	2	72156N	163460W
08/22/90	OR	2	72156N	163460W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
08/22/90	OR	6	72161N	163442W
08/22/90	OR	18	72161N	163442W
08/22/90	OR	12	72161N	163442W
08/22/90	OR	4	72161N	163442W
08/22/90	OR	8	72161N	163442W
08/22/90	OR	13	72169N	163462W
08/22/90	OR	1	72176N	163481W
08/22/90	OR	14	72163N	164033W
08/22/90	OR	2	72153N	164236W
08/22/90	OR	2	72193N	164241W
08/22/90	OR	1	72222N	164217W
08/22/90	OR	2	72225N	164211W
08/22/90	OR	1	72258N	164148W
08/22/90	OR	2	72264N	164136W
08/22/90	OR	4	72274N	164117W
08/22/90	OR	2	72273N	164112W
08/22/90	OR	2	72272N	164107W
08/22/90	OR	1	72270N	164092W
08/22/90	OR	1	72269N	164087W
08/22/90	OR	10	72226N	164059W
08/22/90	OR	1	72226N	164059W
08/22/90	OR	3	72226N	164059W
08/22/90	OR	65	72226N	164059W
08/22/90	OR	3	72252N	164030W
08/22/90	OR	30	72252N	164030W
08/22/90	OR	1	72208N	164073W
08/22/90	OR	1	72194N	164104W
08/22/90	OR	2	72187N	164118W
08/24/90	US	1	71530N	165520W
08/24/90	PH	1	71534N	165521W
09/08/90	PH	1	71489N	165479W
09/14/90	OR	1	71513N	165540W
09/15/90	OR	2	71514N	165356W
09/15/90	US	1	71492N	165503W
09/15/90	OR	1	71492N	165503W
09/15/90	OR	1	71492N	165503W
09/16/90	OR	1	71532N	165497W
09/16/90	OR	1	71532N	165497W
09/20/90	OR	1	71511N	165484W
09/21/90	US	1	71492N	165416W
09/21/90	OR	1	71509N	165463W
09/22/90	US	1	71495N	165489W
09/22/90	US	1	71511N	165494W
09/22/90	EB	1	71515N	165490W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-3. Animal sighting record.

Date	Species	Number	Latitude	Longitude
09/22/90	UP	1	71421N	165416W
09/24/90	EB	1	71306N	165204W
09/27/90	PH	1	71267N	165289W
09/27/90	OR	1	71251N	165325W
09/27/90	OR	2	71251N	165325W
09/27/90	OR	1	71251N	165325W
09/28/90	PH	1	71238N	165464W
09/28/90	PH	1	71238N	165464W
10/01/90	PH	1	71234N	165311W
10/01/90	PH	1	71234N	165311W
10/02/90	UP	1	71234N	165311W
10/02/90	US	3	71234N	165311W
10/02/90	US	1	71234N	165311W
10/02/90	PH	1	71301N	165449W
10/02/90	UP	1	71425N	164446W
10/03/90	UP	1	71455N	166119W
10/03/90	PH	1	71428N	166082W
10/03/90	OR	1	71251N	165325W
10/03/90	OR	1	71251N	165325W
10/04/90	EB	1	71230N	165326W
10/08/90	EB	1	71266N	165213W
10/08/90	OR	1	71266N	165213W
10/09/90	PH	1	71203N	165378W
10/10/90	OR	2	71214N	165304W
10/10/90	PH	1	71192N	165328W

* BA=minke whale, DL=belukha whale, EB=bearded seal, ER=gray whale, OR=walrus, PF=ribbon seal, PH=ringed seal, PL=spotted seal, UM=polar bear, UP=unidentified pinniped, US=unidentified phocid, UZ=unidentified large whale.

Table B-4. Summary of marine mammal sightings recorded by the crew of the Explorer III, Robert LeMeur, Supplier III, and Supplier IV.

DATE	PROSPECT	SPECIES	NUMBER	VESSEL
August 1990	Burger	Pacific walrus	1	Robert LeMeur
September 1990	Popcorn	Pacific walrus	2	Robert LeMeur
September 1990	Popcorn	Pacific walrus	2	Supplier IV
September 1990	Popcorn	Pacific walrus	2	Supplier IV
September 1990	Popcorn	Pacific walrus	1	Explorer III
September 1990	Popcorn	Pacific walrus	1	Supplier III
September 1990	Popcorn	Pacific walrus	1	Explorer III
September 1990	Popcorn	Pacific walrus	1	Explorer III
September 1990	Popcorn	Pacific walrus	1	Explorer III
September 1990	Popcorn	Unidentified pinniped	1	Robert LeMeur
September 1990	Popcorn	Unidentified pinniped	1	Supplier III
September 1990	Popcorn	Pacific walrus	1	Robert LeMeur
TOTAL			**15**	

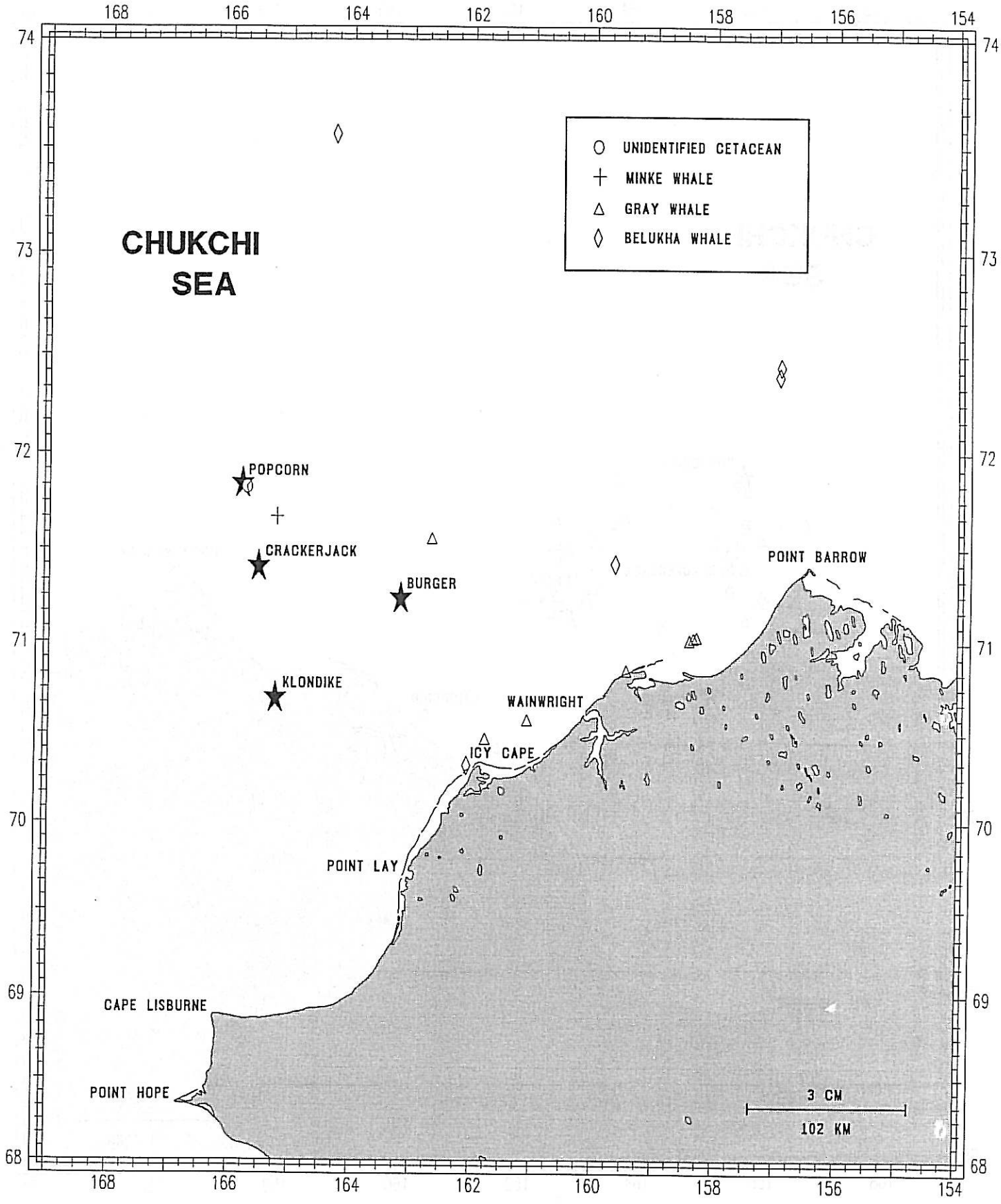

Figure B-1. The distribution of belukha, gray, minke, and unidentified whale sightings in the Chukchi Sea during the drilling season, 1990.

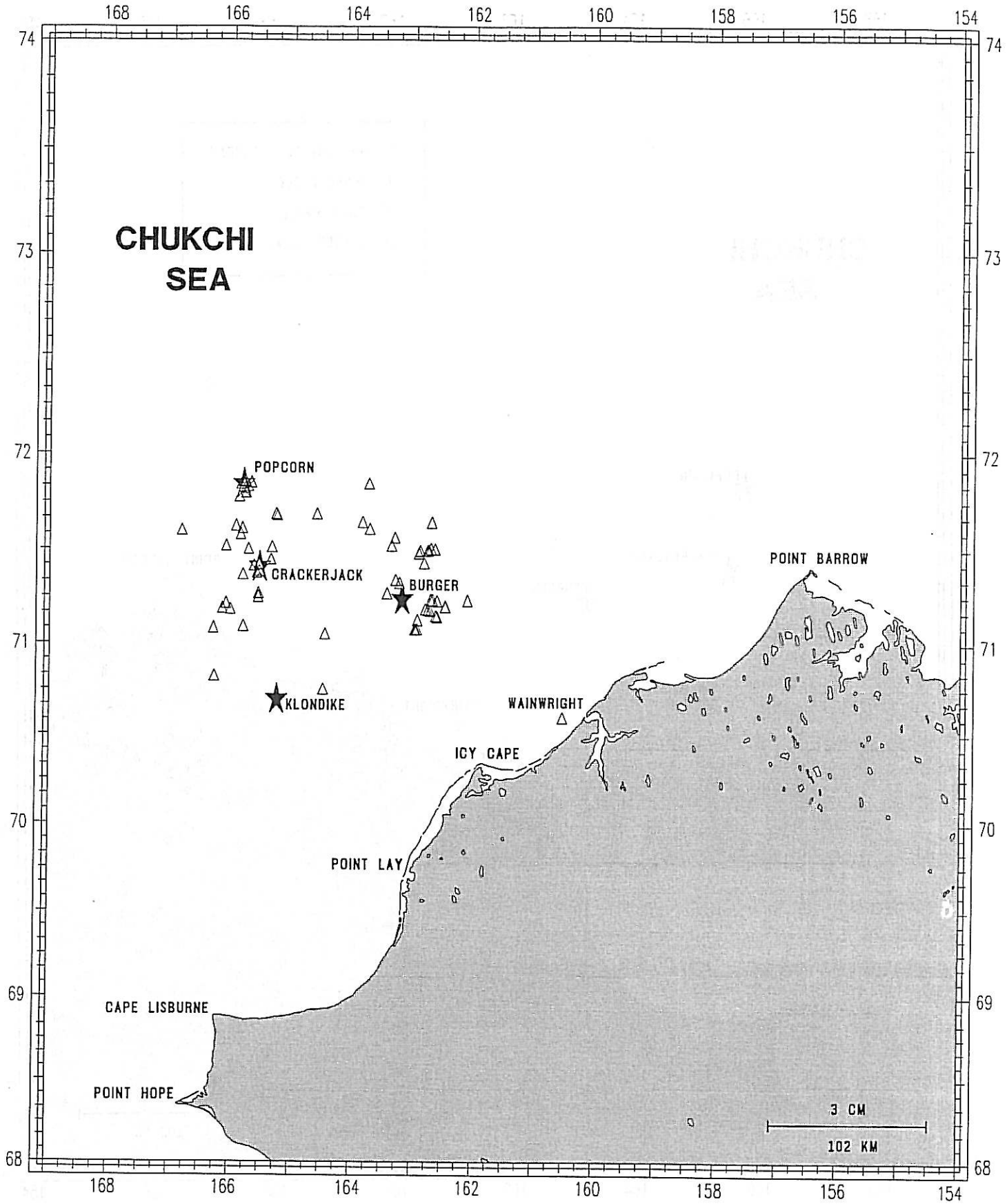

Figure B-2. The distribution of bearded seal sightings (▵) in the Chukchi Sea during the drilling season, 1990.

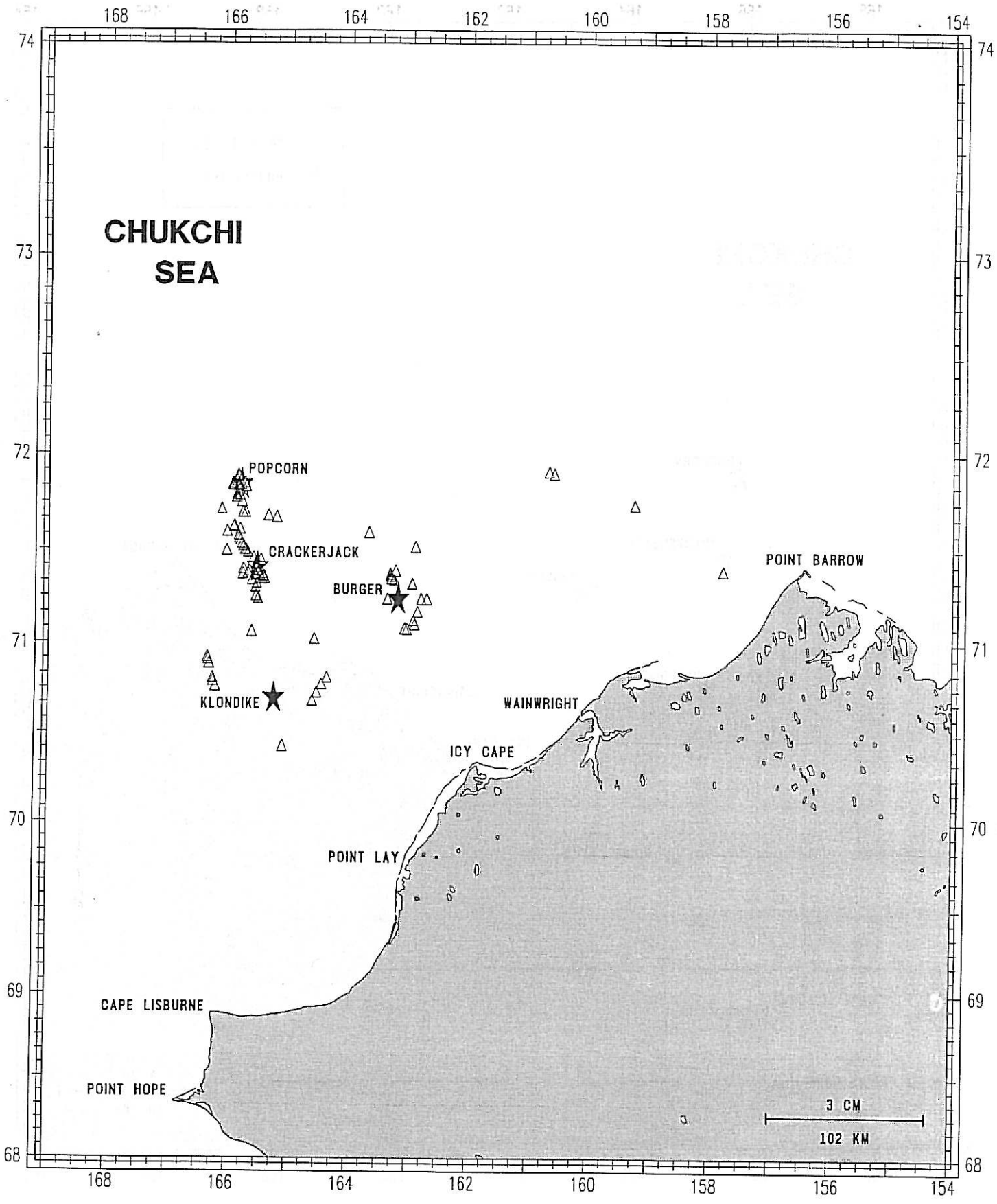

Figure B-3. The distribution of ringed seal sightings (△) in the Chukchi Sea during the drilling season, 1990.

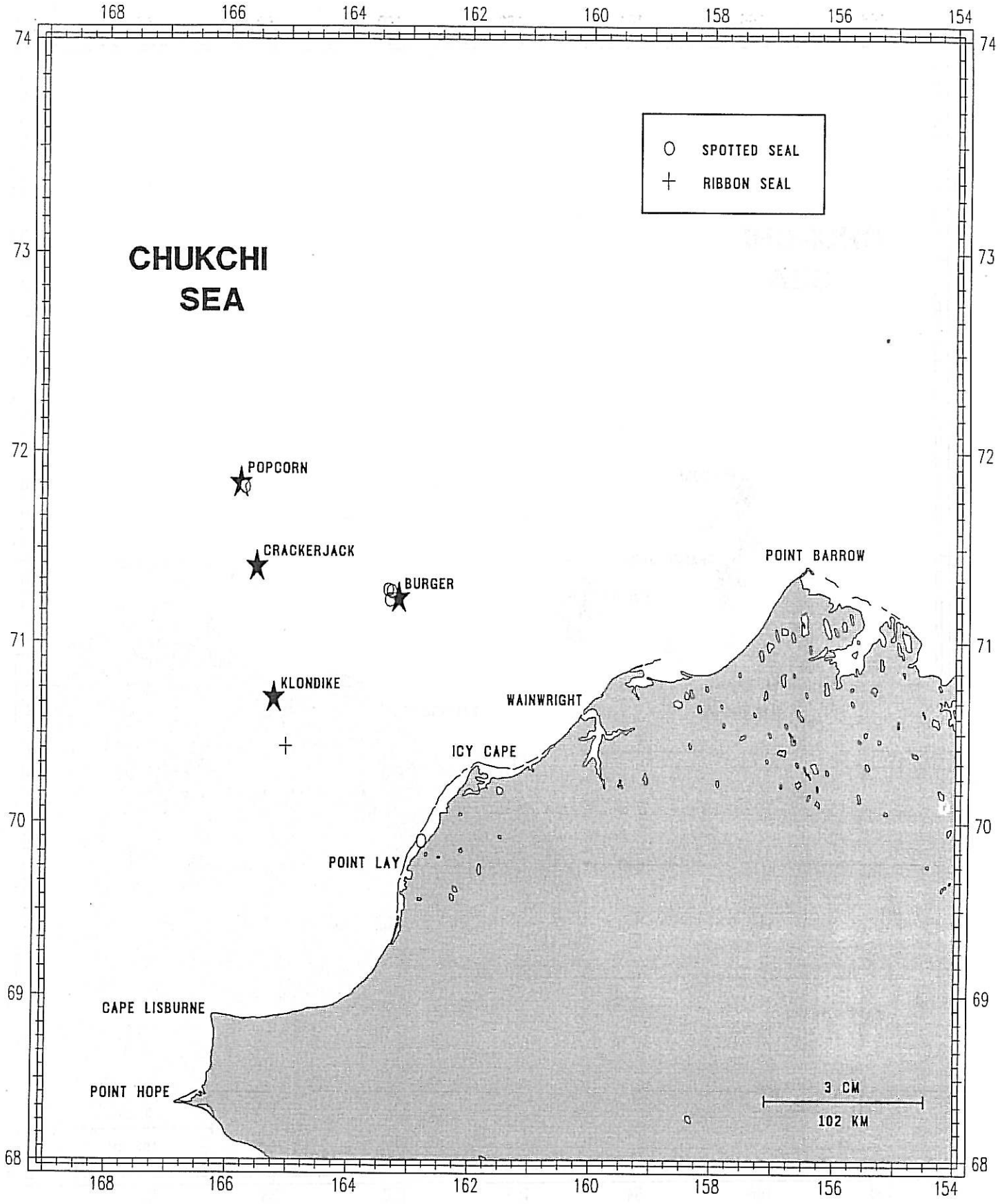

Figure B-4. The distribution of ribbon and spotted seal sightings in the Chukchi Sea during the drilling season, 1990.

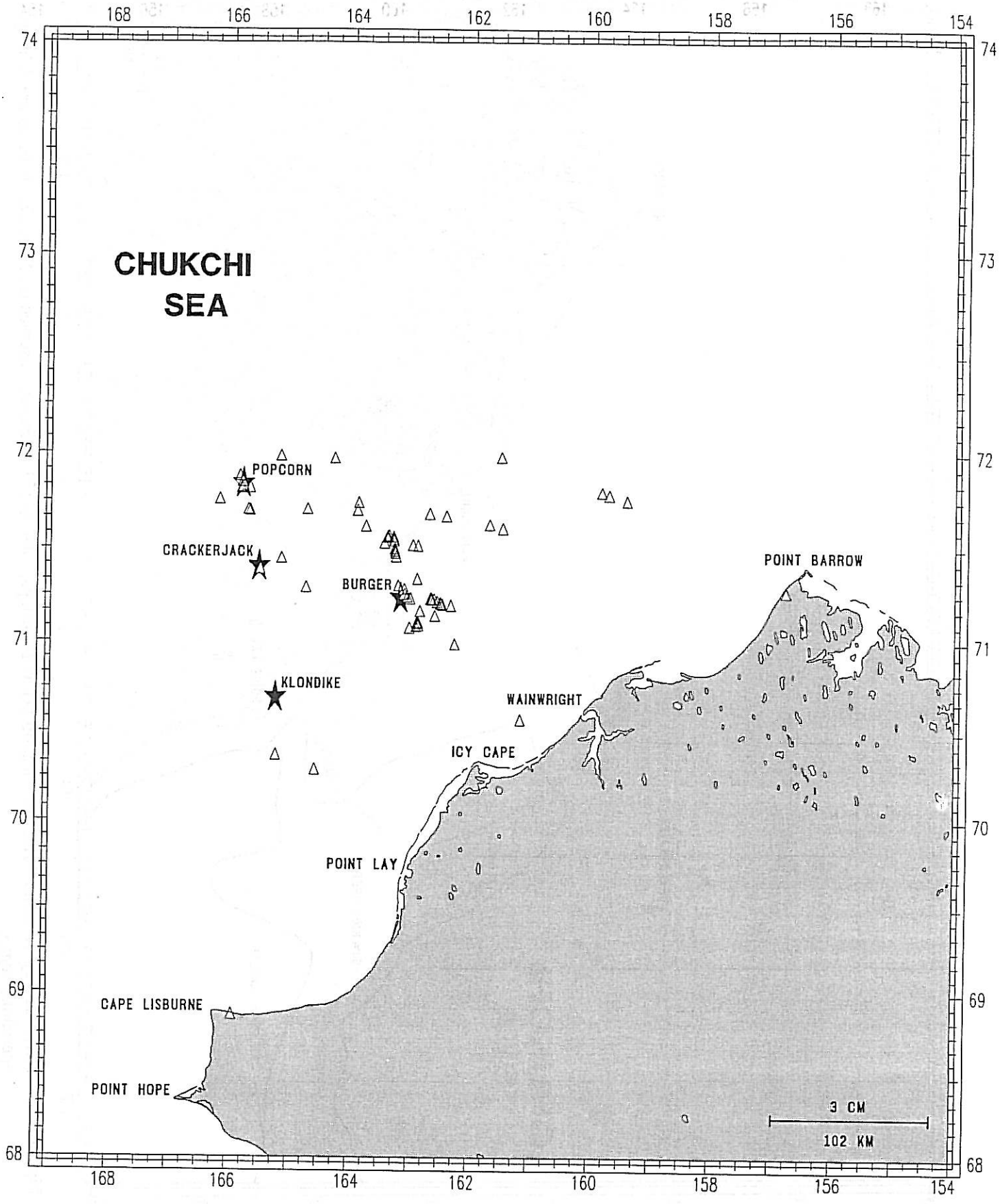

Figure B-5. The distribution of unidentified pinniped sightings (△) in the Chukchi Sea during the drilling season, 1990.

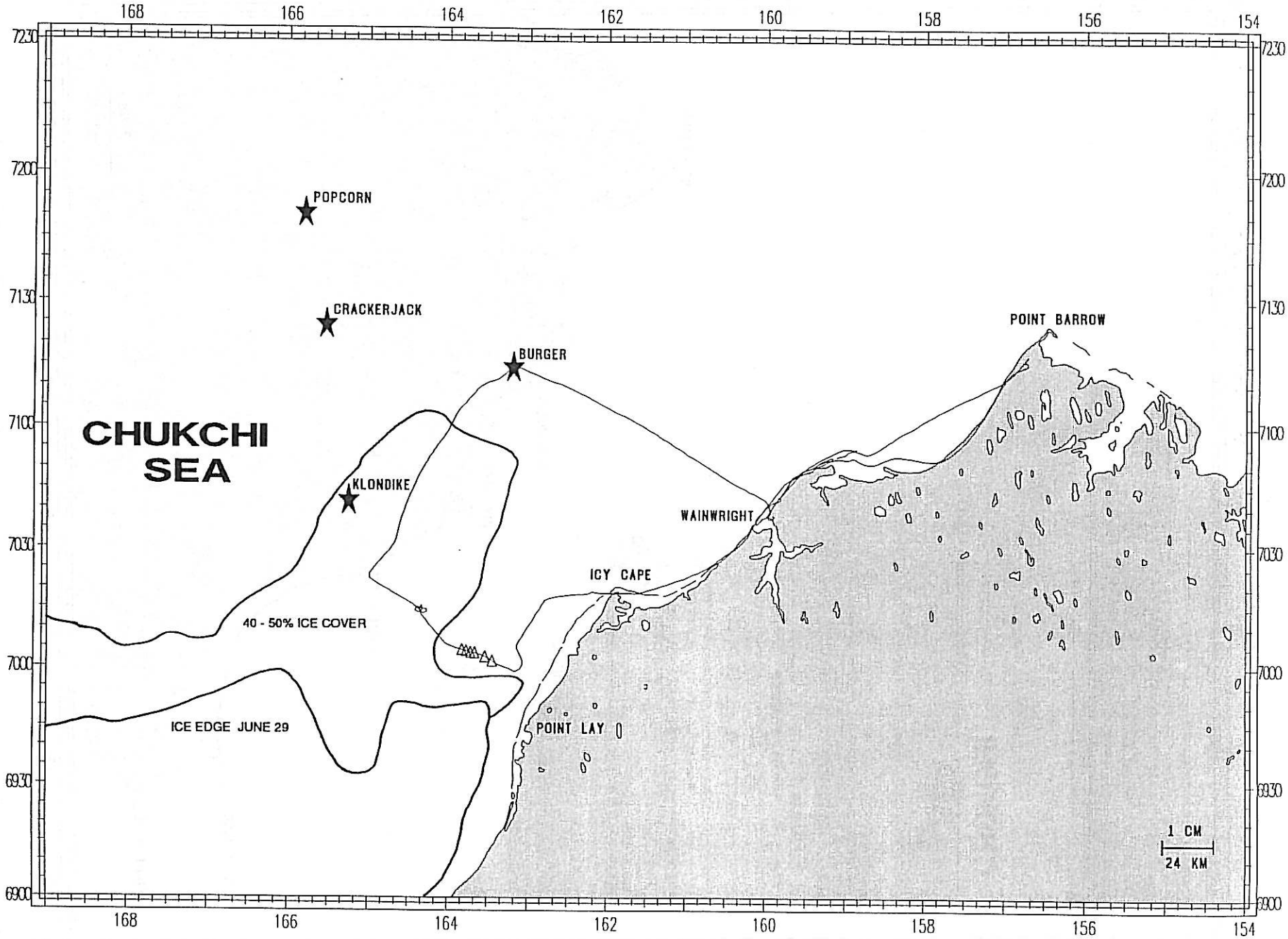

Figure B-6. Aerial survey trackline flown and location (▵) of 14 groups, totaling 581 walruses, observed on June 29, 1990, before drilling operations began.

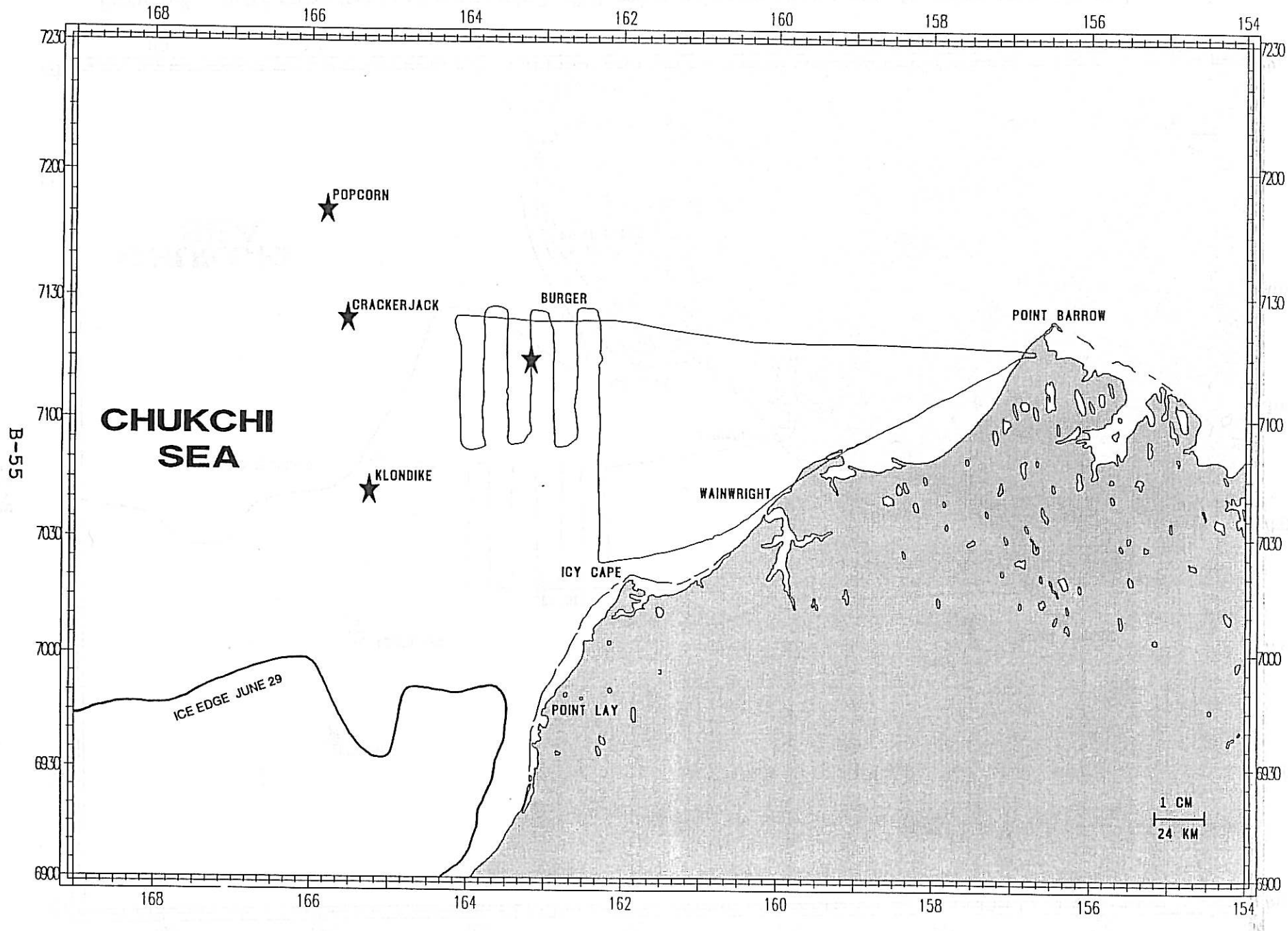

Figure B-7. Aerial survey trackline flown on July 1, 1990, before drilling operations began. No walruses were observed.

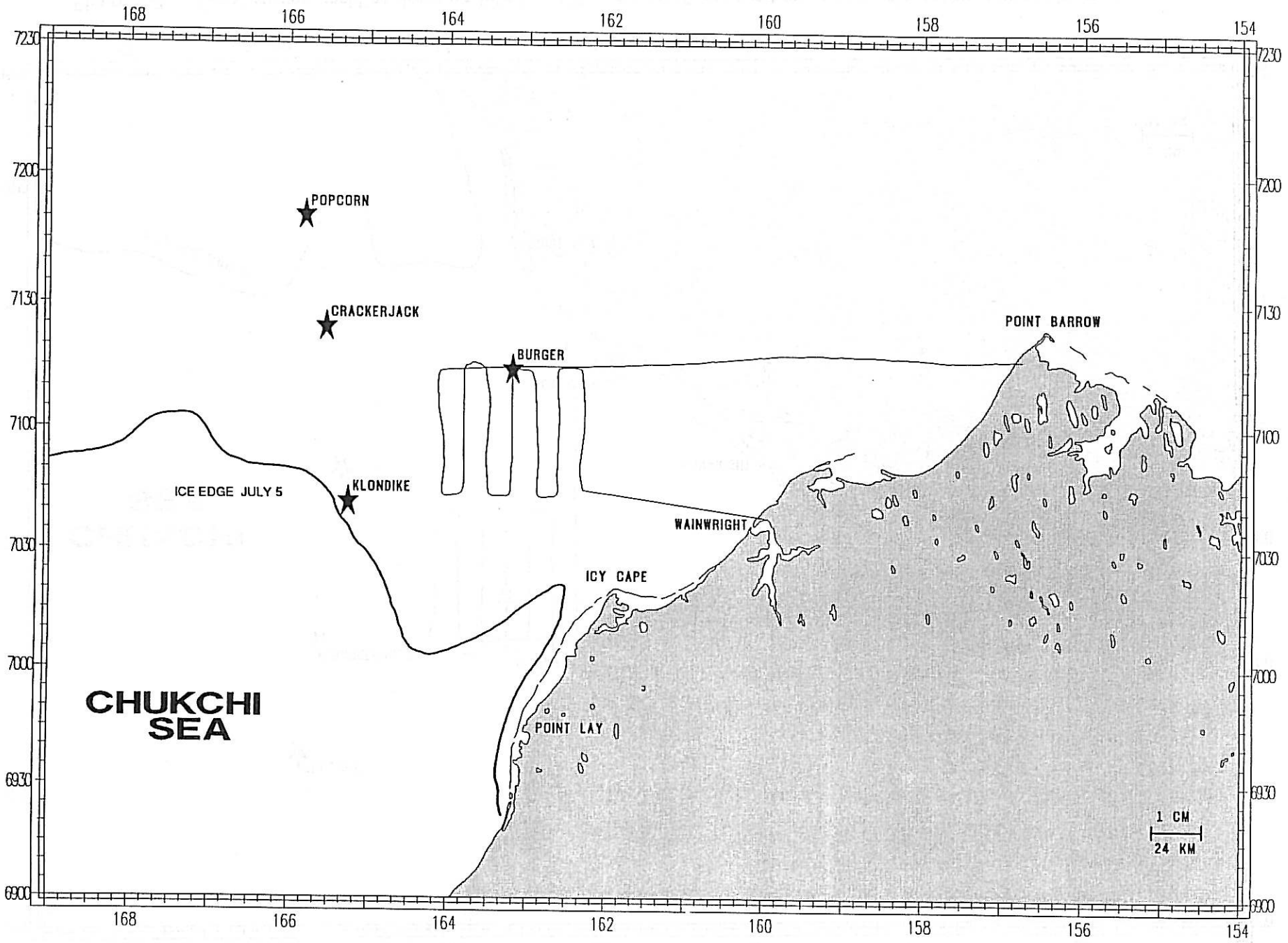

Figure B-8. Aerial survey trackline flown on July 3, 1990, before drilling operations began. No walruses were observed.

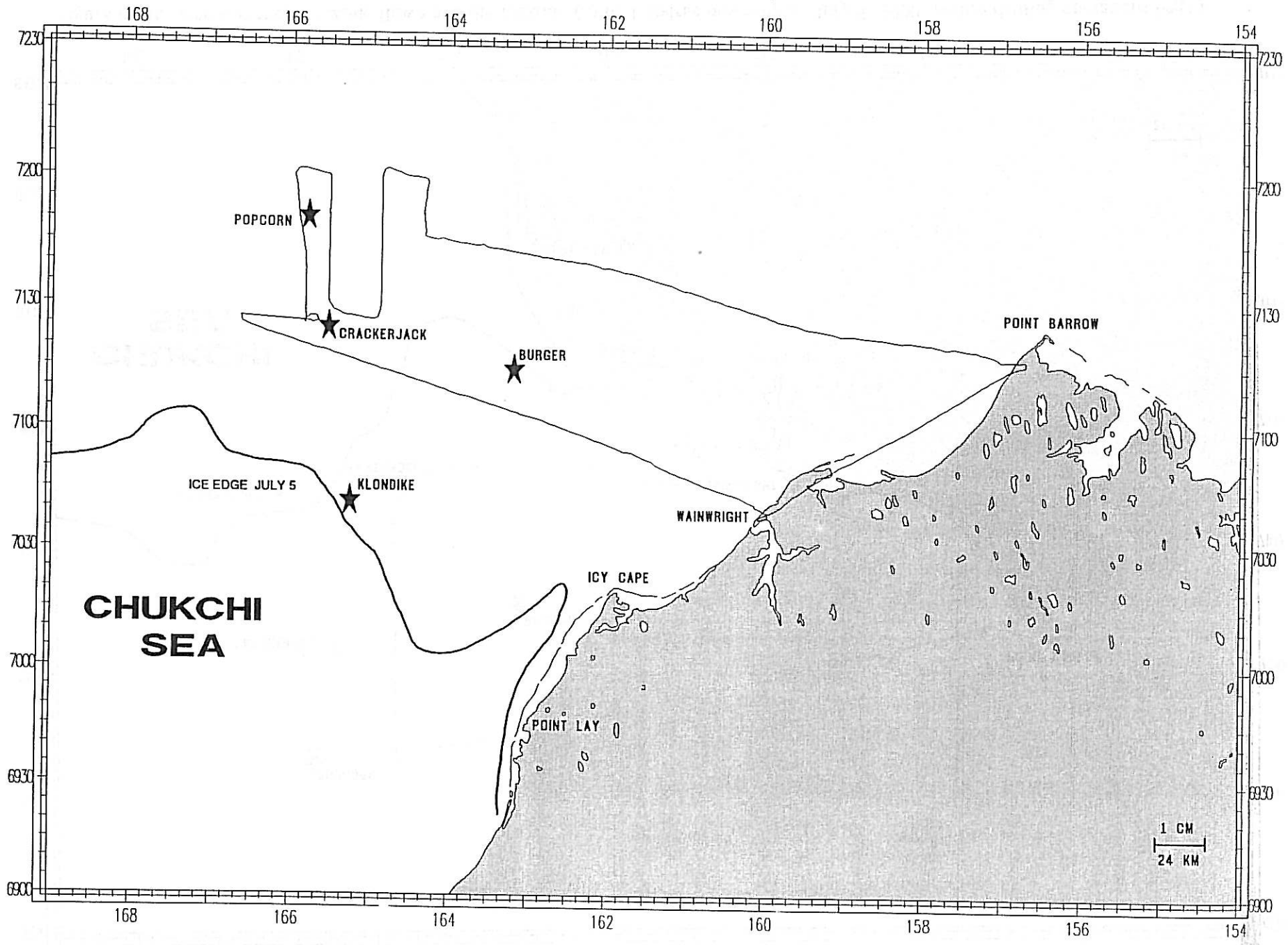

Figure B-9. Aerial survey trackline flown on July 4, 1990, before drilling operations began. No walruses were observed.

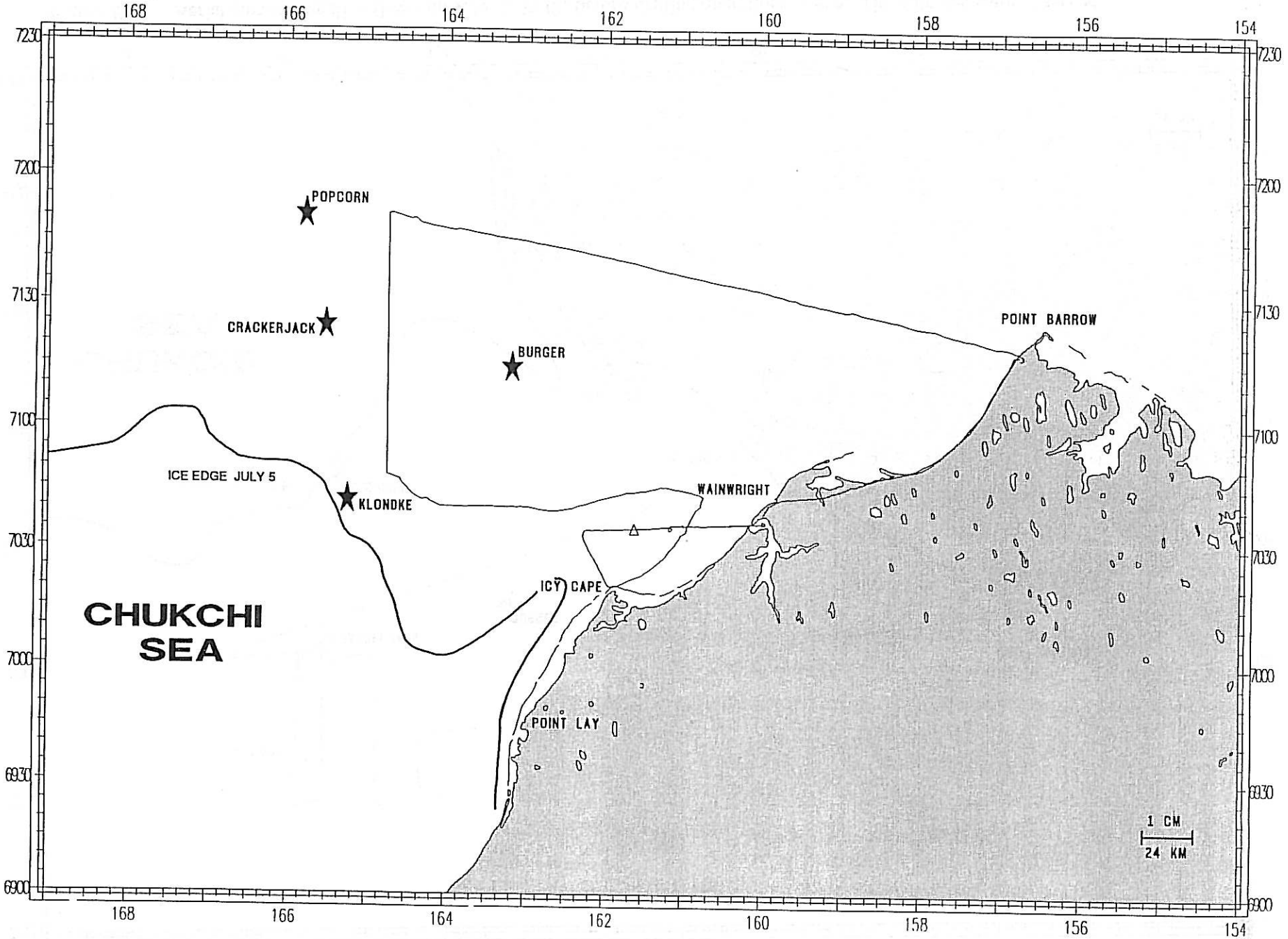

Figure B-10. Aerial survey trackline flown and the location (▲) of 1 walrus observed on July 5, 1990, before drilling operations began.

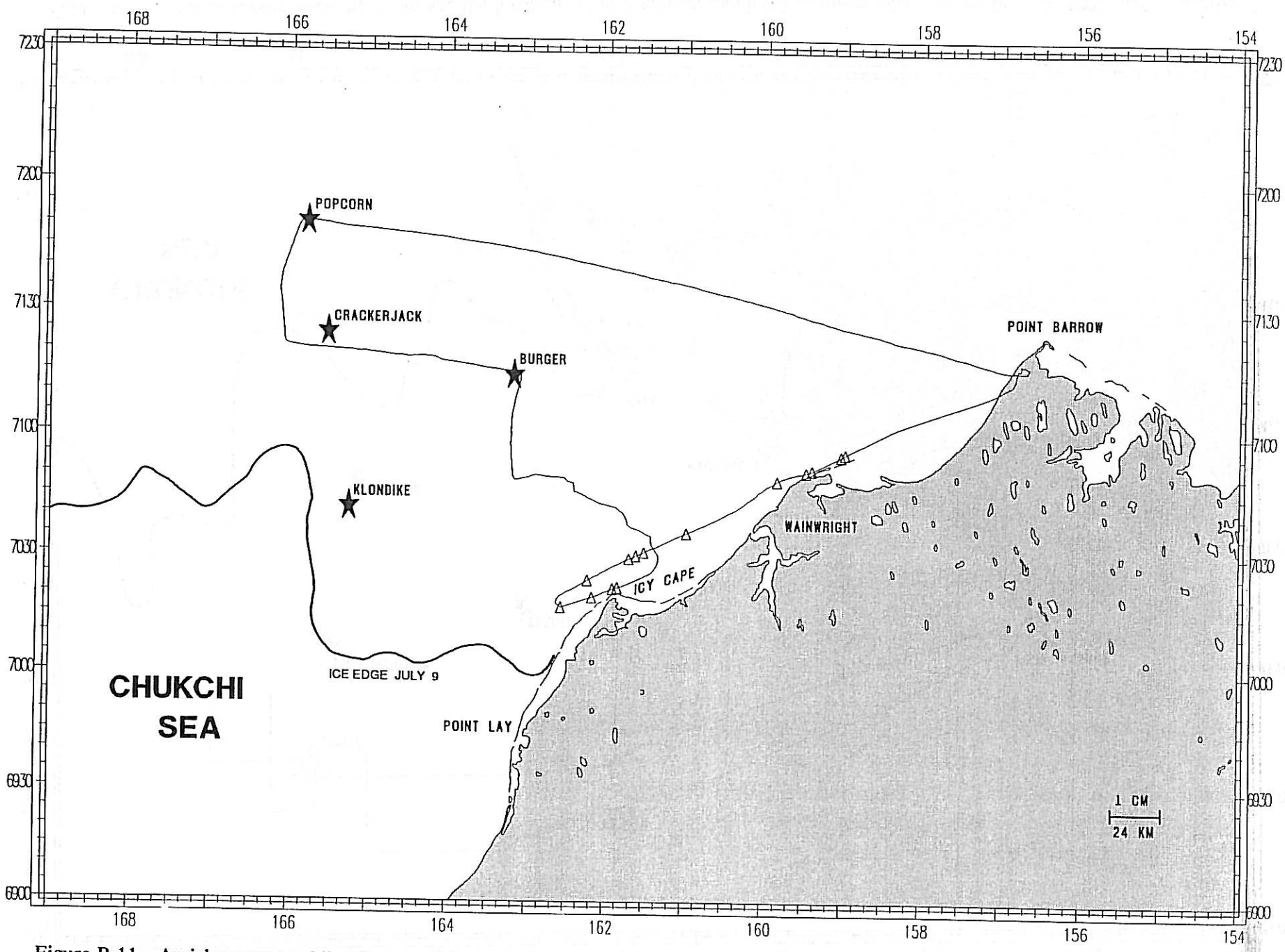

Figure B-11. Aerial survey trackline flown and location (▵) of 20 groups, totaling 47 walruses, observed on July 9, 1990, before drilling operations began. Poor weather conditions at the prospects precluded following a systematic survey pattern.

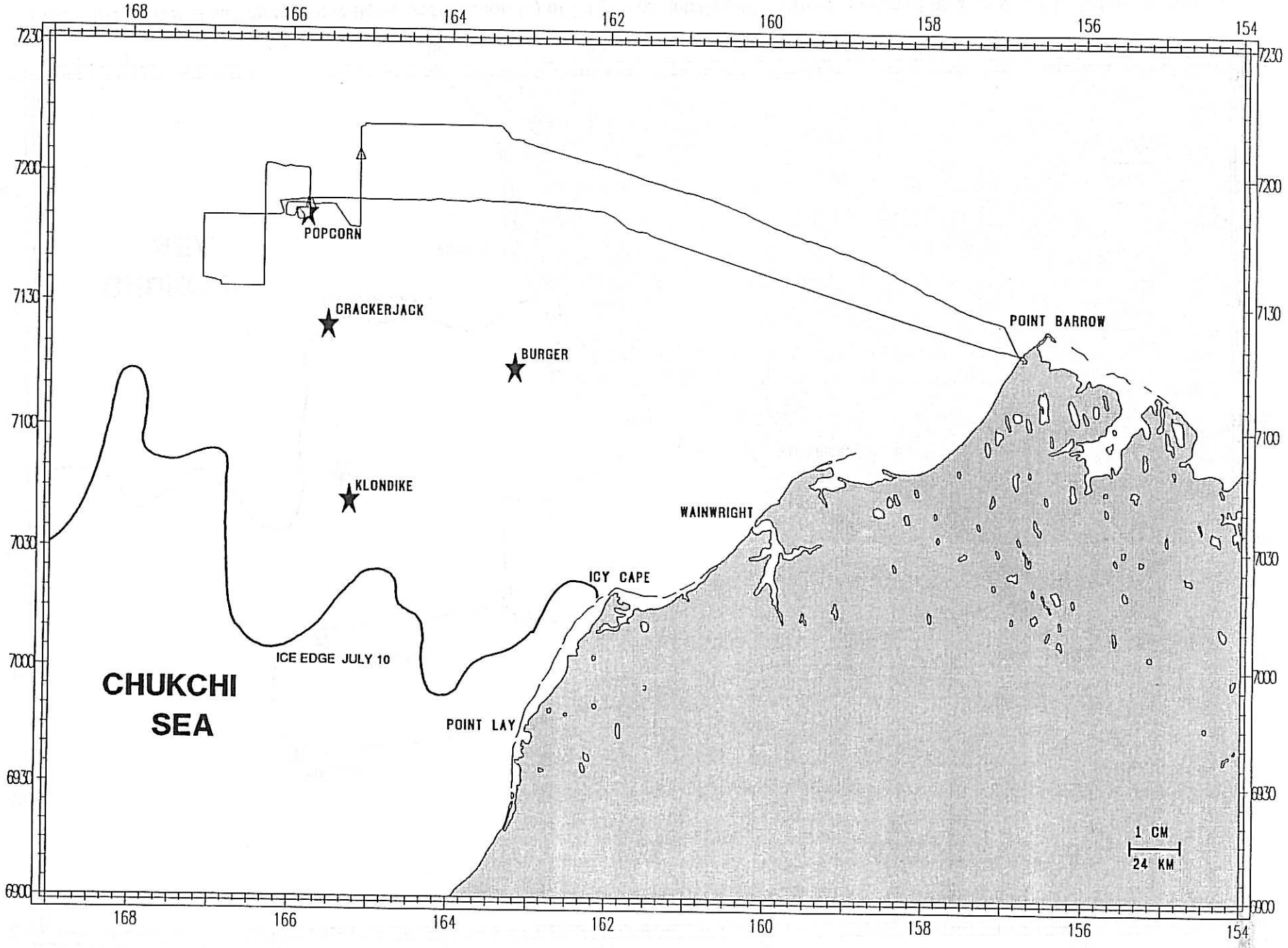

Figure B-12. Aerial survey trackline flown and the location (△) of 2 groups, totaling 5 walruses, observed on July 10, 1990, before drilling operations began.

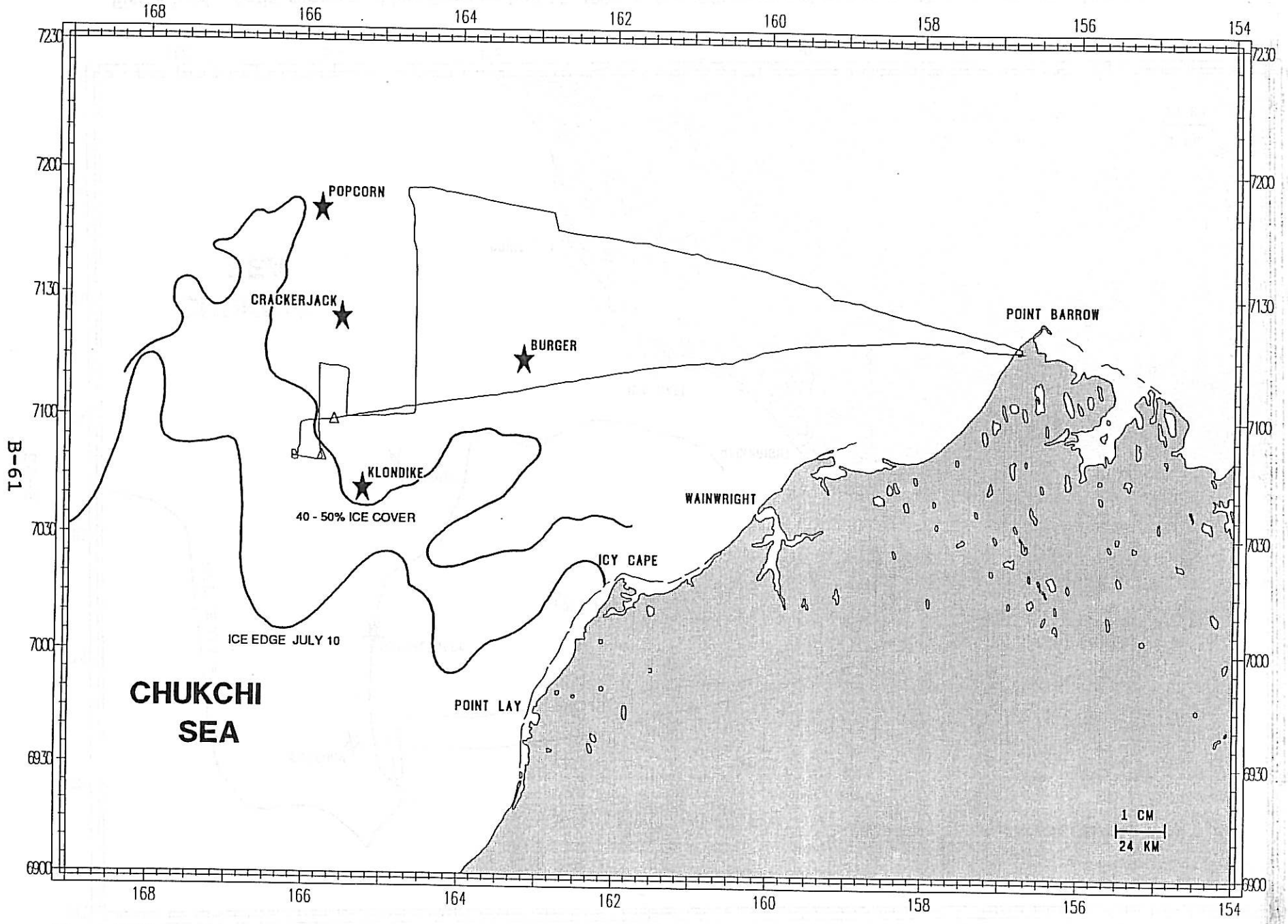

Figure B-13. Aerial survey trackline flown and location (▵) of 3 groups, totaling 13 walruses, observed on July 11, 1990, before drilling operations began.

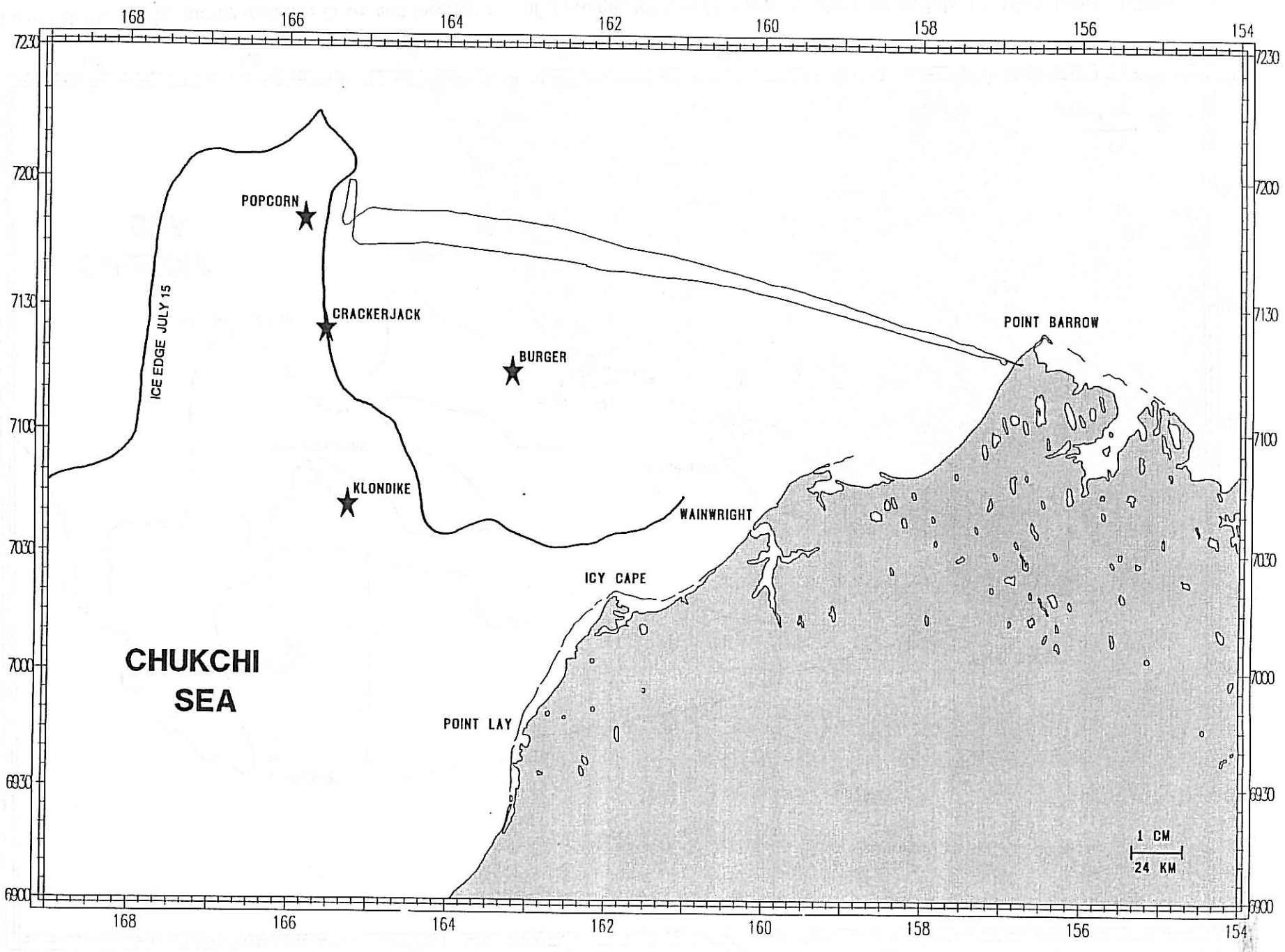

Figure B-14. Aerial survey trackline flown on July 15, 1990, before drilling operations began. No walruses were observed.