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Chukchi Offshore Monitoring in Drilling Area (COMIDA) Distribution and Relative Abundance of Marine Mammals: Aerial Surveys

Final Report

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CHUKCHI OFFSHORE MONITORING IN DRILLING AREA (COMIDA) DISTRIBUTION AND RELATIVE ABUNDANCE OF MARINE MAMMALS: AERIAL SURVEYS

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EXECUTIVE SUMMARY

Aerial surveys for marine mammals were conducted from 2008-2010 during the open water season (June through early November) in the Chukchi Sea Planning Area (CSPA). The Chukchi Offshore Monitoring in Drilling Area (COMIDA) aerial survey objectives were to:

1. Provide data compatible with the MMS marine mammal database directly to MMS for inclusion in that database and for use in estimation of the distribution of cetaceans and pinnipeds in the CSPA from 3 surveys during June-November;
2. Document geographical areas of importance for specific behaviors including calving/pupping, feeding, hauling-out, and migrating; and
3. Provide timely information on marine mammal observations and environmental conditions, including ice conditions, following each survey flight to organizations as directed by the COR (e.g., National Ice Center, National Marine Fisheries Service, Alaska Eskimo Whaling Commission, MMS) for real-time management of activities in the region.

The COMIDA aerial survey study area encompassed approximately 125,000 km^2 of the northeastern Chukchi Sea, from 68°N to 72°N and from 157°W to 169°W. The study area was divided into 10 survey blocks. Over 118,000 km were flown in high wing, twin turbine aircraft, including over 50,000 km on transect. The best overall coverage of the study area occurred in July and August, with the least amount of effort in June and November. Transect coverage was greatest in survey blocks closest to shore; lack of sea ice cover in the study area resulted in high sea states (>Beaufort 5) which limited effort in several offshore survey blocks.

Over 84,000 marine mammals were sighted, including bowhead whales (65 sightings of 112 whales), gray whales (504 sightings of 835 whales), and belugas (64 sightings of 1,567 whales). Bowhead whales were seen in every month except November. In September and October, bowhead whale distribution was southwesterly across the Chukchi Sea, similar to the distribution that was observed during surveys conducted in this area from 1989-1991. Gray whales were mainly seen within 50 km of shore between Pt. Barrow and Wainwright, Alaska and in an area approximately 120 km west of Pt. Hope, Alaska. Gray whales were not seen near Hanna Shoal, which differs from the distribution observed during similar marine mammal aerial surveys conducted between 1989-1991. Most gray whales sighted were feeding. Beluga sightings were scattered throughout the study area within 150 km of shore, with most sightings occurring in July. One fin whale (July 2008) and one humpback whale (July 2009) were also sighted. Polar bears were seen each year, including 10 observed on one day in August 2008 that were swimming between shore and sea ice, approximately 90 km offshore. Walruses were sighted every month except November, and their distribution was associated with sea ice coverage in June through early August, shifting to nearshore habitat, both in open water and in coastal haulouts, in late August and September. Coastal haulouts were documented at Icy Cape,

Alaska in 2009 and near Pt. Lay and Cape Lisburne, Alaska in 2010. Ice seals were recorded in all months COMIDA surveys were conducted.

All data collected during COMIDA aerial surveys were incorporated into the Bowhead Whale Aerial Survey Project (BWASP) historical database that has been maintained by BOEMRE (and its predecessors) since broad-scale aerial surveys were first initiated in 1979. The BWASP historical database (1979-2010) was carefully reviewed for errors and inconsistencies to mitigate problems with using the database for multiyear analyses. All changes to the historical database were catalogued and documented with detailed metadata. To reduce the potential of future errors in data collection, a detailed observer manual was compiled based on input from key personnel familiar with the project, both past and present. The observer manual included information on survey objectives and design, data collection instructions and field data management, and is updated as needed.

Preliminary COMIDA aerial survey data were made available from 2008-2010 to the general public, federal, state and local agency personnel, oil industry representatives, and other researchers and interested parties, on a near real-time basis via a website maintained by the National Marine Mammal Laboratory.

COMIDA aerial survey researchers collaborated with several federal, state and local agencies on issues related to marine mammal research in the area. In particular, data were shared with walrus and polar bear researchers from the U.S. Fish and Wildlife Service, U.S. Geological Survey and Alaska Department of Fish and Game. Cetacean carcass data were shared with the regional National Marine Fisheries Service stranding network and the North Slope Borough Department of Wildlife Management.

PROGRAM OVERVIEW

Introduction

The Chukchi Offshore Monitoring in Drilling Area (COMIDA) aerial survey component was initiated in 2008, via an Interagency Agreement (No. M08PG20023) between the Minerals Management Service (MMS) [Department of the Interior; currently the Bureau of Ocean Energy Management, Regulation and Enforcement] and the National Marine Mammal Laboratory (NMML) [Alaska Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce]. These surveys are a continuation of aerial surveys that were conducted by MMS-sponsored contractors from 1982-1991 (Ljungblad et al., 1987; Moore and Clarke, 1992) and use similar methodology. Aerial surveys remain the only practical means of assessing marine mammal distribution, population density, and habitat use in large study areas. The goal of this study is to investigate the distribution and relative abundance of marine mammals in the Chukchi Sea Planning Area (CSPA) during the open water (ice-free) months of June-October, when various species are undertaking seasonal migrations through the area. The COMIDA study area encompasses the northeastern Chukchi Sea from shore seaward, latitude 68°N to 72°N and longitude 157°W to 169°W, and overlays Lease Sale 193 (offered in February 2008). Species of interest include the bowhead whale (*Balaena mysticetus*), gray whale (*Eschrichtius robustus*), beluga (*Delphinapterus leucas*), polar bear (*Ursus maritimus*), walrus (*Odobenus rosmarus*), and ice seals. Increasing the understanding of marine mammal distribution, abundance and migration timing in this region will assist in decision-making to minimize impacts from petroleum exploration, development and production activities and other anthropogenic impacts.

Objectives

1. Provide data compatible with the MMS marine mammal database directly to MMS for inclusion in that database and for use in estimation of the distribution of cetaceans and pinnipeds in the CSPA from 3 surveys during June-November.
2. Document geographical areas of importance for specific behaviors including calving/pupping, feeding, hauling-out, and migrating.
3. Provide timely information on marine mammal observations and environmental conditions, including ice conditions, following each survey flight to organizations as directed by the COR (e.g., National Ice Center, National Marine Fisheries Service, Alaska Eskimo Whaling Commission, MMS) for real-time management of activities in the region.

Field Methods

Aerial surveys were conducted over the COMIDA study area during summer and autumn 2008-2010. This area comprises 10 survey blocks (Figure 1), which were established in the 1980s when broad-scale surveys were previously conducted (Moore and Clarke, 1992). During the first year of COMIDA (2008), spatial and temporal parameters of the surveys differed from subsequent years. Surveys in 2008 were conducted during three discrete time periods, 16 June–7 July, 3-26 August, and 21 October–10 November (Appendix 1), and transects were situated north-south, which replicated the survey design used in 1982-1991. In 2009, the timing of the surveys was expanded to nearly continuous coverage from 16 June-31 October (Appendix 2). In 2010, surveys were conducted from 1 July-31 October (Appendix 3). A major change between 2008 and 2009-2010 surveys was the revision of the survey design so that offshore transects were oriented perpendicular to the coastline (Figure 1). Under the revised survey design, a set of transect lines is generated from a single random point, designated as the "anchor." Transects are spaced approximately 19 km (10 nm) apart and perpendicular to the coastline. In consecutive years, transects are generated from a new randomly selected anchor and placed in the same relative configuration. In this way, multi-year transect coverage will be uniform throughout the study area. The revised survey design also included a coastal transect between Pt. Barrow and Pt. Hope, Alaska. This design was adopted for several reasons:

1. Perpendicular transects cross the major bathymetric features of the northeastern Chukchi Sea including Barrow Canyon and Hanna Shoal, the retreating summer ice (a tongue of ice usually persists longer in the offshore Chukchi Sea parallel to the coast while coastal areas are ice free earlier in the season), and the predominant Chukchi Sea currents (Woodgate et al., 2005).
2. Perpendicular transects cross bowhead and beluga migration paths as described from bowhead (Quakenbush et al., 2010) and beluga (Suydam et al., 2005) satellite track data, as well as indicated by the distribution of historical bowhead sightings from aerial surveys conducted from 1982-1991 and 2008.
3. Less time is spent on search effort (off transect). As described above, all transects were projected to start at the coastline with a coastal transect flown en route to and/or from offshore transect lines.
4. Enhanced coverage of nearshore areas allows better documentation of pinniped use, including, but not limited to, walrus haulouts. An additional benefit of the coastal transect was to monitor for marine mammal carcasses.
5. Multi-year transect coverage will be uniform throughout the study area.

The new design did not impact any analysis incorporating historical data, and all data were still parsed into pre-existing survey blocks for analyses.

Surveys were conducted in de Havilland Twin Otters provided by NOAA Aircraft Operations Center (Figure 2) and an Aero Commander 690A provided by Northern Commanders

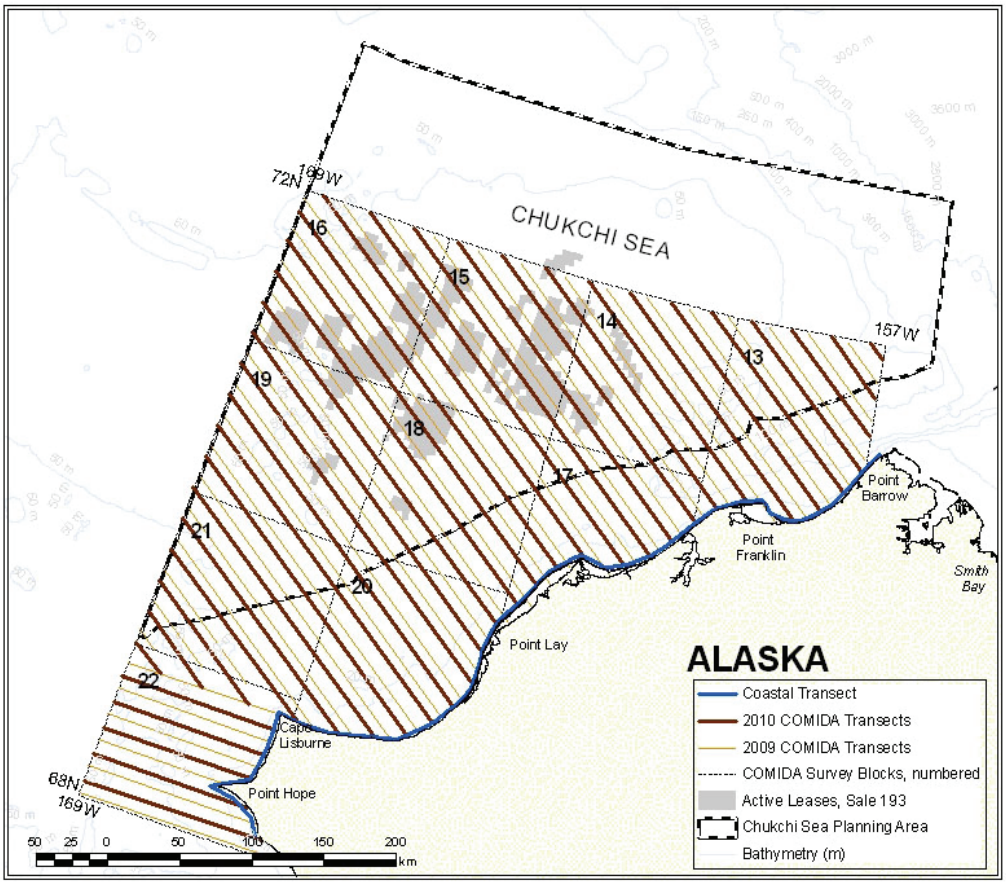

Figure 1. COMIDA study area, Chukchi Sea Planning Area outline, survey blocks, perpendicular transect lines and coastal transect surveyed in 2009 and 2010.

(Figure 3). Potential duration of flights depended on aircraft configuration, ranging from <5 to >8 hrs maximum. During summer months, two flights per day were occasionally attempted when weather conditions allowed, maximizing potential survey time. Survey altitude was generally near 365 m (1,200 ft), although lower cloud ceilings occasionally required that surveys be conducted at or below 310 m (1,000 ft). Surveys near walrus haulouts on ice or land and spotted seal haulouts in Kasegaluk Lagoon were conducted at higher altitudes to avoid potential disturbances. All survey aircraft were equipped with two large bubble windows for visual observations and a removable window to facilitate photography of whales for verification of species and presence of calves, and to document walrus haulouts and whale carcasses. Surveys were flown at a speed of 200 km/hr (110 kts).

Flights were conducted in four modes. Mode 1: transits to and from the survey area were flown at survey altitude and speed, either along a coastal transect approximately 1 km offshore (Transect, on-effort) or via a route that was not pre-determined

Figure 2. NOAA Twin Otter (call sign N46RF), one of four de Havilland Twin Otters operated by NOAA Aircraft Operations Center, Tampa, FL. COMIDA surveys were conducted on NOAA Twin Otters in 2008 and 2009.

Figure 3. Aero Commander 690A (call sign N222ME), owned by Northern Commanders, Spokane, WA, and operated by Clearwater Air, Nikiski, Alaska. COMIDA surveys were conducted on the Aero Commander in 2009 and 2010.

(Search, off-effort). Mode 2: transits to and from the survey area were flown at higher altitude and speed (Deadhead) in order to save time, conserve fuel, or avoid inclement weather. Mode 3: once in the urvey area, transects were flown perpendicular to the coastline (Transect, on-effort). Mode 4: the plane diverted to Circling (off-effort), which was initiated to investigate sightings to verify species, group size, behavior, presence of calves, etc. Data were collected during all survey types except Deadhead.

Surveys were flown with two primary observers, positioned at bubble windows on either side of the aircraft, and a data recorder who also functioned as a secondary observer. All primary observers had significant aerial survey experience, with an emphasis on conducting surveys for bowhead or right whales. Data were recorded onto a laptop computer via customized, menu-driven, data-entry software, developed specifically for these surveys. Data collected included location, environmental conditions, and sighting information. Preliminary summary data were available immediately following each flight, and were posted as Daily Reports to a website maintained by AFSC/NMML.

Marine mammal research activities were permitted under NMFS Permit No. 782-1719 for cetaceans and starting in 2009, under U.S. Fish and Wildlife Service (USFWS) Permit No. MA212570 for polar bears and walruses. In addition, Land Management Permits were obtained from the North Slope Borough (NSB) Planning and Community Services Department to conduct aerial surveys in the COMIDA and adjacent BWASP (Bowhead Whale Aerial Survey Project) survey areas. In 2010, NMML also consulted with the USFWS to conduct aerial surveys in spectacled eider (*Somateria fischeri*) Critical Habitat Unit 4 (Ledyard Bay); the USFWS decided that no adverse impacts to species or habitat were expected based on the altitude at which surveys would be conducted (>1,000 ft). Surveys were adjusted as needed to avoid potential impacts to subsistence hunts for bowhead whales, belugas, walruses and other pinnipeds. Each year, consultations were held with biologists from the NSB Department of Wildlife Management (DWM) prior to the commencement of aerial surveys to discuss areas of importance to subsistence hunters. These areas, generally near villages and within a few kilometers of the coast, were avoided if hunters were observed in small boats.

Additional details on aerial survey methods are included in Clarke et al. (2010) and Appendix 4.

SIGNIFICANT RESULTS

Results from the COMIDA aerial survey project are summarized as a function of the stated objectives.

Objective 1. Provide data compatible with the MMS marine mammal database directly to MMS for inclusion in that database and for use in estimation of the distribution of cetaceans and pinnipeds in the CSPA from 3 surveys during June-November.

Software that allowed entry of aerial survey data onto a laptop computer was previously developed by MMS and Resource Data, Incorporated (USDOI, MMS, 2008), and updated prior to the 2007 BWASP aerial survey season. Enhancements to this software, known as the BWASP Survey Tool, were incorporated to facilitate its application to the COMIDA survey area and improve overall data collection capabilities. Revisions were generally one of three types: 1) adding additional fields to the database, 2) streamlining existing fields to remove redundancy, or 3) enhancing existing fields where needed. An automatic location update every 30 seconds was also added, which allowed for higher resolution effort data and, therefore, more precise determination of flight time and distance. All revisions to the Survey Tool were carefully reviewed to ensure that they would not impact historical data, and all revisions were carefully documented in database metadata.

A detailed Observer Manual with application to both COMIDA and BWASP was compiled based on input from key project personnel (Appendix 4). This document included up-to-date information pertinent to conducting aerial surveys on the north slope of Alaska, including information about local communities, survey objectives and design, the BWASP Survey Tool, data collection instructions, field data management, posting of flight data to a NMML SharePoint site, daily weather checks and reporting, creating field reports, and protocols for naming and storing photographs. The Observer Manual is a dynamic document, and is updated as needed. The manual was distributed to all COMIDA and BWASP team members and is available to anyone interested in more information about the surveys.

A systematic review of the BWASP historical database, 1979-2010, was undertaken, resulting in a “clean” database that will be made available via the NMML website. The BWASP historical database spans >30 years and, while data were collected relatively consistently over time, errors and inconsistencies remained. These inconsistencies were both sloppy in appearance (e.g., “gray” and “gray whale” species codes, both text and numerical behavior codes, cetacean sightings positioned over land, etc) and impeded data analyses (missing start and end transects, sightings without species, etc). Revisions to the database were carried out under careful supervision by, and consultation with, persons familiar with the original 1979-1991 database that provided the foundation for the existing database. All changes were catalogued and documented

with detailed metadata. One result of the historical database review is that total sighting numbers from surveys conducted in 2008 and 2009 changed slightly.

Objective 2. Document geographical areas of importance for specific behaviors including calving/pupping, feeding, hauling-out, and migrating.

Over 118,000 km were flown during COMIDA 2008-2010 (Figure 4), including over 50,000 km on transect (Figure 5). The least amount of survey effort occurred in 2008, when surveys were conducted during three discrete 3-week time periods. Transect coverage was similar in 2009 and 2010. Most transect effort occurred in survey blocks 13 and 17; transect coverage per survey block decreased as distance from shore increased (Figure 6). The lack of sea ice in the study area during most months (NSIDC, 2008; 2009; 2010) made it difficult to conduct surveys in offshore survey blocks because sea states were often too high (>Beaufort 5) to effectively survey. The best overall coverage of the COMIDA study area occurred during July and August (Figure 7). This was likely due to several factors, including the presence of ice in the study area (in July) that reduced sea states even in windy conditions, good weather conditions compared to conditions in September and October, dedicated survey aircraft (limited or no surveys in June; no surveys in September 2008), and unlimited daylight conditions. Least overall survey coverage was in November (surveys in 2008 only) and June (surveys in the latter half of the month in 2008 and 2009 only).

Effort in October was patchy. Surveys were based from Kotzebue, Alaska, in October 2008 and 2009, which required long transits to and from the study area. In October 2010, surveys were based from Barrow, Alaska, but aircraft maintenance, extremely poor weather, and decreasing daylight hours combined to limit survey effort. The efficacy of conducting aerial surveys in late October will be re-evaluated during the the 2011 COMIDA field season.

Over 84,000 marine mammals were sighted during surveys conducted in the COMIDA study area (68°-72°N, 157°-169°W) (Table 1). A few surveys were conducted east of the COMIDA study area but, with few exceptions, results from those surveys are not included here. There were 65 sightings of 112 bowhead whales (including three sightings of dead bowheads), 504 sightings of 835 gray whales (including four sightings of dead grays), 1 sighting of a humpback whale, 1 sighting of a fin whale, and 64 sightings of 1,567 belugas. Because there are several possible cetacean species that can occur in the COMIDA study area, cetaceans that dove prior to positive species identification were classified as unidentified; there were 120 sightings of 144 unidentified cetaceans (including six dead animals). Other marine mammal sightings included polar bears, walruses, bearded seals and unidentified pinnipeds (Table 1).

Bowhead whales were sighted every month surveys were conducted except November (Figure 8; Table 1). Most of the bowhead whale sightings in June and July occurred in 2009,

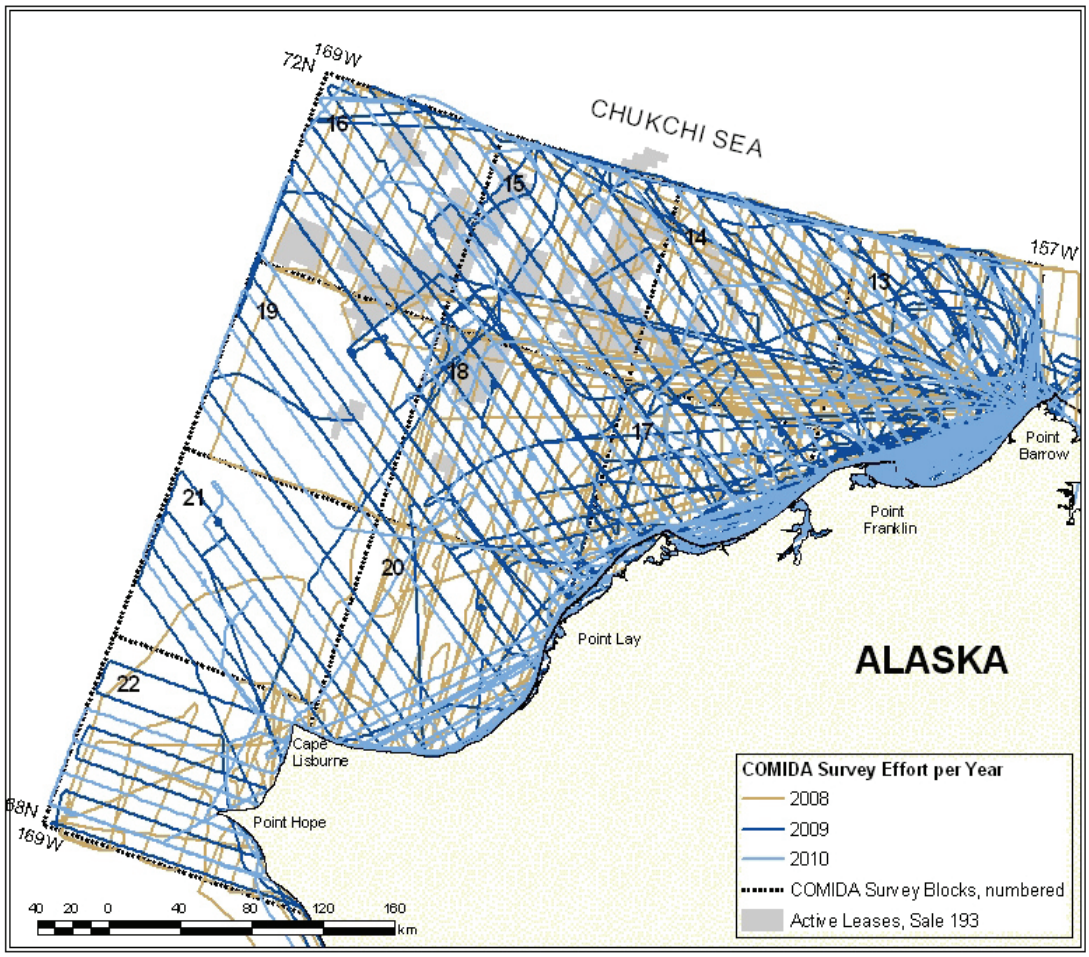

Figure 4. COMIDA total survey effort per year, 2008-2010.

when bowheads were seen between Pt. Franklin and Barrow, Alaska, on several days between 29 June and 11 July (Appendix 2). Bowheads were not seen in this area in either 2008 or 2010 despite good survey coverage, indicating that this area may be important to bowhead whales only in some years or under certain conditions. There were very few bowhead sightings in August in any year. Bowhead whale sightings in the study area increased in September and October, as would be expected based on known historical sighting data (Moore and Clarke, 1992) and results from recent satellite tagging studies (Quakenbush et al., 2010). Sighting rate (whales per transect kilometer) per month for all years combined was also lowest in August and highest in October (Figure 9). Sightings indicated that bowhead whales were distributed broadly west and southwest from Barrow across the Alaskan Chukchi Sea during the autumn migration; this was also observed during surveys conducted from 1982-1991 (Moore and Clarke, 1992). There were no specific areas where whales were concentrated each year. The behavior most often recorded was swimming (43%), followed by feeding (27%). All feeding was observed close to shore between Pt. Franklin and Barrow, Alaska, in June, July and September of 2009. Four calves

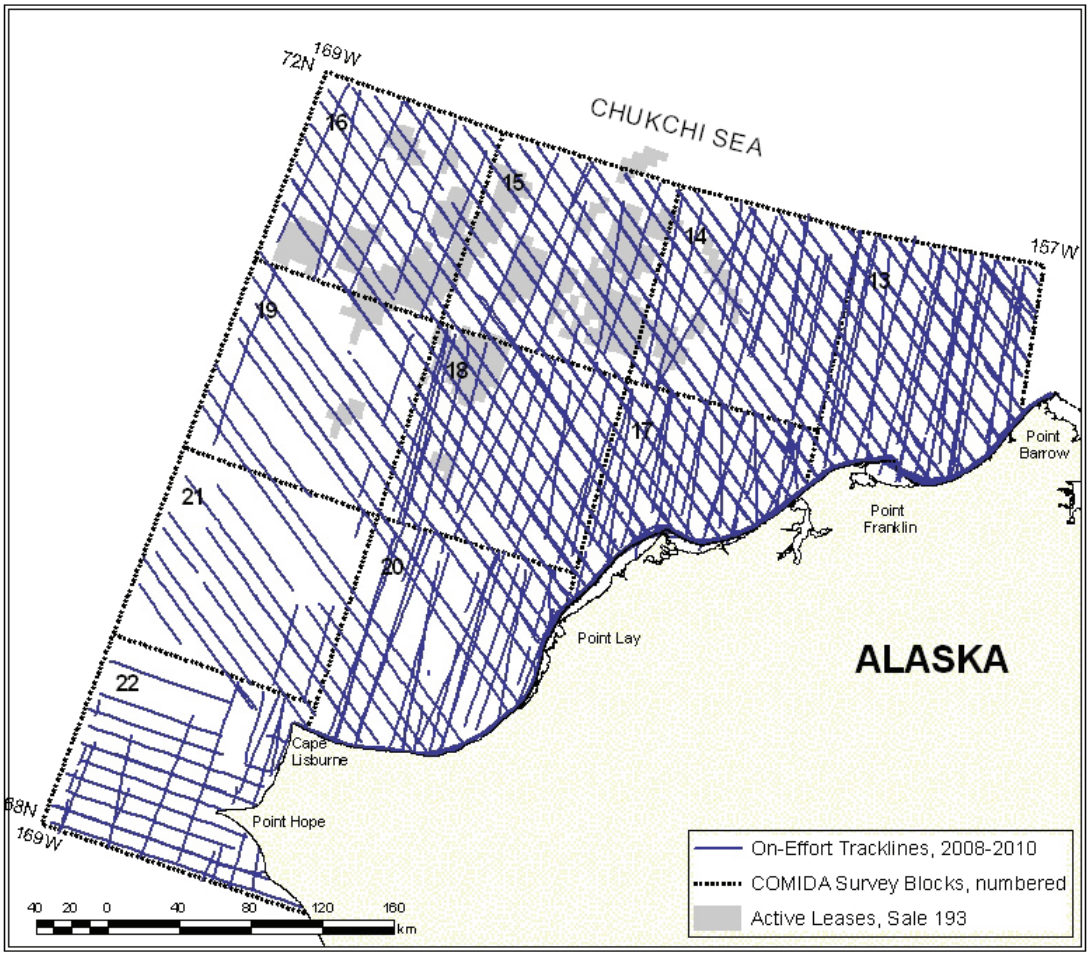

Figure 5. COMIDA transect only survey effort, 2008-2010 combined.

were seen, one in 2008 and 2010 respectively, and two in 2009. Habitat preference, based on sighting rate per depth zone, in early summer was for shallow water (≤35 m depth), primarily due to the sightings in 2009. From July through October, habitat preference was overwhelmingly for water 51-200 m deep (Table 2).

Gray whales were seen every month surveys were conducted, and each year they were observed between Wainwright and Barrow, Alaska within 50 km of shore (Figure 10; Table 1). Gray whales were also consistently seen in the southwest corner of the study area, west of Pt. Hope, Alaska, even though this area was surveyed far less frequently because it falls well outside of the CSPA. Sightings were also scattered throughout the study area more than 50 km offshore. The relative lack of gray whale sightings (and mud plumes, which are indicative of the presence of feeding gray whales) offshore was markedly different from that documented during surveys conducted from 1982-1991, when gray whales were frequently seen on Hanna Shoal (Moore and Clarke, 1992).

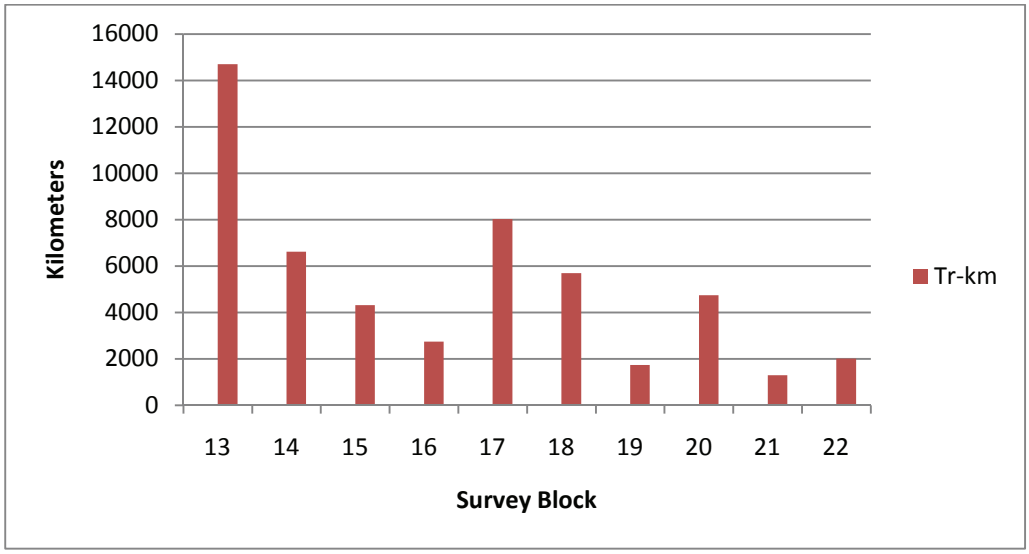

Figure 6. COMIDA transect effort in kilometers (Tr-km) per survey block, 2008-2010 combined.

Gray whale sighting rates per month for all years combined was highest in survey block 17 in June, July and August (Table 3). Gray whale sighting rates in September and October were highest in survey block 13, and were much lower than sighting rates during the summer months (Figure 9). Most gray whales (72%) were feeding and usually accompanied by well-defined mud plumes. Eleven gray whale calves were seen during both on- and off-effort flightlines, nine of which were seen in July 2009. Habitat preference, based on sighting rate per depth zone, was for shallow water (≤35 m depth) in June, but overwhelmingly for deeper water (51-200 m depth) in July through October (Table 2). Although their distribution did not appear to coincide precisely (Figure 11), habitat preference for bowhead and gray whales based on sighting rates per depth zone was very similar (Table 2).

There are several large cetacean species whose ranges may be expanding into the northern Chukchi Sea, including humpback, fin and minke whales (Haley et al., 2010). None of these species were seen during surveys conducted in the COMIDA study area from 1982-1991, but one fin whale (July 2008, Appendix 1) and one humpback whale (July 2009; Appendix 2) were sighted during the current study (Figure 12; Table 1). Additionally, several unidentified cetaceans were recorded (Figure 12, Table 1). Cetaceans were recorded as unidentified when the initial sighting was at a distance from the aircraft where it was not possible to make a positive identification of the animal. Many of the unidentified cetaceans were probable gray whales, based on the close proximity of well-defined mud plumes, but without positive visual identification they remained in the database as unidentified. Sightings were recorded as small unidentified cetaceans when the animal was noticeably smaller in size than a bowhead or

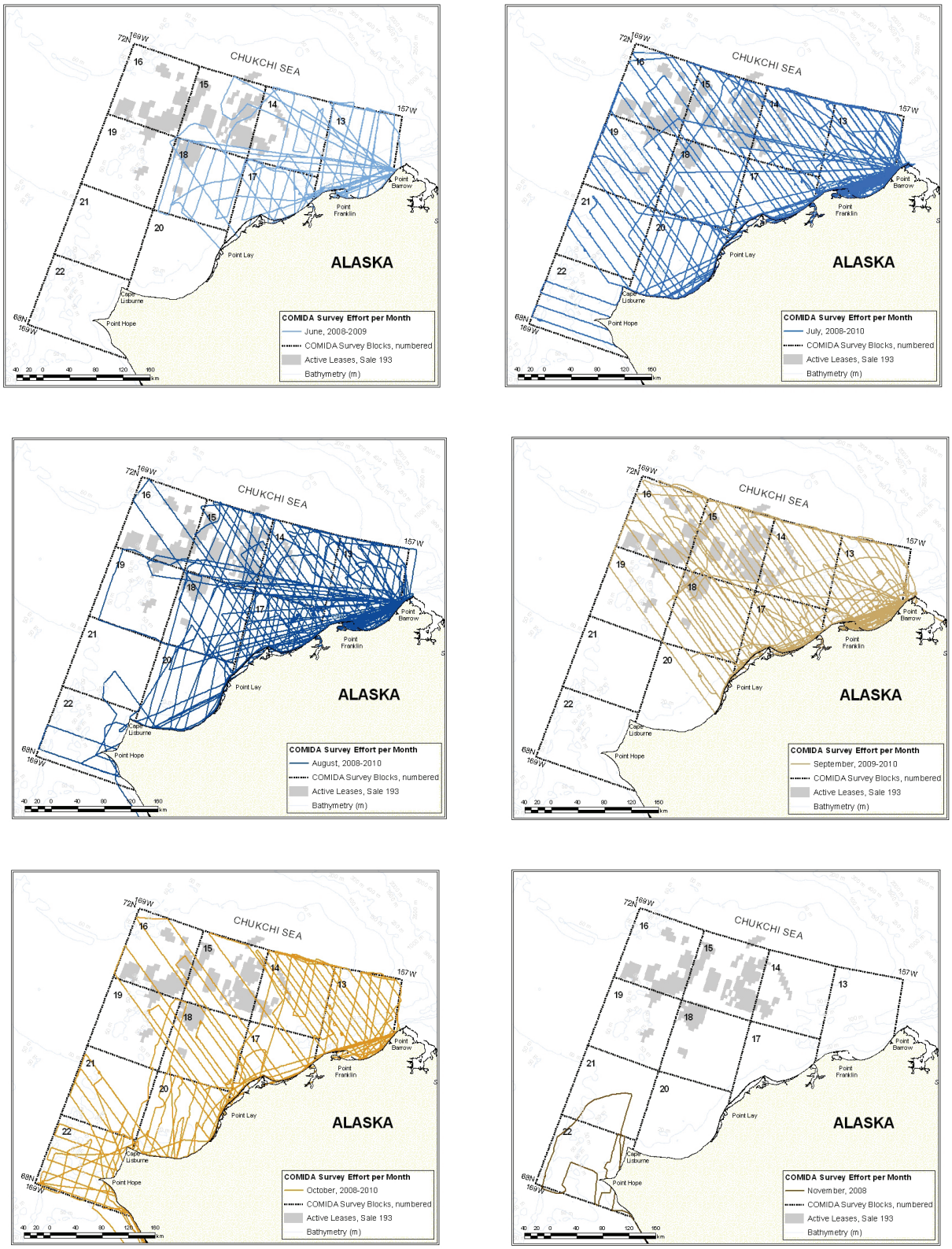

Figure 7. COMIDA total survey effort per month, 2008-2010 combined.

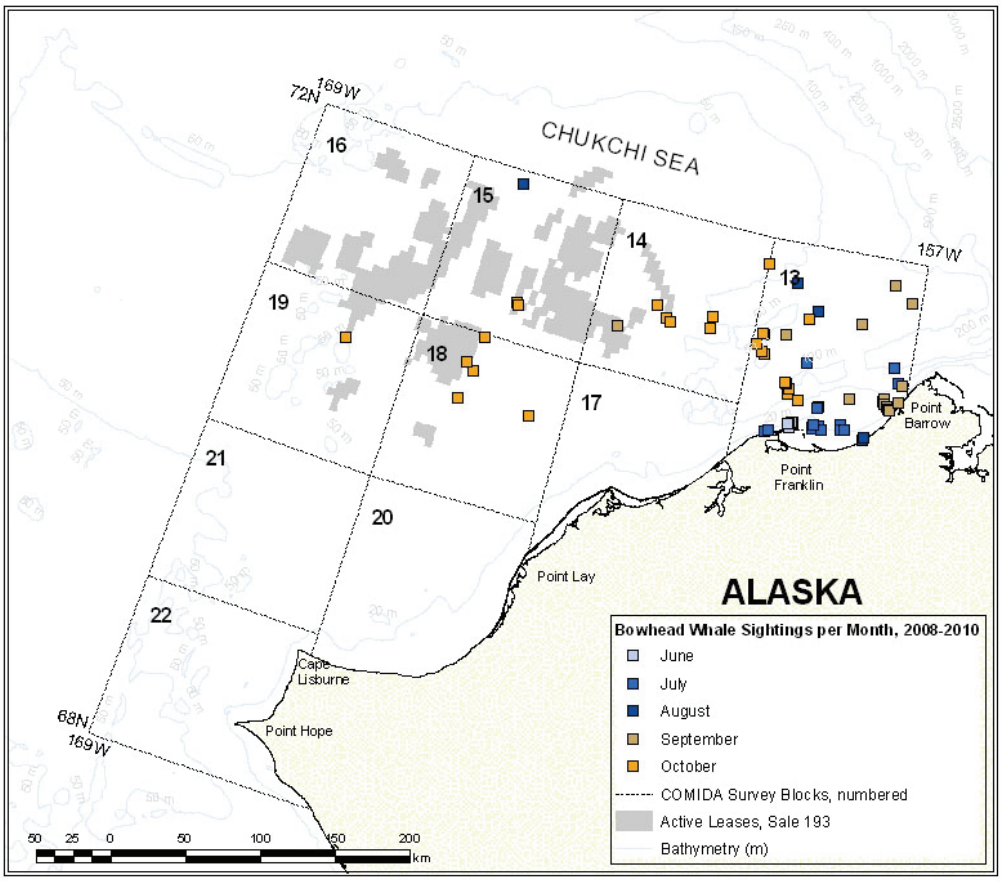

Figure 8. Bowhead whale sightings per month, on- and off-effort, 2008-2010 combined.

gray whale. Small unidentified cetaceans could potentially include belugas, harbor porpoise or killer whales. Neither of the latter two species was positively identified during COMIDA aerial surveys, but both are undergoing apparent range expansions and being seen more frequently in the Chukchi Sea (e.g., Melnikov and Zagrebin, 2005; Haley et al., 2010).

Belugas were seen every month except September (Figure 13; Table 1). Most sightings were in July, including several hundred belugas sighted in Elson Lagoon, east of Pt. Barrow, Alaska in 2010 (Appendix 3) and one sighting of nearly 300 nearshore between Wainwright and Icy Cape, Alaska in 2009 (Appendix 2). Beluga sightings were scattered throughout the study area within 150 km of shore. Group size ranged from 1 to 480 individuals. Highest sighting rate per depth zone was in shallow water (≤35 m depth) (Table 2), likely due to the large groups described above.

Walruses were seen every month except November (Figure 14; Table 1). Distribution was associated with sea ice coverage in June through early August, and shifted to nearshore

Table 1. Summary of COMIDA sightings, on- and off-effort, 2008-2010 (# sightings/# of animals). Total includes sightings between 68°N-72.005°N, 157°W-169.005°W[a], except where noted[b], and dead animals. Total excludes known repeat sightings, except for repeat sightings of walrus haulouts from different days.

	June	July	August	September	October	November	Total
Bowhead Whale	6/17	14/28	5/5	14/27	26/35	0	65/112
Gray Whale	22/44	175/307	217/368	68/82	21/33	1/1	504/835
Beluga[b]	5/55	25/1,151	7/53	0	15/79	12/229	64/1,567
Fin Whale	0	1/1	0	0	0	0	1/1
Humpback Whale	0	1/1	0	0	0	0	1/1
Unidentified Cetacean	1/1	37/50	54/61	8/8	16/20	0	116/140
Small Unidentified Cetacean	0	1/1	1/1	2/2	0	0	4/4
Walrus	55/1,490	358/12,011	508/16,137	247/50,166	10/103	0	1,178/79,907
Bearded Seal	19/20	21/24	73/88	16/18	20/23	1/1	150/174
Ringed Seal	0	0	2/2	0	0	0	2/2
Unidentified Pinniped	42/58	111/149	270/444	19/31	62/82	1/1	505/765
Small Unidentified Pinniped	10/13	241/326	61/72	91/162	95/246	0	498/819
Polar Bear	1/1	1/1	14/14	3/3	0	0	19/19
TOTAL Marine Mammals							3,107/84,346

[a] Sightings slightly north of 72°N and west of 169°W, recorded when the survey aircraft turned at the offshore ends of transects briefly leaving the COMIDA study area, were incorporated into sighting totals.

[b] Includes belugas sighted in Elson Lagoon (east of 157°W) in July 2010.

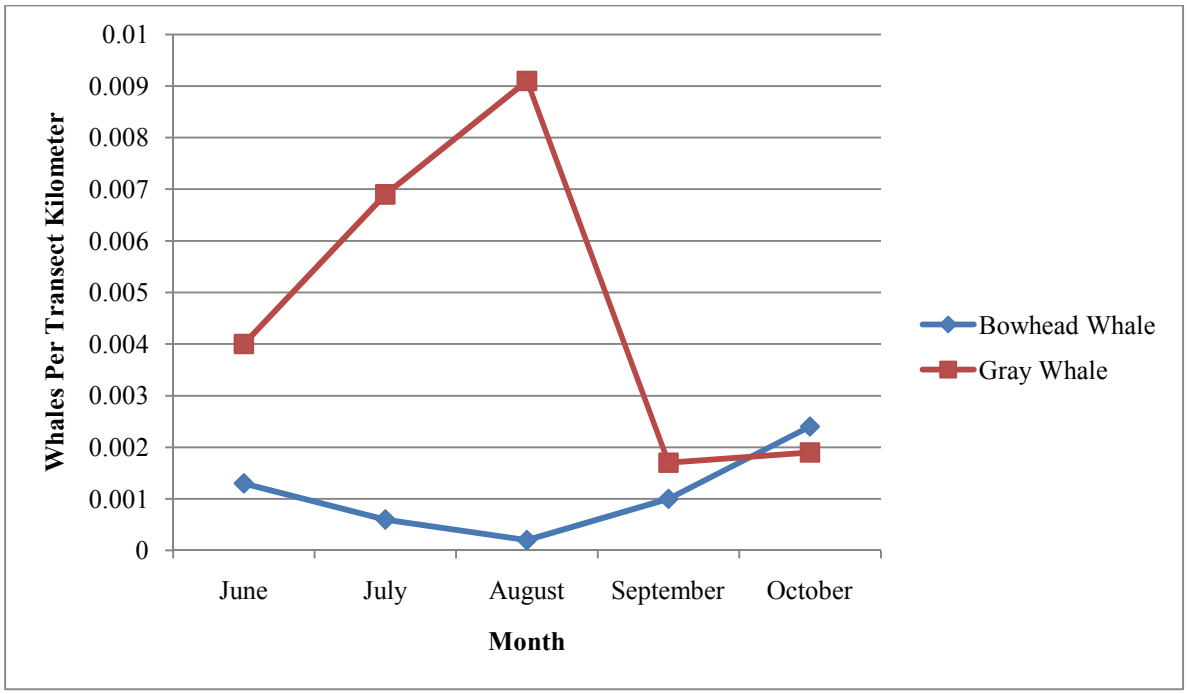

Figure 9. Bowhead and gray whale on-effort sighting rates per month, 2008-2010 combined.

habitat, both in the water and in coastal haulouts, in late August and September. Few walruses were seen in the study area in October of any year. Coastal haulouts were not reported in 2008, when sea ice remained in the COMIDA study area throughout summer and autumn (NSIDC, 2008). Haulouts were reported in autumn 2009 (Appendix 2) and 2010 (Appendix 3) when sea ice retreated far offshore. Walrus data were shared with biologists from USFWS and USGS to facilitate cooperative research.

Phocid seals were seen in all months in the study area and in all areas surveyed (Figures 15 and 16; Table 1). Phocids were difficult to detect during COMIDA surveys conducted in higher sea states (e.g., Beaufort 3-5) due to their smaller size, cryptic coloration, and smaller exhalations (when compared with cetacean exhalations that can be seen from a distance) and the altitude of the survey aircraft (>300 m). Bearded seals (*Erignathus barbatus*) are the largest of the phocid seals expected to occur in the COMIDA study area, and can be identified from the aircraft under good weather conditions. There were 150 sightings of 174 bearded seals, with the highest number observed in August (Figure 15; Table 1). Unidentified pinnipeds included sightings of pinnipeds not seen clearly enough to determine if the animal was a walrus, bearded seal or smaller phocid (Figure 16). Small unidentified pinnipeds included sightings of pinnipeds smaller than most walruses and bearded seals that could not be identified to species, and likely included spotted (*Phoca largha*) and ringed (*Pusa hispida*) seals. The distributions of ringed and

Table 2. Number (n) of on-effort bowhead whales, gray whales and belugas and associated sighting rates (whales per unit effort = WPUE) per depth zone, COMIDA 2008-2010. Tr-km = transect kilometer. The maximum WPUE per month is *italicized* and bolded.

Bowhead Whales

2008-2010	June			July			August			September			October			Total		
Depth Range	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE
≤ 35	708	5	***0.0071***	4,210	3	0.0007	4,284	0	0.0000	4,097	3	0.0007	3,265	1	0.0003	16,563	12	0.0007
36 to 50	1,736	0	0.0000	6,128	0	0.0000	5,873	0	0.0000	5,799	4	0.0007	4,270	11	0.0026	23,806	15	0.0006
51 to 200	1,554	0	0.0000	2,784	5	***0.0018***	2,725	2	***0.0007***	1,746	5	***0.0029***	2,645	12	***0.0045***	11,455	24	***0.0021***
> 200	0			0			0			0			0			0		
Total	3,998	5	0.0013	13,123	8	0.0006	12,882	2	0.0002	11,642	12	0.0010	10,179	24	0.0024	51,824	51	0.0010

Gray whales

2008-2010	June			July			August			September			October			Total		
Depth Range	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE
≤ 35	708	5	***0.0071***	4,210	25	0.0059	4,284	23	0.0054	4,097	3	0.0007	3,265	2	0.0006	16,563	58	0.0035
36 to 50	1,736	11	0.0063	6,128	34	0.0055	5,873	47	0.0080	5,799	7	0.0012	4,270	9	0.0021	23,806	108	0.0045
51 to 200	1,554	0	0.0000	2784	32	***0.0115***	2,725	48	***0.0176***	1,746	10	***0.0057***	2,645	8	***0.0030***	11,455	98	***0.0086***
> 200	0			0			0			0			0			0		
Total	3,998	16	0.0040	13,123	91	0.0069	12,882	118	0.0092	11,642	20	0.0017	10,179	19	0.0019	51,824	264	0.0051

Belugas

2008-2010	Total		
Depth Range	Tr-km	n	WPUE
≤ 35	16,563	440	***0.0266***
36 to 50	23,806	11	0.0005
51 to 200	11,455	282	0.0246
> 200	0		
Total	51,824	733	0.0141

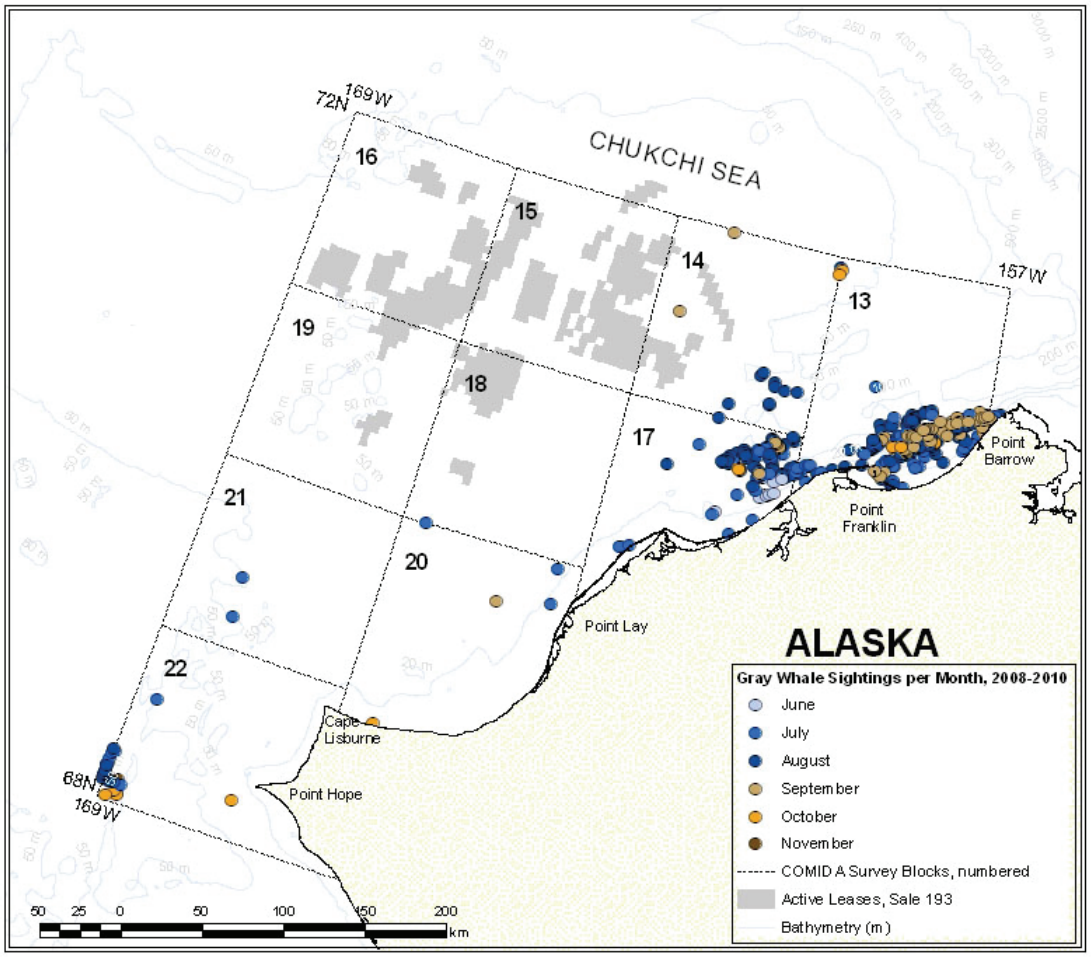

Figure 10. Gray whale sightings per month, on- and off-effort, 2008-2010 combined.

spotted seals overlap in the Chukchi Sea (Boveng et al., 2009; Angliss and Allen, 2009); behaviors and physical characteristics observable from survey altitude are not distinguishable enough to allow positive species identification (D. Rugh and D. Withrow, NMML-AFSC, 7600 Sand Point Way NE, Seattle, WA 98115. pers. comm., 8 December 2009). The majority of phocid surveys are conducted between 100 and 300 m and at slower survey speeds (e.g., Boveng et al., 2003).

Polar bears were sighted in all years of the COMIDA study (Figure 17). Most of the bears (14 out of 19 total) were seen in August 2008 (Table 1), including 10 bears that were observed swimming on 16 August 2008 (Appendix 1). Polar bear sightings also occurred in June 2008 (1 bear), 2009 (3 bears) and 2010 (1 bear). Polar bear data were shared with biologists from USFWS and USGS to facilitate cooperative research.

Thirteen dead cetaceans were documented in the study area between 2008 and 2010, not including known repeat sightings of the same carcass (Figure 18). Two dead cetaceans and one

Table 3. Number (n) of on-effort bowhead and gray whales and associated sighting rates (whales per unit effort = WPUE) per survey block, COMIDA 2008-2010. Tr-km = transect kilometer. The maximum WPUE per month is *italicized* and bolded.

Bowhead Whales

Survey	June			July			August			September			October			Total		
Block	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE
13	1,761	5	***0.0028***	3,389	8	***0.0024***	3,822	2	***0.0005***	3,111	11	***0.0035***	2,620	11	0.0042	14,703	37	***0.0025***
14	546	0	0	1,546	0	0	1,687	0	0	1,438	1	0.0007	1,404	6	0.0043	6,620	7	0.0011
15	105	0	0	1,078	0	0	1,298	0	0	1,345	0	0	480	2	0.0042	4,306	2	0.0005
16	0			707	0	0	906	0	0	787	0	0	333	0	0	2,733	0	0
17	779	0	0	1,566	0	0	2,270	0	0	2,290	0	0	1,117	0	0	8,020	0	0
18	798	0	0	1,057	0	0	1,184	0	0	1,740	0	0	920	5	***0.0054***	5,697	5	0.0009
19	5	0	0	848	0	0	111	0	0	427	0	0	339	0	0	1,730	0	0
20	1	0	0	1,841	0	0	1,208	0	0	419	0	0	1,272	0	0	4,740	0	0
21	0			631	0	0	70	0	0	0			591	0	0	1,293	0	0
22	0			521	0	0	362	0	0	0			1,125	0	0	2,007	0	0
Total	3,993	5	0.0013	13,183	8	0.0006	12,917	2	0.0002	11,557	12	0.0010	10,200	24	0.0024	51,850	51	0.0010

Gray Whales

Survey	June			July			August			September			October			Total		
Block	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE
13	1,761	1	0.0006	3,389	45	0.0133	3,822	66	0.0173	3,111	11	***0.0035***	2,620	13	***0.0050***	14,703	136	0.0092
14	546	0	0.0000	1,546	0	0.0000	1,687	7	0.0041	1,438	1	0.0007	1,404	0	0.0000	6,620	8	0.0012
15	105	0	0.0000	1,078	0	0.0000	1,298	0	0.0000	1,345	0	0.0000	480	0	0.0000	4,306	0	0.0000
16	0			707	0	0.0000	906	0	0.0000	787	0	0.0000	333	0	0.0000	2,733	0	0.0000
17	779	15	***0.0193***	1,566	33	***0.0211***	2,270	44	***0.0194***	2,290	8	***0.0035***	1,117	1	0.0009	8,020	101	***0.0126***
18	798	0	0.0000	1,057	1	0.0009	1,184	0	0.0000	1,740	0	0.0000	920	0	0.0000	5,697	1	0.0002
19	5	0	0.0000	848	0	0.0000	111	0	0.0000	427	0	0.0000	339	0	0.0000	1,730	0	0.0000
20	1	0	0.0000	1,841	2	0.0011	1,208	0	0.0000	419	0	0.0000	1,272	0	0.0000	4,740	2	0.0004
21	0			631	2	0.0032	70	0	0.0000	0			591	0	0.0000	1,293	2	0.0015
22	0			521	8	0.0154	362	1	0.0028	0			1,125	5	0.0044	2,007	14	0.0070
Total	3,993	16	0.0040	13,183	91	0.0069	12,917	118	0.0091	11,557	20	0.0017	10,200	19	0.0019	51,850	264	0.0051

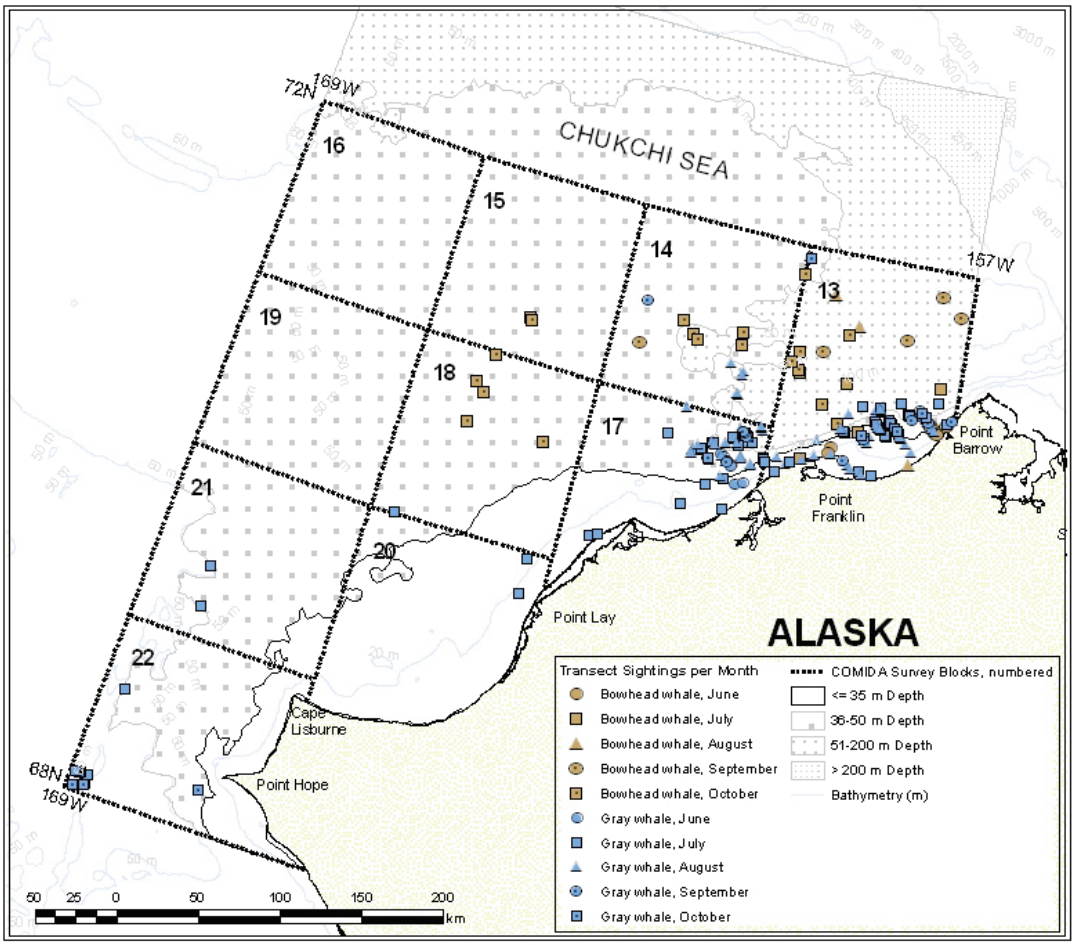

Figure 11. Bowhead and gray whale on-effort sightings per month, 2008-2010 combined.

dead walrus were documented just east of the COMIDA study area. Most of the carcasses could not be identified to species due to advanced stages of decomposition. Those that could be identified included two bowhead whales, two gray whales and one beluga. Carcasses were seen both along the beach and in open water offshore. Whenever possible, photographs of dead whales were taken to assist with species identification and determining cause of death. In addition to cetaceans, eight dead walruses and nine pinniped carcasses that could not be identified to species were also documented.

Objective 3. Provide timely information on marine mammal observations and environmental conditions, including ice conditions, following each survey flight to organizations as directed by the COR (e.g., National Ice Center, National Marine Fisheries Service, Alaska Eskimo Whaling Commission, MMS) for real-time management of activities in the region.

Preliminary COMIDA aerial survey data from 2008-2010 were made available to the general public, federal, state and local agency personnel, oil industry representatives, and other

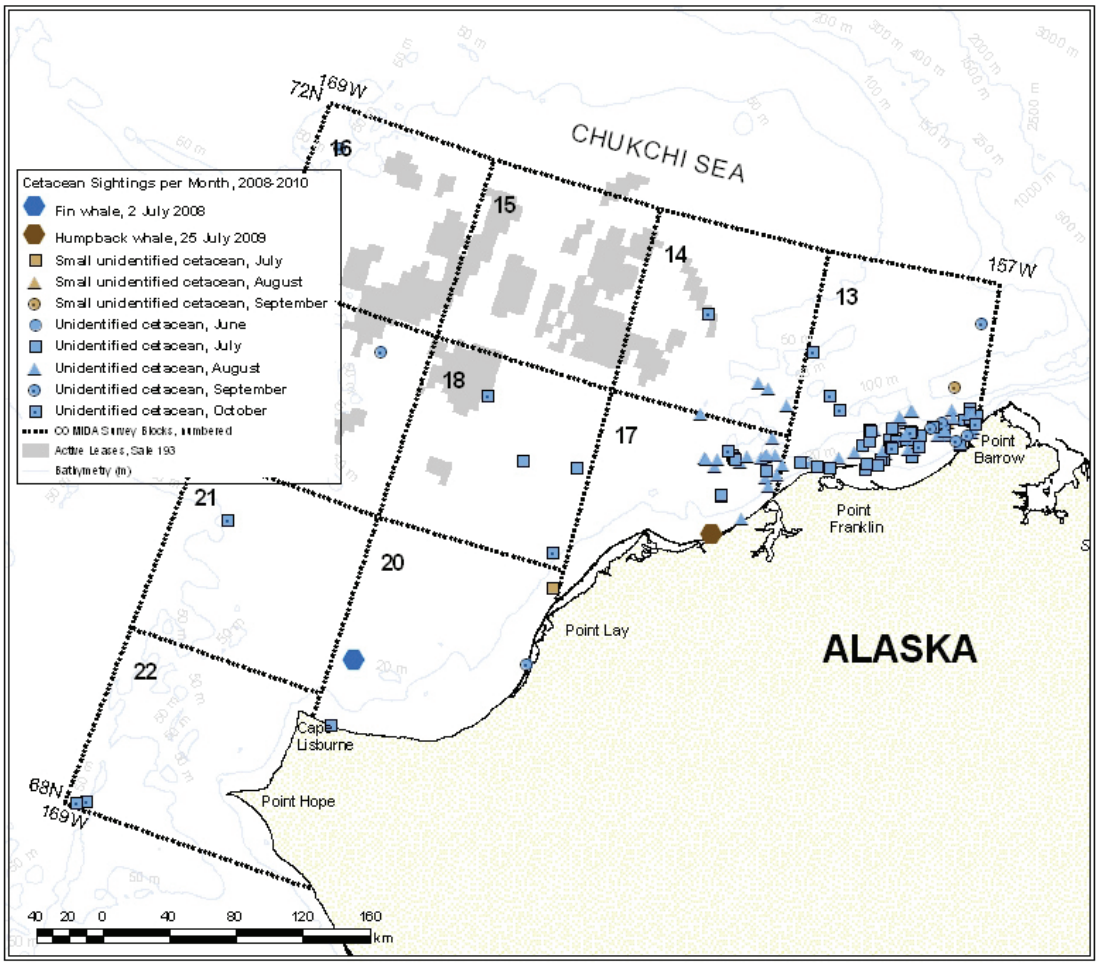

Figure 12. Fin whale, humpback whale and unidentified cetacean sightings per month, on- and off-effort, 2008-2010 combined.

researchers and interested parties, on a near real-time basis via a NMML-maintained website (http://www.afsc.noaa.gov/NMML/cetacean/bwasp/flights_COMIDA.php). Daily reports posted to this website included information on area flown, conditions encountered and details of cetacean sightings (Figure 19).

In 2010, ice distribution data were provided directly to the National Weather Service Ice Desk, in the form of photographs, geo-referenced metadata, and environmental condition summary files. These data were specifically requested to assist with ground-truthing of satellite imagery.

Close collaboration with walrus and polar bear researchers from USFWS, USGS and the State of Alaska Department of Fish and Game was ongoing from 2008-2010. Data on walrus and polar bear sightings were shared on an as-needed basis, usually immediately after an unusual sighting such as a previously undocumented walrus haulout or several polar bears swimming between shore and sea ice located well offshore. Information on walrus aggregations on ice in

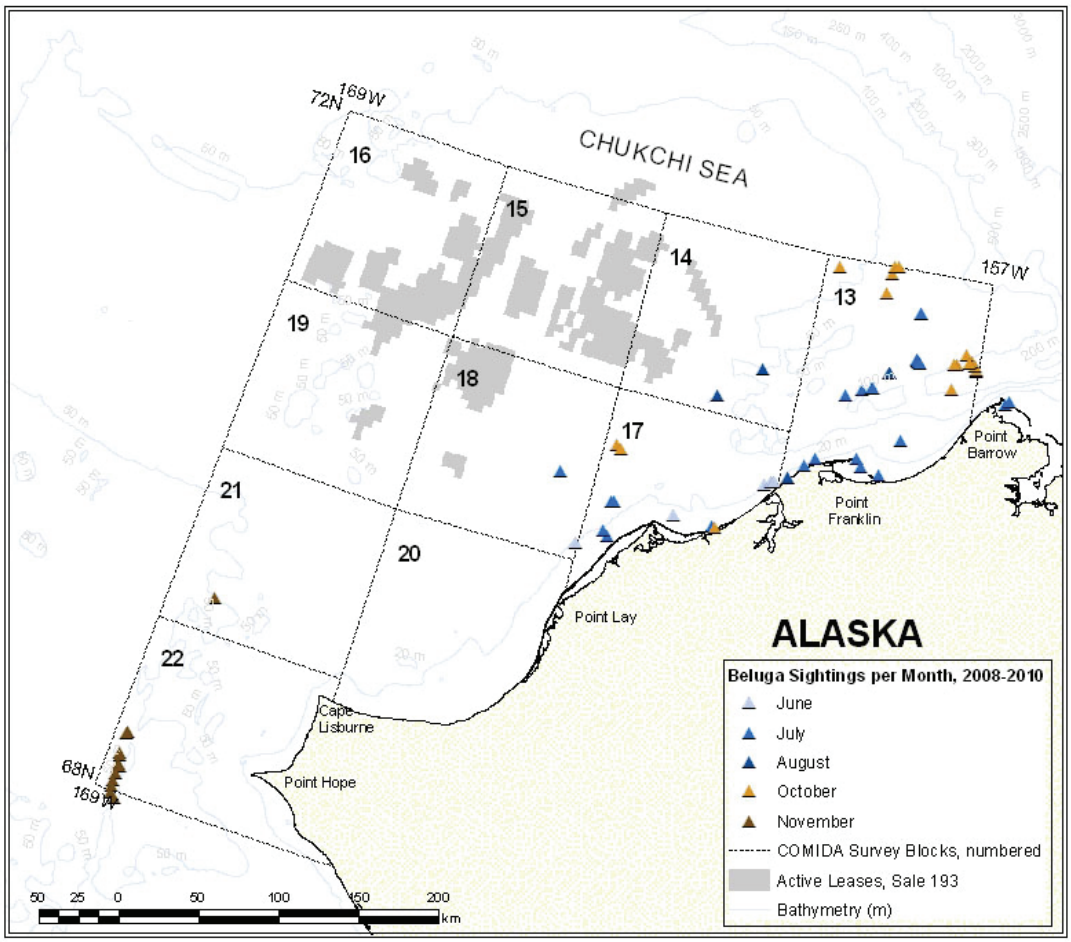

Figure 13. Beluga sightings per month, on- and off-effort, 2008-2010 combined.

summer 2010 was relayed to USGS walrus researchers onboard a vessel at sea to assist with walrus satellite tagging efforts. Collaboration with USFWS walrus researchers led to a joint presentation at the Marine Mammals of the Holarctic International Conference in Kaliningrad in October 2010 by Joel Garlich-Miller (USFWS); the presentation included materials prepared by Cynthia Christman (NMML) summarizing walrus sightings by COMIDA in 2010.

The COMIDA team also worked closely with biologists at the NSB Department of Wildlife Management. COMIDA relayed information about cetacean carcasses to NSB biologists in the event that they were able to send a team out for further investigation. In addition, COMIDA responded to an unusual sighting initially reported by Dr. Robert Suydam (NSB DWM) of ~650 belugas located in Elson Lagoon on 26 July 2010. The COMIDA team flew over the beluga sighting and took photographs in order to facilitate group size and composition (i.e., number of calves present) estimation (Appendix 3).

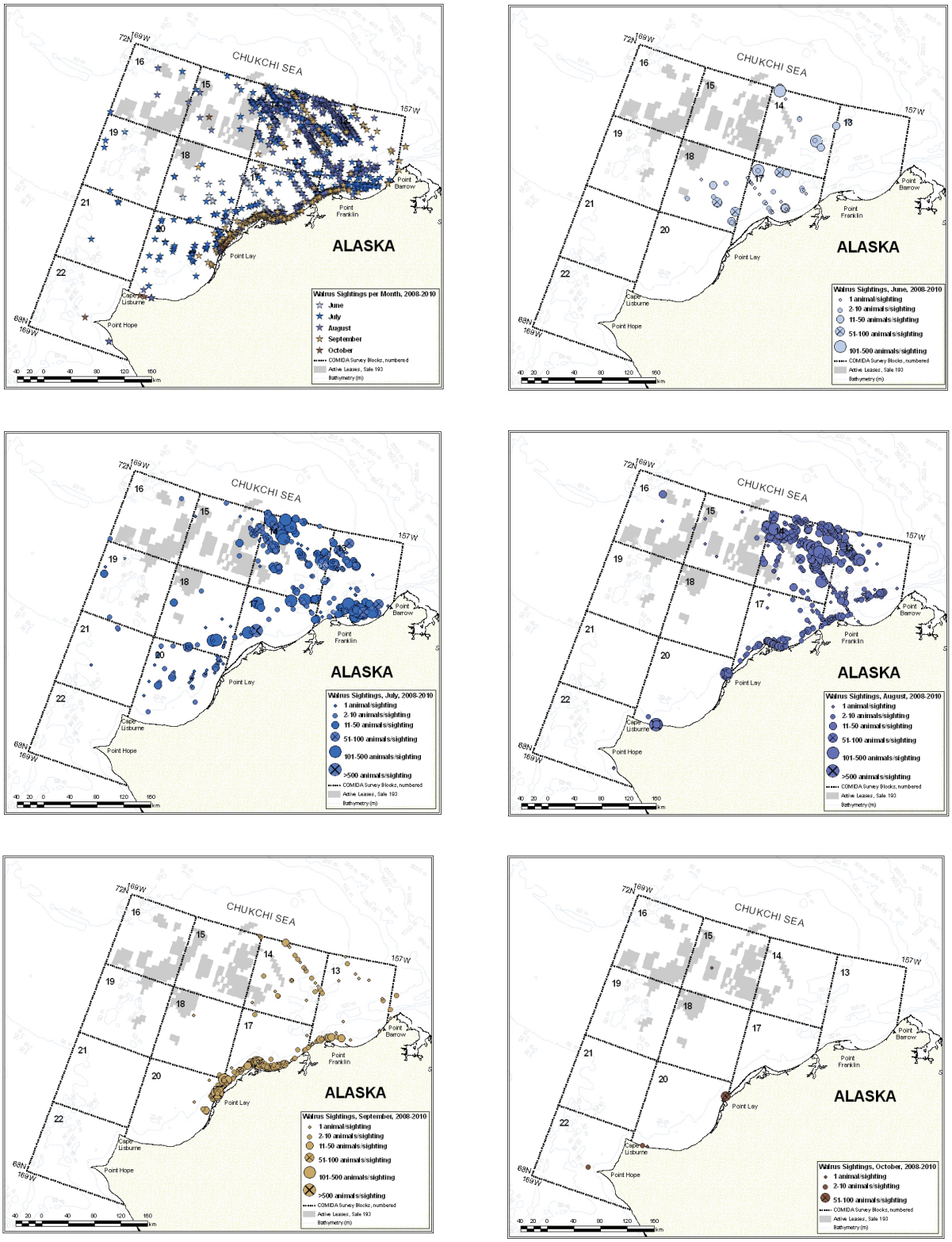

Figure 14. Walrus sightings per month, on- and off-effort, 2008-2010. Group size is indicated by symbol size.

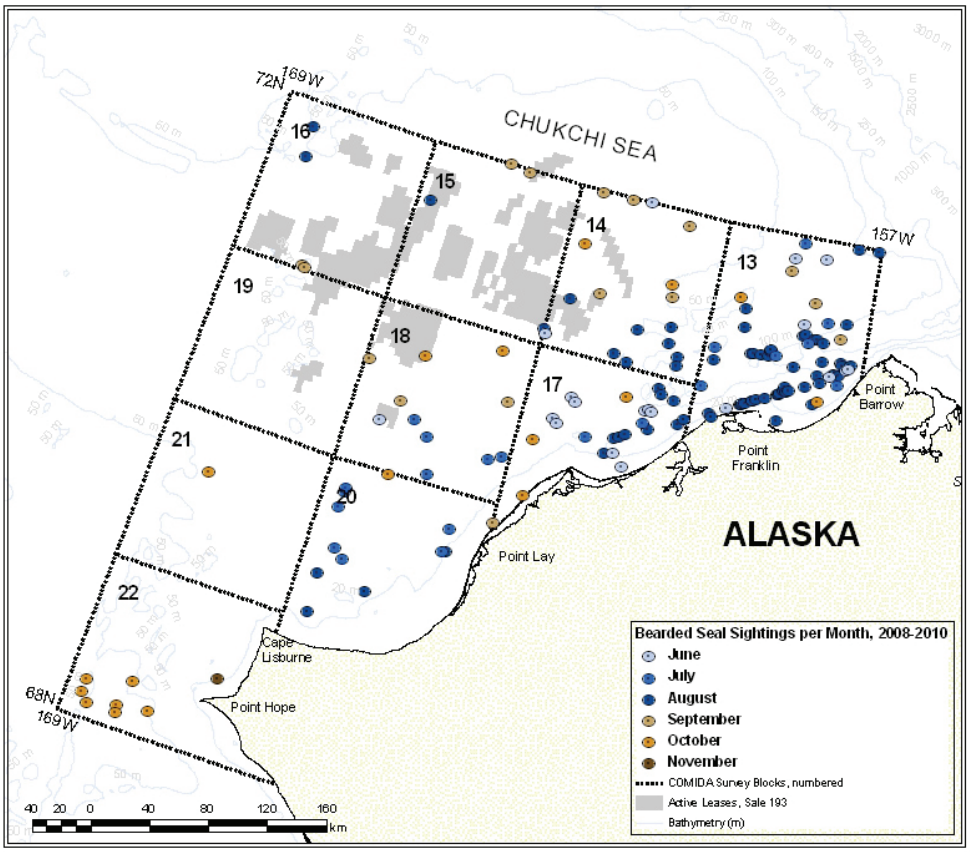

Figure 15. Bearded seal sightings per month, on- and off-effort, 2008-2010 combined.

Presentations, Reports and Publications

In addition to the Daily Reports that were posted to the NMML website after each flight, results of COMIDA research were presented at several venues. Presentations and posters are listed below; abstracts of posters are included in Appendix 5. A paper summarizing COMIDA results from 2008-2009 was presented at the International Whaling Commission Scientific Committee meetings in Morocco in June 2010, and is included as Appendix 6. Two white papers on gray whale abundance in the COMIDA area were also produced at the request of COR Charles Monnett.

List of Presentations:

Monitoring the Distribution of Arctic Whales in the Chukchi Sea. Presentation at the MMS Information Transfer Meeting, October 2008, Anchorage, Alaska. [Clarke].

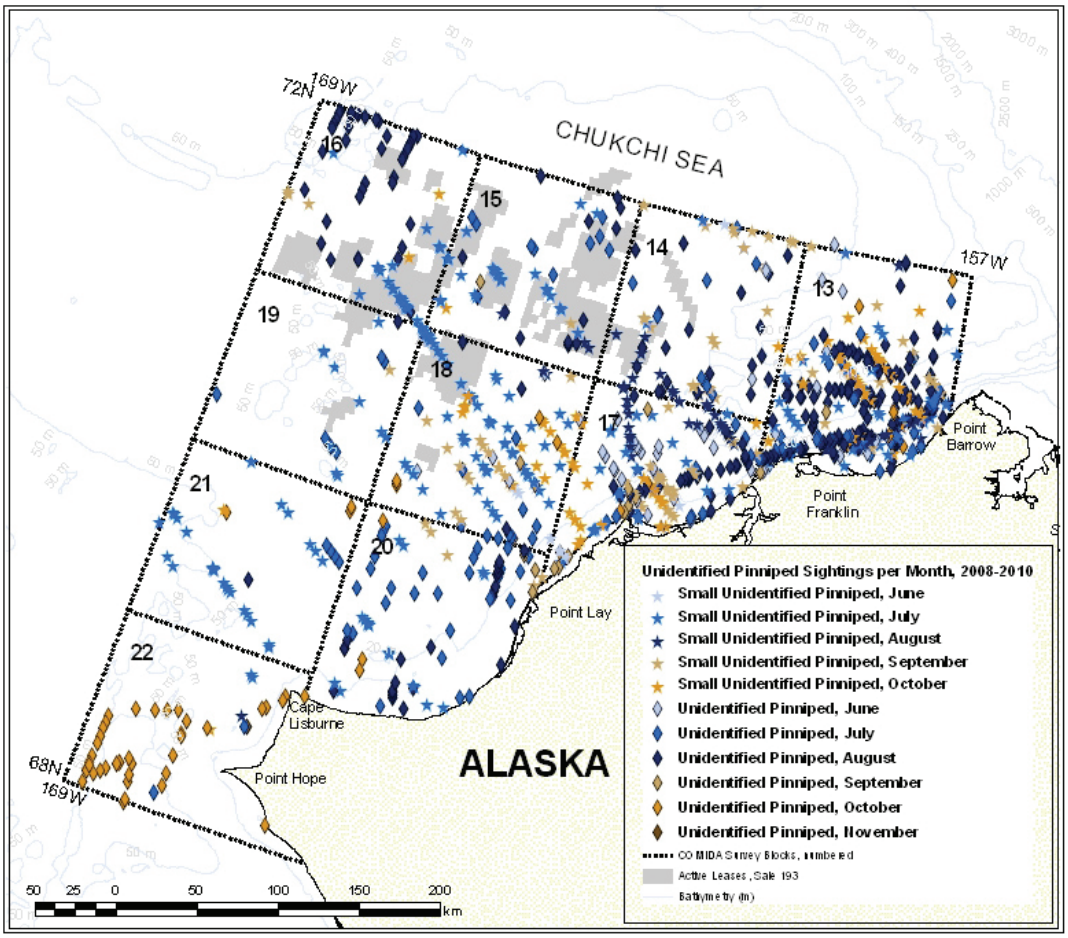

Figure 16. Unidentified pinniped sightings per month, on- and off-effort, 2008-2010 combined.

Marine mammal occurrence in the Northeastern Chukchi Sea, Alaska – comparison of data from autumn 1989-91 and autumn 2008. Poster presented at the Alaska Marine Science Symposium, January 19-23, 2009, Anchorage, Alaska, and the American Cetacean Society's 11th International Conference, November 13-16, 2008, Monterey, California. [Clarke, Morse and Rugh]. Abstract included.

Swimming polar bears in the Alaskan Chukchi Sea – the REAL story. Poster presented at the American Cetacean Society's 11th International Conference, November 13-16, 2008, Monterey, California. [Morse and Clarke]. Abstract included.

Marine mammal occurrence in the Northeastern Chukchi Sea, Alaska – summer 2008. Poster presented at the Alaska Marine Science Symposium, January 19-23, 2009, Anchorage, Alaska, and the American Cetacean Society's 11th International Conference, November 13-16, 2008, Monterey, California. [Morse, Clarke and Rugh]. Abstract included.

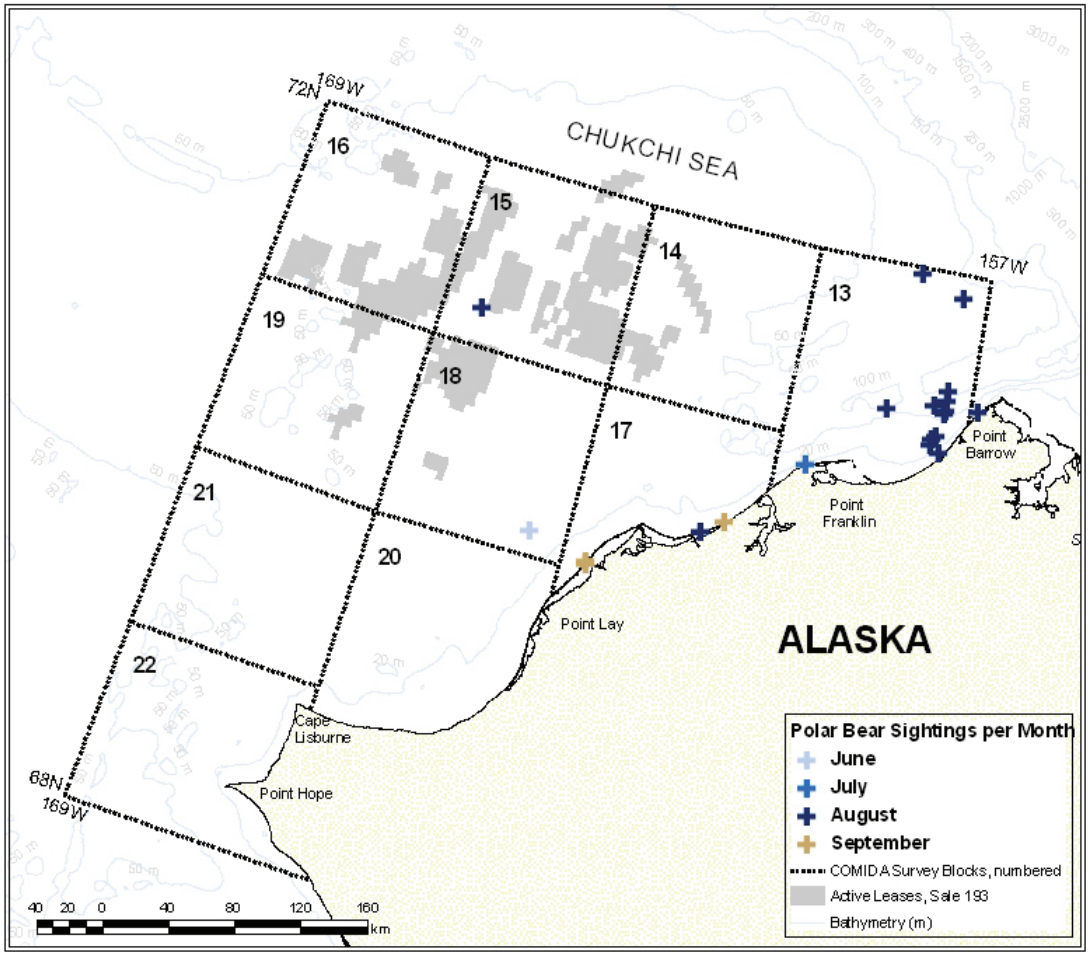

Figure 17. Polar bear sightings per month, on- and off-effort, 2008-2010 combined.

COMIDA and BWASP aerial surveys conducted by NMML 2008. Presentation at the BOWFEST workshop, January 2009, Anchorage, Alaska. [Clarke].

COMIDA and BWASP aerial surveys conducted by NMML 2008 (and 2009 results to date). Presentation to Marine Mammal Observer class, July 7, 2009, Barrow, Alaska. [Clarke].

BWASP and COMIDA aerial surveys in 2008. Presentation at the Arctic Stakeholder Open-Water Workshop, April 6-8, 2009, Anchorage, Alaska. [Clarke, Morse and Rugh].

Estimates of density and abundance of gray whales in the NE Chukchi during COMIDA2 2008. White paper prepared for Charles Monnett, Minerals Management Service, Anchorage Alaska, May 22, 2009. [Ferguson].

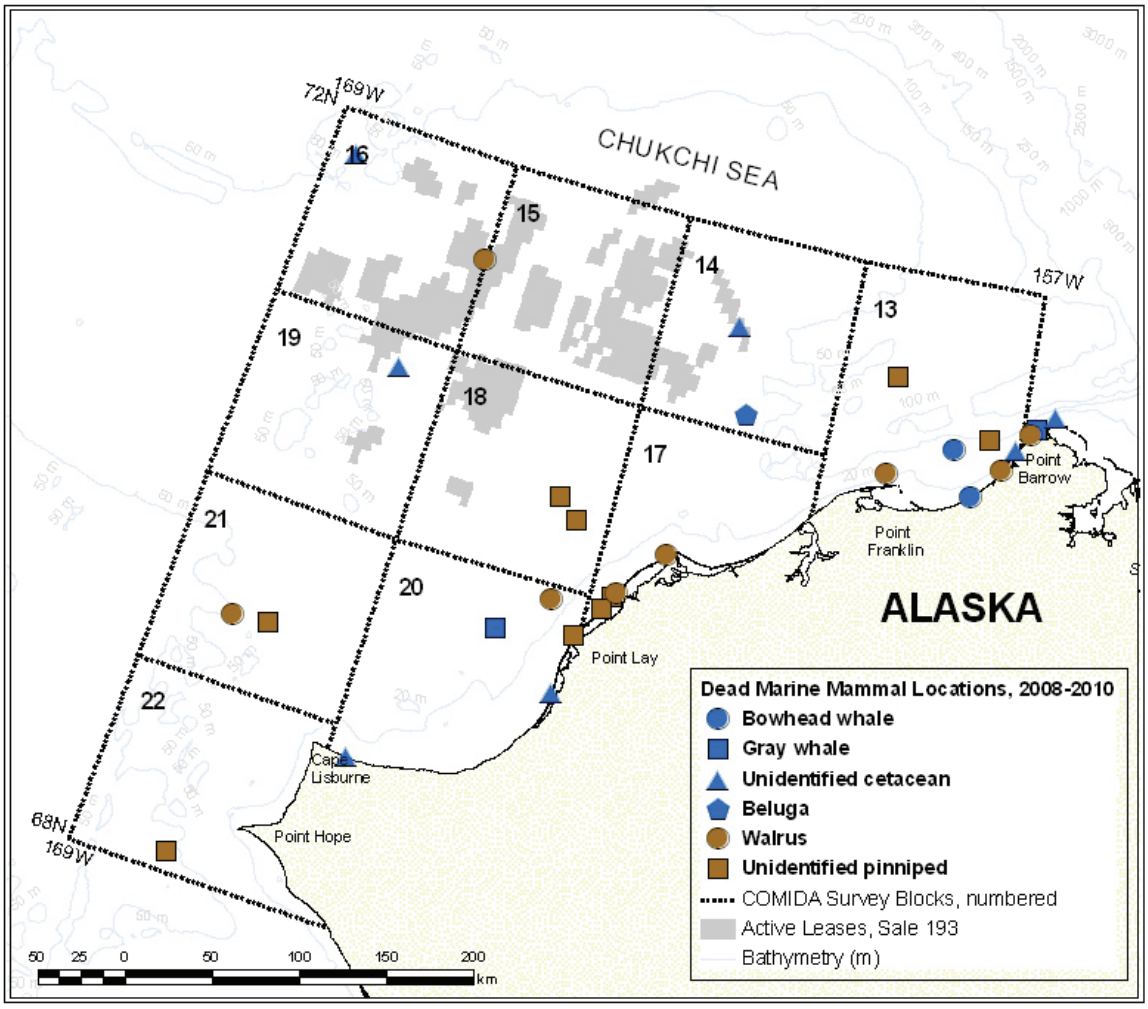

Figure 18. Sightings of dead marine mammals, on- and off-effort, 2008-2010 combined.

Bowhead Whale Aerial Survey Project (BWASP) status update in 2009. Poster presented at the Alaska Marine Science Symposium, January 18-22, 2010, Anchorage, Alaska. [Clarke, Ferguson, Morse, Friedrichsen, Rone and Christman]. Abstract included.

Aerial surveys for marine mammals in the northeastern Chukchi Sea: 2009. Poster presented at the Alaska Marine Science Symposium, January 18-22, 2010, Anchorage, Alaska. [Clarke, Christman, Ferguson and Morse]. Abstract included.

Pacific walrus sightings documented by aerial surveys of the northeastern Chukchi Sea in 2009. Poster presented at the Alaska Marine Science Symposium, January 18-22, 2010, Anchorage, Alaska. [Christman, Ferguson, Friedrichsen, Rone and Clarke]. Abstract included.

COMIDA – Flight 239 – 7 October 2010

Area flown: Transects 7, 5, 3, and 1, complete
Total hours flown: 3.9
Total transect hours: 2.3
Number of bowheads seen: 15 (1 calf)
Weather and visibility: Partly cloudy, with patches of snow showers and low ceilings. Sea state ranged from Beaufort 2 to 4, and visibility ranged from 0 to 10 km. No sea ice was present in the area surveyed.
Sightings: Bowhead whales, unidentified cetaceans, and unidentified pinnipeds

Bowhead Preliminary Summary, Flight 239 Date: 10/7/2010

Total bowheads: 15	Start time: 10/7/2010 10:49:35 AM	End time: 10/7/2010 2:45:26 PM
Bowhead sightings: 11	Transect minutes: 136	Transect km:442.5
Bowheads on transect: 9	Circling minutes: 13	Circling km: 45.3
Bowhead Cow-calf pairs: 1	Trans+Circ minutes: 149	Trans+Circ km: 487.8
Bowhead Cow-calf Pairs on transect: 1	Search minutes: 78	Search km: 288.9
Bowhead repeats: 0	Total minutes: 236	Total km: 812.9
Possible repeats: 0	Deadhead minutes: 8	Deadhead km: 36.2
Total gray whales: 0	Search blocks: 0, 13, 14, 12	
Total belugas: 0	Transect blocks: 13, 0, 14	
Other whale sightings: 2		
Total walrus: 0		
Total bear: 0		

Event	Lat	Long	Block	Species	Total	Repeat	Calves	Swim direction	Swim Speed	Behavior	On effort
78	71.08	-158.91	13	bowhead	1	no	0	-1	.	rest	True
94	71.1	-159.12	13	bowhead	2	no	0	-1	.	swim	False
102	71.14	-159.1	13	bowhead	2	no	0	-1	.	swim	False
113	71.16	-159.18	13	bowhead	1	no	0	-1	.	dive	False
115	71.17	-159.21	13	bowhead	1	no	0	-1	.	dive	True
117	71.18	-159.25	13	unknown cetacean	1	no	0	-1	.	dive	True
125	71.25	-159.47	13	unknown cetacean	1	no	0	-1	.	swim	True

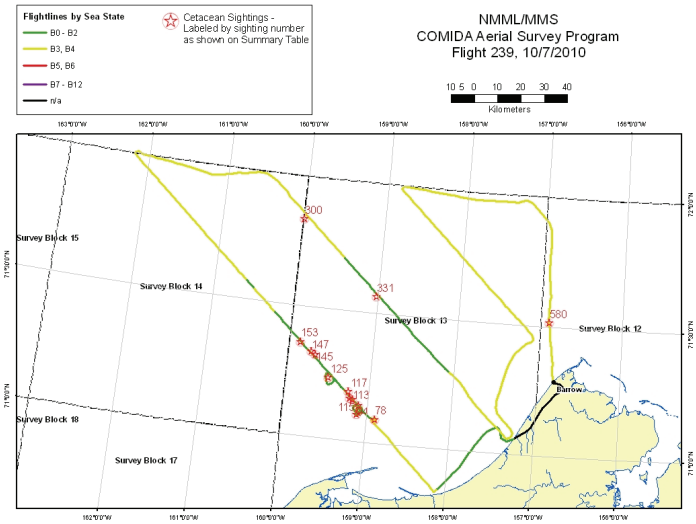

Figure 19. Sample Daily Report, as posted to the NMML COMIDA Survey Project: Preliminary Data website.

Efficiency of unmanned aircraft systems (UAS) relative to manned aircraft for surveying bowhead whale distribution and density in the Arctic. Poster presented at the Alaska Marine Science Symposium, January 18-22, 2010, Anchorage, Alaska. [Ferguson and Angliss]. Abstract included.

Comparison of UASs and manned aircraft for surveying bowhead whale distribution and density. Talk presented at the workshop entitled *Using Unmanned Aircraft Systems to Study Marine Mammals and Other Wildlife Species*, October 10, 2009, Quebec City, Canada. [Ferguson, Angliss, Rugh, Mocklin and Vate Brattström].

COMIDA and BWASP aerial surveys conducted by NMML 2009. Presentation at the BOWFEST workshop, January 2010, Anchorage, Alaska, and the Arctic Stakeholder Open Water Meeting, 24 March 2010, Anchorage, Alaska. [Ferguson and Clarke].

Estimates of density and abundance of gray whales in NE Chukchi during COMIDA surveys in August 2009. White paper prepared for Charles Monnett, Minerals Management Service, Anchorage Alaska, October 23, 2009. [Ferguson].

Eastern North Pacific gray whale distribution and habitat use in the Chukchi Sea from aerial surveys: 1982-1991, 2008-2010. Poster presented at the Alaska Marine Science Symposium, January 17-21, 2011, Anchorage, Alaska. [Brower, Clarke, Ferguson, Christman and Grassia]. Abstract included.

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CONCLUSIONS

The COMIDA aerial survey component met or exceeded all stated objectives from 2008-2010. Valuable data pertinent to the CSPA were collected in all years, supplementing aerial survey data collected in the 1980s and early 1990s. Highlights from 2008-2010 include:

- Bowhead whales continued to be observed in autumn, broadly distributed west and southwest across the northeastern Chukchi Sea; in some years, areas close to shore between Barrow and Pt. Franklin, Alaska, provided temporary feeding opportunities.

- Gray whales were distributed nearshore between Wainwright and Barrow, where feeding behavior was confirmed; unlike the previous survey period (1982-1991), gray whales were not seen offshore in the Hanna Shoal area.

- Two additional endangered cetacean species, one fin and one humpback whale, were sighted in the northeastern Chukchi Sea.

- Belugas were generally not observed in the study area in late summer and early autumn, but were present in early summer and late autumn.

- Walruses were closely associated with sea ice when it was present; when sea ice was not present, relatively large numbers of walruses were observed in coastal haulouts.

- Polar bears were present in the study area in summer and autumn, but their distribution and occurrence were not predictable.

- Aerial surveys by manned aircraft remain the only means of assessing marine mammal distribution and relative abundance in an area as large as the CSPA, despite increasing periods of inclement weather.

ACKNOWLEDGEMENTS

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Appendix 1: Chukchi Offshore Monitoring in Drilling Area (COMIDA) Aerial Survey, Annual Report 2008

CHUKCHI OFFSHORE MONITORING IN DRILLING AREA (COMIDA) AERIAL SURVEY 2008

INTRODUCTION

The Chukchi Offshore Monitoring in Drilling Area (COMIDA) aerial survey component was initiated in 2008, via an Interagency Agreement (Number M08PG20023) between the Minerals Management Service (Department of the Interior) and the National Marine Mammal Laboratory (Alaska Fisheries Science Center, National Marine Fisheries Service, Department of Commerce). These surveys are a continuation of aerial surveys that were conducted by MMS-sponsored contractors from 1982-1991 (see Moore and Clarke, 1992) and were conducted using similar methodology. Aerial surveys remain the only practical means of assessing marine mammal use in large study areas. The goal of this study is to investigate the distribution and abundance of marine mammals in the Chukchi Sea Planning Area (CSPA) during the open water months of June-November when various species are making seasonal migrations through the area. The COMIDA study area encompasses the northeastern Chukchi Sea from shore seaward to 68°N to 72°N and 157°W to 169°W, and it overlays Lease Sale 193 (offered in February 2008). COMIDA aerial surveys were based out of Barrow and Kotzebue. Species of interest include the bowhead whale (an endangered species that is hunted by Native Inupiat from coastal Chukchi villages), gray whale, beluga, polar bear, walrus and the ice seals (bearded, ringed, spotter and ribbon seals). Increasing the understanding of marine mammal distribution, abundance and migration timing in this region will assist in decision-making to minimize impacts from petroleum development activities.

Several communities along the Alaskan Chukchi coast conducted subsistence hunts for beluga, walrus, and other pinnipeds during the COMIDA survey periods. The COMIDA Project Manager and Field Team Leader met with North Slope Borough biologists, C. George and R. Suydam, prior to the commencement of aerial surveys to discuss areas of importance to subsistence hunters. These areas, generally near the villages and within a few kilometers of the coast, were avoided if hunters were observed in small boats. Additionally, areas within the Kasegaluk Lagoon encompass known spotted seal haulouts. During time periods when spotted seals were expected to be at haulouts, overflights of the lagoon were conducted at a higher altitude to avoid potential impacts.

Marine mammal studies are permitted under NMML's Permit No. 782-1719-07. This permit does not include polar bears and walrus, which are under the jurisdiction of the U.S. Fish and Wildlife Service. To avoid potential harassment or take of those species, circling was not conducted and survey altitude remained at or above 1000 ft (310 m).

FIELD PROJECTS

Aerial Surveys

Aerial surveys were conducted over the COMIDA study area during three field seasons: 16 June – 7 July (known as COMIDA1), 3-26 August (COMIDA2), and 21 October – 10 November (COMIDA3) 2008. North-south transects were flown in eleven survey blocks west and south of Point Barrow (Figure 1) in a NOAA Twin Otter aircraft (N56RF and N57RF). These survey blocks are identical to those flown previously, which will allow some comparison between data from the late 1980s and the current surveys. Survey altitude was generally near 365 m (1200 ft), although lower ceilings occasionally required surveys be conducted at 1000 ft (310 m). The airplane was equipped with two large bubble windows and a removable side window to allow for photography of whales for verification of species and presence of calves. Surveys were flown at 110 kts airspeed.

Preliminary analysis of COMIDA data has provided the following provisional information.

COMIDA1

Seven flights were conducted between 19 June and 2 July 2008 during the COMIDA1 survey period (Table 1), based out of Barrow. A total of 35.3 hours of usable surveys were flown, as well as 9.0 hours (20% of total flight time) on deadhead (non-usable survey time due to inadequate visibility or transits over land) (Figure 2). The limited survey time was generally due to low ceilings and widespread fog and low visibility; three days (28-30 June) were also necessary for required 100-hr maintenance on the aircraft. Marine mammals seen included 30 gray whales, three unidentified cetaceans (likely gray whales based on presence of well-defined mud plumes), 63 belugas, 288 walrus, one polar bear, and 72 bearded seals and unidentified pinnipeds (Table 2, Figure 3). Also of note, one fin whale was seen on 2 July 2008 at 69.3° N, 165.7° W (Figure 4). This represents one of the farthest north verified sightings of a fin whale in the Chukchi Sea.

Ice conditions during most of COMIDA1 comprised 80-100% ice cover north of 70.5°N and 0-80% south of 70.5°N. Ice was mostly floe and broken floe, with open and refrozen leads scattered amongst the floe ice. Sea states were excellent (Beaufort 00-02) in high ice coverage areas, and ranged from Beaufort 00 to 04 in open water areas west and south of Pt. Lay.

COMIDA2

Twelve flights were conducted from 7-25 August 2008 during the COMIDA2 survey period (Table 1), based out of Barrow. A total of 57.6 hours of usable surveys were flown, as well as 16.5 hours (22% of total flight time) on deadhead (Figure 5). The increased survey time (compared with COMIDA1) was due to higher ceilings and longer time periods of acceptable survey weather. Marine mammals seen included one bowhead whale (in the northernmost area of Block 15 during a transit back to Barrow), 183 gray whales, 31 unidentified cetaceans (likely gray whale based on presence of well-defined mud plumes), four belugas, 5,707 walrus, 16 polar

bears, and 602 bearded seals and unidentified pinnipeds (Table 2, Figure 6). Of note, ten of the polar bears were seen on a single flight on 16 August, all of which were swimming in open water (Figure 7). On that date, the southernmost bear was within five km of land, and the northernmost bear was nearly 90 km from the nearest land. The northernmost bears were within ~ five km of broken floe ice; the other eight bears were several kilometers from the nearest ice.

Ice conditions during COMIDA2 were quite different from those seen during COMIDA1. Most of the study area was completely ice-free, except for the northernmost survey blocks. Sea states varied from Beaufort 00 in the northernmost area where heavy ice was still present to B06 in open water areas.

COMIDA3

Six flights were conducted from 23 October – 4 November 2008 during the COMIDA3 survey period (Table 1); only one of these flights was completed in November. Surveys were based from Kotzebue, which allowed greater amount of daylight hours than available in Barrow. A total of 26.5 hours of usable surveys were flown, as well as 10.3 hours (28% of total survey time) on deadhead (Figure 8). Survey days in November were stymied by widespread snow showers and low ceilings and visibility. Marine mammals seen included three bowhead whales in the northern Chukchi (including one cow-calf pair), 13 gray whales, two unidentified cetaceans, 284 belugas, and 108 bearded seals and unidentified pinnipeds (Table 2, Figure 9). Gray whales were observed only in the southern Chukchi, despite survey coverage in the more northerly blocks. Gray whales have previously been acoustically recorded near Barrow nearly year-round (Stafford et al 2007), and 2008 ice conditions in the northern Chukchi in late October and early November did not appear to be an impediment to gray whale feeding opportunities. Interestingly, gray whales were also seen in late autumn 1989 only in the same southern Chukchi area (Figure 10), despite excellent survey coverage (Moore and Clarke, 1992). The importance of this area, and the underlying reasons why gray whales occur there, will continue to be investigated in future COMIDA surveys.

Ice conditions during COMIDA3 consisted of shorefast and grease ice, but the majority of the study area remained ice free. Sea states varied from Beaufort 00-01 in sheltered waters to B03-04 in areas of newly formed grease ice. Sea states in open water areas commonly exceeded B06.

Acknowledgements

Numerous individuals and organizations contributed to the success of the COMIDA aerial surveys. Janet Clarke (SAIC Ocean Sciences Division) is the COMIDA Program Manager, Laura Morse (NMFS-AFSC-NMML) is the COMIDA Field Team Leader, and our excellent observers included Jeff Childs (Aquatic Farms), Gary Friedrichsen (NMFS-SWFSC), and Kim Goetz and Megan Ferguson (NMFS-AFSC-NMML). Dr. Charles Monnett (MMS, Alaska OCS Region, COR) and Dave Rugh and Kim Shelden (NMML Project Coordinators)

provided useful advice and logistics support throughout the season; AFSC also provided web support for posting of daily survey reports. Mike Hay (MMS database programmer) gamely updated the data collection program when requested. The survey aircraft, pilots and mechanics were provided in 2008 by NOAA Aircraft Operations Center; we especially appreciate the services of pilots Douglas MacIntyre, Phillip Eastman, Jon French, and Scott Sandorf, and mechanics Sean Campbell, Mike Merik, and Ron Paully. Jan Bennett and Lark Wuerth (Department of the Interior Aviation Management Unit) monitored every 2008 flight via satellite-linked Aviation Flight Following. In Barrow, additional logistics support was provided by the North Slope Borough, Arctic Science Research Consortium and King Eider Inn. The aircraft was kept warm and safe in a hangar in Kotzebue made available from the State of Alaska and Alaska National Guard. A final word of appreciation and acknowledgment is extended to Flight Service personnel in Barrow and Kotzebue.

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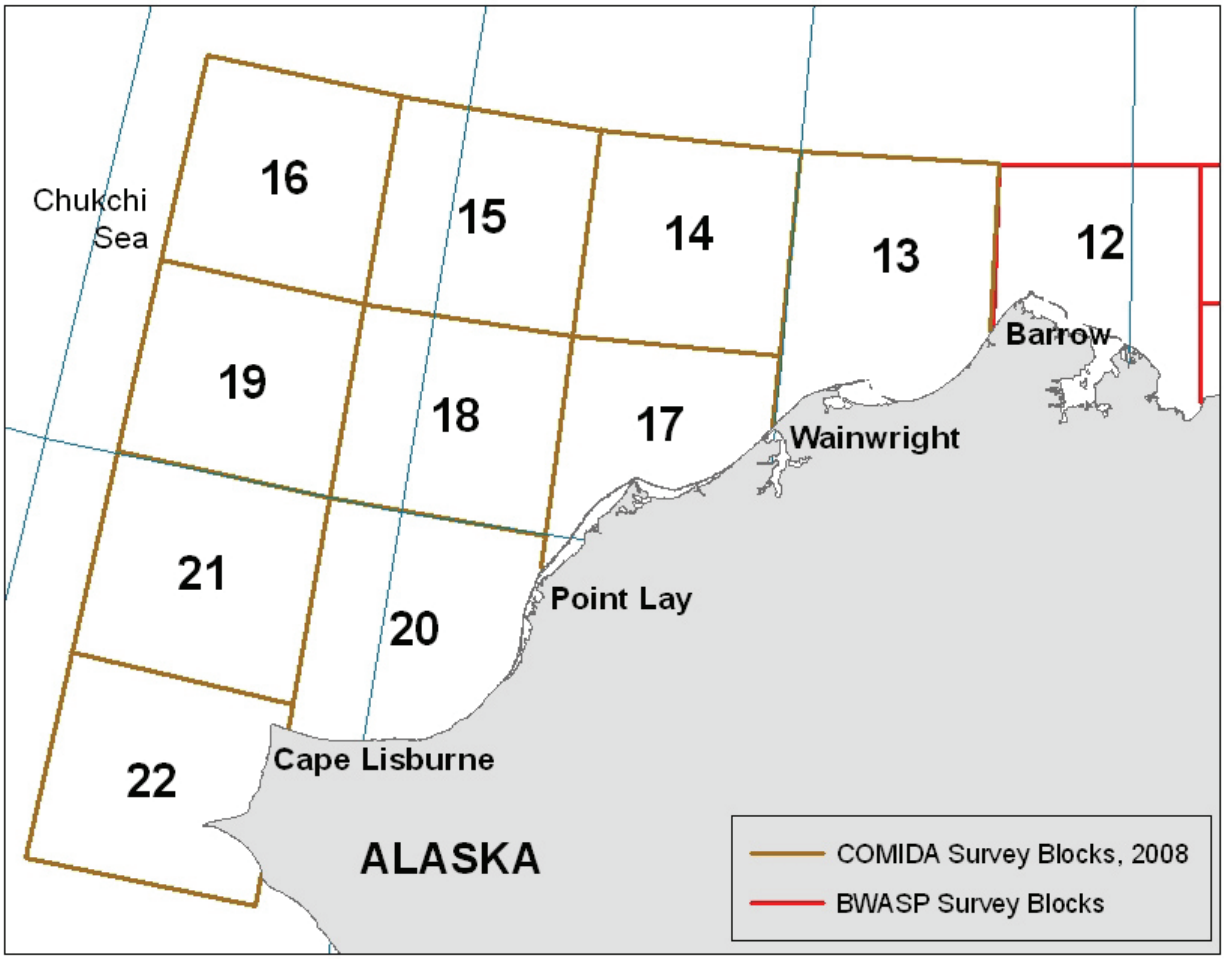

Figure 1. COMIDA survey blocks 13-22. Block 12 is part of the BWASP survey area and was occasionally surveyed if weather precluded surveying the COMIDA area.

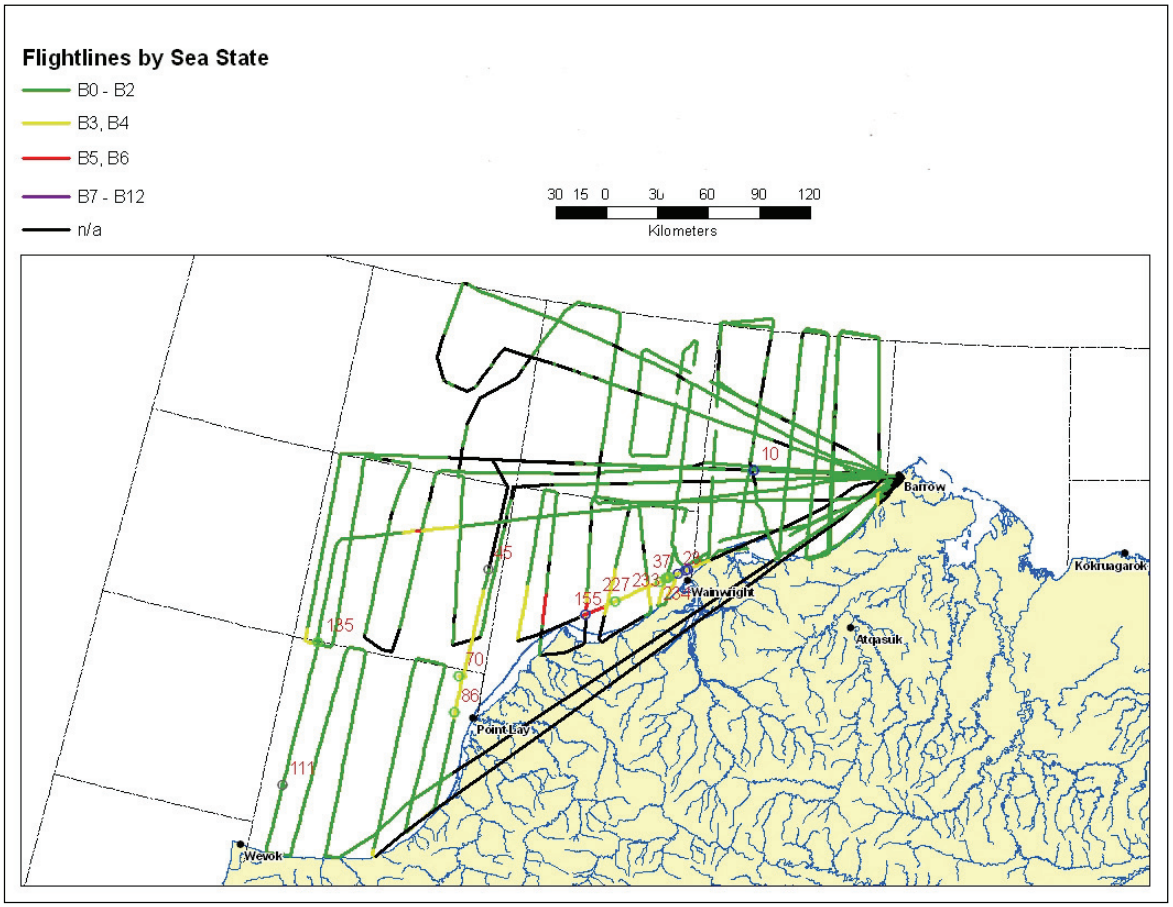

Figure 2. COMIDA1 effort, 19 June-2 July 2008, depicted by sea state (black lines indicate time on deadhead). Numbers represent cetacean sighting events (see Fig. 3 for complete sighting details).

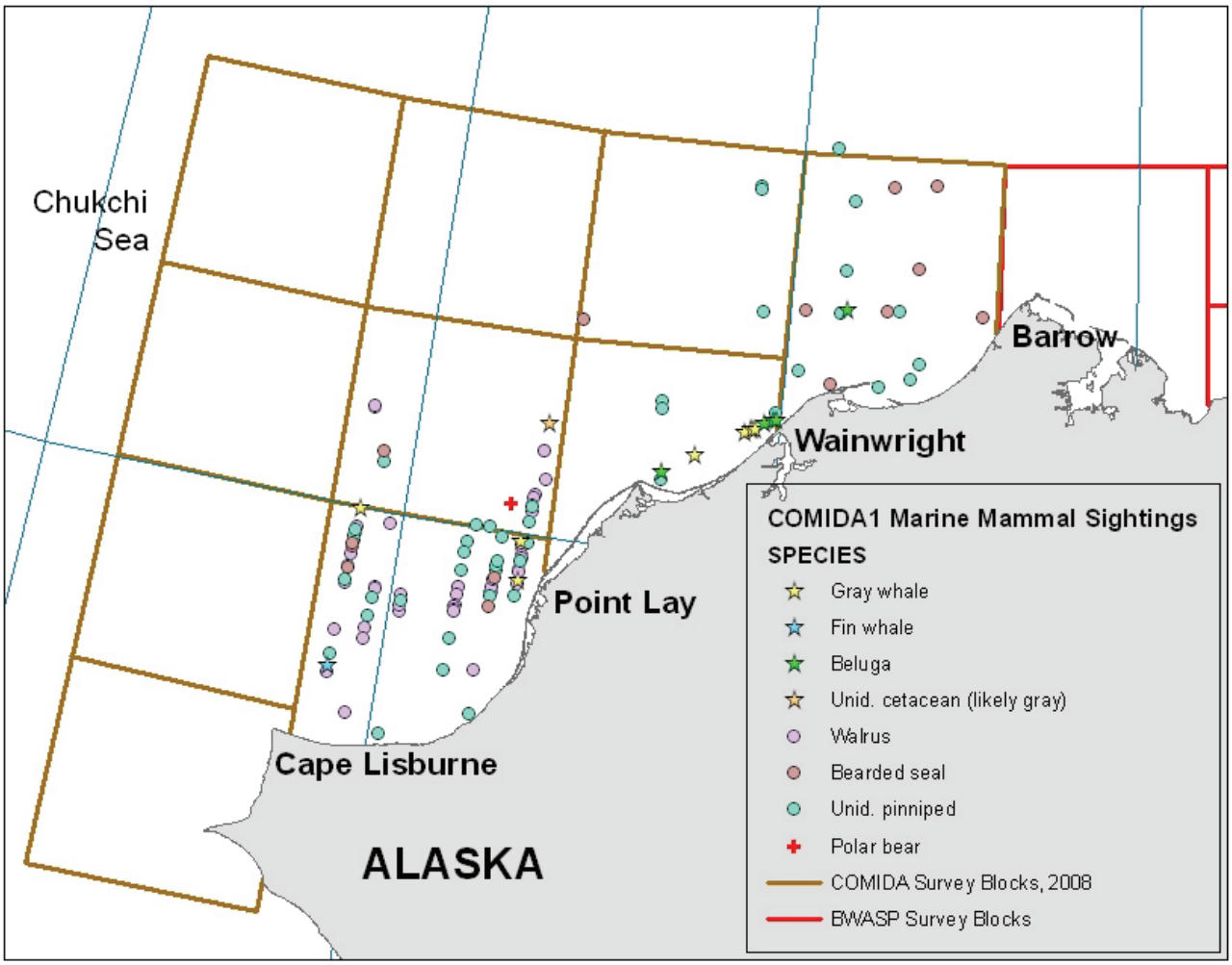

Figure 3. COMIDA1 marine mammal sightings, 19 June-2 July 2008.

Figure 4. Fin whale sighting, 2 July 2008 (photo by L. Morse, NMML).

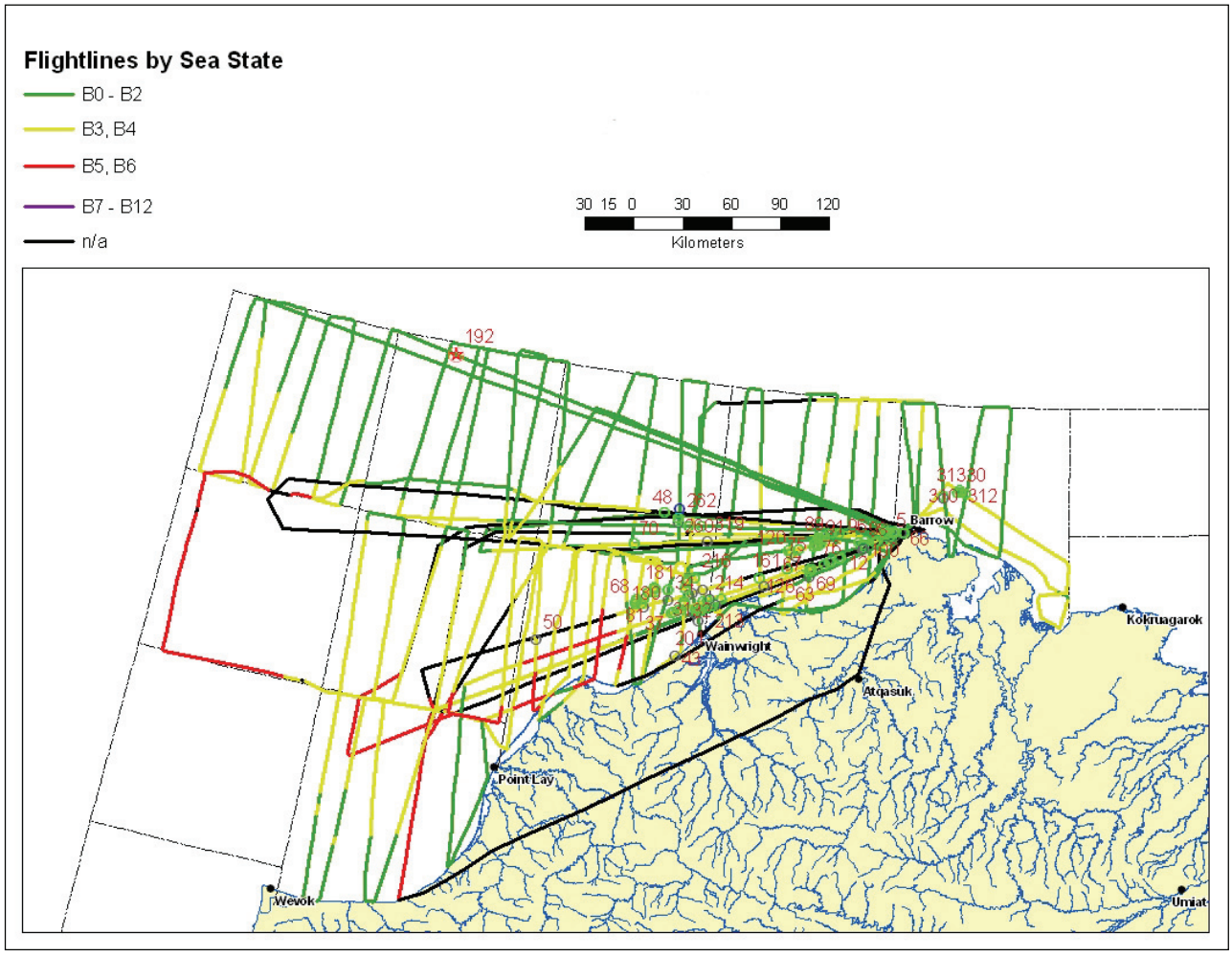

Figure 5. COMIDA2 effort, 7-25 August 2008, depicted by sea state (black lines indicate time on deadhead). Survey lines in block 12 (directly east of COMIDA study area) were flown to determine if bowhead whales were present prior to the start of the BOWFEST effort. Numbers represent cetacean sighting events (see Fig. 6 for sighting details).

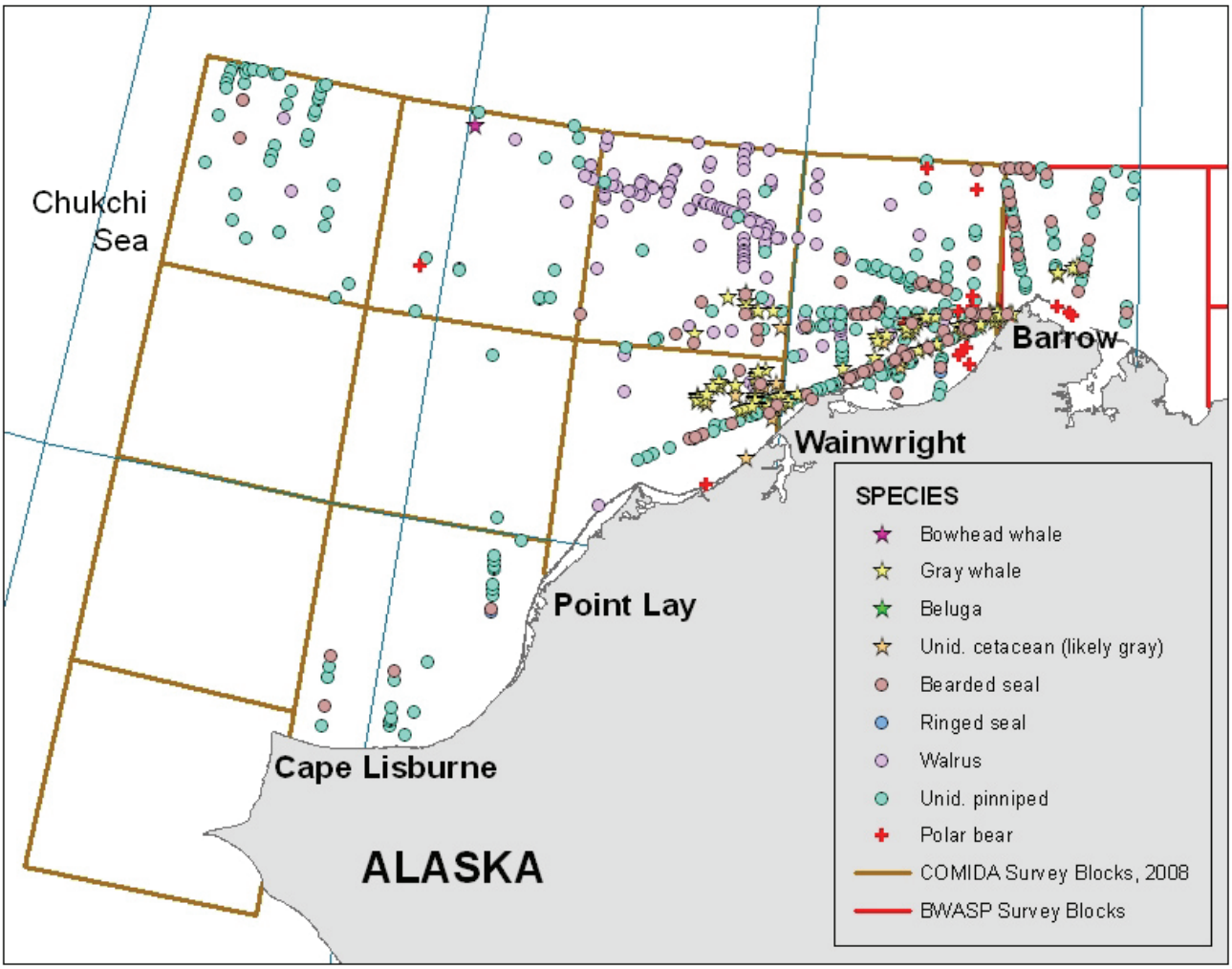

Figure 6. COMIDA2 marine mammal sightings, 7-25 August 2008.

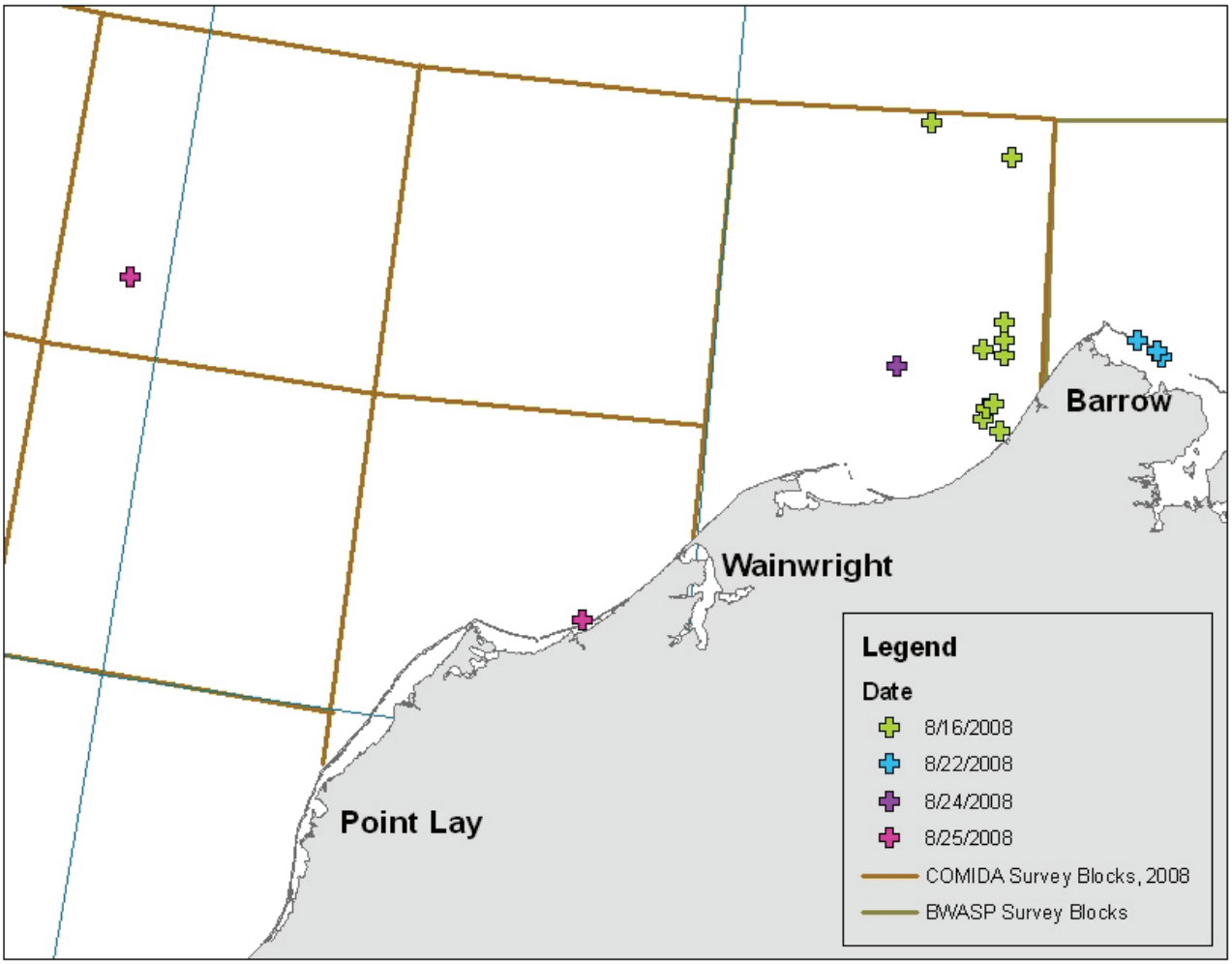

Figure 7. COMIDA2 polar bear sightings, 16-25 August 2008.

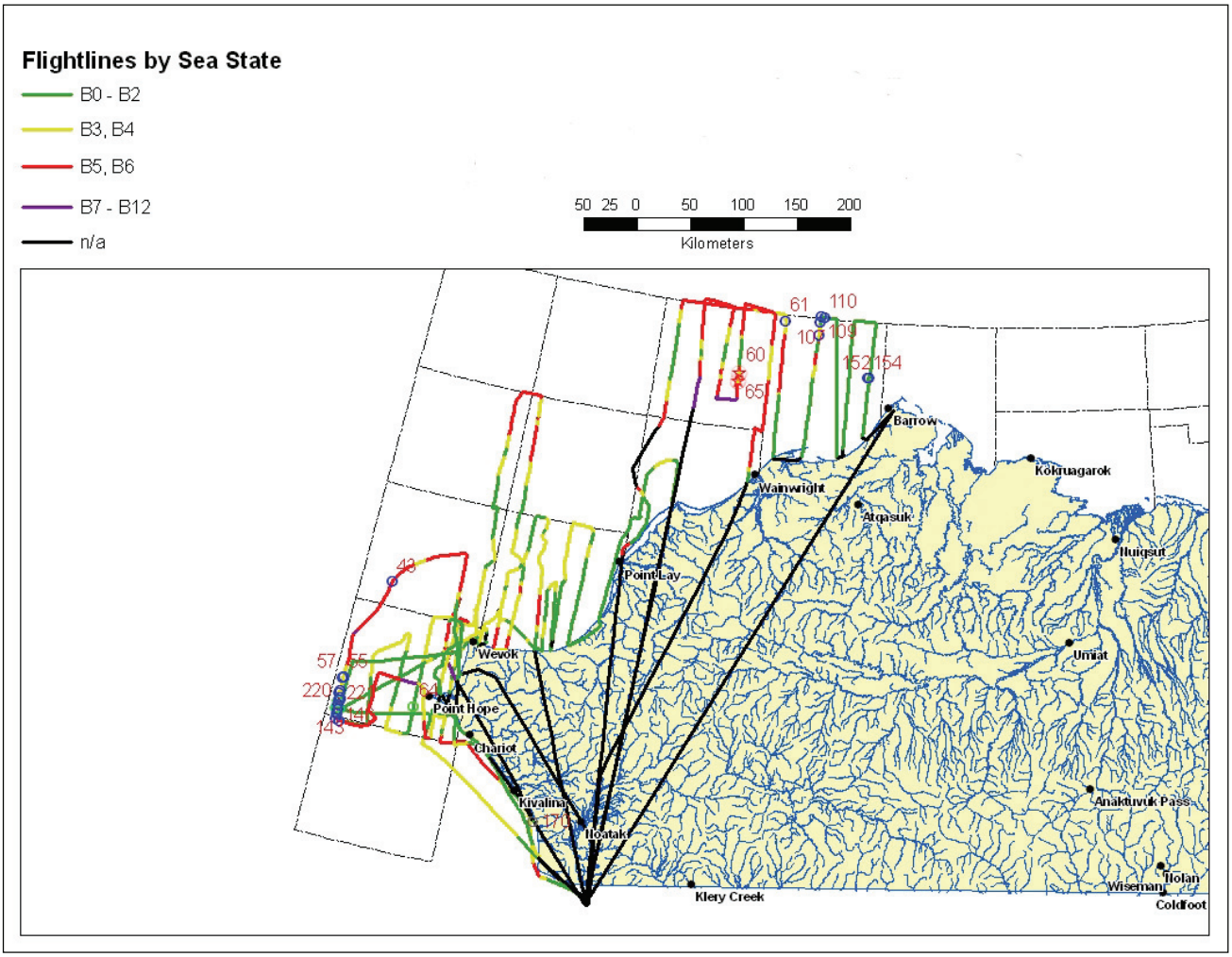

Figure 8. COMIDA3 effort, 23 October-4 November 2008, depicted by sea state (black lines indicate time on deadhead). Numbers represent cetacean sighting events (see Fig. 9 for complete sighting details).

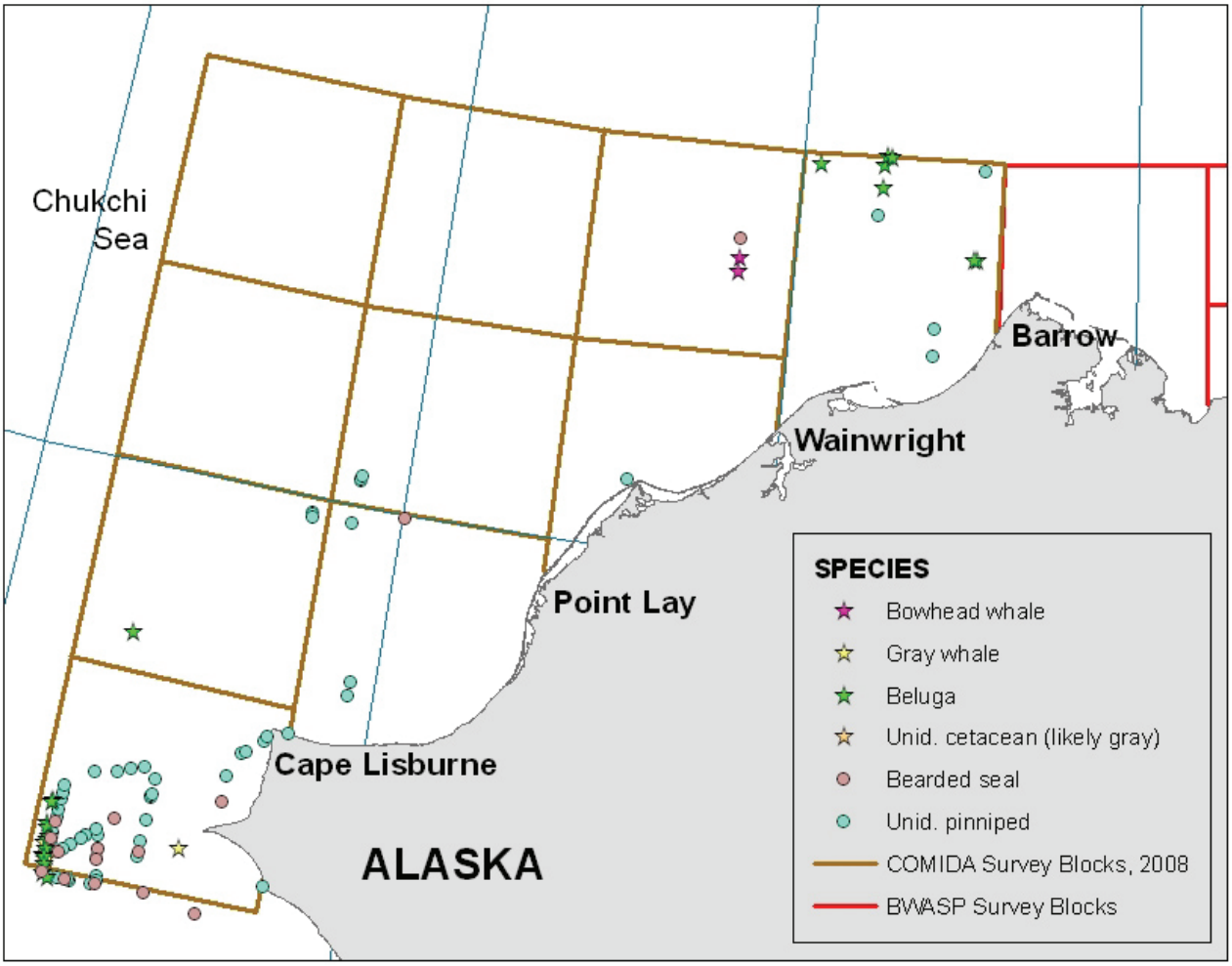

Figure 9. COMIDA3 marine mammal sightings, 23 October-4 November 2008.

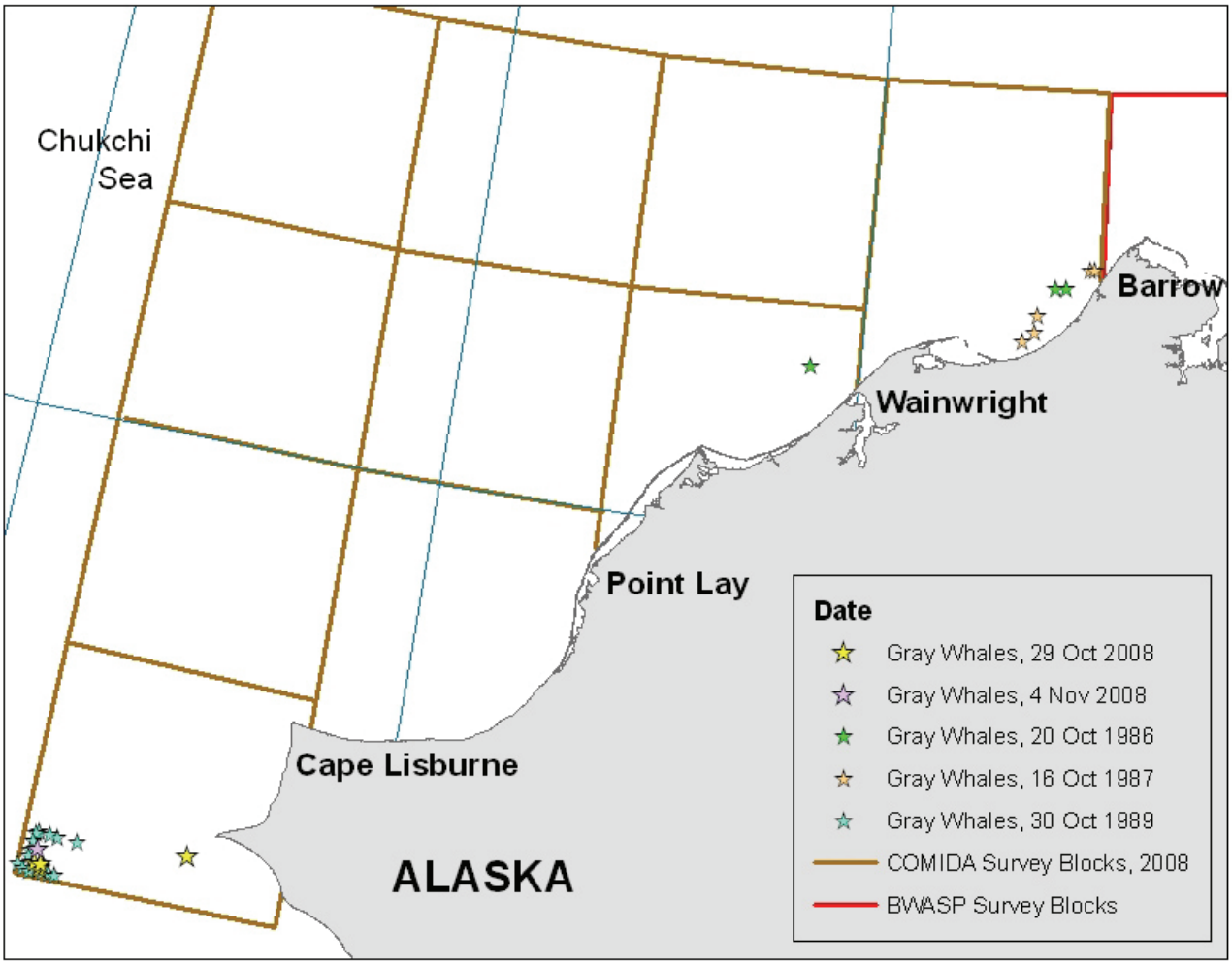

Figure 10. Comparison of gray whale sightings, late autumn, 1982-91 and 2008.

Table 1. Summary of 2008 COMIDA flight effort.

Dates	Project	Total Flights	Transect Kilometer	Transect Hour	Total Kilometer	Total Hour
16 June-7 July	COMIDA1	7	3,594	17.7	7,263	35.3*
3-26 August	COMIDA2	12	5,366	26.3	11,990	57.6**
21 October-10 November	COMIDA3	6	3,035	14.5	5,550	26.5***

* does not include 9.0 hours of deadhead (non-useable) survey time

** does not include 16.5 hours of deadhead survey time

*** does not include 10.3 hours of deadhead survey time

Table 2. Summary of 2008 COMIDA sightings.

	COMIDA 1		COMIDA 2		COMIDA 3	
Species	**On Transect**	**Total Survey**	**On Transect**	**Total Survey**	**On Transect**	**Total Survey**
Bowhead	0/0	0/0	0/0	1/1	2/3	2/3
Gray	4/7	9/30	27/41	86/183	3/4	7/13
Unid Cetacean	0/0	2/3	4/4	28/31	1/2	1/2
Beluga	1/4	5/63	1/4	1/4	13/287	22/284
Fin	0/0	1/1	0/0	0/0	0/0	0/0
Walrus	46/283	48/288	58/1846	144/5707	0/0	0/0
Polar Bear	1/1	1/1	6/6	16/16	0/0	0/0
Bearded Seal	10/14	14/18	36/41	88/104	8/9	15/18
Other Pinniped	38/58	45/68	157/264	286/498	37/50	63/88

Table format: # of sightings/ # of animals

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Appendix 2: Chukchi Offshore Monitoring in Drilling Area (COMIDA) Aerial Survey, Annual Report 2009

CHUKCHI OFFSHORE MONITORING IN DRILLING AREA (COMIDA) AERIAL SURVEY 2009

INTRODUCTION

The Chukchi Offshore Monitoring in Drilling Area (COMIDA) aerial survey component was initiated in 2008, via an Interagency Agreement (Number M08PG20023) between the Minerals Management Service (Department of the Interior) and the National Marine Mammal Laboratory (Alaska Fisheries Science Center, National Marine Fisheries Service, Department of Commerce). These surveys are a continuation of aerial surveys that were conducted by MMS-sponsored contractors from 1982-1991 (see Moore and Clarke, 1992) and were conducted using similar methodology. Aerial surveys remain the only practical means of assessing marine mammal distribution, population density, and habitat use in large study areas. The goal of this study is to investigate the distribution and relative abundance of marine mammals in the Chukchi Sea Planning Area (CSPA) during the open water (ice-free) months of June-October when various species are undertaking seasonal migrations through the area. The COMIDA study area encompasses the northeastern Chukchi Sea from shore seaward, 68°N to 72°N and 157°W to 169°W, and overlays Lease Sale 193 (offered in February 2008). COMIDA aerial surveys were based out of Barrow and Kotzebue. Species of interest include the bowhead whale (an endangered species that is hunted by Native Inupiat from coastal Chukchi Sea villages), gray whale, beluga, polar bear, walrus and the ice seals (bearded, ringed, spotted and ribbon seals). Increasing the understanding of marine mammal distribution, abundance and migration timing in this region will assist in decision-making to minimize impacts from petroleum development activities and other anthropogenic impacts.

Several communities along the Alaskan Chukchi coast conducted subsistence hunts for beluga, walrus, and other pinnipeds during the COMIDA survey periods. The COMIDA Project Manager met with North Slope Borough (NSB) biologists, C. George and R. Suydam, prior to the commencement of aerial surveys to discuss areas of importance to subsistence hunters. These areas, generally near the villages and within a few kilometers of the coast, were avoided if hunters were observed in small boats. Additionally, areas within the Kasegaluk Lagoon encompass known spotted seal haulouts. During time periods when spotted seals were expected to be at haulouts, overflights of the lagoon were conducted at a higher altitude to avoid potential impacts. Survey altitude was also increased when walruses were sighted on ice or on beach haulouts to minimize disturbance.

Marine mammal studies were permitted under NMML's Permit No. 782-1719-09 for cetaceans and FWS Permit No. MA212570 for polar bears and walrus. In addition, Land Management Permits were obtained from the NSB Planning and Community Services Department to conduct aerial surveys in the COMIDA and adjacent BWASP (Bowhead Whale Aerial Survey Project) survey areas.

FIELD PROJECTS

Aerial Survey Protocol

A revised survey design was adopted in 2009, with offshore transect lines oriented perpendicular to the coastline instead of oriented north-south (Figure 1). In addition, the survey design included a coastal transect between Pt. Barrow and Pt. Hope. This design was adopted for several reasons.

1. Transects now run across the major bathymetric features of the northeast Chukchi, including Barrow Canyon and Hanna Shoal, across the retreating summer ice (a tongue of ice usually persists longer in the offshore Chukchi Sea parallel to coast while coastal areas are ice free earlier in season), and across the predominant Chukchi Sea currents.
2. Transects now cross perpendicular to bowhead and beluga migration paths as described from bowhead and beluga satellite track data, as well as indicated by the distribution of historical bowhead sightings from 1982-2008.
3. Less time is spent on search effort (off transect). As described above, all transects were projected to start at the coastline and a coastal transect would be flown enroute to and/or from transect surveys.
4. Enhanced coverage of the nearshore areas allows better documentation of pinniped use including, but not limited to, walrus haulouts. An additional benefit of the coastal surveys was to monitor for marine mammal carcasses; data on stranded marine mammals will be immediately shared with NSB Department of Wildlife Management and will also be sent to the NMFS Stranding Network.

The new design will not impact any analysis incorporating historical data, and all data can still be parsed into pre-existing survey blocks for analysis. The new survey design is as follows:

Each year, one set of transect lines is generated from a single random point, designated as the "anchor." Each transect is then spaced approximately 19 km (10 nm) from the next closest transect; this distance represents the mean distance that transects were generally spaced in the N-S survey design previously used. Transects are perpendicular to the coastline. In consecutive years, transects will be generated from a new randomly selected anchor and placed in the same relative configuration, with 19 km separating adjacent transects, and an orientation that is perpendicular to the coastline. In this way, multi-year transect coverage will be uniform throughout the study area.

Results

Aerial surveys were conducted over the COMIDA study area from 24 June to 29 October 2009 in NOAA de Havilland Twin Otter aircraft (N48RF, N56RF and N57RF) and an Aero Commander 690A provided by Northern Commanders. Survey altitude was generally near 365 m (1,200 ft), although lower ceilings occasionally required surveys be conducted at or below 310 m (1,000 ft). Each aircraft was equipped with two large bubble windows and a removable window to facilitate photography of whales for verification of species and presence of calves. Surveys were flown at 200 km/hr (110 kts) airspeed.

Weather and aircraft maintenance prevented flying for periods of more than seven days on two occasions: 16-23 June and 13-24 July. A survey aircraft was not available to the project from 30 July-8 August. Despite these gaps, survey coverage in the COMIDA study area far surpassed aerial survey efforts in 2008 (Clarke, 2009).

A total of 240 hours were flown in 2009, with 175 hours actively surveying in good conditions and 59% of that time spent on transect effort (Table 1). Survey coverage was highest in July and September (Figure 2). Marine mammals recorded included bowhead whales (*Balaena mysticetus*), gray whales (*Eschrichtius robustus*), belugas (*Delphinapterus leucas*), one humpback whale (*Megaptera novaeangliae*), unidentified cetaceans (species could not be verified), polar bears (*Ursus maritimus*), walruses (*Odobenus rosmarus*), bearded seals (*Erignathus barbatus*) and several smaller pinnipeds (Table 2, Figure 3).

Nineteen dead animals were sighted in 2009, including one carcass that was identifiable as a bowhead whale, three identifiable gray whales, six non-identifiable large cetaceans, five identifiable walrus and four non-identifiable pinnipeds (Table 3). All carcasses were reported to NMFS Alaska Region Stranding Coordinator; all cetacean carcasses were also reported to the NSB Department of Wildlife Management.

June

Four flights were completed in June for a total of 16.5 hours and nearly 3,400 km (Table 1). The limited survey time was generally due to low ceilings and widespread fog and low visibility; the survey aircraft did not arrive in Barrow until 20 June due to an unexpected maintenance issue. Marine mammals seen included 17 bowhead whales, 28 gray whales, one unidentified cetacean, one beluga, 1,390 walruses, and 77 bearded seals and unidentified pinnipeds (Table 2, Figure 4).

Of special note were sightings of bowhead whales on 26 and 30 June in the vicinity of Pt. Franklin. The bowheads appeared to be feeding because they were observed swimming in echelon formations and birds were observed at the surface (Figure 5). Most gray whales were feeding, and they were in the presence of numerous well defined mud plumes. Most walruses were on ice and distributed offshore. Walruses appeared to respond to aircraft overflights, so

higher altitudes (400-670 m; i.e., 1,600-2,200 ft) were maintained in areas where walruses were abundant.

Ice conditions during most of June comprised 80-100% ice cover north of 70.5°N except in the nearshore area which was ice free. Ice was mostly floe and broken floe, with open and refrozen leads scattered amongst the floe ice. Observed sea states were excellent (Beaufort 00-02) in high ice coverage areas, and ranged from Beaufort 00 to 06 in open water areas.

July

Ten flights were completed in July for a total of 53.7 hours and over 11,000 km (Table 1). Low ceilings and widespread fog and low visibility negatively affected survey time; the survey aircraft was not present in Barrow for six days during mandatory 100-hr maintenance in Anchorage. Marine mammals seen included 27 bowhead whales, 176 gray whales, 47 unidentified cetaceans (most likely gray whales due to the presence of well-defined mud plumes), one humpback whale, 311 belugas, 7,817 walruses, 207 bearded seals and unidentified pinnipeds, and one polar bear (Table 2, Figure 6).

The bowhead whale sightings were likely of the same group that was seen in June. Bowheads were seen in the Pt. Franklin/Peard Bay area on 1, 8, 9, and 11 July, with additional sightings west of Barrow on 25 and 26 July (Figure 7). At least one easily identifiable whale was seen on more than one day (Figure 8). Gray whales were often seen in the same immediate area as the bowhead whales.

Gray whales were sighted nearshore between Pt. Lay and Pt. Barrow, and the prevailing behavior was feeding as evident from well-formed mud plumes. Ten gray whale calves were seen in July (Figure 9).

The humpback whale was seen on 25 July between Icy Cape and Wainwright, feeding in close proximity to four gray whales (Figure 10).

Walruses were distributed throughout the survey area, both in the water and hauled out on scattered ice floes.

Ice conditions in July varied greatly depending on the winds. Strong westerly winds blew broken floe ice (and the walrus resting on that ice) towards shore on a few occasions. When the wind shifted out of the east, the ice retreated offshore. By the end of July, the southern part of the COMIDA study area (south of 71°N) was entirely ice free, and 20-70% broken floe ice remained in the more northerly regions. Observed sea states were very good (Beaufort 00-02) in high ice coverage areas and ranged from Beaufort 00 to 06 in open water areas.

August

Ten flights were completed in August for a total of 38.0 hours and 8,000 km (Table 1). There was no survey aircraft available until 8 August; low ceilings precluded flying on several days or caused surveys to be shortened. Marine mammals seen included two bowhead whales, 129 gray whales, 33 unidentified cetaceans (most likely gray whales due to the presence of well-defined mud plumes), 1,913 walruses, 47 bearded seals and unidentified pinnipeds, and one polar bear (Table 2, Figure 11).

The two bowhead whales were seen northwest of Pt. Barrow. Gray whales remained mainly in nearshore regions between Pt. Lay and Pt. Barrow, and the prevailing behavior was feeding as evidenced by well-formed mud plumes. Walruses were distributed throughout the survey area north of 71°N, both in the water and hauled out on the few remaining scattered ice floes. In late August, most walruses were very near shore between Wainwright and Barrow.

Open water persisted throughout most of August, with only scattered broken floes in the study area. Observed sea states ranged from Beaufort 02 to 07 in open water areas.

September

Thirteen flights were completed in September for a total of 63.6 hours and 13,700 km (Table 1). Survey conditions improved in September allowing greater coverage. Marine mammals seen included 23 bowhead whales, 37 gray whales, four unidentified cetaceans, 10,860 walruses, 201 bearded seals and unidentified pinnipeds, and two polar bears (Table 2, Figure 12).

Most of the bowhead whales were seen on 19 September, southwest of Barrow. Several of the bowheads were feeding (Figure 13). Compared to summer, very few gray whales were seen in the study area, and areas where gray whales were seen in 1989-91 near Hanna Shoal (Moore and Clarke, 1992) remained unused in 2009.

Of particular note were the walrus sightings. A large (estimated minimum 2,500 animals) walrus haulout was recorded on Icy Cape on 2 September, and resighted on 6 and 13 September (Figure 14). The haulout was not sighted after 13 September, despite several overflights of the location. Walruses continued to be seen throughout the month in nearshore areas from south of Pt. Lay to Pt. Barrow and were also observed swimming offshore.

Open water persisted throughout September, with only scattered broken floes in the study area. Observed sea states ranged from Beaufort 02 to 07 in open water areas.

October

Twelve flights were completed in October for a total of 68.4 hours and 15,600 km (Table 1). A significant percentage (54%) of the flight time, however, was on deadhead (no survey effort) because the base of operations moved to Kotzebue so that the aircraft could be parked in a hangar. Only 21.1 hours (31%) of time was on-transect. Marine mammals seen included 37 bowhead whales, 20 gray whales, 11 unidentified cetaceans, 113 belugas, 9 walruses, and 277 bearded seals and unidentified pinnipeds (Table 2, Figure 15).

Most of the bowhead whales were seen on 29 October, northeast of Barrow, in an area where feeding bowheads were documented in summer and fall during BOWFEST (Bowhead Whale Feeding Ecology Study) and BWASP studies. Bowheads were also sighted in offshore blocks of the COMIDA study area, close to active lease sales. Sightings of other marine mammals were far fewer in October than other months.

Open water persisted throughout October, with new/grease ice forming in shallow nearshore areas only. Observed sea states ranged from Beaufort 02 to 07 in open water areas.

Conclusions

Despite a few periods of limited survey activity due either to aircraft logistics or environmental conditions, COMIDA achieved excellent coverage of the study area in 2009. Nearly every transect line was surveyed at least once. The coastal transect provided additional flexibility for transiting to and from the survey area, and yielded some of the season's most notable sightings.

The Peard Bay/Pt. Franklin area appeared to provide excellent feeding habitat for cetaceans, particularly bowhead and gray whales, throughout the study period (Figure 16). Cetaceans were sighted in this area from 26 June to 15 October 2009, which is the last day surveys were conducted in good conditions in this area. Gray whales have been sighted here historically (Figure 17), and the presence of bowheads, particularly in summer, underscores the importance of the COMIDA study.

The lack of gray whales in the offshore regions of Hanna Shoal (western half of Block 13 and eastern half of Block 14) was unexpected. There was also no evidence of mud plumes, which are generally seen in areas where gray whales are feeding. Feeding gray whales were regularly sighted offshore in the 1980s (Figure 17). The opportunity to continue to collect data in the COMIDA study area for several years to come will allow us to determine if the lack of offshore gray whales in 2009 was an unusual event or representative of a changing Arctic environment.

Problems and Recommendations

In 2009, the survey protocol called for flying every third transect line to avoid any possible duplication of cetacean sightings. This proved to be neither practical nor advisable. Too much time was spent transiting from the end of one line to the start of the third line over, and often environmental conditions deteriorated during the transit. Circumstances (remaining fuel, environmental conditions, daylight) often dictated that consecutive lines were flown. In 2010, we plan on flying every other transect line whenever possible.

Transits to and from transect starting and ending points in 2009 were often flown as deadheads, at altitudes too high to conduct even off-effort (search) surveys. This was occasionally dictated by weather patterns, but was often done to conserve fuel for maximum transect surveying. The aircraft used for COMIDA surveys from mid-June through early September 2009 had an active survey range of approximately five hours (with one hour reserve), and inclement weather in Barrow often dictated an even greater fuel reserve. Longer-range aircraft, due to larger internal fuel tanks, were used for surveying from early September though the end of October, increasing survey range and transect coverage in the study area. In 2010, the aircraft scheduled for the entire COMIDA season will have the larger internal tank and therefore greater range, so surveying the coastal transect to and from starting points of perpendicular transects should be possible more often.

Conducting surveys in the COMIDA study area while basing out of Kotzebue, as was done in 2008 and 2009, is too costly in fuel, time and impacts to pilots and scientists. The study area is greater than one hour distant from Kotzebue, and areas of highest interest (e.g., active lease areas) are more than two hours away. Surveys will not base from Kotzebue in 2010, and will operate out of Barrow exclusively. Kotzebue, as well as Deadhorse, will remain alternate fuel sites. NOAA AOC will not work out of Barrow in October without a hangar; an alternate aircraft contractor with comparable aircraft will be used for surveys at that time.

Presentations of COMIDA 2009 Data

Two COMIDA-related posters will be presented at the 2010 Alaska Marine Science Symposium, Anchorage, AK.

- Aerial Surveys for Marine Mammals in the Northeastern Chukchi Sea: 2009 - Janet Clarke, Megan Ferguson, Laura Morse, Gary Friedrichsen, Brenda Rone and Cynthia Christman
- Pacific Walrus Sightings Documented by Aerial Surveys of the Northeastern Chukchi Sea in 2009 - Cynthia Christman, Megan Ferguson, Gary Friedrichsen, Brenda Rone, and Janet Clarke

Acknowledgements

Numerous individuals and organizations contributed to the success of the COMIDA aerial surveys. Megan Ferguson (NMFS-AFSC-NMML) is the NMML Program Coordinator and Janet Clarke (SAIC Ocean Sciences Division) is the COMIDA Program Manager. In addition to Ferguson and Clarke, Gary Friedrichsen, Laura Morse and Brenda Rone (NMFS-AFSC-NMML) acted as COMIDA Field Team Leaders, and observers included Dee Allen, Amelia Brower, Jeff Childs, Cynthia Christman, Kim Goetz, Stephanie Grassia, Wendy Lewis and Katie Sweeney (NMFS-AFSC-NMML). We are especially appreciative of the October crew, who doggedly flew several hours of deadhead to and from Kotzebue to collect valuable October survey data during rapidly waning daylight. Charles Monnett (MMS, Alaska OCS Region, COR) and Dave Rugh, Kim Shelden (NMML Project Coordinators) and Janice Waite (NMFS-AFSC-NMML) provided useful advice and logistics support throughout the season; AFSC also provided web support for posting of daily survey reports. Mike Hay (RDI) gamely updated the data collection program and provided additional software support in a timely manner. The Twin Otter survey aircraft, pilots and mechanics were provided by NOAA Aircraft Operations Center; we especially appreciate the services of pilots Dave Cowan, Chris Daniels, Jon French, Nickie Lambert, Jason Mansour, Ron Moyer, and Scott Sandorf; mechanics Sean Campbell, Mike Merek and Ron Pauley; and logistics support by Nancy Ash and others in the AOC Program Office. The Aero Commander was provided by Northern Commanders and piloted by Andy Harcombe and Will Vacendak. Jan Bennett and Lark Wuerth (Department of the Interior, Aviation Management Unit) monitored every flight via satellite-linked Aviation Flight Following. In Barrow, additional logistics support was provided by the North Slope Borough and King Eider Inn. The aircraft was kept warm and safe in a hangar in Kotzebue made available from the State of Alaska and Alaska National Guard. A final word of appreciation and acknowledgment is extended to Flight Service personnel in Barrow and Kotzebue and the National Weather Service office in Barrow, particularly Jim Salzwedeo and Gina Strum.

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Moore, SE and JT Clarke. 1992. Distribution, abundance and behavior or endangered whales in the Alaskan Chukchi and western Beaufort Seas, 1991: with a review 1982-91. Prepared for Minerals Management Service, OCS Study MMS 92-0029.

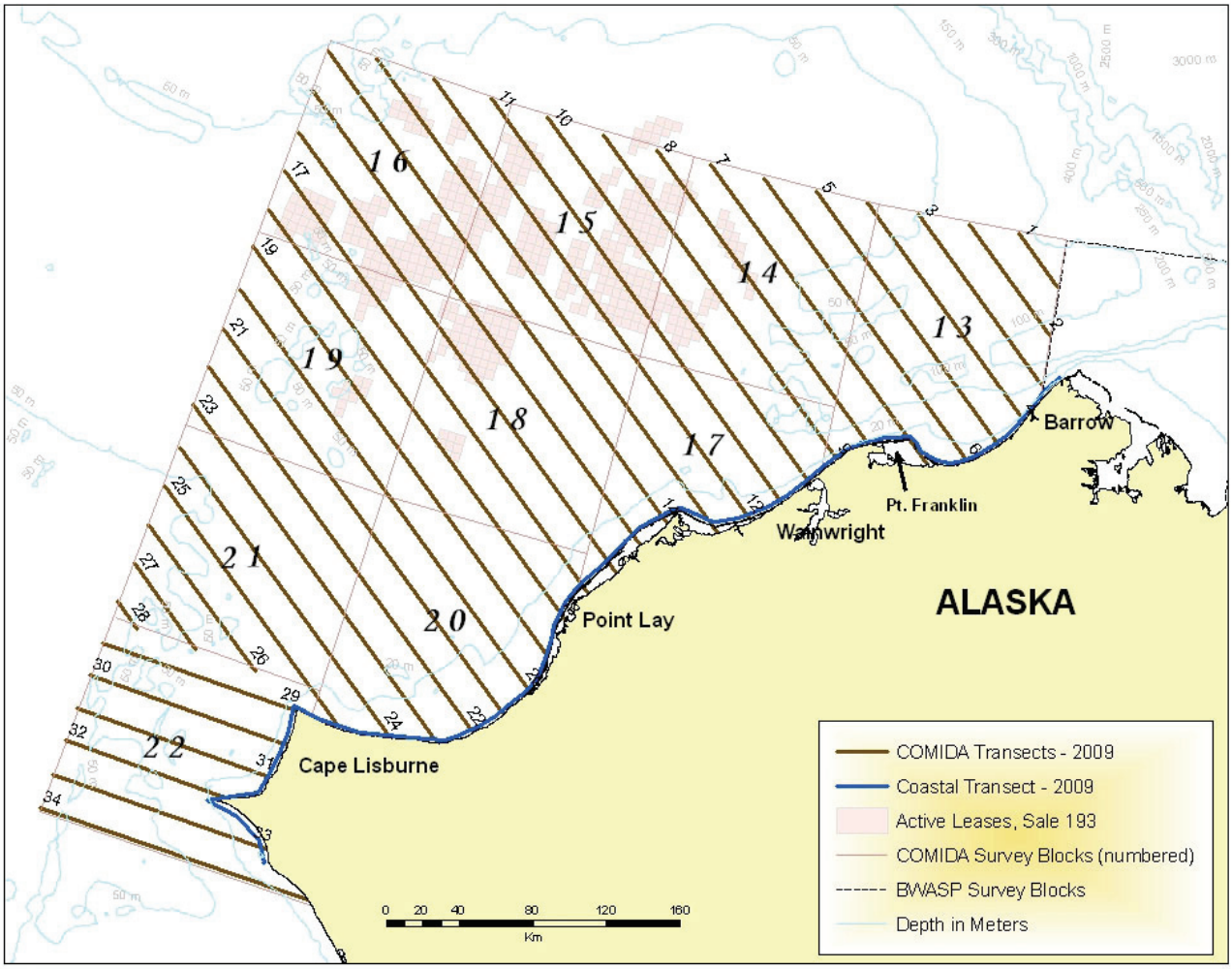

Figure 1. COMIDA study area, 2009: Perpendicular transect lines, coastal transect, bathymetry and Sale 193 Lease Blocks.

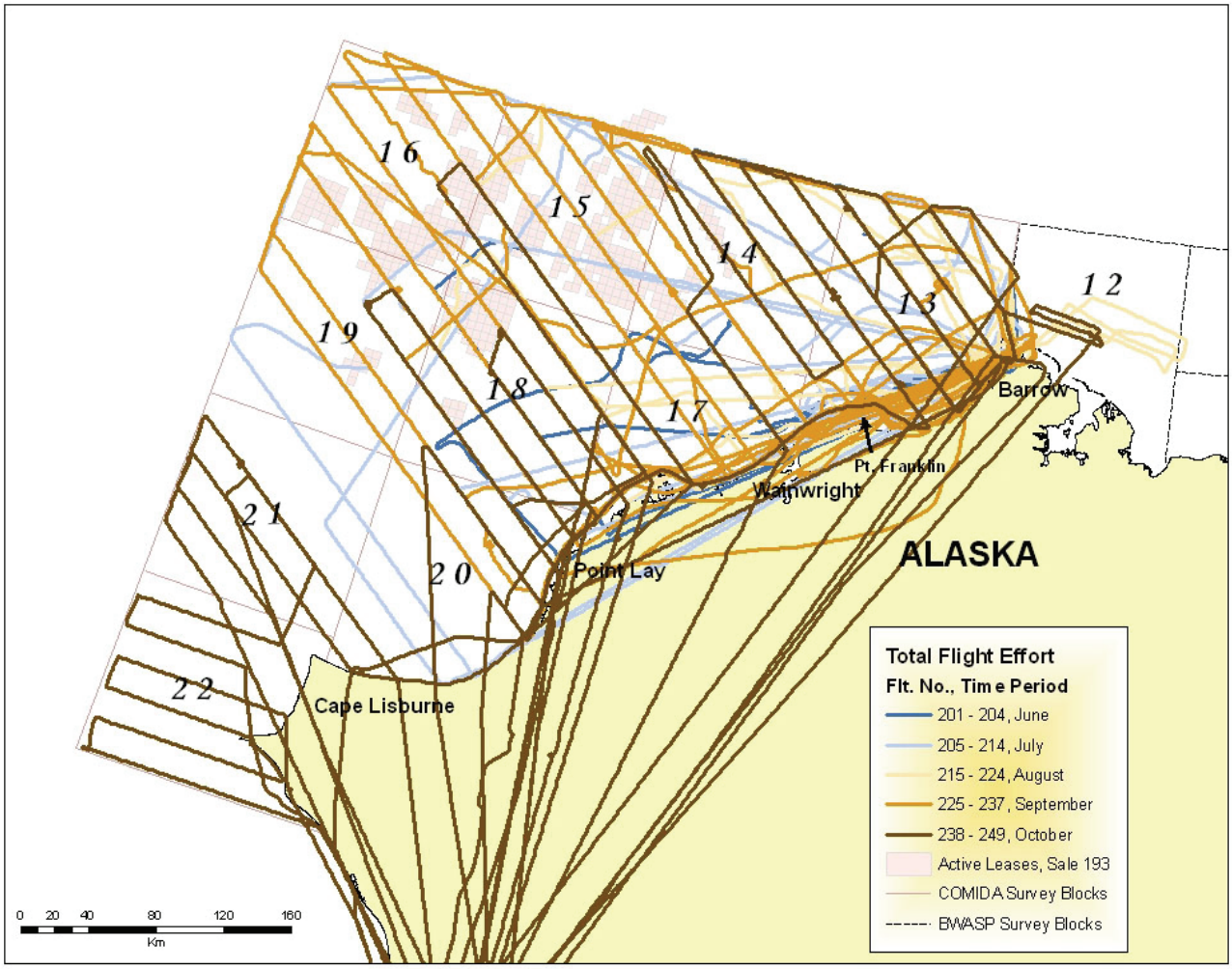

Figure 2. COMIDA survey effort by month, 2009.

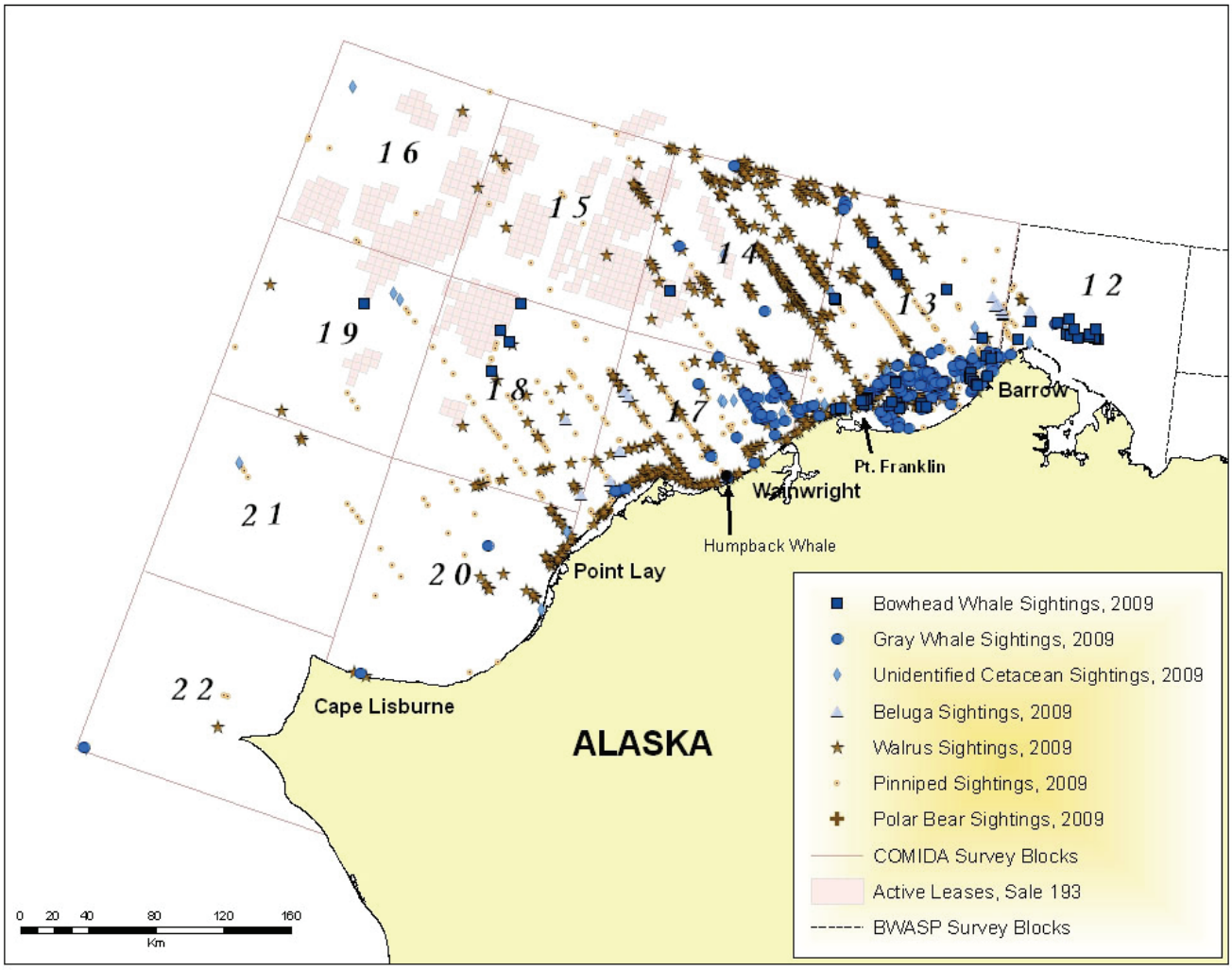

Figure 3. COMIDA marine mammal sightings by species, 2009.

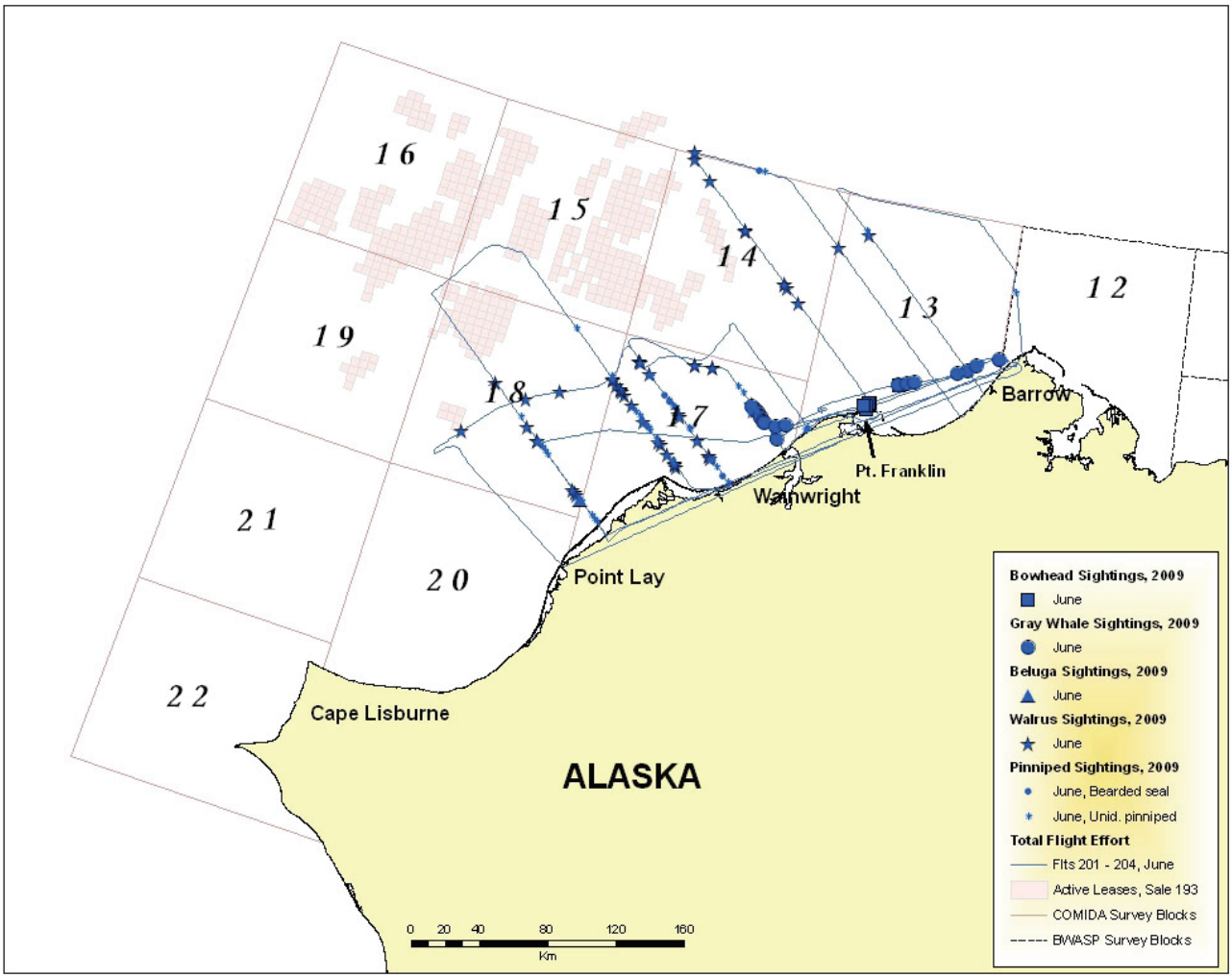

Figure 4. COMIDA marine mammal sightings and effort, June 2009, not including unidentified cetaceans.

Figure 5. Bowhead whale feeding group north of Pt. Franklin, 30 June 2009.

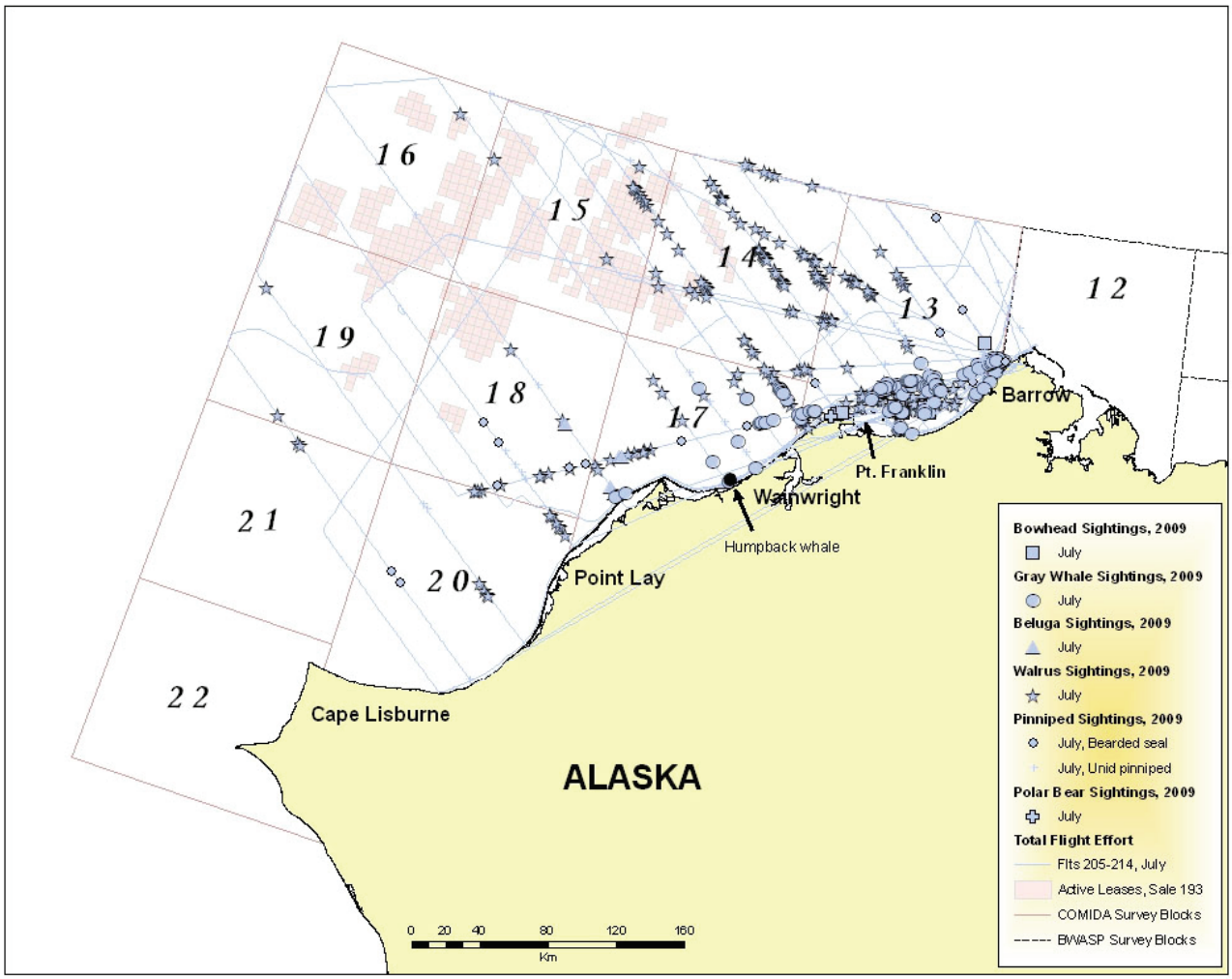

Figure 6. COMIDA marine mammal sightings and effort, July 2009, not including unidentified cetaceans.

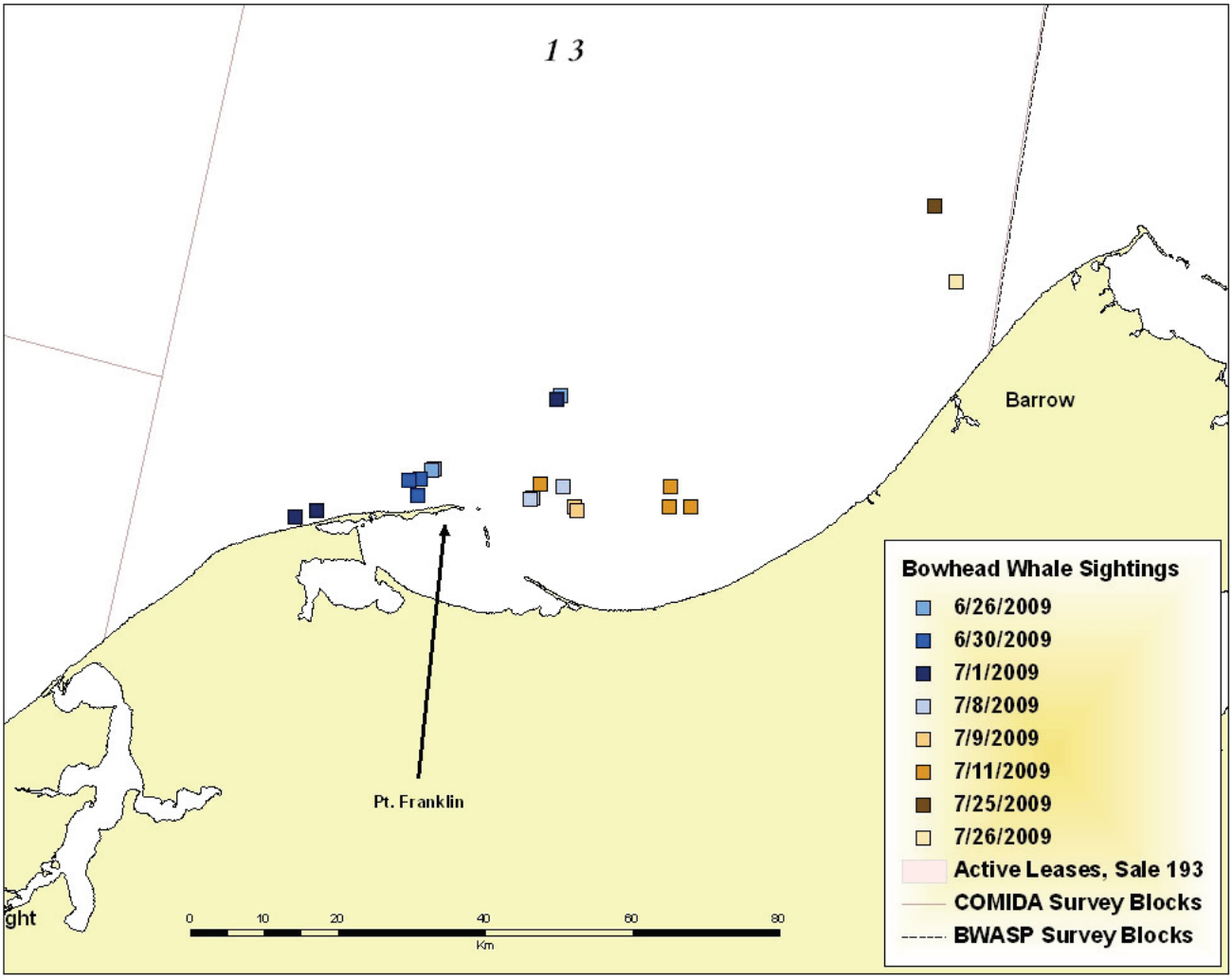

Figure 7. Bowhead whale sightings, late June through July 2009, near Pt. Franklin/Peard Bay area.

Figure 8. Bowhead whale observed north of Pt. Franklin on 30 June 2009 (left) and east of Pt. Franklin on 11 July 2009 (right).

Figure 9. Gray whale cow-calf pair (calf underneath cow) seen in immediate vicinity of feeding bowhead whales, 11 July 2009.

Figure 10. Humpback whale, sighted very close to shore between Wainwright and Icy Cape, 25 July 2009.

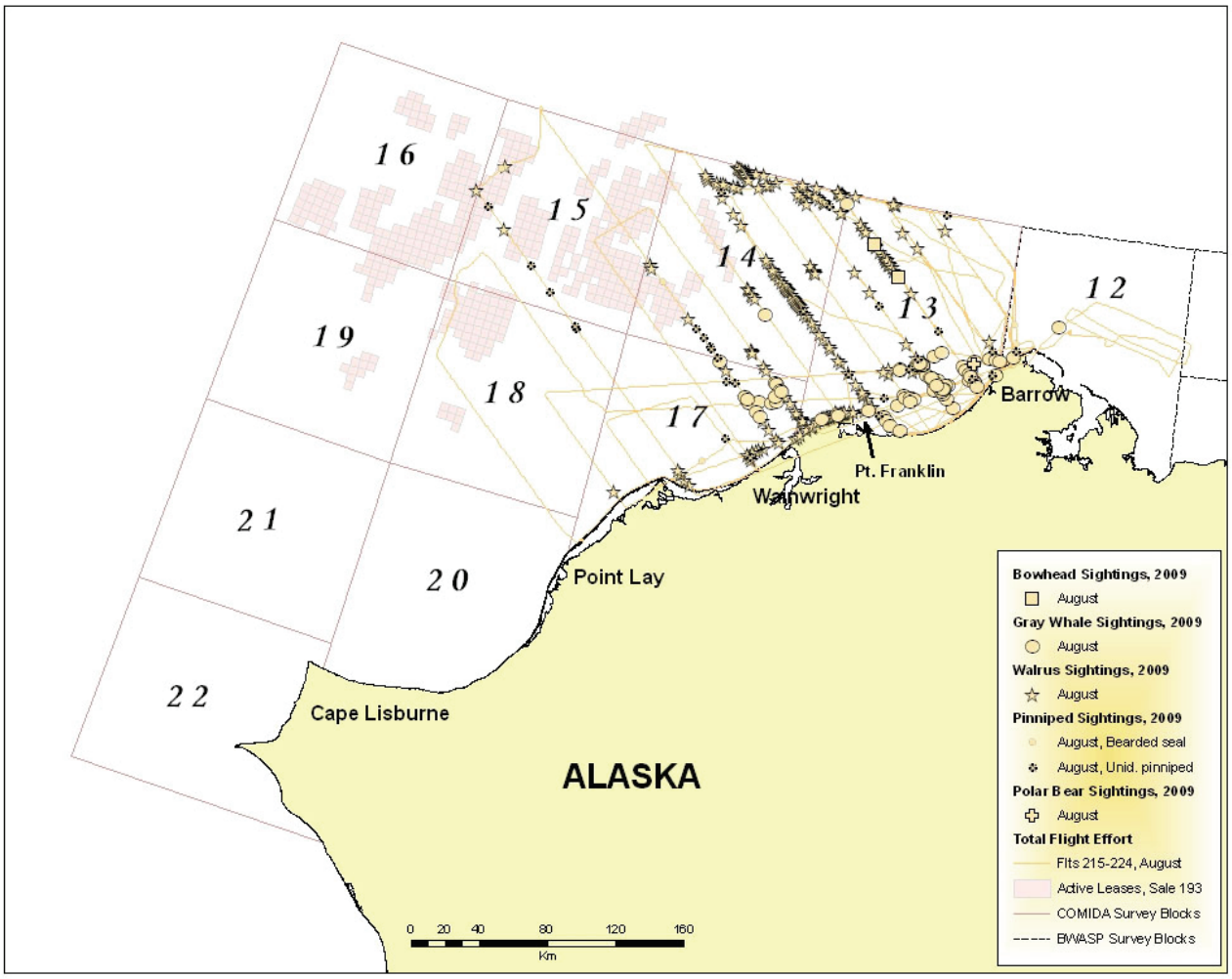

Figure 11. COMIDA marine mammal sightings and effort, August 2009, not including unidentified cetaceans.

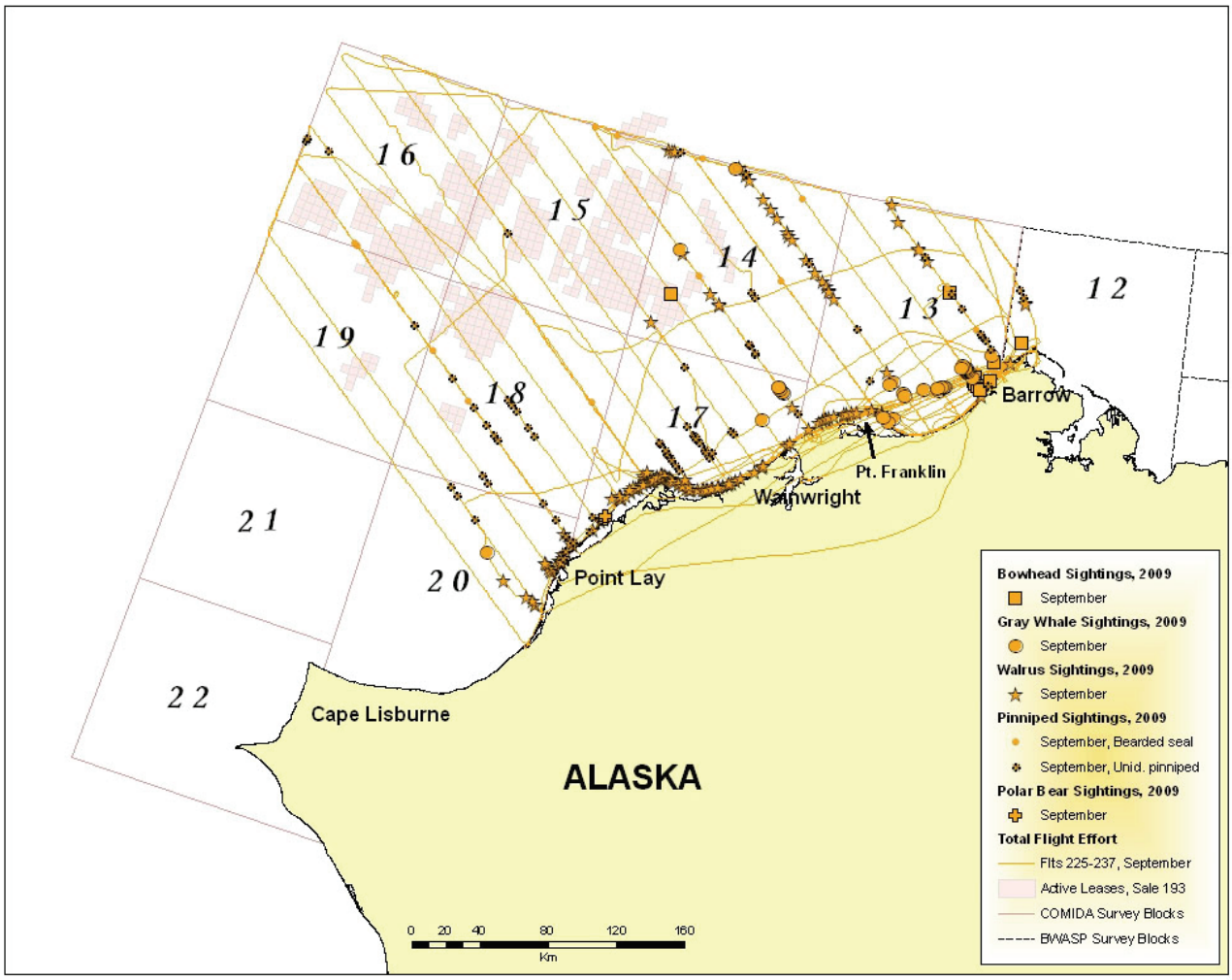

Figure 12. COMIDA marine mammal sightings and effort, September 2009, not including unidentified cetaceans.

Figure 13. Feeding bowheads southwest of Barrow, 19 September 2009.

Figure 14. Walrus haulout, Icy Cape, September 2009. Sighted on 2, 6 and 13 September 2009.

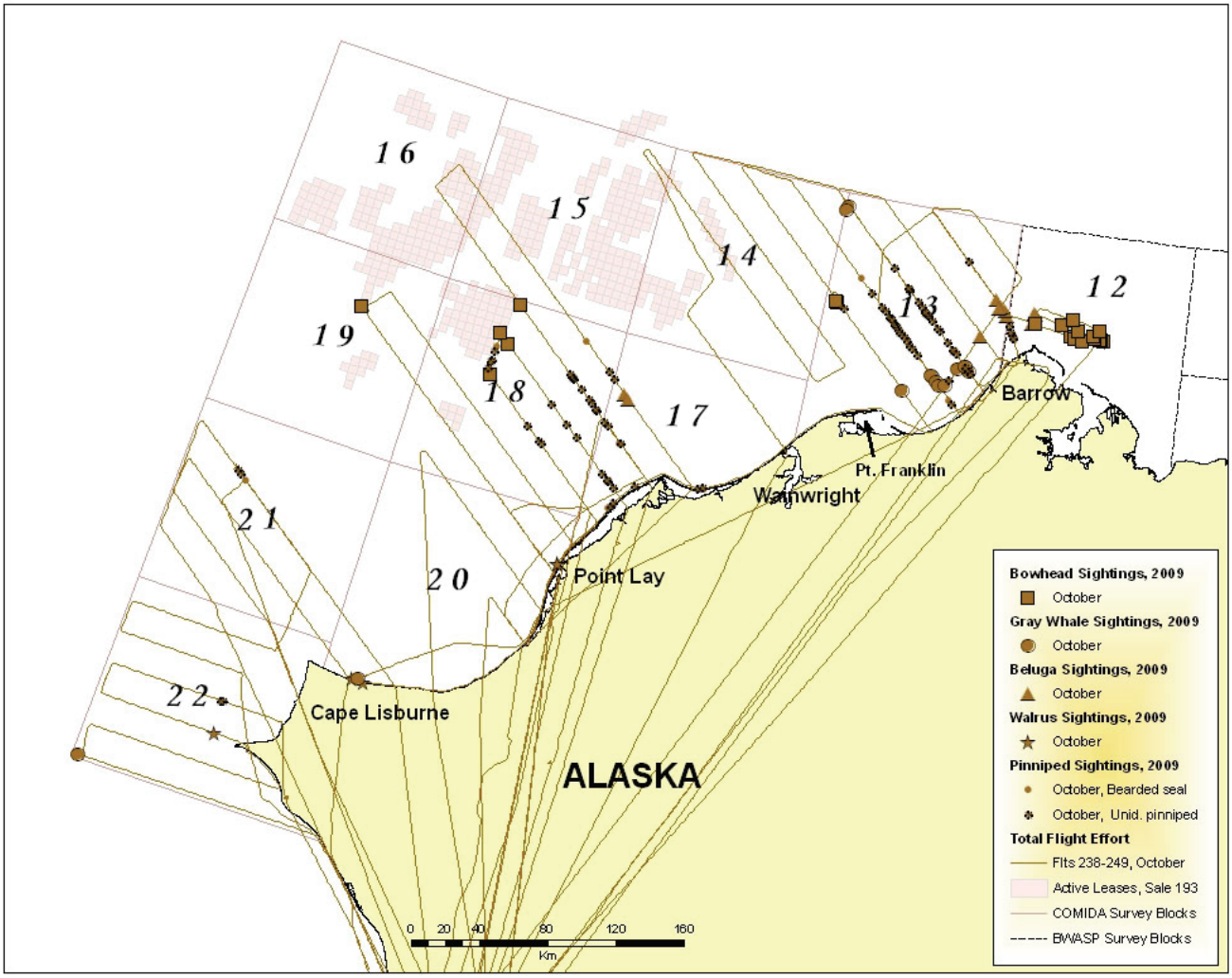

Figure 15. COMIDA marine mammal sightings and effort, October 2009, not including unidentified cetaceans.

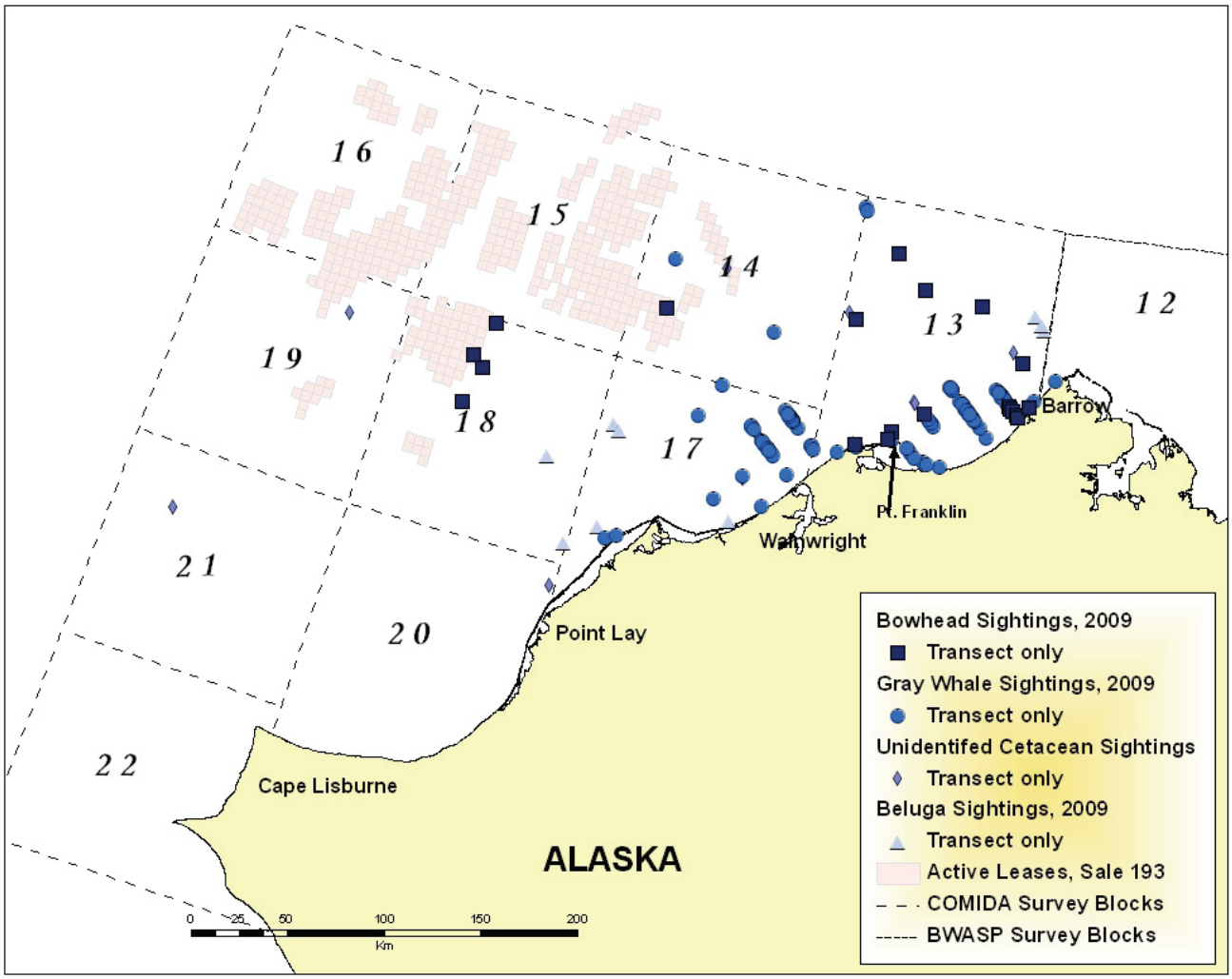

Figure 16. COMIDA cetacean sightings made on transect, June-October 2009.

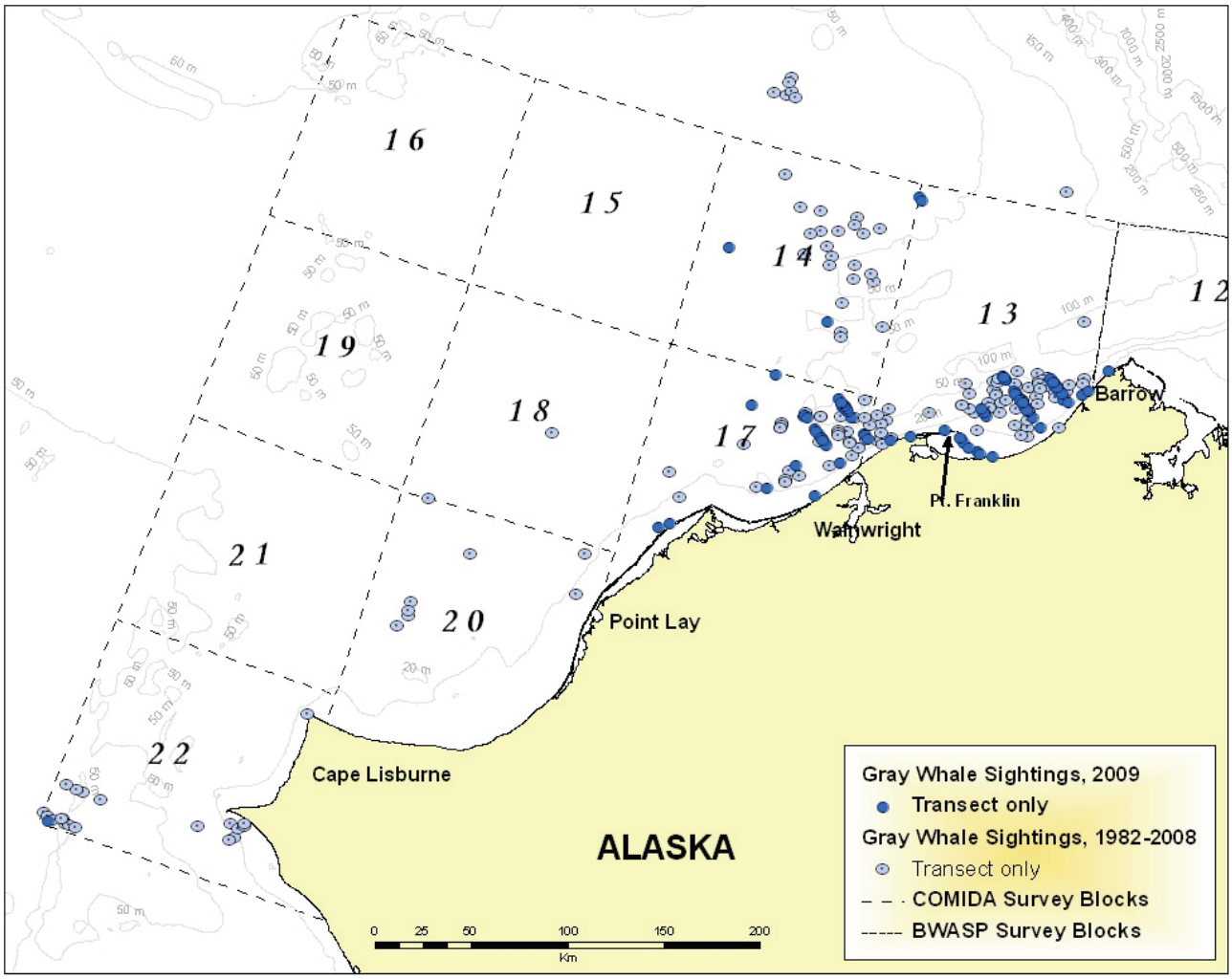

Figure 17. Gray whale sightings made on transect, June-October 1982-2009.

Table 1. Summary of 2009 COMIDA flight effort.

	Total Time (h)	**Transect Time (h)**	**Surveyable Time (h)**	**Deadhead Time (h)**	**Total Distance (km)**	**Transect Distance (km)**
June	16.5	5.6	11.3	5.3	3,366	1,202
July	53.7	24.3	44.4	9.3	11,326	5,163
August	38.0	18.0	36.0	2.0	8,006	3,753
September	63.6	34.0	51.8	11.8	13,713	6,985
October	68.4	21.1	31.6	36.8	15,608	4,329
Total 2009	240.2	103.0	175.1	65.2	52,019	21,432

Table 2. Summary of 2009 COMIDA sightings (# of sightings/# of animals).

	Bowhead Whale	Gray Whale	Humpback Whale	Unid. Cetacean*	Beluga	Walrus	Unid. Pinniped**	Bearded Seal	Polar Bear
June	6/17	18/28	0/0	1/1	1/1	54/1,390	50/60	6/17	0/0
July	13/27	114/176	1/1	35/47	8/311	226/7,817	139/180	13/27	1/1
August	2/2	83/129	0/0	28/33	0/0	231/1,913	33/45	2/2	1/1
September	11/23	37/37	0/0	4/4	0/0	148/10,860†	90/178	11/23	2/2
October	20/37	14/20	0/0	8/11	13/113	5/9	92/240	20/37	0/0
Total	52/106	266/390	1/1	76/96	22/425	664/21,989†	404/703	52/106	4/4

* includes any cetacean that could not be identified to species, regardless of size
** includes any pinniped that could not be identified to species, regardless of size
† includes two repeat sightings (of 7,500 walrus) at Icy Cape haulout

Table 3. Summary of carcasses sighted during COMIDA 2009.

Flt No	Date	Latitude (N)	Longitude (W)	Species	Total No	Notes
220	8/20/09	70.917	157.607	bowhead	1	carcass
223	8/27/09	71.206	157.004	gray whale	1	carcass on beach
223	8/27/09	71.314	156.753	gray whale	1	initially sighted and reported by NSB
227	9/6/09	69.707	164.185	gray whale	1	
221	8/21/09	71.191	157.002	unidentified cetacean	1	probably gray whale, on beach
221	8/21/09	71.387	156.462	unidentified cetacean	1	on beach
231	9/19/09	69.463	163.148	unidentified cetacean	1	inside beach, probably gray whale
231	9/19/09	70.836	166.774	unidentified cetacean	1	heavily decomposed, flukes trailing, pectoral flippers observed
234	9/25/09	71.786	168.545	unidentified cetacean	1	advanced decomposition
242	10/15/09	71.524	161.760	unidentified cetacean	1	.
224	8/29/09	71.455	159.087	unidentified pinniped	1	floating carcass with flock of birds
231	9/19/09	70.026	162.638	unidentified pinniped	1	associated with polar bear
231	9/19/09	69.951	162.759	unidentified pinniped	1	.
231	9/19/09	69.781	163.057	unidentified pinniped	1	.
223	8/27/09	71.501	166.016	walrus	1	.
231	9/19/09	70.052	162.598	walrus	1	.
231	9/19/09	70.299	162.016	walrus	1	.
231	9/19/09	71.086	157.191	walrus	1	.
231	9/19/09	71.286	156.812	walrus	1	on beach

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Appendix 3: Chukchi Offshore Monitoring in Drilling Area (COMIDA) Aerial Survey, Annual Report 2010

CHUKCHI OFFSHORE MONITORING IN DRILLING AREA (COMIDA) AERIAL SURVEY 2010

INTRODUCTION

The Chukchi Offshore Monitoring in Drilling Area (COMIDA) aerial survey component was initiated in 2008, via an Interagency Agreement (No. M08PG20023) between the Minerals Management Service (MMS) [Department of the Interior; currently the Bureau of Ocean Energy Management, Regulation and Enforcement] and the National Marine Mammal Laboratory (NMML) [Alaska Fisheries Science Center, National Marine Fisheries Service, Department of Commerce]. These surveys are a continuation of aerial surveys that were conducted by MMS-sponsored contractors from 1982-1991 (Moore and Clarke, 1992) and use similar methodology. Aerial surveys remain the only practical means of assessing marine mammal distribution, population density, and habitat use in large study areas. The goal of this study is to investigate the distribution and relative abundance of marine mammals in the Chukchi Sea Planning Area (CSPA) during the open water (ice-free) months of June-October, when various species are undertaking seasonal migrations through the area. The COMIDA study area encompasses the northeastern Chukchi Sea from shore seaward, latitude 68°N to 72°N and longitude 157°W to 169°W, and overlays Lease Sale 193 (offered in February 2008). In 2010, COMIDA aerial survey operations were based out of Barrow. Species of interest include the bowhead whale (*Balaena mysticetus*), gray whale (*Eschrichtius robustus*), beluga (*Delphinapterus leucas*), polar bear (*Ursus maritimus*), walrus (*Odobenus rosmarus*), and ice seals. Increasing the understanding of marine mammal distribution, abundance and migration timing in this region will assist in decision-making to minimize impacts from petroleum exploration, development and production activities, and other anthropogenic impacts.

Several communities along the Alaskan Chukchi coast conducted subsistence hunts for bowhead whales, belugas, walruses, and other pinnipeds during the COMIDA survey period. The COMIDA Program Coordinator and Project Manager met with North Slope Borough (NSB) biologists, Craig George and Robert Suydam, prior to the commencement of aerial surveys to discuss areas of importance to subsistence hunters. These areas, generally near villages and within a few kilometers of the coast, were avoided if hunters were observed in small boats. Additionally, areas within the Kasegaluk Lagoon encompass known spotted seal haulouts. During time periods when spotted seals (*Phoca largha*) were expected to be at haulouts, overflights of the lagoon were conducted above the normal survey altitude of 1000 to 1200 ft to avoid potential impacts. Survey altitude was also increased when walruses were sighted on ice or in beach haulouts to minimize disturbance.

Marine mammal research activities were permitted under NMFS Permit No. 782-1719-09 for cetaceans and U.S Fish and Wildlife Service (USFWS) Permit No. MA212570 for polar bears and walruses. In addition, Land Management Permits were obtained from the NSB Planning and Community Services Department to conduct aerial surveys in the COMIDA and adjacent BWASP (Bowhead Whale Aerial Survey Project) survey areas. In 2010, NMML also consulted with the USFWS to conduct aerial surveys in Critical Habitat Unit 4 (Ledyard Bay) for spectacled eiders; no adverse impacts to species or habitat were expected based on the altitude at which surveys would be conducted (>1,000').

FIELD PROJECTS

Aerial Survey Protocol

Offshore transect lines were generated for 2010 from a single random point, designated as the "anchor", and were offset from transect lines in 2009. Transects were oriented perpendicular to the coastline, and were spaced approximately 19 km (10 nm) apart (Figure 1). In addition, the survey design included a coastal transect (1 km offshore) between Pt. Barrow and Pt. Hope, Alaska.

Aerial surveys were conducted in an Aero Commander 690A, provided by Northern Commanders (Figure 2). The Aero Commander was used for the duration of the survey period in lieu of a de Havilland Twin Otter because the latter was unavailable to support surveys. Survey altitude was generally near 365 m (1,200 ft), although lower ceilings occasionally required that surveys be conducted at or below 310 m (1,000 ft). As stated above, surveys near walrus haulouts on ice or land and spotted seal haulouts in Kasegaluk Lagoon were conducted at higher altitudes to avoid potential disturbances. The aircraft was equipped with two large bubble windows for visual observation and a removable floor panel to facilitate photography of whales for verification of species and presence of calves, and to document walrus haulouts and whale carcasses. Surveys were flown at 200 km/hr (110 kts) airspeed.

Additional details on aerial survey methods are included in Clarke et al. (2010).

Results

Aerial surveys were conducted over the COMIDA study area from 3 July to 25 October 2010. A total of 44 surveys were conducted, ranging from 0.5 to 9.4 hours. Conditions ranged from superb, as in late July when a record-breaking nine days were flown consecutively, to abysmal, as in late October when high winds precluded flying for several consecutive days. Conditions allowed for two flights per day on six days. Weather and aircraft maintenance prevented flying for periods of seven or more days on three occasions: 1-7 August, 29 September-6 October and 13-24 October. A survey aircraft was not available to COMIDA on 5 July and from 7-9 July due to previously scheduled commitments to support unrelated research. Lack of fuel in Barrow prevented flying on five days, and flights focusing at least partially on the BWASP survey area (Beaufort Sea) were conducted on three days. Despite these limitations, survey coverage in the COMIDA study area in 2010 was comparable to that completed in 2009 (Clarke, 2010).

A total of 179.9 hours were flown in 2010, with 130.2 hours actively surveying in good conditions and 72% of that time spent on transect effort (Table 1). Survey coverage was highest in July (Figure 3). Marine mammals recorded included bowhead whales, gray whales, belugas, unidentified cetaceans (species could not be verified due to limited view by observer), one polar bear, walruses, bearded seals (*Erignathus barbatus*) and several smaller pinnipeds (Table 2, Figure 4). Smaller pinnipeds could not be identified to species but were likely ringed (*Pusa hispida*) or spotted seals.

Over the course of the season, 11 dead animals were sighted, including one bowhead whale, one beluga, one unidentified large cetacean (likely gray whale), three walruses and five unidentified pinnipeds (Table 3). All carcasses were reported to National Marine Fisheries Service Alaska Region Stranding Coordinator; cetacean carcasses were also reported to the NSB Department of Wildlife Management.

July

During July, 16 flights were conducted for a total of 66.6 hours and nearly 17,000 km (Table 1). Low ceilings, widespread fog and poor visibility negatively impacted survey time in early July, but superb weather conditions in the latter half of July allowed for an unprecedented nine consecutive survey days. Marine mammals observed included 1 bowhead whale, 136 gray whales, 831 belugas (mainly in Elson Lagoon just east of Pt. Barrow, Alaska), 3 unidentified cetaceans, 4,004 walruses, and 273 unidentified pinnipeds (Table 2, Figure 5).

Gray whales were sighted nearshore between Wainwright and Pt. Barrow, Alaska, and the prevailing behavior observed was feeding, as evident from well-formed mud plumes. Gray whales were also seen west of Pt. Hope, Alaska, in the southernmost part of the study area. A dead cetacean, initially reported to the aerial team by Lisburne Radio, was observed close to shore east of Cape Lisburne, Alaska, on 27 July (Table 3). Review of the images taken of the carcass indicated it was likely a gray whale (Figure 6).

Several hundred belugas were observed in Elson Lagoon northeast of Barrow, Alaska, on 26 July (Figure 7). The COMIDA team diverted from normal survey operations to investigate the lagoon after initial shore observations were reported by Robert Suydam and Leslie Pierce of the NSB Department of Wildlife Management. Approximately 8% of the belugas appeared to be calves, based on analysis of photographs.

Walruses were mainly distributed north of latitude 71.5°N, near or hauled out on ice floes (Figure 8). When possible, survey altitude was increased near walruses hauled out on ice to avoid potential disturbances.

Sea ice was present only in the northernmost part of the study area, generally north of latitude 71.5°N. Ice coverage in this area varied from 0-95% broken floe, and sea states were

generally very good (Beaufort 00-02). The remainder of the study area was completely ice-free. Sea states ranged from Beaufort 00-07. From 20-28 July, survey conditions were phenomenal in the study area, with low sea states (Beaufort 00-04) and excellent visibility.

August

During August, nine flights were conducted for a total of 41.7 hours and 10,500 km (Table 1). The survey aircraft was not available from 1-6 August due to scheduled aircraft maintenance in Anchorage, Alaska, and low ceilings precluded flying on several days or caused surveys to be shortened. In addition, the Instrument Landing System (ILS) at the Wiley Post-Will Rogers Airport in Barrow, Alaska, was not fully operational in mid-August and jet fuel was extremely limited in late August, both of which further impacted survey opportunities. Marine mammals observed included 80 gray whales, 49 belugas, 3 unidentified cetaceans, 8,584 walruses, 1 bearded seal and 69 unidentified pinnipeds (Table 2, Figure 9).

Gray whales remained mainly in nearshore regions between Wainwright and Pt. Barrow, Alaska, and the prevailing behavior was feeding, as evidenced by well-formed mud plumes. Gray whales were also observed in the area west of Pt. Hope, Alaska, where they had been observed in July.

In early August, walruses were distributed throughout the survey area north of latitude 71°N, both in the water and hauled out on the few remaining scattered ice floes. In late August, most walruses were very near shore between Pt. Lay and Barrow, Alaska. On 30 August, several large walrus haulouts on the coast were documented by the COMIDA team. Walruses were observed at three haulouts located 22 miles east of Cape Lisburne, comprising an estimated 2,500, 1,000 and 200 animals each (Figure 9). These haulouts were on narrow beaches along rocky cliff faces. Despite the aircraft maintaining a survey altitude of 1,500 ft and avoiding direct overflight of the animals, walruses in the smallest aggregation seemed to respond to the aircraft by flushing into the water. The Cape Lisburne haulouts were not observed again due to their more remote location and the decision to avoid further potential disturbance.

The fourth haulout documented on 30 August was approximately 3 miles northeast of Pt. Lay, Alaska (Figure 9). It was located was located on the beach of a low-lying barrier island. Approximately 4,000 animals were at the haulout.

Biologists from the USFWS and U.S. Geological Survey (USGS) were notified throughout the field season with information about all haulouts to facilitate agency monitoring of the aggregations.

Open water persisted throughout August, with only scattered broken floe ice throughout the study area. Observed sea states ranged from Beaufort 02 to 07 in open water areas.

September

During September, thirteen flights were conducted for a total of 46.3 hours and 10,900 km (Table 1). Survey conditions improved slightly in September, although periods of high winds curtailed surveying on several days. The BWASP study area was surveyed on three days, and those data are not included here. Marine mammals seen included 10 bowhead whales, 45 gray whales, 3 unidentified cetaceans, 1 small unidentified cetacean, 1 polar bear, 39,309 walruses (includes repeat sightings of Pt. Lay haulout), and 46 unidentified pinnipeds (Table 2, Figure 10).

Bowhead whales were seen on 13 September northwest and west of Pt. Barrow, and on 18 September north of Pt. Barrow, Alaska (Figure 10). One dead bowhead was sighted on 17 September approximately 50 km southwest of Barrow, Alaska (Table 3, Figure 11). Despite efforts to relocate the carcass during a flight on 18 September, the animal was not resighted due to low ceilings and reduced visibility in the area.

Gray whale distribution remained nearshore between Pt. Franklin and Barrow, Alaska, although fewer whales were seen compared to July and August.

Walruses continued to be observed in large numbers nearshore and in the aggregation hauled out near Pt. Lay, Alaska, which was first sighted by the COMIDA team on 30 August. The Pt. Lay haulout was resighted during subsequent flights on five dates: 6, 12, 16, 17 and 24 September. Group size estimates of the haulout varied substantially, from <1,000 walruses to >15,000 walruses, indicating that the haulout was very dynamic (Figure 12, Figure 13).

The single polar bear was observed on 24 September on the beach, at position 70.445°N, 160.578°W.

Open water persisted throughout September, with only scattered broken floe ice in the northernmost part of the study area. Observed sea states ranged from Beaufort 02 to 07 in open water areas.

At the request of the National Weather Service Ice Desk, the survey team took photographs of sea ice in the COMIDA study area. The images, along with georeferencing data, were sent to ice forecasters to assist with ground-truthing of satellite imagery (Figure 14).

October

During October, six flights were conducted for a total of 25.2 hours and 5,600 km (Table 1). The aircraft was grounded due to mechanical issues for six days in early October and was unavailable for five days in mid-October due to scheduled maintenance in Anchorage. Weather was dismal in the latter half of October, and persistent high winds (>25 kts) led to an early end of

COMIDA 2010 on 27 October. Marine mammals observed included 22 bowhead whales, 5 gray whales, 1 beluga, 6 unidentified cetaceans, 94 walruses, 2 bearded seals and 27 unidentified pinnipeds (Table 2, Figure 15).

Sightings of marine mammals were fewer in October than in previous months of the survey period, and fewer than October surveys in past years, likely due to decreased survey effort and suboptimal survey conditions. Bowhead whales were observed during three flights on 7, 8 and 9 October, northwest and west of Barrow, Alaska, including areas near active lease sales. Walruses were still present in the survey area, but none were seen at the haulout near Pt. Lay, Alaska, during a survey conducted on 8 October.

Open water persisted throughout October, with new/grease sea ice forming in shallow nearshore areas only. Observed sea states ranged from Beaufort 02 to 07 in open water areas.

Conclusions

Despite periods of limited survey activity due to aircraft logistics or environmental conditions, COMIDA achieved very good coverage of the study area in 2010. A portion of each transect line was surveyed at least once, with especially good coverage of transects in the CSPA. Total kilometers on transect in 2010 (19,326, Table 1) were comparable to kilometers on transect in 2009 (21,432), despite a 2010 field season that was shorter by three weeks; average transect kilometer per week was greater in 2010 (1,171) compared to 2009 (1,128). The coastal transect continued to provide additional flexibility for transiting to and from the survey area and for documenting walrus haulouts on land.

Bowhead whale sighting distribution in 2010 (Figure 16) was north and west of Pt. Barrow, Alaska, and similar to that observed in previous years in the northeastern Chukchi Sea (Clarke and Ferguson, 2010). Unlike summer 2009 (Clarke, 2010), bowheads were not seen nearshore between Pt. Franklin and Barrow, Alaska, indicating they may use that area intermittently.

The area between Wainwright and Pt. Barrow, Alaska, continued to provide excellent feeding habitat for gray whales throughout the study period (Figure 17). Gray whales were sighted in this area throughout the field season, from 3 July to 9 October. Gray whales were also concentrated west of Pt. Hope, Alaska, where they were recorded both times flights were conducted in the southernmost survey block, on 20 July and 20 August. As in 2008 and 2009, gray whales were not seen near Hanna Shoal, which they did occupy in the late 1980s and early 1990s (Moore and Clarke, 1992).

Walrus distribution and movements were similar to those documented in 2009 (Figure 18). Walruses were seen in the vicinity of, and hauled out on, sea ice when it was present (July and August). When sea ice diminished in the survey area (early September), walruses were

clustered in the water nearshore and aggregated in coastal haulouts on land. Group size estimates at the haulout near Pt. Lay, Alaska, varied considerably throughout September. Few walruses were observed in October. Tagging data from the USGS indicated that walruses remained close to the Pt. Lay haulout location until early October, after which most of the tagged animals left the COMIDA study area (http://alaska.usgs.gov/science/biology/walrus/2010 animation_Norseman.html).

Problems and Recommendations

COMIDA project management learned in May 2010 that the NOAA Aircraft Operations Center (AOC) would not be able to provide a previously-scheduled survey aircraft (de Havilland Twin Otter) to COMIDA until August, at the earliest, due to NOAAs ongoing aerial monitoring of the Deepwater Horizon oil spill in the Gulf of Mexico. Increasing concern over NOAA AOCs ability to support COMIDA 2010 led management to actively pursue an alternative survey aircraft. Thanks to the efforts of several individuals at MMS, NMML, and the Department of the Interior Aviation Management Division, COMIDA was able to procure the services of a Turbo Aero Commander 690A for the duration of the 2010 field season. It is highly likely that 2010 COMIDA aerial survey effort would have been seriously compromised, or perhaps not even occurred, if the Aero Commander had not been available. The use of an Aero Commander for the duration of COMIDA 2010 demonstrated the feasibility of using this type of aircraft exclusively for surveys in the Chukchi Sea study area. A Turbo Aero Commander will be used for COMIDA aerial surveys in 2011.

Conducting surveys in late October has proven difficult. In 2008 and 2009, October surveys were based from Kotzebue, Alaska. Several flights were conducted, but a large percentage of survey time was spent off-effort during transits to and from the study area, or they were focused on the southernmost part of the study area, which is not a high priority for COMIDA. In 2010, October surveys were solely based from Barrow, Alaska. Shorter periods of daylight, frequent snow squalls, potential icing conditions, and prolonged strong wind events curtailed survey effort. Survey planning in 2011 should consider a provisional end to the survey season by mid-October, with the possibility of extending surveys only if weather conditions permit.

Presentations of COMIDA 2010 Data

In January 2011, three COMIDA-related posters and one talk will be presented at the Alaska Marine Science Symposium, Anchorage, Alaska.

Posters:

- Eastern North Pacific Gray Whale Distribution and Habitat Use in the Chukchi Sea from Aerial Surveys: 1982-1991, 2008-2010 – Amelia Brower, Janet Clarke, Megan Ferguson, Cynthia Christman and Stephanie Grassia
- Pacific Walrus Sightings Documented by Aerial Surveys of the Northeastern Chukchi Sea in 2010 - Cynthia Christman, Amelia Brower, Janet Clarke, Megan Ferguson and Stephanie Grassia
- Distribution, Relative Abundance and Behaviors of Bowhead Whales in the Alaskan Beaufort and Northeastern Chukchi Seas – Autumn, 2007-2010 – Stephanie Grassia, Janet Clarke, Megan Ferguson, Cynthia Christman and Amelia Brower

Talk:

- A Tale of Two Seas: Lessons from Multi-decadal Aerial Surveys for Cetaceans in the Beaufort and Chukchi Seas – Megan Ferguson, Janet Clarke, Cynthia Christman, Stephanie Grassia and Amelia Brower

ACKNOWLEDGEMENTS

Numerous individuals and organizations contributed to the success of the 2010 COMIDA aerial surveys. Megan Ferguson (NMFS/AFSC/NMML) is the NMML Program Coordinator and Janet Clarke (SAIC Ocean Sciences Division) is the COMIDA Program Manager. In addition to Ferguson and Clarke, Cynthia Christman, Amelia Brower, and Stephanie Grassia (NMFS/AFSC/NMML) acted as COMIDA Field Team Leaders (Figure 19). Observers included Mike Borden, Brendan Hurley, Brenda Rone and Becky Scott, (NMFS/AFSC/NMML). Charles Monnett (MMS, Alaska OCS Region, COR), Robyn Angliss, Dave Rugh, Kim Shelden and Janice Waite (NMFS/AFSC/NMML) provided useful advice and logistical support throughout the season; AFSC also provided web support for posting of daily survey reports. Mike Hay gamely updated the data collection program and provided additional software support in a timely manner. The Aero Commander was provided by Northern Commanders, where we appreciated the support of Mary Pratt and Jeff Wolfe. We are particularly grateful for the enthusiastic efforts of our Clearwater Air pilots (Figure 20), Andy Harcombe and Aiden Loehr, and co-pilots, Stan Churches and Chris Palm, whose ingenuity allowed us to survey even when circumstances did not seem to be in our favor. Jan Bennett and Lark Wuerth (Department of the Interior, Aviation Management Unit) monitored every flight via satellite-linked Aviation Flight Following. In Barrow, Alaska, additional logistical support was provided by the North Slope Borough and King Eider Inn. A final word of appreciation and acknowledgment is extended to the Flight Service and National Weather Service offices in Barrow, Alaska. Our thanks to all.

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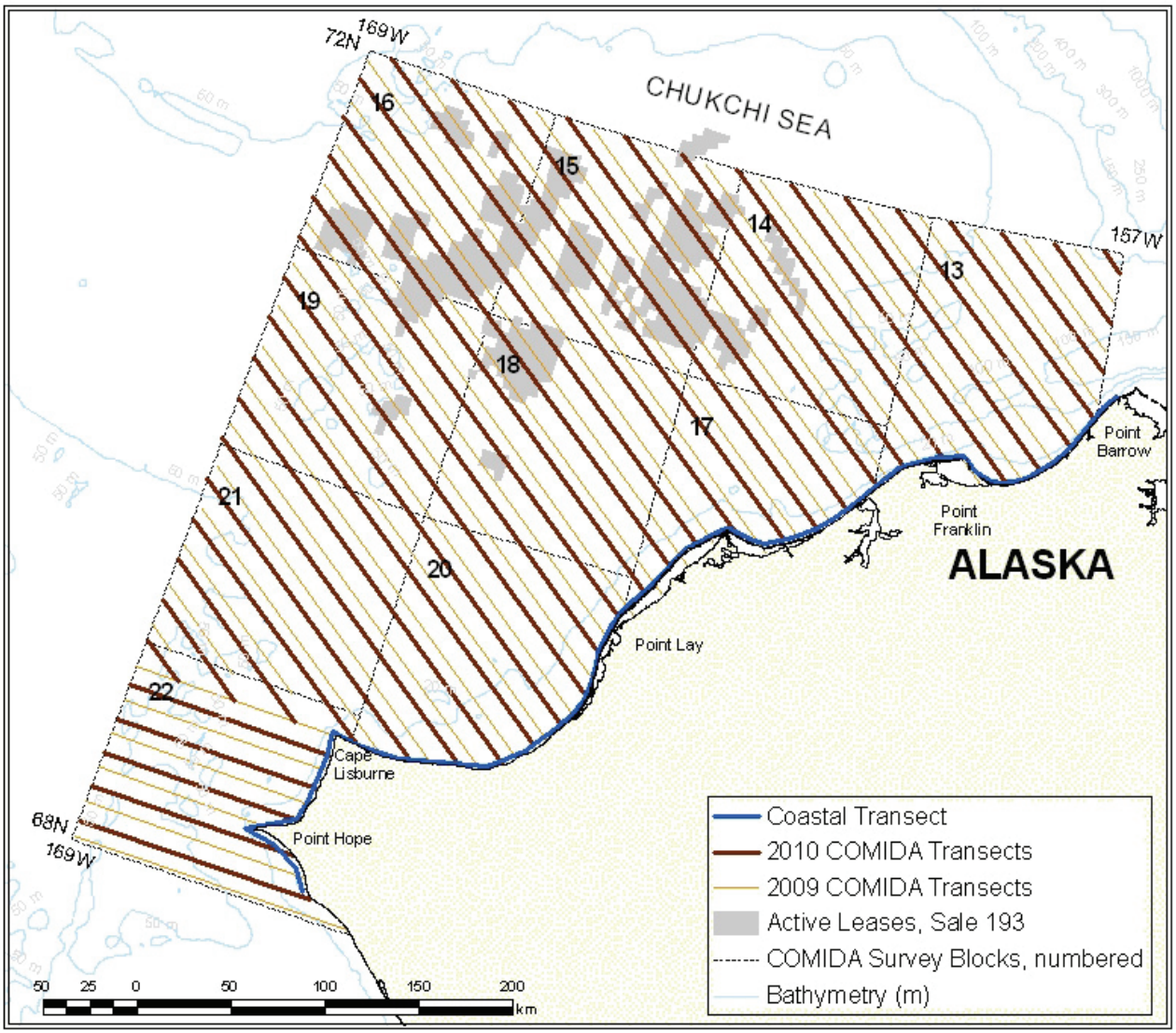

Figure 1. COMIDA 2010 study area showing perpendicular transect lines, coastal transect, bathymetry and Sale 193 Lease Blocks.
2009 transect lines are also plotted to illustrate varying coverage between years.

Figure 2. COMIDA 2010 survey aircraft, Turbo Aero Commander 690A, call sign N222ME, chartered from Northern Commanders, Spokane, Washington. Photo by Janet Clarke (SAIC).

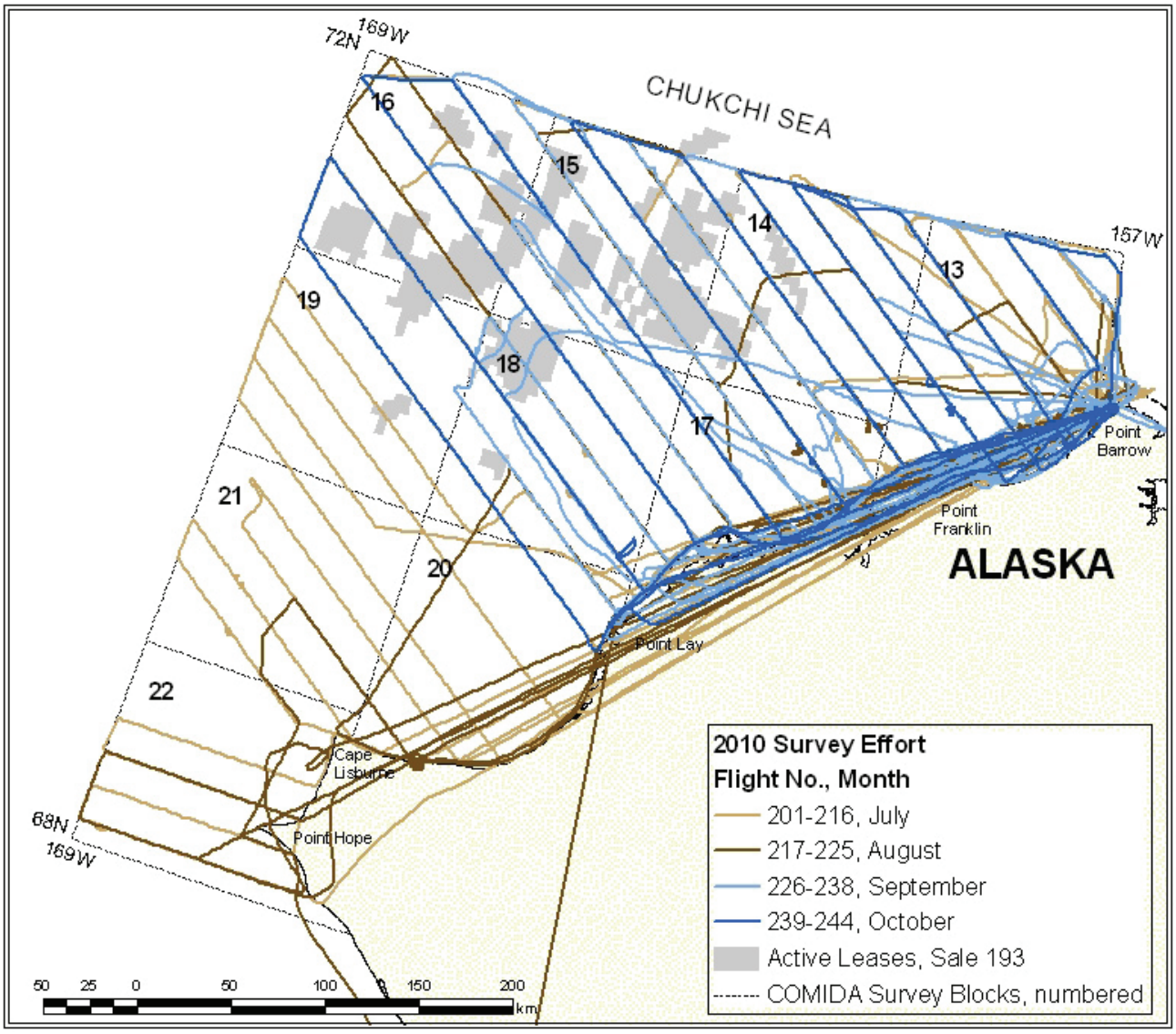

Figure 3. COMIDA survey effort by month, 2010.

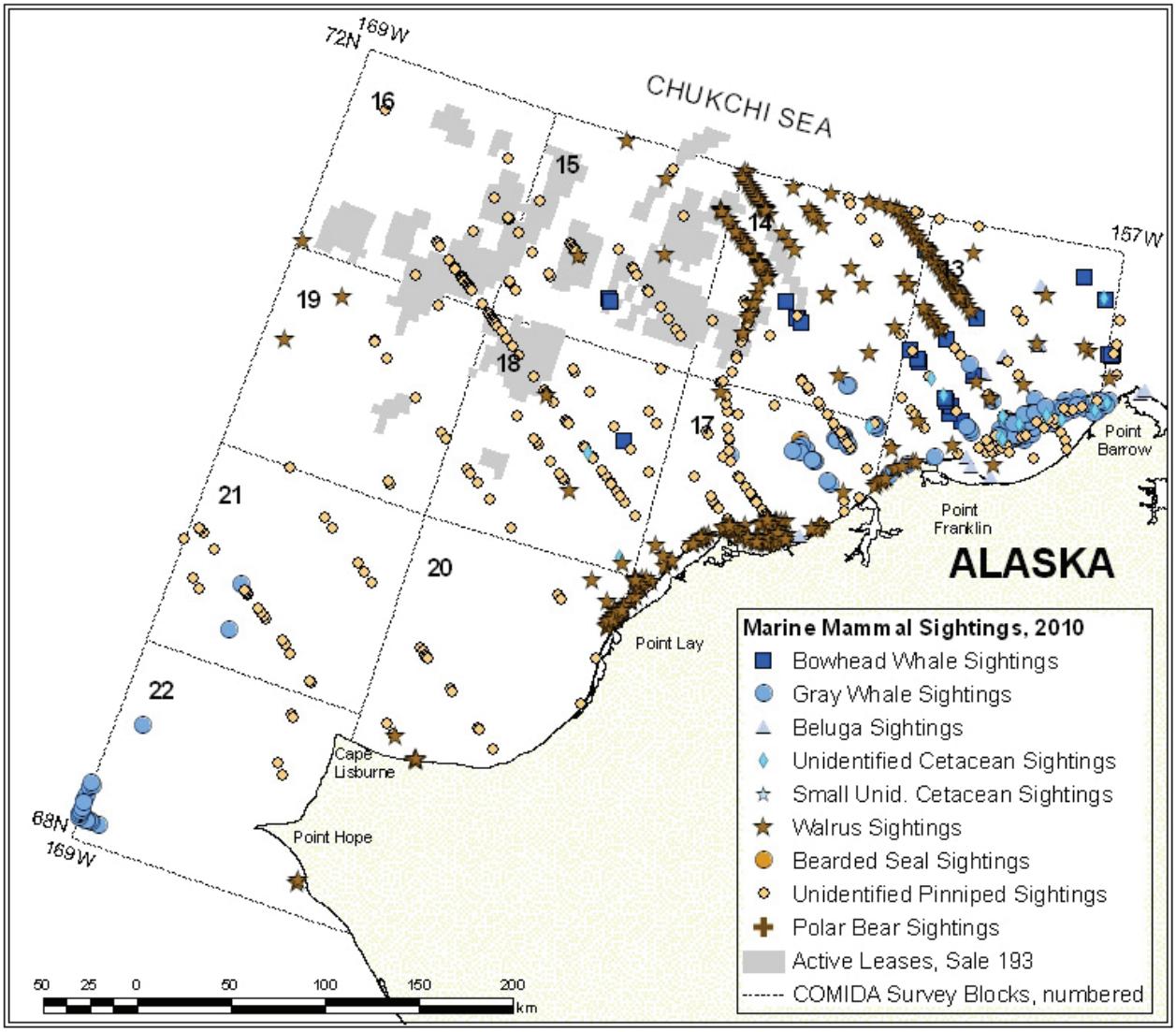

Figure 4. COMIDA marine mammal sightings by species, 2010.

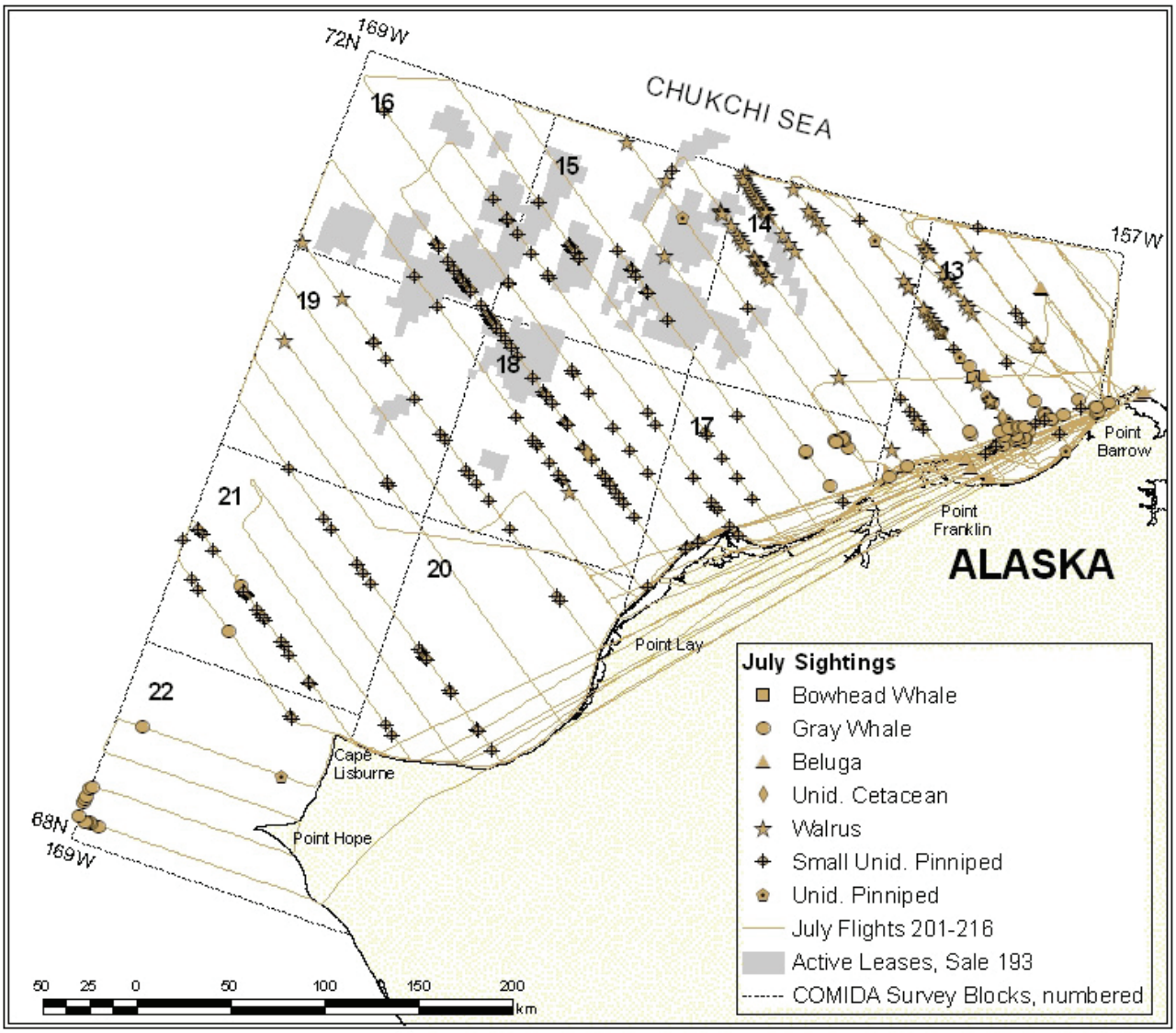

Figure 5. COMIDA marine mammal sightings and survey effort, July 2010.

Figure 6. Carcass of an unidentified cetacean (likely a gray whale) sighted on Flight 214, 27 July 2010, at position 68.856°N, 165.718°W.
Photo by Amelia Brower (NOAA/AFSC/NMML) under NMML Permit No. 782-1719-09.

Figure 7. Large group of belugas sighted on Flight 213, 26 July 2010, in Elson Lagoon northeast of Barrow, Alaska.
Photo by Amelia Brower (NOAA/AFSC/NMML) under NMML Permit No. 782-1719-09.

Figure 8. Walruses hauled out on sea ice.
Photo by Amelia Brower (NOAA/AFSC/NMML) under USFWS Permit No. MA212570-0.

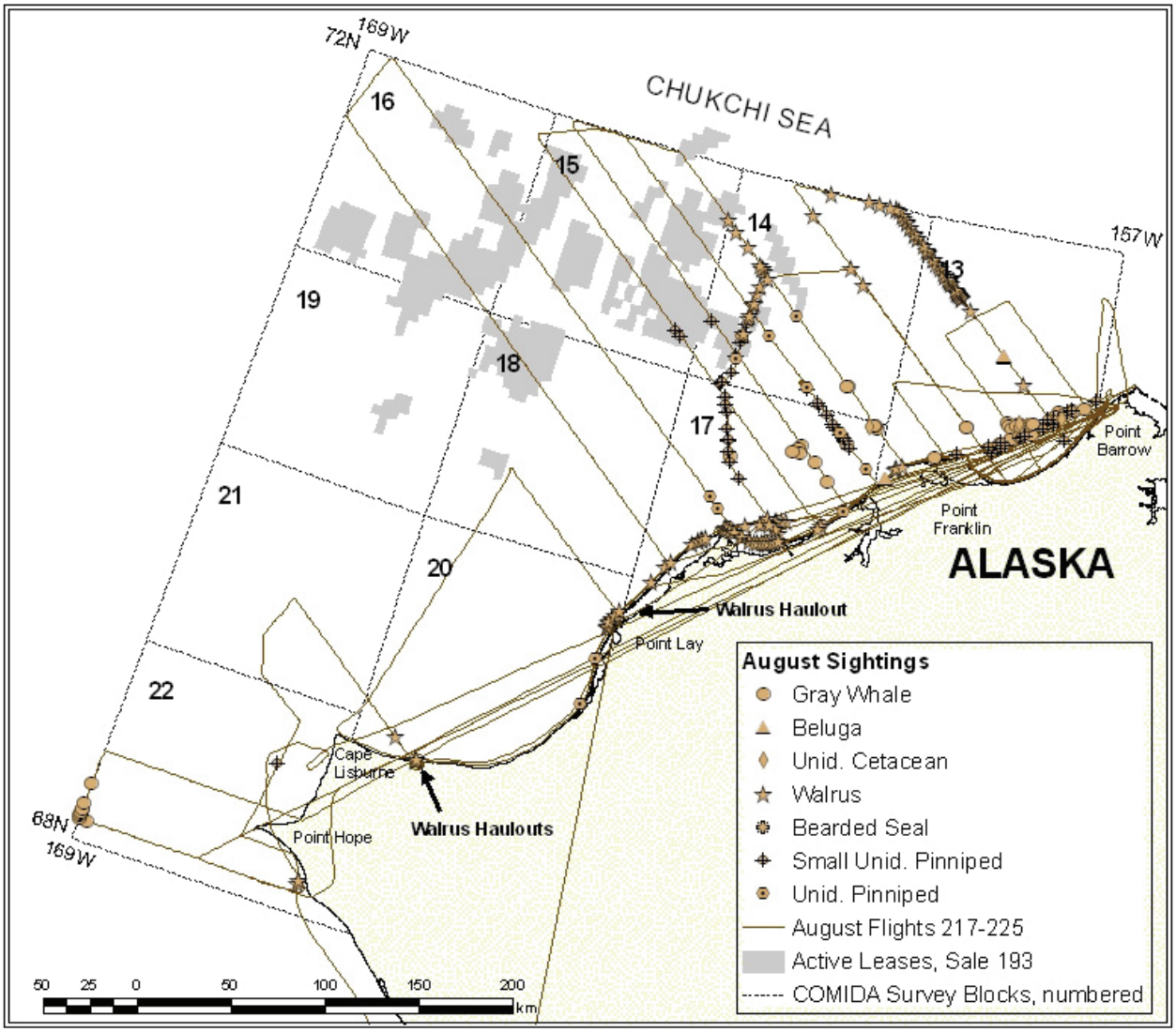

Figure 9. COMIDA marine mammal sightings and survey effort, August 2010.

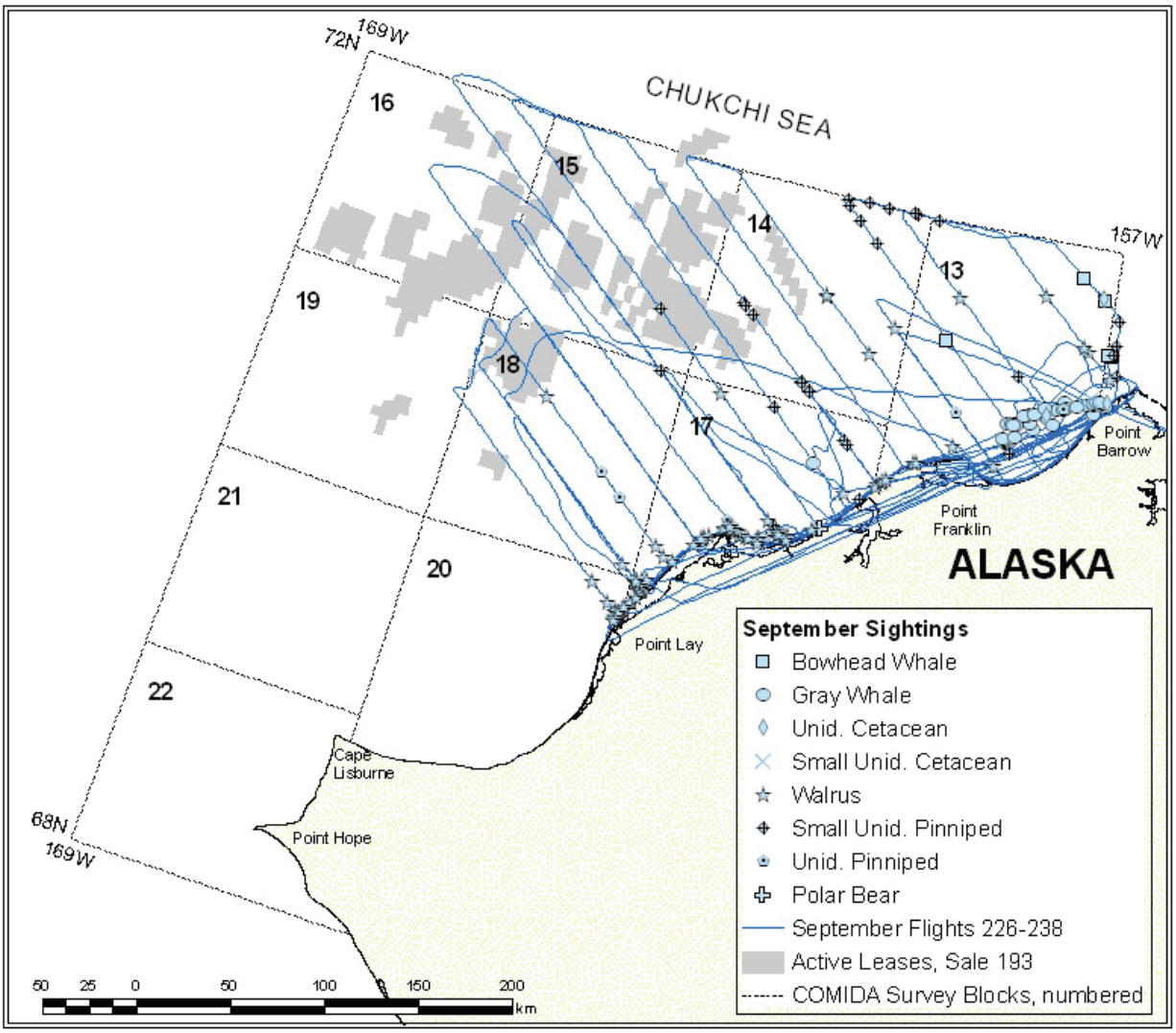

Figure 10. COMIDA marine mammal sightings and survey effort, September 2010.

Figure 11. Carcass of a bowhead whale, sighted on Flight 233, 17 September 2010, at position 71.146°N, 157.986°W.
Photo by Mike Borden (NOAA/AFSC/NMML) under NMML Permit No. 782-1719-09.

Figure 12. Walrus haulout near Pt. Lay, Alaska, 6 September 2010. The haulout size was estimated at 15,000 walruses. The yellow arrow indicates a small pond that can be used for geographical reference with Figure 13.
Photo by Mike Borden (NOAA/AFSC/NMML), USFWS Permit No. MA212570-0.

Figure 13. Walrus haulout near Pt. Lay, Alaska, 17 September 2010. An estimated 6,000 walruses were hauled out on land and an additional 2,000 animals were observed in nearby waters. The yellow arrow indicates a small pond that can be used for geographical reference with Figure 12.
Photo by Mike Borden (NOAA/AFSC/NMML), USFWS Permit No. MA212570-0.

Figure 14. Sea ice, Flight 229, 12 September 2010. Photo by Mike Borden (NOAA/AFSC/NMML).

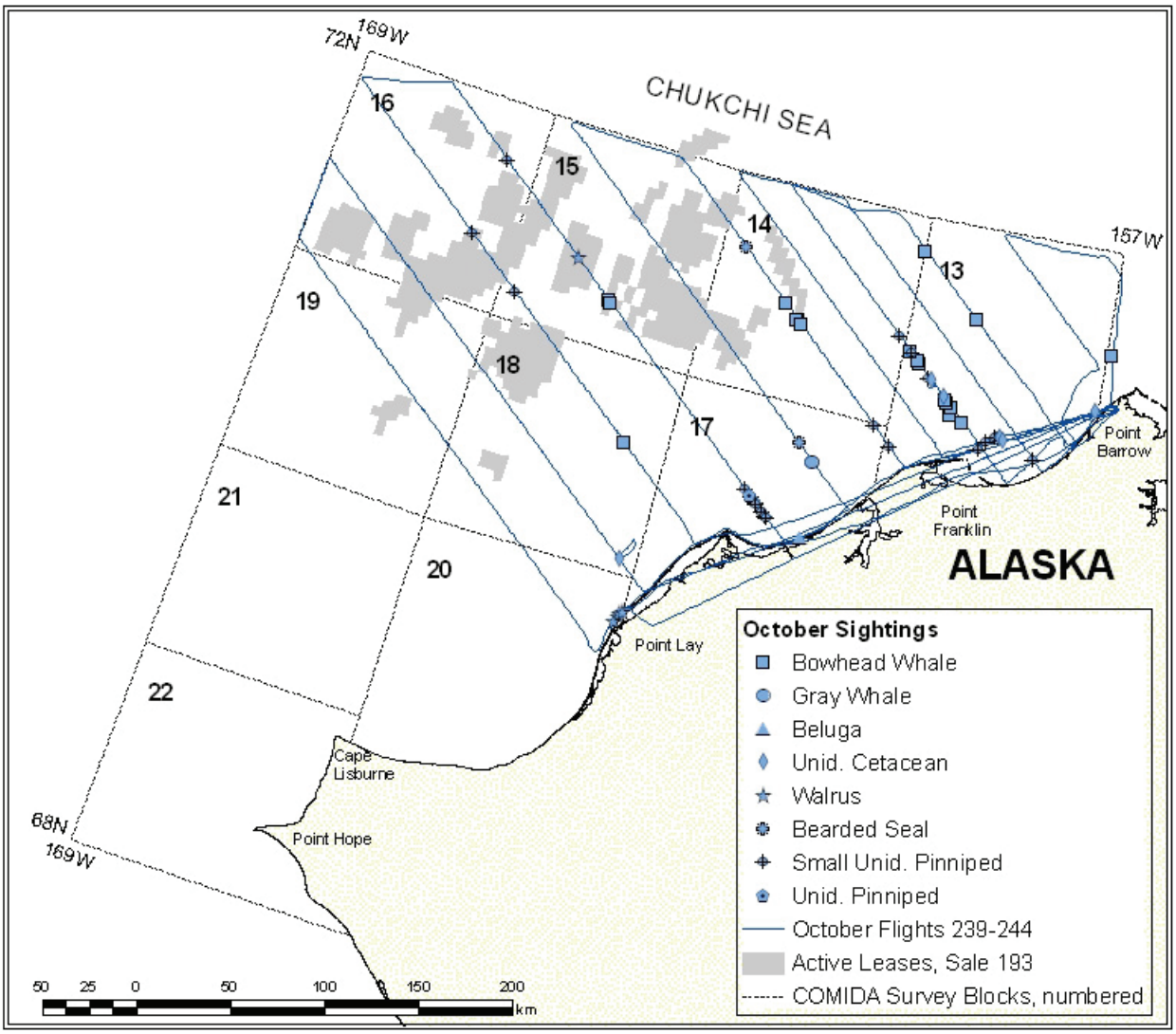

Figure 15. COMIDA marine mammal sightings and survey effort, October 2010.

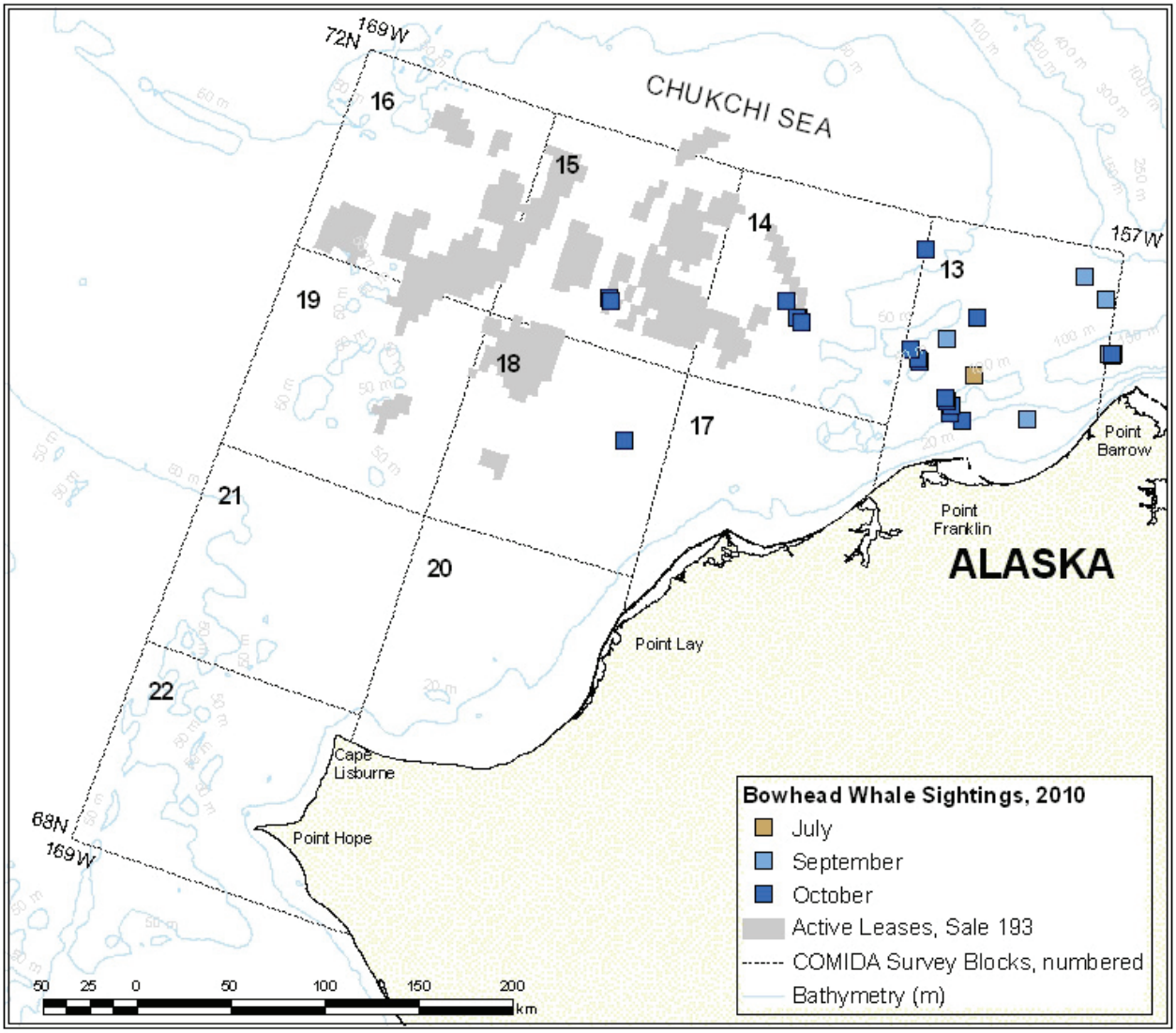

Figure 16. COMIDA bowhead whale sightings, July-October 2010.

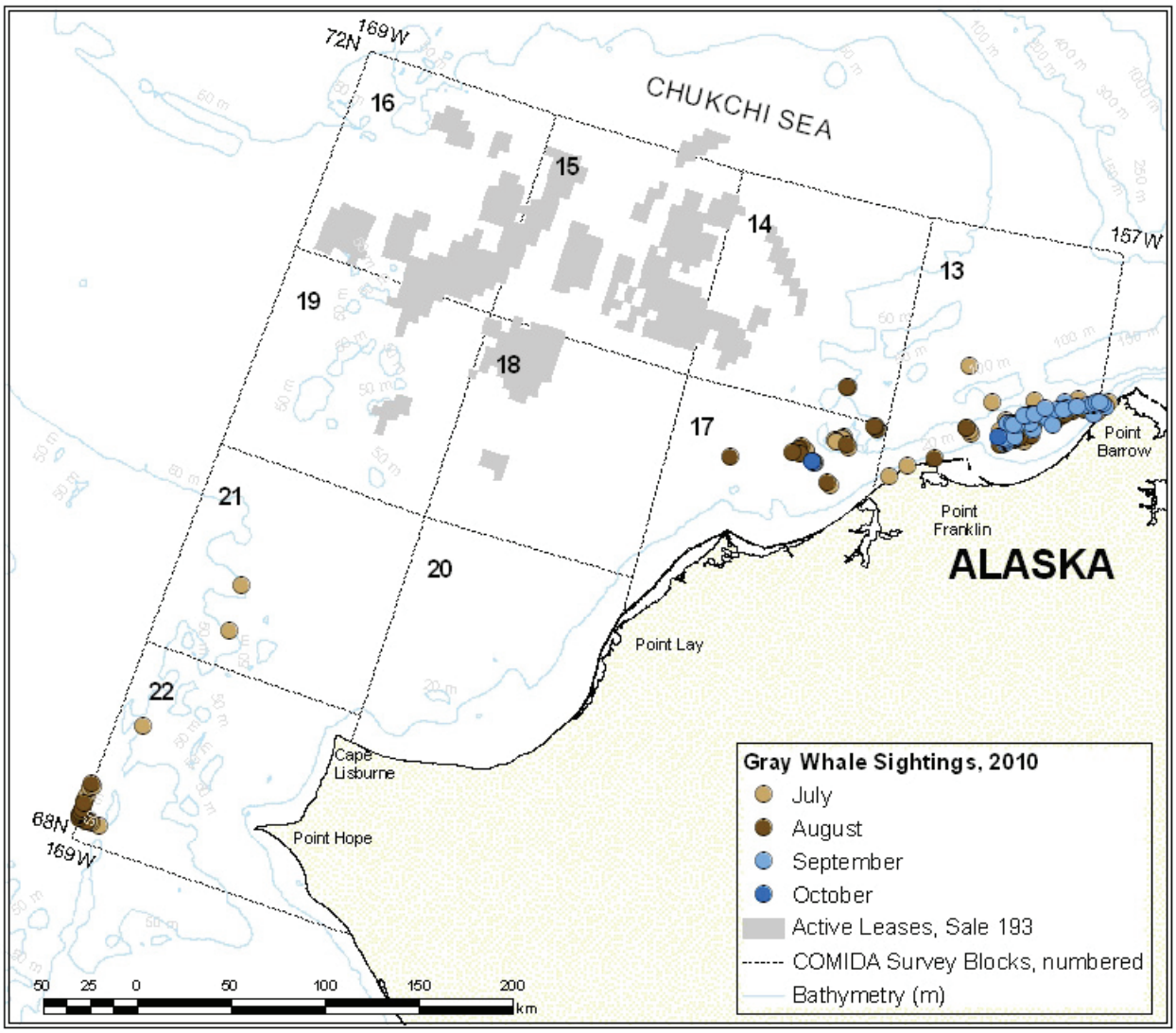

Figure 17. COMIDA gray whale sightings July-October 2010.

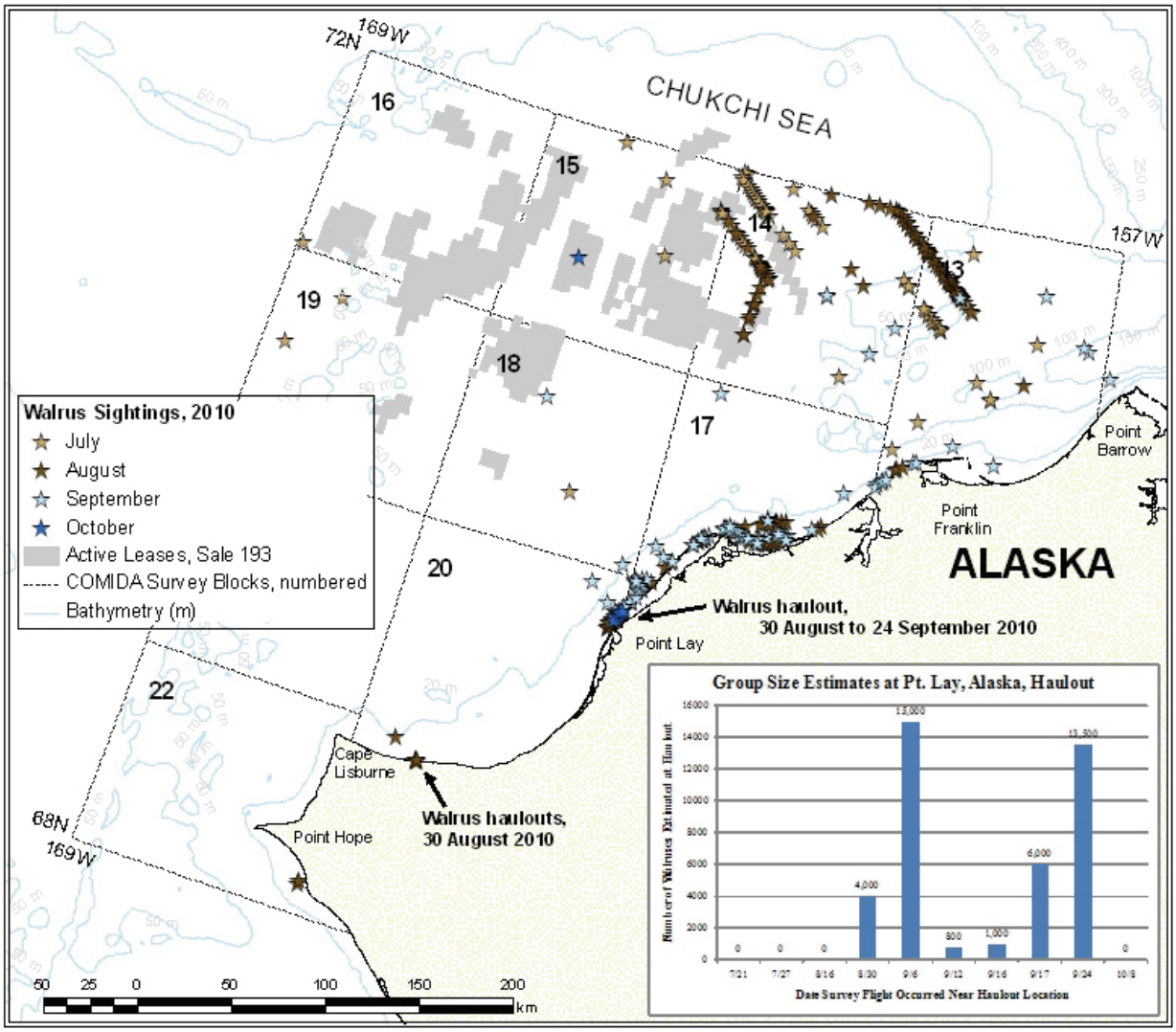

Figure 18. COMIDA walrus sightings, July-October 2010.
Embedded chart depicts observed changes in group size estimates of walruses hauled out near Pt. Lay, Alaska.

Figure 19. COMIDA 2010 Team Leaders.
From left to right – Janet Clarke, Megan Ferguson, Cynthia Christman, Stephanie Grassia and Amelia Brower.
Photo by Stan Churches (Clearwater Air).

Figure 20. COMIDA 2010 pilots, Stan Churches and Andy Harcombe.
Photo by Mike Borden (NOAA/AFSC/NMML).

Table 1. Summary of 2010 COMIDA survey effort.

Month	Total Time (hr)	Total Km	Transect Time (hr)	Transect Km
July	66.6	16,771	35.9	7,416
August	41.7	10,506	19.8	4,105
September*	46.3	10,953	23.3	4,832
October	25.2	5,585	14.7	2,973
Total	**179.9**	**43,814**	**93.7**	**19,326**

* excludes time and distance from portions of Flights 229 and 235 dedicated to BWASP surveys

Table 2. Summary of 2010 COMIDA marine mammal sightings (no. of sightings/no. of animals). Includes dead animals.

Month	Bowhead Whale	Gray Whale	Beluga	Unidentified Cetacean[1]	Small Unidentified Cetacean[2]	Polar Bear	Walrus	Bearded Seal	Unidentified Pinniped[3]	Small Unidentified Pinniped[4]
July	1/1	66/136	16/831	3/3	0/0	0/0	85/4,004	0/0	8/8	196/265
August	0/0	58/80	6/49	3/3	0/0	0/0	134/8,584	1/1	16/16	51/53
September*	8/10	34/45	0/0	3/3	1/1	1/1	99/39,309	0/0	8/8	31/38
October	18/22	3/5	1/1	6/6	0/0	0/0	5/94	2/2	1/1	21/26
Total	**27/33**	**161/266**	**23/881**	**15/15**	**1/1**	**1/1**	**323/51,991†**	**3/3**	**33/33**	**299/382**

* excludes marine mammals seen during portions of Flights 229 and 235 dedicated to BWASP surveys
[1] includes any large cetacean that could not be identified to species; likely bowhead or gray whale, but possibly other mysticetes
[2] includes any small cetacean that could not be identified to species; possibly belugas or harbor porpoises
[3] includes any large pinniped that could not be identified to species; possibly walruses or bearded, ringed or spotted seals
[4] includes any small pinniped that could not be identified to species; likely ringed or spotted seals
† includes several repeat sightings of walruses hauled out near Pt. Lay, Alaska

Table 3. Summary of 2010 COMIDA dead marine mammal sightings.

Flight No.	Date	Latitude (°N)	Longitude (°W)	Species	Notes
207	7/20/2010	68.112	167.679	unidentified pinniped	
214	7/27/2010	68.856	165.718	unknown cetacean	reported to survey team by Lisburne Radio; probable gray whale; very close to shore
214	7/27/2010	69.367	167.912	walrus	
218	8/14/2010	71.098	161.327	beluga	floating
225	8/30/2010	69.388	167.379	unidentified pinniped	probable walrus
233	9/17/2010	71.146	157.986	bowhead whale	searched for again on 18 September but not resighted
233	9/17/2010	70.445	163.811	unidentified pinniped	
233	9/17/2010	70.351	163.460	unidentified pinniped	
233	9/17/2010	71.224	157.465	unidentified pinniped	
233	9/17/2010	69.934	163.509	walrus	
233	9/17/2010	70.957	158.974	walrus	

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Appendix 4: BWASP and COMIDA Observer Manual – 2010

Bowhead Whale Aerial Survey Program (BWASP)
and
Chukchi Offshore Monitoring in Drilling Area (COMIDA)

Observer Manual – April 2010

NOAA/NMFS/AFSC/NMML
Contributors:
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Stephanie Grassia
Mike Hay
Laura Morse

Preface

The National Marine Mammal Laboratory (NMML), Alaska Fisheries Science Center (AFSC), NOAA Fisheries Service, under formal Interagency Agreements (IA) with the Minerals Management Service (MMS), has the lead on the collection and analysis of data for the BWASP (Bowhead Whale Aerial Survey Project) and COMIDA (Chukchi Offshore Monitoring in Drilling Area) projects. Both of these projects involve aerial surveys of the Outer Continental Shelf in northern Alaska with an emphasis on documenting bowhead whale distribution. There is considerable interest by regional and federal government agencies, including the North Slope Borough and the US Fish and Wildlife Service, and the general public in information collected by these projects.

This document provides an information overview for participants in the BWASP and COMIDA aerial surveys, including the procedures and protocols instituted for data collection, data processing and information dissemination. This is not a static document, as updates are frequently required to keep the information current. Major revisions to the document will be undertaken annually prior to the start of the field season. Aerial survey participants are encouraged to provide feedback on the documentation to the Project Manager.

I. COMIDA/BWASP Observer General Information – 2010

Introduction

BWASP and COMIDA aerial surveys will be coordinated by the Project Manager. The Project Manager will work closely with the Team Leaders, who will direct all field activities. The remainder of each field team will consist of two biological observers, pilot, co-pilot and mechanic. The Project Manager and MMS COR will occasionally be in the field, and it is possible that they may join one of the teams as a 4th observer. All members of the field team will have specific duties and responsibilities, including but not limited to weather briefings, occasional aircraft safety briefings, flight data QA/QC, and equipment checks. Each flight team will have a designated Field Data Manager and Weather Data Manager, the duties of which are described elsewhere. The Project Manager and Team Leaders will likely be in daily communication, either email or phone. Team members are welcome to contact the Project Manager if needed, although communication via the Team Leader is preferred. Additional information concerning field duties is included in the Survey Objectives, Protocol and Design section.

Communities

Barrow - COMIDA aerial surveys are based in Barrow, which is located in the northwest corner of Alaska, bordered by the Chukchi Sea to the west and the Beaufort Sea to the east (Figure 1). Demographics in Barrow and nearby Browerville are ~60% Inupiat and 40% non-Inupiat making for a very diverse community. Information about Barrow can be found at a website hosted by King Eider Hotel at http://kingeider.net/eider/ (look for Barrow links at the bottom of the page). The local government is the North Slope Borough, based in Barrow but with jurisdiction for the entire North Slope, including villages ranging from Kaktovik in the east to Anaktuvak Pass in the interior and Pt. Hope in the southern coastal area. The current mayor of the NSB is Mr. Edward Itta. The NSB website is an excellent source of information, http://www.co.north-slope.ak.us/. It is important for team members to be aware of the cultural sensitivities of the communities we are working from, and conduct themselves responsibly. In particular, do not trespass on private property, do not go to Pt. Barrow without a guide, and remember that anything you say or do will be reflected back on the project. If there are any questions as to appropriate behavior, check with the Team Leader or Project Management.

Deadhorse - BWASP aerial surveys will be based from Deadhorse, aka Prudhoe Bay, which is located near the central Alaskan Beaufort Sea coast (Figure 2). Deadhorse is a collection of oilfield camps located near the airport. Access to the actual oilfield is restricted. There is no town, per se; most people working in Deadhorse are generally on some type of two or three week rotation.

Other Villages (aka Emergency Landing Sites) - There are several small villages/ camps along both the Chukchi (Wainwright, Pt Lay, Atqusuk, Pt Hope) and Beaufort Sea (Nuiqsut, Alpine, Kaktovik) coasts that have runways suitable for landing our survey aircraft. However, most of them do not have lodging, basic visitor services, or aircraft fuel. There are two emergency landing sites with services, where the aircraft can be diverted if landing at Barrow or Deadhorse is not possible. Both are at least two hours from our base of operations, which is why pilots insist on having considerable fuel reserves until they are able to assess daily weather. Kotzebue is located on Kotzebue Sound south of the COMIDA study area, and is an emergency alternate for COMIDA flights. The Maniiliq Corporation website has some basic information on Kotzebue (http://www.maniilaq.org/kotzebue.html). Bettles is located south of Deadhorse on the south side of the Brooks Range, and is an emergency alternate for BWASP flights. There is very little in Bettles, but it does have a lodge and fuel http://www.bettleslodge.com/. Neither of these sites should be planned stopovers, although all observers are encouraged to carry overnight essentials with them in case diversions are necessary.

Lodging and Other Amenities

Lodging arrangements have been made for scientific crew, pilots and mechanic in both Barrow and Deadhorse. Each team member is responsible for paying for their own meals and lodging and expensing for reimbursement. We are not able to set up accounts in either location.

Barrow – all team members will be staying at the King Eider Inn (contact information: 907 852 4700; mailing address PO Box 1283; physical location 1752 Ahkovak St, Barrow, AK, 99723), which is located directly across the street from the airport. Some of the rooms have kitchenettes. Team members may either eat at one of several restaurants in town or purchase food for preparation; most team members do a combination of both. There are workout facilities available at the high school or recreation center, and several semi-organized sports events.

Deadhorse – most team members will be staying at Deadhorse Camp (contact information: 907 388 8535; mailing address: PO Box 340040, Deadhorse, AK, 99734, shipping address: Mile 412.8, Dalton Highway, Deadhorse, AK, 99734), which is located about a mile from the airport. Some team members may stay at the Prudhoe Bay Hotel, which is located closer to the airport (907 659 2449). All food is provided for team members as part of the lodging cost. Deadhorse Camp does not have its own workout facilities, but team members have been successful at infiltrating workout facilities at other camps.

Transportation

Barrow - the King Eider is located within walking distance to the airport and no vehicle will be needed (with the possible exception of arrival and departure days to ferry equipment to and from the aircraft). Most everything is within walking distance in Barrow or Browerville, including restaurants and grocery. Taxis are plentiful and most trips are <$10.

Deadhorse - Deadhorse Camp is far enough from the airport to require a truck. Truck rental is difficult to set up because trucks are limited. A crew cab pickup will be reserved for ferrying

the entire crew to and from the aircraft, as well as running various errands. Gasoline will need to be paid for by observers, and expensed accordingly.

Alcohol

Barrow is a "damp" city. Absolutely no alcohol can be bought or sold, but can be in possession and brought in for personal consumption. On a commercial flight, the following can be transported in checked baggage: one 12-pack of beer, two bottles of wine OR one bottle of hard liquor. Most hotels have policies on alcohol as well. Note that the King Eider hotel does not allow alcohol in their establishment.

Deadhorse is dry and alcohol is strongly frowned on in all of the camps, including Deadhorse Camp.

All crew members are expected to abide by the laws and rules of the city and private establishments.

Firearms

The COMIDA/BWASP projects do not provide firearms for the project and no personal observer firearms are allowed on the survey aircraft. It is up to the discretion of the pilots whether they bring firearms onto the plane. Both the King Eider and Deadhorse Camp allow firearms in their establishments, but with caution. They ask that the firearms stay unloaded and locked or stowed away while in the hotel or camp.

Communications

Personal cell phones may work in Barrow; AT&T/Cingular and T-Mobile generally work. Verizon has generally not worked or is, at best, intermittent (as of 2009). If personal cell phones do not work, the next choice is calling cards. Service availability is subject to change so will be assessed at the start of the field season.

Cell phone service in Deadhorse is excellent for almost any carrier.

Most lodging has free wifi or Ethernet. There is wifi available at most rooms in the King Eider; Wifi is available at all camps in Deadhorse.

Public Relations

COMIDA, BWASP and other arctic research projects are of immense interest to the local communities. Our crew(s) should make every reasonable effort to meet with stakeholders to discuss the objectives, methods and goals of the COMIDA and BWASP aerial survey projects. Much of this will be started by the Project Manager when she is on-site, but continued throughout the field seasons by the Team Leader(s). It is important to stress during these meetings that the field crew is responsible for collecting data and making sure that they are disseminated to interested parties, but that field biologists are not involved in policy decisions.

Media Requests:

Any team member that is approached by the media should refer them immediately to the Team Leader. In the event that our project has unique or out-of-the-ordinary sightings or circumstances, the Team Leader(s) will immediately contact the Project Manager or Project Coordinator, who will collect the pertinent information and coordinate with Public Affairs personnel at NMFS Headquarters (connie.barclay@noaa.gov) and similar personnel at FWS (for sightings of walrus and/or polar bears). Management will also ensure that supervisors, Division Directors, Doug DeMaster and Bill Karp are kept informed. Coordinating in this way allows for the information to be shared in a controlled and manageable way, and removes the field crew from having to directly deal with media requests. See Appendix A for additional information on coordination with Public Affairs Officer regarding sharing of photographs.

Non-Animal Photography:

The MMS sponsor has requested that the BWASP/COMIDA team provide him with "action" images and videos taken throughout the field season. He may distribute images within MMS to raise/maintain awareness of our projects. Examples might include pilots/mechanic preparing the aircraft prior to a flight, setting up the computer and entering data, looking out the window, etc. These are not the most exciting photos, but will be much appreciated by MMS. Short videos are also welcome. Any images should be stamped with name and agency, but do not need to have permit numbers included. Send images to either the Project Manager or Project Coordinator.

Decision-making Processes

The pilots are solely responsible for determining if conditions are safe enough to fly and return safely to base, as they are responsible for the safety of people and property. This is true regardless of the experience level of the pilot or Team Leader. Team Leaders are encouraged to discuss weather conditions with pilots to better understand their concerns about local weather patterns and establish a positive team environment. Weather conditions change rapidly in the Arctic, and unsafe flying conditions in the morning may give way to beautiful conditions in the afternoon and vice versa.

Once a determination has been made as to safety of flight conditions, Team Leaders, in consultation with the Project Manager and the pilots, will decide the most appropriate areas to fly.

For both COMIDA and BWASP, the intention is to cover the survey area(s) as completely as possible. The COMIDA area is divided into survey blocks which, in the past, have been surveyed with north-south transect lines. In 2009, a new survey protocol was introduced that features systematic transect lines that run southeast-northwest, or roughly perpendicular to the

shore line (Figure 1). Details of the survey protocol are included in the Survey Objectives, Protocol and Design section. A coastal transect is also flown to and from transect starting points when possible. One complete coastal transect per week is the targeted level of effort. As always, flexibility is essential, because the reality of Arctic flying is that the best laid plans on the ground will often need to be adjusted once airborne. The highest priority survey blocks in the COMIDA survey area are those with active lease areas, followed by the coastal blocks. The southernmost part of the study area, including Block 22 and parts of Blocks 20 and 21, is of lowest priority as it is not part of Chukchi Lease Sale 193. Transects in the southernmost part of the COMIDA study area may require a refueling stop in Kotzebue.

BWASP survey blocks are all accessible via Deadhorse (Figure 2) and are flown using north-south transects with randomly chosen start and end points. Details are included in the Survey Objectives, Protocol and Design section. Far western blocks may require re-fueling in Barrow. As with COMIDA, the intent is to fly all survey blocks equally, without duplicating effort in any one area before other areas have been flown. Starting in the west and working towards the east is always preferable as the direction of the autumn migration of cetaceans through the Alaskan Beaufort Sea is from east to west.

Occasionally, unforeseen circumstances may occur that preclude regular surveying. Possibilities include:

Automated Flight Following unavailable – in the event that AFF monitoring is not available to conduct real-time monitoring of survey flights, the only survey that will be initiated is a coastal transect with a very specific flight plan. No offshore surveys will be conducted without monitoring by AFF. Increased sat phone communication will be initiated, upon consultation with pilots. If AFF becomes unavailable once a survey flight is already in progress (as indicated by sat phone call from ADM in Anchorage), the survey aircraft will immediate transit directly back to either Deadhorse or Barrow. Should AFF become available again during that flight, transect surveys may continue at the Team Leader and pilots discretion.

Flight Service unavailable – Barrow and Deadhorse Flight Service close at 10 PM, after which air traffic control defaults to Fairbanks. Surveys should never be planned such that the aircraft is not on the ground prior to 10 PM. No exceptions. Local Flight Service can provide much better forecasts and up-to-the-minute local weather conditions that are not possible from Fairbanks.

Search and Rescue request for assistance – human safety always precludes survey requirements; we will assist if asked and collect data during those flights as possible.

Avoidance of hunting areas – always truncate transect lines away from coastal villages during various hunting seasons and whalers in boats; we will get additional guidance from NSB and other groups as to timing and locations of these hunts. Furthermore, there is a Whaler Communication Center in Barrow and Deadhorse (at SA-10 camp) to assist with whaling logistics and ensure whaler safety. Individuals at the communication center can provide

information on if and where whalers are active. See also below under Avoidance of Sensitive Wildlife Areas.

Confirming a unique or odd marine mammal sighting, assisting with finding a struck whale, and/or VIP on board – These are rather discretionary circumstances. The Team Leader should contact the Project Manager and discuss the circumstances of discretionary requests. Further communication with NMML and MMS representatives may be required.

Aircraft Safety Considerations

Each person flying on the COMIDA/BWASP surveys must be aircraft egress trained, including dunk-tank training, and have completed several additional trainings. All observers will be issued flight suits (Mac 100s) and must wear them during over-water flights. Swit-liks are also worn during (minimum) takeoff and landing, but should be worn throughout the flight as well. In addition, the Team Leader(s) and pilots will conduct periodic egress and safety trainings on the aircraft so that each team member knows precisely what their responsibilities are in an emergency situation. These trainings will review emergency materials, including use of GPS, sat phone, EPIRBs, Aircraft and Marine band handheld radios, etc. Additional information on Aviation Safety is available in the NOAA Aviation Safety Policy, which is available on the NMML LAN.

One-time flights are available for non-egress-trained individuals ("VIP"), but must be pre-approved by the Project Manager and the aircraft operator. Individuals requesting a ride on a flight must have a mission-applicable reason for doing so (e.g., representatives from the NSB Wildlife Management Department, MMS, NMFS Headquarters or Region, ADF&G, USGS, etc.). Survey flights will not be altered to suit the needs of VIPs (e.g., flying to specific areas for flight-seeing), and all VIPs must be made aware that the flight may last in excess of seven hours.

Cooperation with NSB Search and Rescue (SAR)

Upon arrival in Barrow, the COMIDA Project Manager and Team Leader(s), along with at least one of the pilots, will make contact with the NSB Search and Rescue Department to let them know of our presence and activities, including our aircraft type, call sign, emergency frequencies, contact phone numbers and map of the study area and survey blocks. This visit has a two-fold purpose: both to introduce our project in the event that we should need assistance and let NSB SAR know that our aircraft and crew could be available for coordination and assistance should the occasion arise for a SAR effort while we are based in Barrow.

Avoidance of Sensitive Wildlife and/or Hunting Areas

Subsistence hunting is an essential part of life on the North Slope. Targeted marine mammal species include bowhead whales, belugas, walrus and pinnipeds. Every effort will be made to avoid direct over-flights of areas where subsistence hunting of marine mammals is taking place. Transects should be truncated three to five miles short of where any subsistence activity is

occurring. Most subsistence activity will be fairly close to shore and within nearshore lagoons, although whalers can be found in excess of 40 miles offshore. A map showing the bowhead whale hunting areas for North Slope villages is provided for reference (Figure 3); timing may change slightly from year to year so will need to be verified prior to the start of the field seasons. Exact dates for the fall hunts can be obtained from either Craig George (craig.george@north-slope.org) or Robert Suydam (robert.suydam@north-slope.org) with the NSB Wildlife Management Department. There are also several subsistence use maps available on the NSB Department of Wildlife Management Coastal Resource Atlas webpage, http://www.north-slope.org/nsb/default.htm.

There is a critical habitat area for Spectacled Eiders in the Ledyard Bay area. The eiders are molting and care needs to be taken that they are not disturbed during this time. If there is a considerable reaction of the birds from aircraft overflight, survey protocol will be adapted.

As new pilots are introduced to this project, they will need to be informed of when and where to alter flight paths and altitudes. It will be the responsibility of the Team Leader to remind pilots of the importance of respecting subsistence pursuits. Survey Objectives, Protocol, and Design includes a summary of situations and scenarios where altitudes and flight paths may need to be adjusted.

Cooperation with Other Research

The potential level of industrial activities occurring in the Chukchi and Beaufort Seas in 2010 is likely to be high, and it is anticipated that there will be additional fixed wing aircraft flying other over-water surveys as well as helicopters conducting crew transfers. Team Leader(s) should foster good working relationships with other scientists whenever possible. Seismic exploration and other assorted research may be conducted by Conoco Phillips, Shell and MMS (Figure 4). Industry will monitor for marine mammals via Marine Mammal Observers (MMOs) onboard participating vessels and aircraft, and marine mammal sightings from these projects will be disseminated via official channels. Sharing of information about BWASP/COMIDA marine mammal sightings should also be sent through official channels (see Dissemination section below). General information about other project study areas and frequency of planned aerial surveys are included in Appendix B. USFWS and USGS will also be active in the area in July if walrus haulouts are detected on the Chukchi coast as they were in 2007 and 2009. Steps for disseminating information about COMIDA walrus sightings are included in Section VIII.

Dissemination of Information to Stakeholders/ Interested Parties

A daily report from the Team Leader(s) to the Project Manager will be uploaded to SharePoint each day of the field season; more information on this task is included elsewhere in this document. Regulatory decisions concerning industrial activities may be contingent on information from COMIDA/BWASP surveys, so at no time do we want to hold up the process.

Internet connectivity can prove difficult, however. In the event that a daily report cannot be transmitted electronically, pertinent information (particularly about bowhead or other cetacean sightings) can be phoned in to the Project Manager, who will in turn relay the information to appropriate stakeholders. Transmittal of the daily report should NOT delay flights on surveyable days, but every effort should be made to transmit the information as soon as feasible. Ideally, the daily report should be uploaded on the same day as the survey flight.

Flight Days - Immediately following each survey flight, the Field Data Manager will check the flight data for quality (additional information in the Field Data Manager Section). Reports on cetacean sightings, weather summary and flight path information are generated automatically by the Data Collection program at the end of each flight; those individual files together with the edited Access flight file will be transferred to the Team Leader. After checking the files for errors or inconsistencies, the Team Leader will email a short text summary and all flight information and files to the Project Manager. The Project Manager will conduct further QA on the flight file and email a single file to NMML and MMS. Team Leader(s) and team members should not disseminate any information directly; rather, requests for information should be referred to the Project Manager. If for any reason, daily flight information cannot be emailed within a reasonable amount of time, the Team Leader(s) should inform the Project Manager as to the situation. Transfer of daily flight information should occur no more than five hours after the end of the flight.

Non-Flight Days - In the event that no flight is undertaken, an email should be sent as soon as the decision is made to not fly, stating the reason why (low visibility, high winds, pilot day off, etc) no flight has occurred.

Other Useful Information

The 2010 Observer & AOC Pilot Schedule, and COMIDA/BWASP & NOAA AOC Master Contact List are included as Appendices in this document. These particular documents will be updated throughout the field season, and new copies will be made available to all interested parties. Phone numbers, email addresses and other contact information should not be distributed beyond project participants without the consent of the Project Manager and Project Coordinator.

Ground Safety and Bear Awareness

The North Slope is home to two bear species, polar bears (*Ursus maritimus*) and brown bears (*Ursus arctos*). An awareness of their presence and behavior is important for your personal safety.

In Barrow, polar bear sightings are common throughout the season along the beach and, on occasion, in town. You will be walking a fair bit around town during your stay in Barrow, so

it is important to remain aware at all times of your surroundings. Always be aware of places where you can take cover, including flagging down anyone in a vehicle. The King Eider managers usually hear the latest on if/where there are bears around, so we generally have a good idea of day-to-day activity. Most sightings make the rounds via word of mouth around town and the community of Barrow is very "bear aware". I**f you think a bear has gone undocumented, advise the Team Leader who will contact NSB Wildlife Department representatives**.

In Deadhorse, brown bears are year round residents in the area and are frequently seen around the camps. In the fall of 2008, one well known bear managed to wander into Prudhoe Bay Hotel and had to be killed. Camps are frequently visited by brown bears throughout the year as the bears check out the dumpsters around the buildings. Walking around Deadhorse is frowned upon, due to the bear presence as well as industrial activity and truck traffic in the area. Polar bears are rarely sighted in Deadhorse but, if observed, understand that these bears are far less habituated to human activity and may be far more aggressive than resident brown bears. **If you observe any bears anywhere in Deadhorse, report it to the NSB police located in SA-10 immediately or to camp managers**.

Each project has bear deterrent devices for carrying during survey flights and which will be available to take and carry when moving around town or heading down the Haul Road, including:
- Bear Spray
- Bear Bangers
- Air Horn

Situational awareness is your best form of defense. For further information refer to the Bear Awareness and Defense Training Manual on the NMML LAN.

II. BWASP/COMIDA Survey Objectives, Protocol, and Design

Introduction

The MMS-sponsored Bowhead Whale Aerial Survey Project (BWASP) has two components, defined by geographic area:

"BWASP" generally refers to surveys flown in the Alaskan Beaufort Sea (east of 157°W)

"COMIDA" refers to surveys flown in the Alaskan Chukchi Sea (west of 157°W).

Survey protocol (i.e., data collection) is similar between areas, but survey design is quite different. Preparation and observer duties for each component are the same. All data collected are appended to the same large "BWASP" database, which extends back to 1979.

Aerial surveys are flown every day, weather permitting. Scheduled aircraft maintenance (e.g., 100 hr), pilot's off-duty day, illness, and absence of Automated Flight Following (AFF) are valid reasons for flights to not be scheduled. On any other day, all observers should be prepared to be rolling down the runway at 9:00 AM, unless previously indicated.

COMIDA and BWASP aerial surveys are conducted under authorization of the National Marine Fisheries Service, Permit No. 782-1719, and Fish and Wildlife Service, Permit No. MA212570-0. In addition, BWASP and COMIDA have also received Administrative Approval from the North Slope Borough Planning and Community Services Department. Copies of each of these permits are in all field computer cases, and should always be on the aircraft during surveys.

Survey Objectives and Design - COMIDA

COMIDA surveys in 2010 will start 1 July and end around 31 October. Surveys will be flown on an Aero Commander provided by Northern Commander.

Objectives

1. Provide data compatible with the MMS marine mammal database for use in estimation of the distribution of cetaceans and pinnipeds in the Chukchi Sea Planning Area (CSPA). The CSPA is shown in Figure 1.
2. Document geographical areas of importance for specific behaviors including calving/ pupping, feeding, hauling out, and migrating.
3. Provide timely information on marine mammal observations and environmental conditions, including ice conditions, following each survey flight to organizations as directed by the MMS Contracting Officer for real-time management of activities in the region.

The COMIDA survey design was modified in 2009, so that transect lines are perpendicular to shore. The following describes the new survey design and "best case scenario" protocol.

Aerial surveys remain focused on a study area encompassing the northeastern Chukchi Sea from shore seaward, ranging from 68°N to 72°N and 157°W to 169°W, overlaying Lease Sale 193 and incorporating ten survey blocks (Figure 1). The transect lines overlaying the CSPA (and adjacent areas closer to shore) have higher priority than survey lines in the southernmost area (i.e., Block 22). COMIDA surveys are based out of Barrow.

Target airspeed is 110 kts; faster airspeeds may be initiated during deadheads (over large areas unsurveyable due to lack of visibility), transits over land or emergency situations, at the Team Leader's discretion after consulting with the pilot about fuel consumption.

Each year, one set of transect lines will be generated from a single random point, designated as "anchor" (Table 1). Each transect will be spaced approximately 19 km (10 nm) from the next closest transect (Figure 1). Transects are perpendicular to the coastline. In consecutive years, transects will be generated from a new randomly selected anchor, and placed in the same relative configuration of 19 km apart and perpendicular to the coastline. In this way, multi-year transect coverage will be uniform throughout the study area. Transects that are less than ~30 km in length will not be targeted, unless surveying them allows for smoother transitions between other lines.

Transect lines that terminate at 72N or 169W should end just short of those points, so that search effort between transect lines is conducted with the study area. When we terminate the lines right at 72N or 169W, the subsequent turn puts us outside the survey area and that effort ends up being excluded during some post-field analyses.

Transect lines should terminate slightly offshore of the coastline (regardless of where the computer-generated end point is positioned), such that the search line between transects is about ½ km offshore of the coast/barrier island. This will allow coverage of the coastline for presence of hauled out walrus, other pinnipeds, and polar bears, but will also allow observers to search for small odontocetes that might be in very near shore areas. Transect termination should not occur over land.

COMIDA survey lines and waypoints will be provided to all team members on both the BWASP and COMIDA aircraft, as circumstances may arise where both aircraft could fly COMIDA lines. Because a single set of transect lines will be flown each year in the COMIDA area, the waypoints for those lines will only need to be entered once, at the beginning of the survey year, by the pilots.

The objective of the survey will be to fly each transect in its entirety prior to re-surveying any transect. In summer (July through August), surveys will ideally start with transects in the northern part of the survey area and work transect lines consistently southward (note that pilots may prefer to work opposite of this pattern for safety of flight reasons). This pattern is expected to reduce any potential re-sightings within one day as most marine mammals would be expected to be migrating northward into the Chukchi Sea area in summer. During a survey, every second transect line will be flown, again to reduce the likelihood of repeat sightings. For example, one day would ideally find transects 1, 3, 5, and 7 flown in their entirety. The following day, transects 9 and 11 would be flown in their entirety, and so on. Once every second transect has been surveyed within the study area from north to south, transects in the north would again be targeted, starting with transects 2, 4, 6, and 8, etc. Ideally, this pattern will repeat until all transects have been flown at least once. At that time, all transect lines will be resurveyed. Estimated times for completing various transect groupings are provided in Table 2.

In fall (September through October), the sequence will be reversed, working from the southernmost transects northward in the same manner as described above. During this time period, marine mammals would be expected to start migrating southward out of the Chukchi area, so the survey coverage will once again be against the migration, and reduce the incidence of repeat sightings.

The reality of surveying in the northeastern Chukchi Sea is that weather plays a significant role in where useful surveys can be completed. Transect lines will likely need to be truncated due to reduced visibility, low ceilings, high sea states, etc. In those circumstances, the next acceptable transect line will be surveyed using the following general guidelines:

a. If environmental conditions appear to be localized and surveying further in the direction of travel looks possible, transit to next adjacent survey line and continue in same direction of travel.

b. If environmental conditions appear to be widespread and surveying further in the direction of travel looks less than desirable, transit to the second transect line from current and head in the opposite direction.

c. Surveys to or from the start of transect lines will be flown along the coastal transect (weather and fuel permitting) to target near shore areas, search for carcasses, and monitor pinniped haulouts.

d. Sections of transects will be flown, where possible, to “stair step” to and from areas offshore.

When survey effort on transect ends due to decreasing light, survey conditions or fuel requirements, the return to Barrow will be along the coastline whenever possible, using the predefined coastal transect to maintain consistency over the entire field season. This transect is offset from shore by approximately one km, and can be adjusted to avoid sensitive subsistence

hunting areas and sites known to have spotted seal haulouts. The coastal transect can also be flown enroute to the start of an offshore transect. Experience in 2009 showed that the best approach to the coastal transect is to visually reference the one km distance from shore, rather than try to fly to waypoints.

Aerial surveys in the northeastern Chukchi Sea are contingent on the environmental conditions present in any particular season and year. The scenarios presented above are "best case", and may not always be attainable due to low ceilings, fog, snow squalls, high sea states or any of a myriad of other unsuitable survey conditions. The proposed transect survey design remains flexible enough to allow deviations to the planned survey sequence to take advantage of the best survey conditions while still achieving adequate coverage of the entire survey area. When transects are truncated due to environmental conditions, the Team Leader and Project Manager will determine the best means of completing those transects.

In the event that the Flight Plan filed by the pilots changes drastically during the course of the survey due to unsuitable survey conditions, it may be necessary to update Flight Service with new information. This may require an increase in altitude for increased radio range or a call to AFF to ask them to relay the information. The pilots will determine if the Flight Plan needs to be updated and the best means of doing so. Team Leaders should work closely with the pilots to ensure that Flight Plans have enough flexibility to allow COMIDA objectives to be met while still providing the detail needed in case of emergency.

During summer, it may be possible to conduct two surveys in one day. The Team Leader may opt to do this when the weather is favorable and pilot flight time allows. Consecutive days of two flights each are not recommended due to fatigue of both pilots and observers.

There are several villages along the Alaskan Chukchi coast that conduct subsistence hunts of marine mammals, which were referenced in the "Avoidance of Sensitive Wildlife and/or Hunting Areas" section. Every effort should be made to not interrupt or interfere with subsistence hunts. Transects may be truncated or possibly skipped to avoid active hunting areas; the coastal transect may need to be modified as well.

The southernmost COMIDA block (22) and areas in Ledyard Bay (blocks 20 and 21) are of lower priority as they are outside of the CSPA, so effort should be adjusted accordingly. If circumstances arise where surveys will target the southern part of the COMIDA study area, it may be necessary to refuel in Kotzebue. The Standard Operating Procedure in those circumstances will be to head to Kotzebue <u>first</u>, and see if fuel is available. If fuel is available, then a full survey can be planned from there. If it is not available (or available in a timely fashion), then the survey can be adjusted to use the fuel on board and still make it back to Barrow. A coastal transect could be flown enroute to Kotzebue, either completely to Pt. Hope,

or partial (cutting across land near Cape Sabine). Conducting transect surveys in the southern area first, before attempting to refuel, is not recommended as fuel might not be available in Kotzebue and an unplanned overnight stay would be warranted. Surveys in the southern part of the COMIDA study area should not be attempted if there is any foreseeable chance that the survey will not be able to return to Barrow. While Kotzebue has fuel and lodging, it is not our base of operations and overnights should not be planned for.

The COMIDA survey team may be asked to fly transects in Block 12 or elsewhere in the BWASP study area. Surveys in the BWASP area would likely be limited to August (prior to the start of BWASP or BOWFEST) or late October after BWASP has ended and would likely be flown only in situations where weather or other circumstances preclude flying in the COMIDA area. Surveys in the BWASP area will only be conducted on direction from the Project Manager. Transects in the BWASP study area will be flown consistent with other BWASP transect coverage (see below).

Survey Objectives and Design – BWASP

BWASP surveys started in 1979 and have continued uninterrupted since then, with few modifications to their design or purpose. One of the biggest changes over time has been the survey time period. In the early 1980s, surveys were conducted from April through October; currently surveys are limited to 31 August to 20 October. The current objectives are:

1. Determine annual fall migration of bowhead whales, including inter-year differences and long term trends in distance from shore and water depths;
2. Monitor temporal and spatial trends in the distribution, relative abundance, habitat and behaviors of endangered whales;
3. Provide real-time data to MMS and NMFS on general progress of the fall migration of bowhead whales across the Alaskan Beaufort Sea;
4. Provide an objective area-wide context for management understanding of the fall migration of bowheads and site-specific study results (e.g., industry);
5. Record and map beluga whale distribution and incidental sightings of other marine mammals; and
6. Determine seasonal distribution of endangered whales in other planning areas of interest to MMS.

Aerial surveys are conducted in a study area encompassing the Alaskan Beaufort Sea from shore to 72°N, between 140°W and 157°W, and incorporating twelve survey blocks (Figure 2). In recent years, very few surveys have been conducted in blocks 8, 9, and 10. Bowheads are seldom seen that far offshore in open water (light ice) years in September and October, and the area is far north of any active lease areas. Survey blocks 8, 9, and 10 remain optional to fly, depending on annual circumstances. The Project Manager, in consultation with the MMS COR and NMFS PI, will determine if and how often blocks 8, 9 and 10 should be flown once the BWASP season starts.

BWASP flights are based out of Deadhorse. Target airspeed is 110 kts; faster airspeeds may be initiated during deadheads (over large areas unsurveyable due to lack of visibility), transits over land or emergency situations, at the Team Leader's discretion.

Transects are flown in survey blocks based on sets of unique transect grids computer-generated for each survey block (or two survey blocks together). Transect grids are derived by dividing each survey block into sections 30 minutes of longitude across. Random points along the north and south edge of each block(s), per 30 minutes of longitude, are connected with a transect line. Transect lines are connected alternately at their northernmost or southernmost ends to produce one continuous flight grid within each survey block. Survey blocks are often combined and flown together. Common combinations include blocks 3 and 11, 1 and 2, 4 and 6, and 5 and 7. When two survey blocks are flown together, one continuous transect line is flown per 30 minutes of longitude (there is no need to start new lines at the boundary of the new block). Additional information on generating waypoints for BWASP survey blocks is provided in Section III.

The selection of the survey blocks to be flown on a given day is nonrandom, based on reported or observed weather conditions over the study area and what blocks have been surveyed recently. Weather permitting, the project attempts to distribute effort fairly evenly across the entire study area. Surveys should be flown west to east to avoid duplication of sightings. An ideal sequence of surveys would be the following: Block 12, Blocks 3 and 11, Blocks 1 and 2, Blocks 4 and 6 and Blocks 5 and 7. In reality, this sequence often cannot be flown due to weather. Transits to and from the start of the survey blocks should be modified over time so as not to follow the same path. Any of the above mentioned combinations, with the exception of blocks 5 and 7, can easily be flown in one survey in the twin otter or commander.

Transect lines that terminate at 72N or 169W should end just short of those points, so that search effort between transect lines is conducted with the study area. When we terminate the lines right at 72N or 169W, the subsequent turn puts us outside the survey area and that effort ends up being excluded during some post-field analyses.

Much of the central Alaskan Beaufort Sea coast has barrier islands that range anywhere from a few to several kilometers from the main coastline. Transect lines should terminate outside of the barrier islands (regardless of where the computer-generated end point is positioned), such that the search line between transects is about ½ km offshore of the barrier island. This will allow coverage of the barrier island itself for presence of polar bears but will also allow observers to search for small odontocetes that might be in near shore areas. Detailed coverage of the coastline for polar bears is of lower priority as FWS conducts their own low-altitude surveys to census polar bears along the coastline.

The western edge of Block 12 is just offshore from Barrow and may require a refueling stop there, but should not require an overnight stay. Deadhorse is ~1.5 hours from Barrow, so refueling should only be necessary to extend the survey day.

In the event that the Flight Plan filed by the pilots changes drastically during the course of the survey due to unsuitable survey conditions, it may be necessary to update Flight Service with new information. This may require an increase in altitude for increased radio range or a call to AFF to ask them to relay the information. For BWASP flights, radio calls to Deadhorse Flight Service can usually be made without forfeiting the entire survey, due to its centralized location. The pilots will determine if the Flight Plan needs to be updated and the best means of doing so. Team Leaders should work closely with pilots to ensure that Flight Plans have enough flexibility to allow BWASP objectives to be met while still providing the detail needed in case of emergency.

There are two subsistence whaling areas in the BWASP survey areas. Kaktovik conducts bowhead whaling near their village on Barter Island (~143°W) in early to mid-September. Nuiqsut, which is a village located inland on the Colville River, conducts bowhead whaling off Cross Island which is a barrier island immediately northeast of Prudhoe Bay. Nuiqsut whaling usually occurs in early to mid-September. During their respective whaling seasons, care should be taken to avoid overflights of Kaktovik or Cross Island as well as overflights of whaling boats. This can be done by surveying alternate blocks or by truncating transect lines near shore. There is a whaler communication center at the SA-10 camp in Deadhorse that can provide information on whaling activities. The North Slope Borough Department of Wildlife Management can also provide information on whaling activities and timing.

In 2010, the MMS-funded BOWFEST project will be flying aerial surveys in the area of Block 12 until ~18 September. Block 12 should not be targeted for BWASP surveys until BOWFEST is completed for the season. BOWFEST data can/will be incorporated into analyses of bowhead migration.

Other Considerations

In 2010, there will be two BWASP/COMIDA survey aircraft on the North Slope from 31 August to 20 October. There may be situations or circumstances whereby both aircraft/survey teams fly BWASP or both fly COMIDA areas. Every effort will be made to give teams prep time if those circumstances occur, and every effort will be made to ensure that teams are back at their respective base camps by the end of the day.

Daily Sequence

The Team Leader and Pilot-in-Command will determine the likelihood of a survey flight on a daily basis. On most flight days, pilots and mechanic will be asked to have the aircraft ready to

take-off at 9:00 AM, which means that all observers and equipment need to be at the aircraft no later than ½ hour prior, or 8:30 AM. In rare circumstances (e.g., late flight the previous day), the scheduled earliest take-off time may be delayed.

On days during which weather may delay take-off, it is the responsibility of each observer to maintain contact with the Team Leader; an email and phone list has been distributed to each observer. It is the Team Leader's responsibility to provide adequate information to each observer as to the plans for the day. All observers are "on-call" until such time when a survey flight has been cancelled for the day. Exceptions to the "on-call" status are noted elsewhere.

When a flight plan has been agreed upon by the Team Leader and pilots, the Team Leader will relay that information to the Project Manager, either via email or phone. Information should include estimated time of departure, area planned to be surveyed (transect line numbers for COMIDA and survey blocks for BWASP), and number of observers (if number is other than the standard three). This, in addition to the information provided by the pilots to the Automated Flight Following (AFF) monitoring team at DOI, allows an additional degree of flight safety.

On days when no survey flight is possible, Team Leaders should inform the Project Manager, via email, ASAP, as to reason(s) why.

Field Team Members - General Responsibilities

Team Leader – Main conduit of information from Project Manager to rest of observer team and pilots. Consults with Project Manager about flight plans and survey successes and/or problems. Consults with pilots to determine suitability of weather for safely surveying and decides on primary and secondary plans for surveying. Responsible for *in situ* survey decisions relating to circling, high density areas, transit courses to/from survey areas, disputes, sea states, etc. May serve as Data Recorder during flight. Responsible for receiving daily flight information from Field Data Manager within a few hours of the end of the flight, conducting further data checks and formatting draft daily report to send to Project Manager. Sign aircraft billing statements, scan copies of them, and upload them to SharePoint at: Shared Documents/PaperworkAndReceipts/<YEAR>/AircraftUseReports. Fill out Flight Suit Tracker (Appendix I) spreadsheet after each flight to keep track of flight suit use. Send photos of sea ice to The National Weather Service (NWS) and Pacific Marine Environmental Laboratory (PMEL). Our pictures are valuable because they show NWS's Sea Ice Desk things that the remote sensing cannot. The sea ice photos should be put in either a Word document or PDF with the Event No. included and, if possible, include the approximate size of the floe. Also attach and send the Ice Summary of the flight. Send this to: Amy Holman (Amy.Holman@noaa.gov), Kathleen Cole (kathleen.cole@noaa.gov), of the NWS, and Jim Overland (james.e.overland@noaa.gov) at PMEL.

Field Data Manager – Responsible for timely (within a few hours of end of flight) initial quality check of daily flight data, including cross-checking with Data Recorder and handwritten observer notebooks. May serve as Data Recorder during flight. Depending on base location, may be needed to ferry pilots to and from aircraft before and after flight, and assist with carrying project gear to and from aircraft. Participate in safety briefings and egress practices, as determined by Team Leader.

Weather Data Manager – Responsible for cataloguing daily weather information for archival purposes (see attached Weather document). May serve as Data Recorder during flight. Depending on base location, may be needed to ferry pilots to and from aircraft before and after flight, and assist with carrying project gear to and from aircraft. Participate in safety briefings and egress practices, as determined by Team Leader.

Field Team Members - Survey Responsibilities

Primary Observers - two (one left, one right), positioned at bubble windows, responsible for providing the Data Recorder with clear and concise information on sightings and environmental variables; provide the pilots with clear instructions regarding locations of animals and subsequent circling. Observers need to stay focused on task and continuously scan and search the water the entire time while on transect, search, or circling. Animals can pop up and disappear very quickly, and it is important not to miss any sightings.

Data Recorder – primarily responsible for entering all data as completely and concisely as possible into the Data Collection program; collecting environmental data whenever overall conditions change; tracking relative position of aircraft to animals during circling; getting pilot's attention when intercom is not on secondary observer.

Each Team Leader will determine the best configuration given the field team present. Occasionally a 4th observer may fly as part of the team, although this is not standard practice. Under rare circumstances, a survey may be conducted with less than three scientific crew, but this is not ideal and should not be undertaken without consulting with the Project Manager.

AOC Pilot Regulations

All AOC pilots need to abide by AOC crew duty rules, which include the following:

1. There must be a pilot "off-duty" day at least every seventh day. This is true regardless of whether or not flights have occurred on the active days. Pilots need to inform AOC of their "off-duty" day in the morning, so the decision to call for a "no-flight" day needs to be made the night before.
2. Flight time per day cannot exceed 12 hours per day; crew duty time cannot exceed 16 hours per day.
3. There must be 12 hours of off-duty time between crew duty periods. Therefore, a late flight on one day must be followed with a late start the next day.

There may be some flexibility in AOC crew duty schedules. Team Leaders will work closely with AOC pilots to ensure that BWASP/COMIDA objectives are met in a safe and responsible manner.

Additional information on AOC is included in the OMAO Crewmember Guidelines, which is available on the NMML LAN.

Automated Flight Following (AFF)

Automated Flight Following (AFF) is a system that automatically tracks the location and velocity of specially-equipped aircraft, providing this information in near-real-time to dispatchers, aviation managers, and other authorized users. The equipment includes geolocation and data communications devices that use satellite-based technology. For COMIDA and BWASP, the AFF system is monitored by personnel at the DOI Aviation Management Office (AVM) in Anchorage (Jan Bennett, 907 271 3935; Lark Wuerth, 907 271 6032). In the event that AFF is unavailable to conduct real-time following of survey flights and/or that AVM is not available to monitor the flight via AFF, no offshore surveys will be conducted. Additional monitoring of AFF may be conducted by the Project Manager and others, but following by AFF and dedicated monitoring by AVM must be in place for an offshore flight to be initiated. The only survey that will be initiated if either of these systems is not available is a coastal transect with a very specific flight plan. Increased satellite phone communication will be initiated, upon consultation with AOC pilots. If AFF becomes unavailable once a survey flight is already in progress (as indicated by sat phone call from ADM in Anchorage), the survey aircraft will immediately transit directly back to either Deadhorse or Barrow. Should AFF become available again during that flight, transect surveys may continue at the Team Leader and pilot discretion.

Survey Planning

Weather should be checked by the Team Leader no later than 8 am each morning, with the exception of mandatory pilot off days (note: the Weather Data Manager should collect daily weather regardless of flight status). The pilots will generally check with flight service (FAA) in either Barrow or Deadhorse. Pilot reports are often available as are weather reports from various surface vessels in the area. Vessel reports are particularly useful as there are generally not many aircraft that are flying offshore. The more information available, the better an informed decision can be made as to when and where to fly.

If a survey is not possible due to weather, it is important to document weather for the day as detailed in the Weather Reporting section of this document.

Current and forecasted weather conditions assist in the decision-making process concerning if, when and where survey can be safely and effectively conducted. Determining when and where to fly is a cooperative effort between the Team Leader and the pilots. Decisions about

safety, flight endurance and forecasted weather, particularly as it relates to landing requirements such as reserve fuel and alternate landing field, are the responsibility of the pilots. Decisions about where to fly (what survey areas), once safety has been considered, are the responsibility of the Team Leader who will base his/her decisions on previous survey effort and objectives. The objective of the surveys is to get coverage of the entire study area and ideally all transects will be flown before being repeated, with new areas targeted during each survey. However, if weather does not cooperate, transect surveys can be flown in the same area more than once.

Factors to consider when planning surveys**:**

Light – sunrise and sunset. This is not an issue during summer but will become an increasing limiting factor as fall approaches, particularly during late October surveys.

Ice cover (or lack thereof) – ice cover will mollify the effects of high winds, and allow for successful surveying of areas in higher than normal wind conditions.

Icing – mainly an aircraft safety issue, about which it is the prime responsibility of the pilots to keep the Team Leader informed. Severe icing at ground level may be enough to keep the aircraft grounded; icing once airborne should be avoided. Doing so means avoiding snow squalls, and avoiding flying in and out of cloud cover.

Forecast – surveying off northern Alaska means that there are relatively few airstrips that can be used as alternates to Deadhorse and Barrow, particularly those with instruments and fuel. Therefore, the forecast needs to be heeded to ensure that returning to base is possible.

Wind speed – high wind speeds may hinder survey effort, particularly when there is no ice cover, as high winds lead to unacceptable sea states. Transect surveys should not be conducted in wind speeds >21 kts (unless there is ice cover) because this would indicate a Beaufort scale of >B5 which are unacceptable conditions (see Table 4). This does not mean that a survey flight should not be attempted if winds are >21 kts; there may be areas in the vast study area where winds are not that strong and sea states are acceptable. High winds sustained over several days, when ice is not present, will generally preclude survey efforts as it takes a few days for the seas to calm after high wind events.

Wind direction – impacts how the survey is flown. Strong winds in any direction will produce head winds, tail winds, and cross winds which need to be factored into flight endurance by the pilots and can also affect visibility.

Visibility – No flight should be undertaken if visibility is at or below minimums at the airport. If visibility is suitable at the airport and is forecast to remain so over the course of the day, and other conditions (wind, etc) are suitable, then a survey flight should likely be attempted. Visibility during surveys generally refers to downward/outward visibility as this is what impacts the ability to see marine mammals.

General Survey Guidelines and Protocol

Both BWASP and COMIDA are flown using basic line-transect methodology, but there are several line-transect assumptions that are not met. For example, we do not fly with a center line

observer. Perhaps the main assumption that is not met is that transects are NOT randomly allocated in the study area independently of the distribution of the survey population(s). The determination of where to survey for both BWASP and COMIDA is dependent upon weather, previous survey effort, and trying to meet the objectives of each project. These surveys are not conducted to assess population size or density, but rather to attempt to meet objectives determined by MMS, which stress determination of distribution and migration timing.

Altitude

Target altitude for COMIDA 1,200', although higher or lower altitudes are acceptable, as noted below:

- <1000' should not be maintained for >10 minutes except for safety reasons; flying lower than 1000' is in violation of our USFWS permit for overflights of walruses and polar bears;
- >1500' over walruses on ice (if responding to aircraft by diving into water) and polar bears on ice or swimming in water (if responding to aircraft by running or swimming erratically). Note: FWS flies at 700 m (~2300') to avoid disturbance when photographing walruses on ice; walruses will react differently depending on behavioral state, but in general seem to respond to abrupt changes by the aircraft (e.g., turning, change in pitch) more than if the aircraft continues in straight line. In 2009, walruses on ice responded to the aircraft at 1200', so altitude was increased to >1500' prior to overflights;
- >1500' over walrus haulouts on land; however, recommended guidelines are for higher altitudes such as 2000' and to stay over the water both for passing by and for circling because walruses tend to react more to the noise of a plane over land than over water; be very cautious near any cliffs as the topography may amplify noise from the plane. Walrus spook very easily and a stampede can be disastrous for them;
- >1500' in areas of walrus subsistence hunting near Wainwright, Barrow and Pt. Lay;
- >3000' over spotted seal haulouts in Kasegaluk Lagoon and adjacent areas;
- 1000-1500' to avoid localized weather such as low clouds or precipitation.

The target altitude for BWASP 1,500' (the historic target altitude), but higher or lower altitudes are acceptable, as noted below.

- <1000' should not be maintained for >10 minutes except for safety of flight purposes.
- >1500' over walruses on ice (if responding to aircraft by diving into water) and polar bears on ice or swimming in water (if running or swimming erratically in response to aircraft).

Note: If target altitudes cannot be met, alternate survey transects/blocks can be selected

Flight Path Adjustments

COMIDA coastal transect – should be flown approximately 1 km offshore coastline. Exceptions noted below:

- Active subsistence hunting of belugas or other marine mammals, as evidenced by several small boats in area – divert by at least 5 km around subsistence hunt activity.

COMIDA offshore transects – should be flown via pre-determined waypoints

- Nearshore end of transect ends offshore by ~0.5 km and does not cross over land
- Transects should not cross beyond barrier islands or traverse lagoon systems
- Transects that end near villages (within 10 km) should be truncated IF marine subsistence activity is present
- Bowhead fall whaling area (near Barrow) should be avoided on days when whalers are hunting

BWASP transects – should be flown via daily generated survey block waypoints

- Nearshore end of transect ends offshore by ~0.5 km and does not cross over land
- Transects should not cross beyond barrier islands or traverse lagoon systems
- Transects that end near villages (within 10 km) should be truncated IF marine subsistence activity is present
- Two N-S survey blocks flown together (e.g., 1 and 2) should have one smooth transect between the two (e.g., do not have short transit between end of one block and start of next).
- Bowhead fall whaling areas (near Barrow, Kaktovik and Cross Island) should be avoided if possible on days when whalers are hunting.

Species Priority

The order of priority for data collection is large cetaceans (bowheads, grays, minke, fin, humpback, right), small cetaceans (beluga, harbor porpoise, killer whale, Dall's porpoise, narwhal), polar bear, walrus, and other pinnipeds. A data "cheat sheet" is provided in Table 3 and will be given to each observer as a reminder of priorities, both between and within species groups.

Sightings/Marks

Only Primary Observers (left and right) will call (mark) initial sightings while on transect. Pilots, Data Recorder, and 4th Observers will not call (mark) sightings until sightings are aft abeam of the aircraft (3 and 9 o'clock). Sightings will then be entered as "off transect". More information on this is included in Section IV.

High Density Sightings

In areas of high density sightings where circling will not be initiated (e.g., walrus groups on ice, gray whales enroute to transect, spotted seal haulouts), individual sightings should be entered as unique events for as long as practicable. In situations where it is no longer possible for the data to be entered consistently and completely, and where the Data Recorder is not able to keep up with event entry (and this will happen!), sightings of one species can be "clumped" into groups based on increments of 30 seconds. Best, high, low estimates can be entered into the sighting form. The Data Recorder will be responsible for informing the Primary Observers when this is necessary. The Team Leader can provide additional guidance in these situations, but the

data is only as good as what is entered by the Data Recorder, so the latter has the ultimate say. Each Observer will have a log book in which notes can be written for individual events – these will be particularly useful in high density sighting areas. There is additional information in Section IV.

Circling

Circling will be initiated whenever a Primary Observer needs to investigate a sighting for further details, such as species, group size or presence of calves, and can occur both while on transect or on search. The aircraft should not divert from level until the Data Recorder has entered a Sighting Event and the Observer has provided a clinometer angle. Circling will be to the side of the aircraft on which the original sighting was made, and the Primary Observer on that side will be the main person responsible for directing the pilot to the location of the original sighting. All observers should give clear and concise instructions to the pilots, using either "port" and "starboard" or "left" and "right" or numbers on a clock face. Sample preferred instructions include "break track right" or "break track port".

Once circling has been initiated, it is important that all observers work together with the data recorder to calmly collect information on the number of cetaceans present. Whales in close proximity (within five whale lengths) to the original sighting may be added to the original sighting. Sightings beyond the original group should be entered individually, as possible. In situations where there are too many whales to be entered individually, one entry can be used to enter an area-wide group number, with information on geographic area for group included in the Notes field. The data collection program allows for an initial group size to be entered, which can then be updated later to better reflect the "final_group" size.

When circling has been initiated AND numerous cetaceans are in the area, sightings of ringed, bearded or unidentified pinnipeds should not be called out. Sightings of rarer pinniped species (e.g., ribbon seal) or large groups of walruses on ice should be indicated, but can also be noted when the circling event is completed. There is simply too much information that needs to be recorded that is of higher priority.

If photography is needed/wanted, the Primary Observer and data recorder should work together to direct the pilots to circle in the direction of the removable window.

Circling can be disorienting so care needs to be taken to avoid calling out duplicate sightings; the Data Recorder will have primary responsibility for keeping track of relative positions by using the BWASP Tool to zoom in and track carefully. There is more information on this capability in Sections III and IV. The push pin and text feature allow for real-time notation of relative positions and sub-group sizes.

Circling should never be initiated on walrus or pinniped sightings, with few exceptions. Walrus groups hauled out on land should be photographed, as per USFWS instructions, although flyovers should be kept to a minimum and occur only long enough to obtain photos. At no time should walruses (or any other marine mammal) be intentionally harassed. Polar bears may be circled upon based on the USFWS permit, however this should be done only when recorded information can be significantly enhanced by a more intensive look. Polar bears on Cross Island (after whalers have left) or congregated around another large food source (e.g., floating whale carcass) are significant activities to photograph.

Unique situations will present themselves over the course of the field season, and each Team Leader will determine the best course of action during the flight. The Project Manager may advise on various ways to handle situations but, ultimately, the Team Leader is the one who will make decisions real time. The Team Leader should always provide adequate documentation of decisions that might appear unorthodox.

Photography

The BWASP/COMIDA project does not have a photography objective. However, photography is encouraged, particularly in the following circumstances:

Rare species (for the Alaskan Arctic) sightings, such as mysticetes other than bowheads or gray whales, odontocetes other than belugas, pinnipeds such as ribbon seals

Bowhead calves, preferably with cow in same frame

Walruses at shore haulouts

Swimming polar bears but only if photo can be taken on initial flyby

Unexpected behaviors, such as mating

Feeding bowheads

Carcasses

Sea ice distant shots, showing the horizon, especially any ice that looks “gnarly” or like it might be multi-year ice.

Photography sessions should not exceed 15 minutes in most cases, as they are not part of the overall objectives. All photos should be shot in **RAW** when possible. Pictures should be put on the NMML-BWASP-COMIDA computer in the appropriate folder and processed and renamed the day they are taken. This is important because the photos get named sequentially, and if photos do not get added in the correct order, they will be named out of order. The photos should also be catalogued in the Excel photo log in sequential order with date, species, event number, photographer, and comments. For Photo and Photo log Protocol, see Section IX.

Reporting

BWASP/COMIDA has several reporting requirements, including daily, quarterly and annual reports. Reporting requirements related directly to field activities are detailed in Section VIII.

Most reporting will be the responsibility of the Project Manager, with assistance from Team Leaders.

III. BWASP SURVEY TOOL - Developed by MMS and RDI

Introduction

1.1. Programs needed on the NMML survey laptops for BWASP-COMIDA field work:

1.1.1 Basic Programs: Windows XP, MS Office 2007 (including Word, Access and Outlook)

1.1.2 Specific Programs – should be installed onto C: drive (not in Docs andSettings):

1.1.2.1 BWASP_Tools directory – This should be copied directly from a different laptop as an intact folder, as it contains all data and most of the software. Make sure the folder includes the most recent version of the BWASP_Survey Tool. Also ensure that the Access database is the most recent version saved, or else flights will be out of sequence when the reconfigured laptop is used again. From the BWASP_Tools directory, several Shortcuts can and should be placed on the Desktop, including Shortcuts to the Data, BWASP_Survey tool, Waypoint Maps directory and Waypoint Creator program.

1.1.2.2 ArcGIS 9.3 and 9.3.1 – BWASP-COMIDA programs use the 9.3.1 version (have not yet upgraded to ARCGIS 10.0). If a laptop has been completely reconfigured after a crash, then version 9.3 must be loaded first, with the 9.3.1 upgrade after that. Version 9.3.1 will not load if there is a previous version of ARCGIS has not been installed on the computer.

1.1.2.3 Visual Basic (must be loaded for the BWASP_Survey Tool to work), Internet Explorer (must be used to accessing Sharepoint), ACDSee

1.2. BWASP Survey Program requirements for GPS:

Ultimately the GPS unit needs the ability to port to a computer and send the datastream. It should have a barometric altimeter because that is what has been used in previous years. The 76 does not have a barometric altimeter, but the 76cs does. Datastreams from the unit are in a standardized format (nmea 183), so the particular unit the data are coming from doesn't matter, but there does have to be a way to send it to the computer, such as a serial port or usb. However, if the port changes (e.g. serial to usb) then the survey program will have to have a few lines changed to read from the new port.

1.3. The **BWASP Survey Tool** is used to collect environmental, effort and sighting data during BWASP/COMIDA surveys.

1.4. This tutorial provides navigation of the data collection tool; additional detailed information on how to enter data specific to BWASP and COMIDA is included in Section IV.

2. Setting up the Survey Laptop

2.1 Connecting to survey plane power supply

2.1.1 Once the aircraft auxiliary power is on, plug in and start the computer. Plug in the mouse and insert the external drive in the USB port.

1.2 Connecting to the GPS Unit

2.2.1 When the laptop is powered up with the mouse connected and external drive in the USB port and has finished the boot-up processes, connect the GPS unit with the serial port connection to the port on the back of the computer. (The GPS should already be calibrated with Comm setting as "NMEA" and 4800 baud rate). If this is not done in the correct order, the computer mouse may malfunction or other bugs may arise.

2.2.2 To turn on the GPS unit, hold down the button with the red light bulb icon until the first screen display appears. The screen display changes automatically. When the second screen display appears press the *PAGE* button. Press the *PAGE* button again when the third screen display appears. In the fourth screen display the unit defaults to a satellite search mode.

2.2.3 If the mouse cursor is not reacting properly to user inputs, turn off the GPS unit, unplug the serial port connector, restart the computer, and resume at step 2.0.

2.2.4 Sync the computer time with the GPS unit time. Click on the computer clock (right hand lower corner) and make sure that the date is correct, and if necessary, sync the computer time so that it matches what the GPS unit is reading.

2.2.5 For further information on working with the Garmin GPS unit, consult the Garmin Users Manual which is in the computer pelican case. The manual can also be found online at: http://www8.garmin.com/manuals/GPSMAP76S_OwnersManual.pdf

3.0 Using the Survey Tool

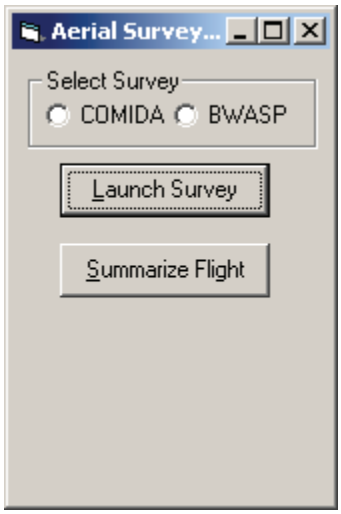
3.1 Launching the Survey Tool

3.1.1 There are two ways to launch the tool:

3.1.1.1 Double click the icon for the *Shortcut to BWASP_Survey.exe* on the desktop.

3.1.1.2 In Windows Explorer select C:\BWASPTools\bin\BWASP_Survey.exe.

3.2 The Start-Up Form



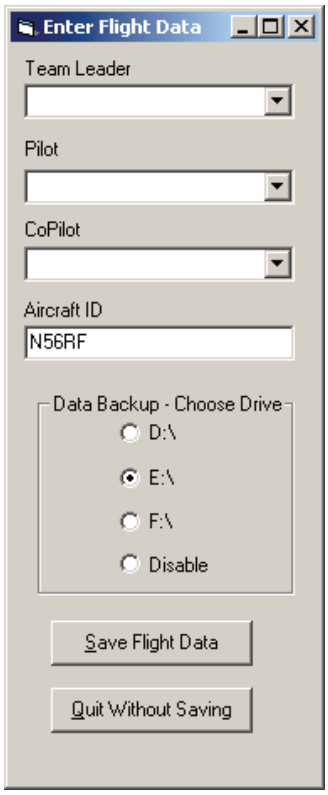
3.2.1 The first form encountered at launch is the Start-Up form. It allows the user to choose either the **Launch Survey** function, which is selected for collecting data during a survey, or the **Summarize Flight** function, which is used for summarizing data once the survey is complete (data summary occurs automatically on closure of the Survey Tool, but this added function allows the user to re-summarize if post-flight editing occurs).

3.2.2 To launch the survey, the user must first select the survey being flown, (i.e. **BWASP or COMIDA**).

3.2.3 Like most forms in the BWASP_Survey application, the controls can be navigated through with the mouse, the *Tab* and arrow keys, or with standard Windows shortcuts, such as using the *Alt* key or provided shortcut keys. These and similar shortcuts exist throughout the application, and are very useful for efficient data entry and form navigation. Note that shortcuts for any given form work only when the form is active. As is standard in Windows, only one form can have the focus, or be active, at any given time.

3.2.4 To begin the survey application, select **Launch Survey**.

3.3 The Enter Flight Data Form



3.3.1 The **Enter Flight Data** Form is used to collect data pertinent to each flight. All of the dropdown boxes (Team Leader, Pilot, Co-pilot) and the Aircraft ID text box need to have entries before the form will allow the user to save. To scroll through each dropdown list, use the arrow keys or mouse. Data can be entered using the dropdown list or a new name can be entered by hand (Aircraft ID must be entered by hand, no drop-down exists). There is a character limit in this window so abbreviate if there is a problem with the program crashing (i.e. *Aero Commander* should be typed in as *Aero*).

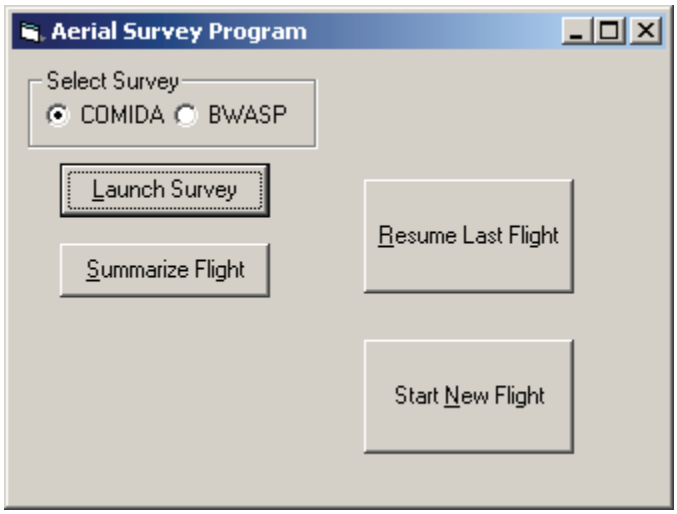
3.3.2 To enter names permanently into the database (and avoid having to add them manually), go to the Access database for the survey being flown (BWASP or COMIDA), and select the "**lut_observer**" table to enter additional observers or "**lut_pilot**" to add additional pilots.

3.3.3 Data backs up to an external drive which defaults to the *E: drive*. If a backup flash drive is not used then *Disable* should be chosen. Once the survey program is running the backup drive can be changed, turned on or turned off using controls on the Main form, which will be discussed later.

3.3.4 When the data have been entered click the *Save Flight Data* button or press *Alt* + s.

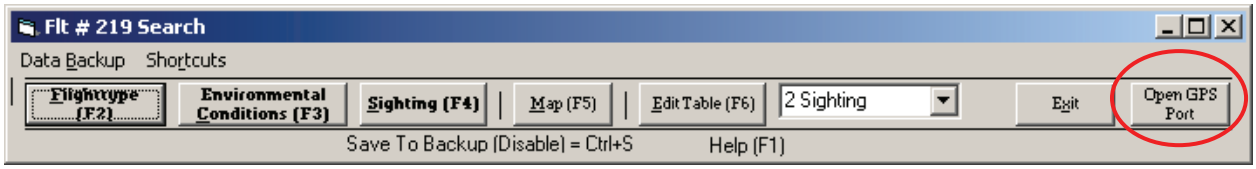
3.3.5 The **Main Menu** form that will appear (see section **3.6**) will indicate the flight number.

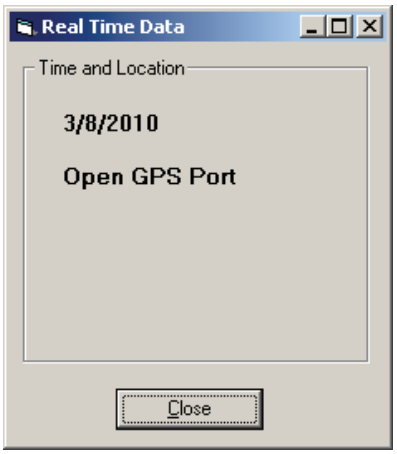
3.4 The Resume Flight Form



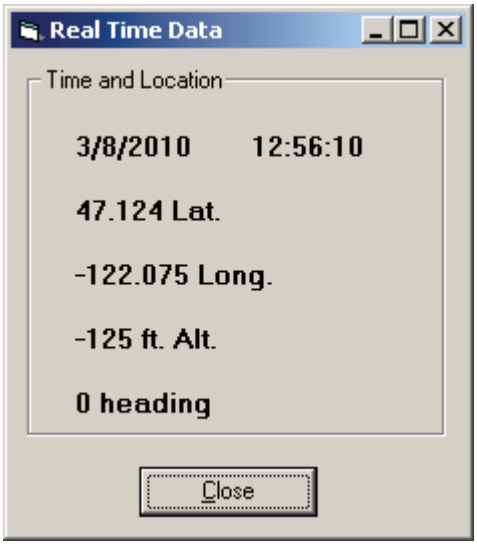
3.4.1 It is possible to resume data entry for a flight begun earlier (e.g., a flight interrupted by a refueling stop). If the *Launch Survey* button is chosen from the Start-Up Form and a flight has already been logged for that day, select **Resume Last Flight**, because there should only be one flight number per day per survey.

3.5 The Real Time Data Form





3.5.1 The first two menus to appear are the **Main Menu** (above and next section) and **Real Time Data** (above) forms. On the far right of the **Main Menu** form is an **Open GPS Port** button (circled in red above). Select this button to engage the GPS.



3.5.2 The **Real Time Data Form** shows date and time from the computer, and latitude, longitude and altitude as output from the GPS unit (once the *Open GPS Port* button is selected). The data shown on the form are updated every two seconds. If the GPS unit is not streaming data, the *Real Time Data Form* will show 0 for both latitude and longitude. If event buttons are selected when the GPS is not streaming data to the computer, the following window will open:

(To resume data collection, you must resolve the GPS data stream interruption which may necessitate a program restart, but often is because the GPS has been accidentally unplugged from the power strip.)

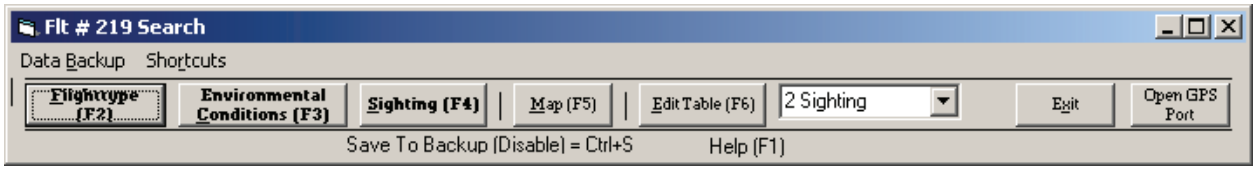
3.5.3 The GPS unit must be calibrated. It has 3 different ways of calibration: Current Elevation, Current Pressure, and GPS Elevation. The GPS elevation is triangulated from satellites, is the least accurate, and should not be used.

3.5.3.1 The "auto calibrate" function needs to be turned off, otherwise the GPS will continue to calibrate based on the GPS elevation. This can be done by navigating to the GPS information page and hitting Menu twice. Scroll to the Setup option, hit Enter, scroll right to Altimeter, and select Altimeter Auto Calibration Off if it is not already done so.

3.5.3.2 The other thing to do is to calibrate the barometric pressure. Navigate to the plot page. When you do, you will get a pop up saying "no data coming from GPS unit", but the data are in fact still being logged, so hit OK. Hit Menu, Calibrate Altimeter, scroll to the Calibrate Altimeter Using, hit Enter, and select Current Pressure. Ask the pilots for the current pressure (e.g. 29.96), enter that in, and hit Set .

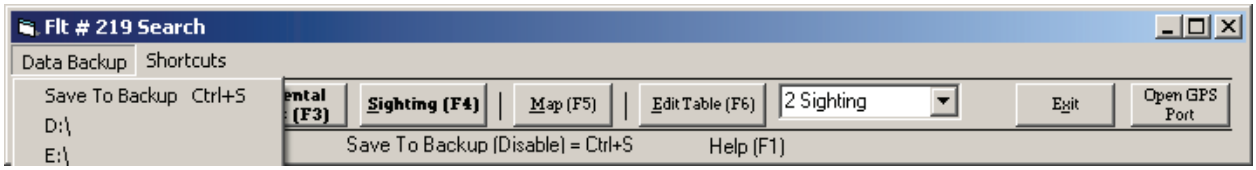
3.5.3.3 Check the altimeter readings throughout the flight. If the Real Time Data screen is reading consistently more than 100' off of the pilots' radar altimeter, it might be a good idea to recalibrate to the current elevation based off of the pilots' reading. To do this, navigate to the plot page, hit Menu, Calibrate Altimeter Using, hit Enter, and select Current Elevation. Ask the pilots for the current elevation, enter that in, and hit Set.

3.6 The Main Menu Form

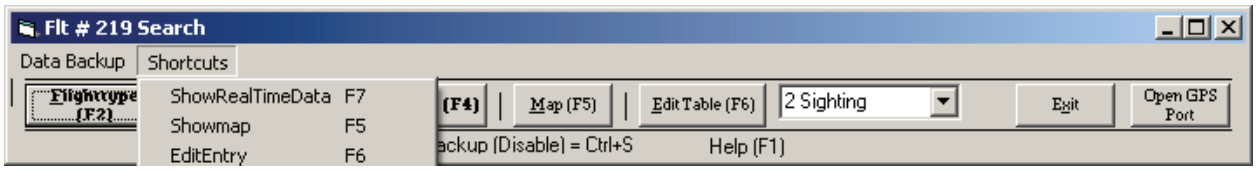


3.6.1 The **Main Menu Form** has the flight number and flight type in the title bar. On the form there are two menus, seven buttons and a dropdown list.

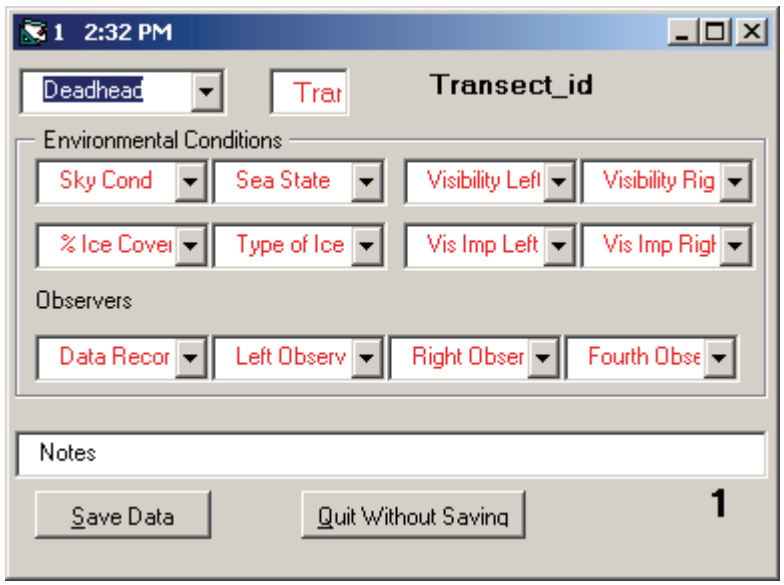
3.6.1.1 Menu **Data Backup** allows the user to change the port being used for data backup, or to manually save to the flash drive.



3.6.1.2 Menu **Shortcuts** provides another way to perform functions, and can be used as a reminder of what the available shortcuts are.



3.6.1.3 The button **Flighttype** is selected to start and end the flight, and whenever the flight type changes. Initial environmental conditions (Event #1) for the flight are entered here; environmental conditions can also be updated whenever a change in flight type occurs. Event number and time are shown in the title bar; event number is also displayed in the lower right corner.

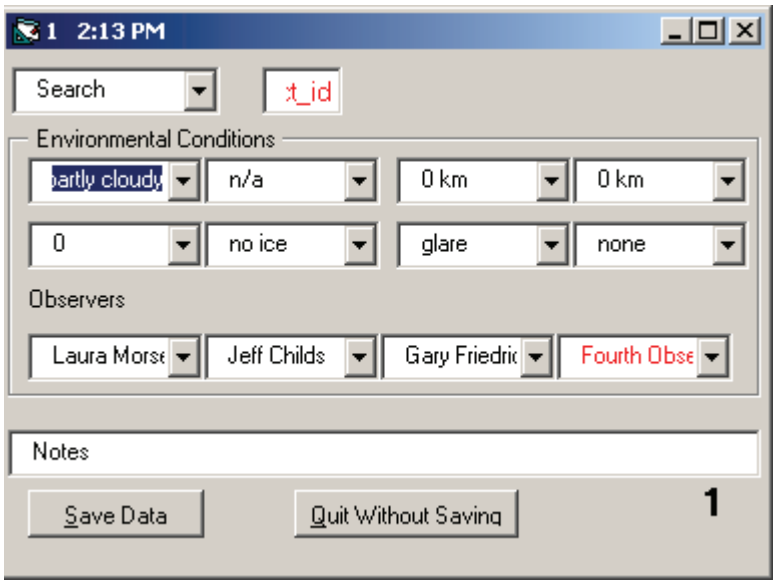


** This form can also be opened using *Alt* + t shortcut or the *F2* key.

3.6.1.3.1 Before an entry has been made in a dropdown list, the name of the field (e.g., Sea State, Visual Impediment, etc.) is shown in red font color. Once the entry has been made the font color changes to black. The name of the entry field also appears in the upper right of the form when the mouse pointer hovers over a list or a list is selected. To move between the dropdown lists use the *Tab* key or mouse. To scroll through the drop down list, use the keyboard down arrow, type the first few letters of the desired entry (auto-complete will finish the word), or use the mouse to expose and select from the dropdown list.

3.6.1.3.2 Observers <u>must be entered</u> on **Event 1**. If this is not done, observers will need to be manually entered into the Access database at a later time for events missing this info. Observers will trickle down to all

subsequent recorded events once entered. Observers can be changed on any event.



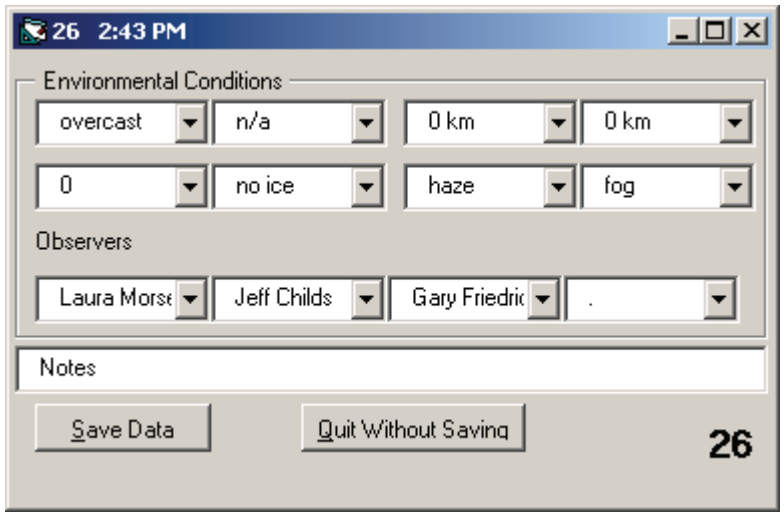
3.6.1.3.3 The **Transect_id** Box is used for COMIDA flights only. The **transect # or C** for coastal transect is to be entered in this field when COMIDA transects are started. When the transect ends, this field will automatically remain empty in the database.

3.6.1.3.4 When the flight type, environmental conditions and observers have been entered, select **Save Data**. If the event does not need to be saved, select **Quit Without Saving**.

3.6.1.4 The button **Environmental Conditions** loads a Data Entry Form for changing environmental conditions. The *Environmental Conditions* Event Data Entry Form is used when the event is logged solely for the purpose of entering a change in environmental conditions. The data entry fields are populated automatically from the previous saved entry.

When the data have been entered, select **Save Data**. If the event does not need to be saved, select **Quit Without Saving**.

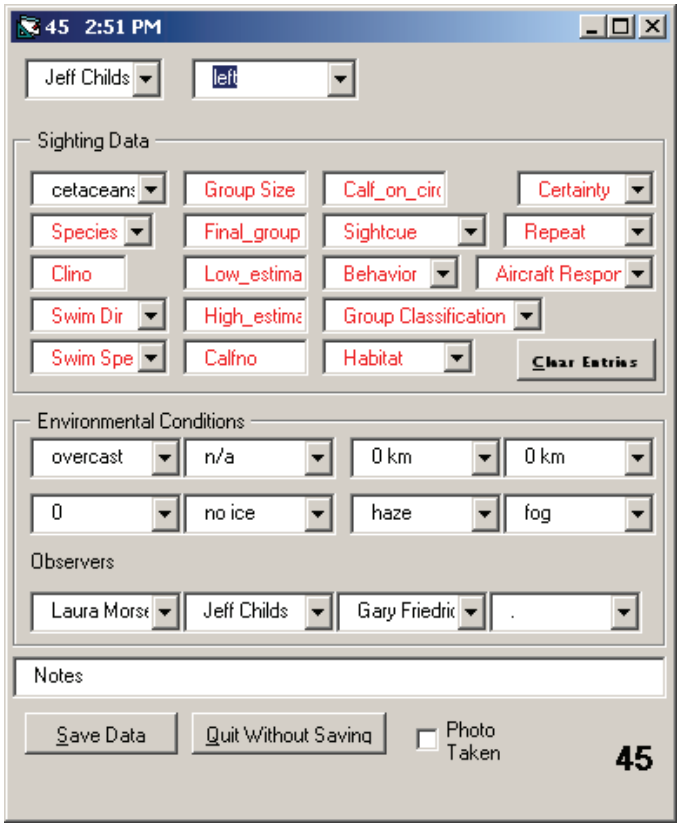
3.6.1.4.1 This form can also be opened with the *F3* key.



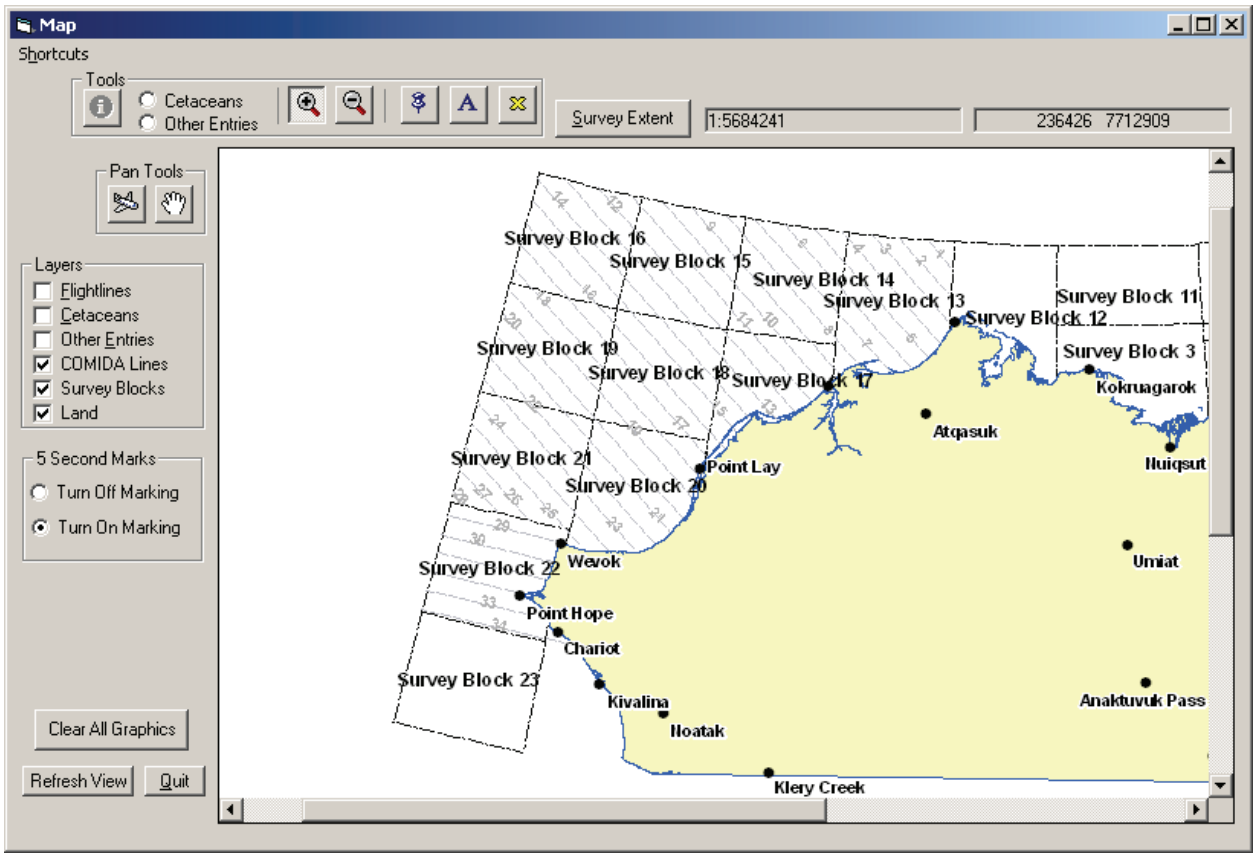
3.6.1.5 The button **Sighting** loads a Data Entry Form for sightings, and is used only when a sighting needs to be entered. Sightings should never be logged during a change in Flight Type. Details on entering data in this form can be found in **Section IV** of this manual.

When the data have been entered, select **Save Data.** If the event does not need to be saved, select **Quit Without Saving**.

3.6.1.5.1 This form can also be opened using the *F4* key.

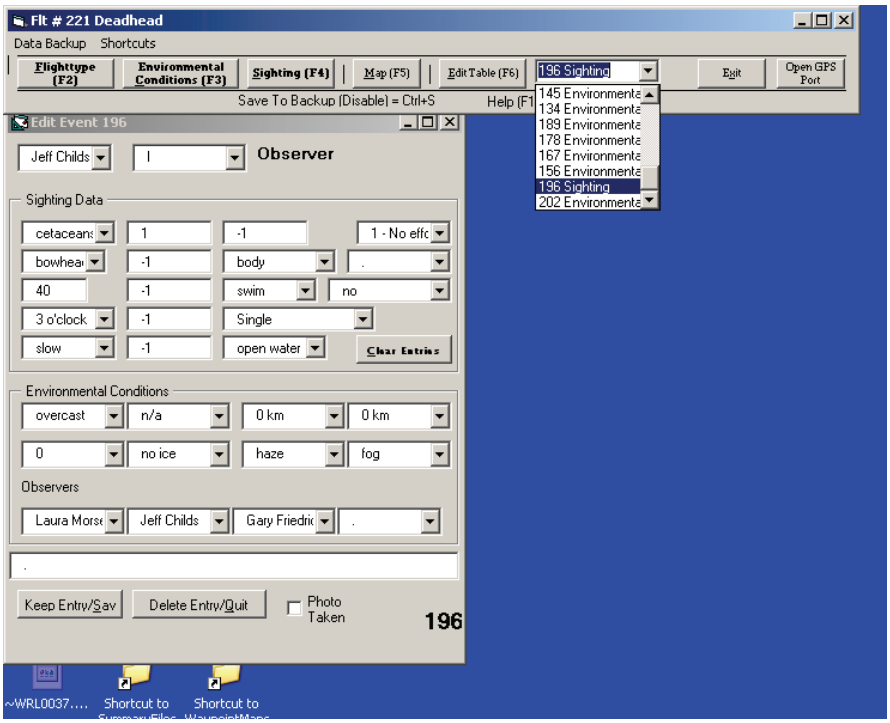


3.6.1.6 The button **Map** loads the real time Map display, which shows flightlines, sightings and other features as needed. See **Section 3.7** for further detail.

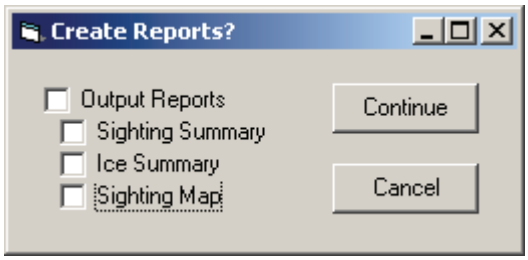


3.6.1.7 The button **Edit Table** (also selectable via the *F6* key) loads the selected record in a form that allows the user to edit previously saved data. The record is selected by choosing the available event from the dropdown list adjacent to the *Edit Table* button. Note that the adjacent drop down includes the Event number and Event type (Flight Type, Sighting, Environmental). Events that were not saved are not available in the list.

(Note that fields with no data entered have either -1 or "." saved to the database.)



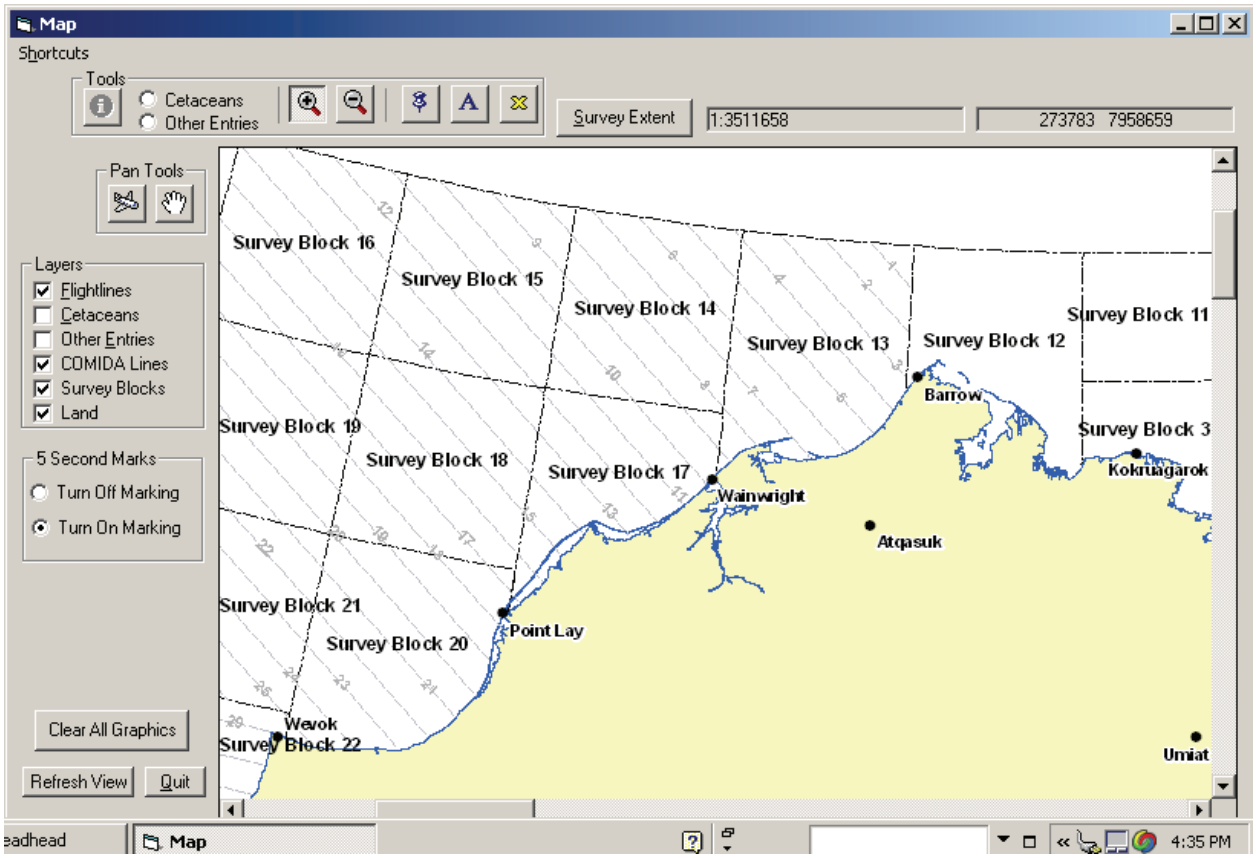
3.6.1.8 The button **Exit** is used to exit the program and prompt the generation of the flight data summary. (Note: Do not close out of the program by clicking the "x" in the top right corner or certain fields in the final table will not populate.) This should be selected at the end of the flight or flight segment (in the event that the flight will be resumed). All, some, or no reports can be chosen after which **Continue** is selected. See **Section 3.8** for further detail.



3.6.1.9 There is also one shortcut labeled on the bottom of the Main form, **Save To Backup (E:\) = Ctrl + S**. *Save To Backup* allows the Data Recorder to manually back-up the database to the external drive, which is largely unnecessary because events are written to the external drive automatically. If for any reason the external drive has been disabled, the shortcut will indicate

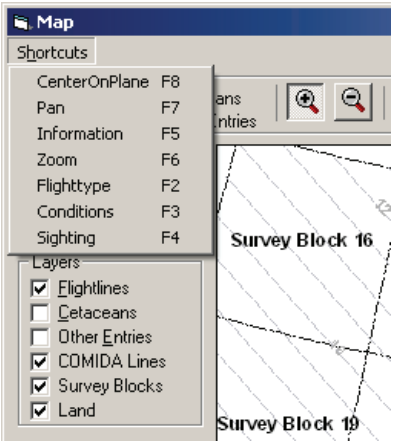
Save To Backup (Disable) = Ctrl + S. The external drive should never be disabled unless the program is opened for training purposes.

3.7 The Map Form

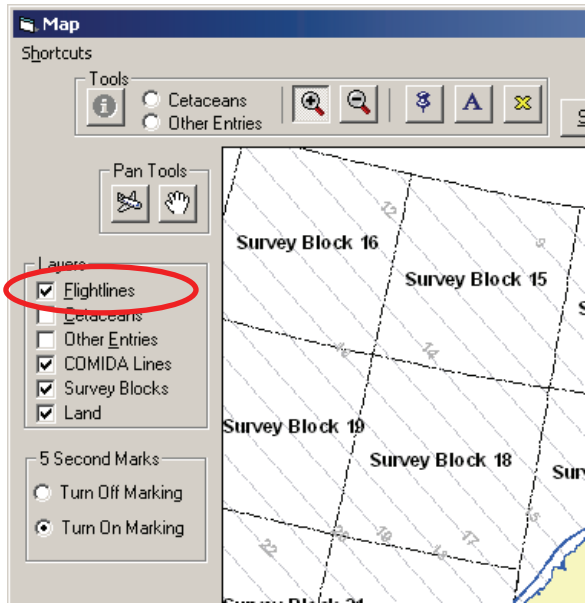


3.7.1 Select the **Map** button on the main form (*or F5 or Alt + m*). A basic map of northern Alaska will be displayed.

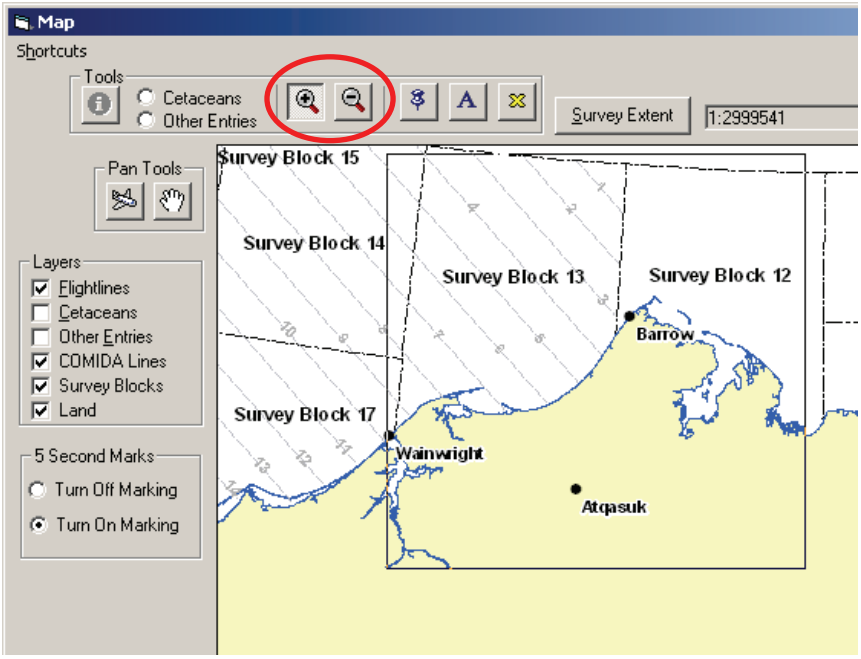
3.7.2 There is a **Shortcuts** menu in the upper left that will allow the user to select tools and defines what the tool shortcuts are.



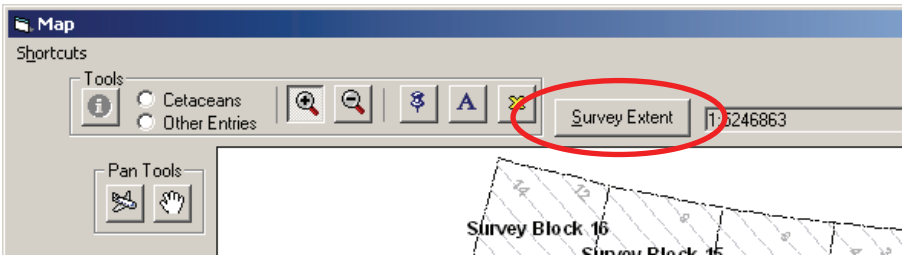
3.7.3 Layers such as Flightlines, Cetaceans, COMIDA Lines etc., can be displayed by selecting the appropriate check boxes on the left hand side of the map. Layers can also be de-selected if the display gets too "busy".



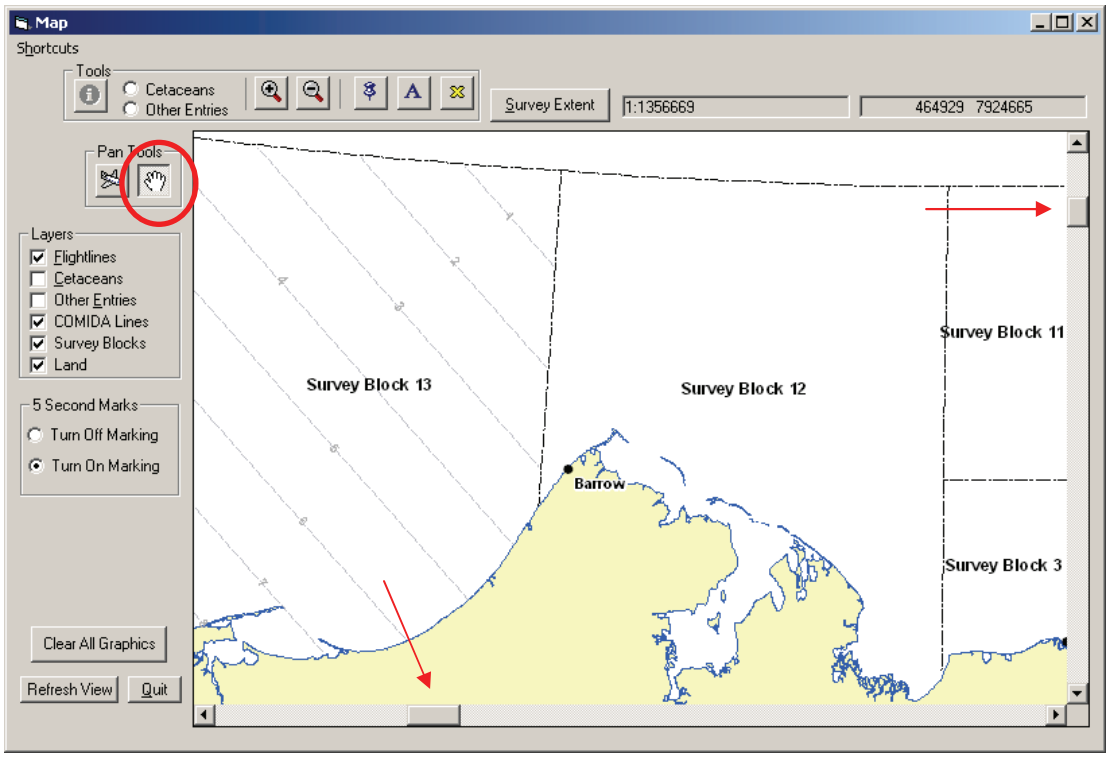
3.7.4 The map scale can be adjusted with the **Zoom Tools** (the +/- symbols) which will zoom in/out of the user-defined extent by using the mouse "click and drag" over the area of interest). More detailed geographic features appear as the scale is enlarged.



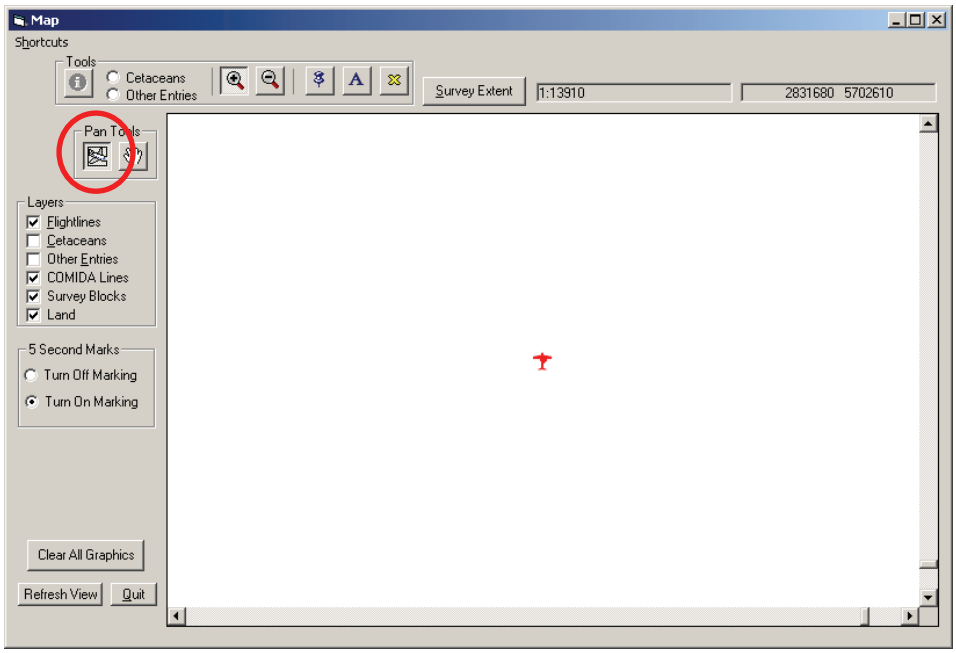
3.7.5 The **Survey Extent** button zooms back out to the extent of the survey. Note that the *Zoom Tool* is still activated and remains activated until another tool is chosen.



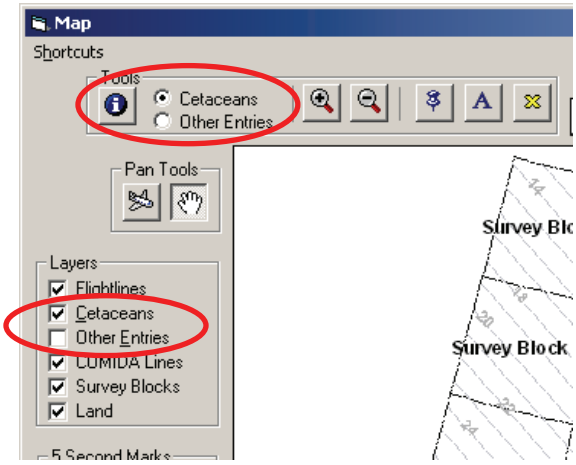
3.7.6 The **Pan Tool** (hand symbol) allows the user to move the map to the desired display by left-clicking with the mouse. Scroll bars on the map allow the same utility (red arrow below). Both of these methods require use of the mouse.



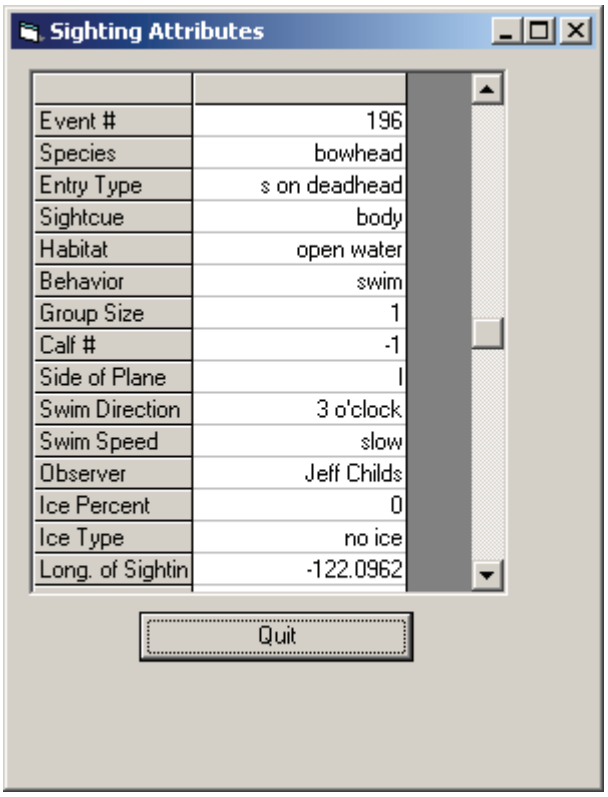
3.7.7 The **Center on Plane** *Pan Tool* (airplane symbol) will automatically center the display on the coordinates streaming from the GPS unit, and mark the plane's location with a red symbol. This automatically updates every 10 seconds. As long as the toggle is depressed the display will center on the plane. To deactivate the Center on Plane - *Pan Tool*, select the Hand symbol – *Pan Tool*.



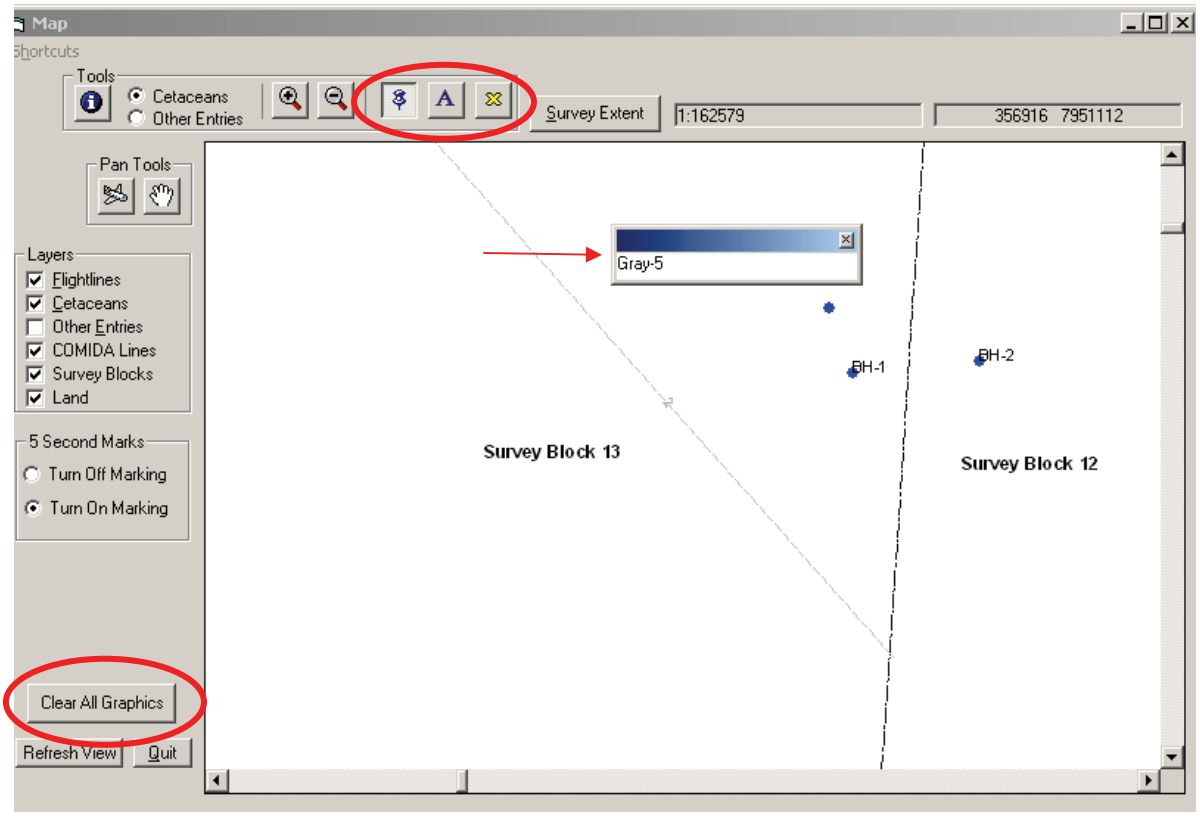
3.7.8 The **Information Tool** provides the user with a method of viewing data on a particular sighting. This tool can only be enabled when one of the sighting layers is turned on.



3.7.8.1 Once the *Information Tool* is selected and the category of interest -**Cetaceans** or **Other Entries** - is selected, use the mouse to click on the sighting/event of interest, and a **Sighting Attributes** form with pertinent details of the event will pop-up.



3.7.9 The **Temporary Point** and **Text Tools** provide the user with a method for denoting a temporary location. This tool is indicated by the pushpin button. Clicking on the pushpin will change the cursor to a pen icon, which can then be placed anywhere on the map. When a Temporary Point is placed on the map, a **Text Box** will appear.



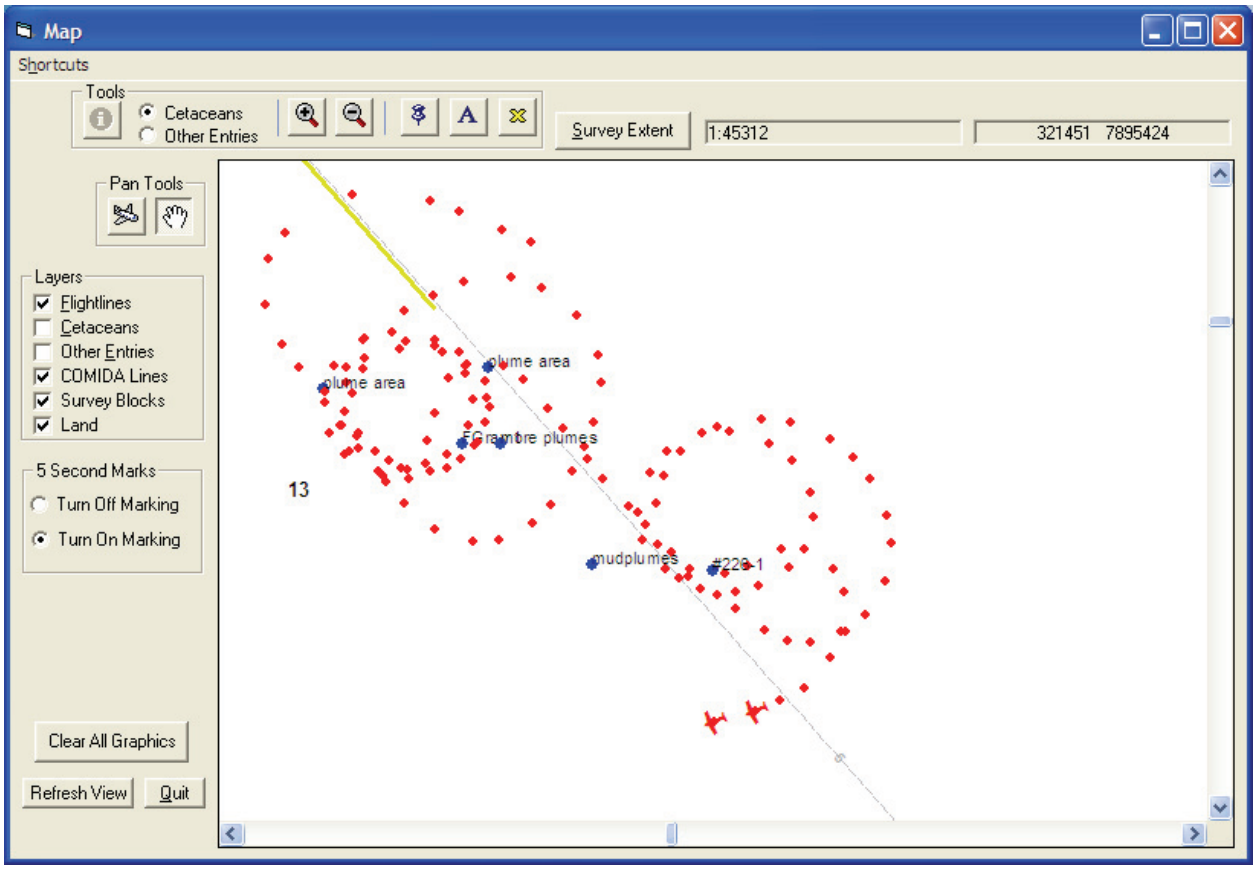
3.7.9.1 Enter text in the *Text Box* that refers to the point (e.g., BH group 1), then hit Enter. Be brief and concise to prevent clutter on the map. Text can be changed by selecting the **Change Text Tool** (button with an "A"), then selecting the *Text Box* to be changed.

3.7.9.2 To Delete *Temporary Points* and *Text Boxes*, select the **Yellow "X" button**, and drag and drop to include the features to be deleted. The **Clear All Graphics** can also be used to delete graphics.

3.7.9.3 The *Temporary Point Tool* is designed to be used during circling opportunities for spatial referencing, when the map has been zoomed in to a tight view. Individual cetacean sightings or groups can be denoted with temporary points. These points are <u>not saved</u> in the database.

3.7.10 The **5 Second Marks Tool** is intended to be used for high temporal resolution marking of the planes position while circling. It is used together with the above *Temporary Point* and *Text* tools. There are two choices for this tool – **Turn Off Marking** and **Turn On Marking**.

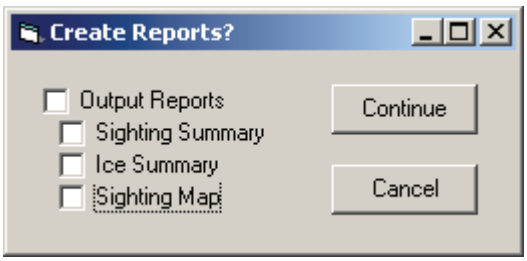
3.7.10.1 This tool is activated only when the map is zoomed in to a ratio of ~1:70,000. The high resolution marking aids in accurate drops of temporary points (e.g., sightings) and in improving group estimation and delineation of sub-groups.



3.8 Summarizing data with the BWASP Summary Application

3.8.1 The data are summarized automatically on exit of the Survey Application. After the Main form is exited, a **Create Reports?** Menu will open. There are three possible reports, **Sighting Summary, Ice Summary and Sighting Map**. If all three reports are desired, check **Output Reports**. If only some of the reports are desired, check only those reports. One of the reports is a jpg map image and the other two are Word files with information on the flight and sightings. The summary files may take a while

to compile, depending on the length of the flight. An example of these reports are included as Figure 5.



3.8.1.1 *Sighting Summary* produces two tables in a single word document, one with summary data for the flight and one with a summary of cetacean sightings.

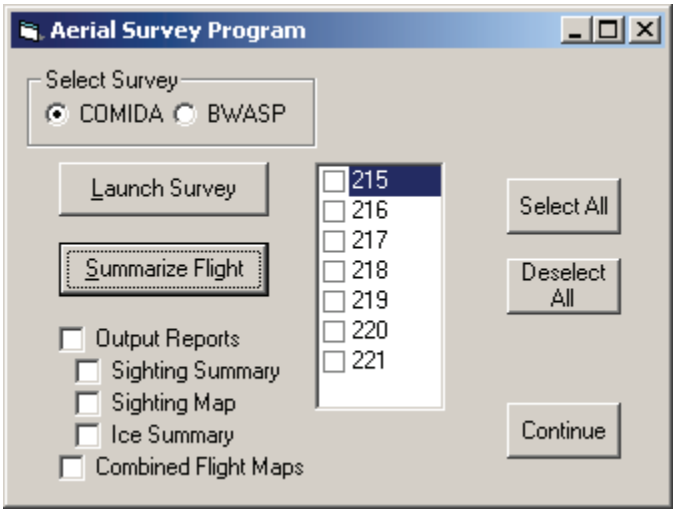
3.8.1.2 *Ice Summary* is a summary of environmental conditions at every saved event. This summary takes quite long to compile and <u>it is recommend that this NOT be run on the aircraft</u> and can be compiled at a later time.

3.8.1.3 *Sighting Map* is a map of the flight track and all cetacean sightings.

3.8.2 Reports are saved to C:\BWASPTools\SummaryFiles. These files are part of the Daily Report that is sent to the Project Manager each day.

3.8.3 Data are usually edited after the survey has ended, in which case the flight should be summarized again. To launch the Summary Application follow the directions in Section 3.2 of this manual, but select **Summarize Flight**.

3.8.3.1 The following window will appear. The user will select the **Survey (**BWASP or COMIDA), the **flight number** (check box) and which **reports** need to be re-summarized. Once these have been appropriately selected, hit **Continue**.



3.8.3.2 To create a **Combined Flight Map,** select the flights of interest, check the *Combined Flight Map* option, and select Continue. The generation of the map may take some time.

4.0 Waypoint Creator – BWASP surveys blocks only

4.1 Launch the Waypoint Creator Tool

4.1.1 Waypoints for the BWASP survey area should be generated prior to the survey flight. Several maps should be generated, including: each individual block, block combinations 3 and 11, 1 and 2, 4 and 6, and 5 and 7. Waypoints do not need to be generated for any of the COMIDA survey blocks (blocks 13-22).

4.1.2 There are two ways to launch the *WaypointCreator Tool*.

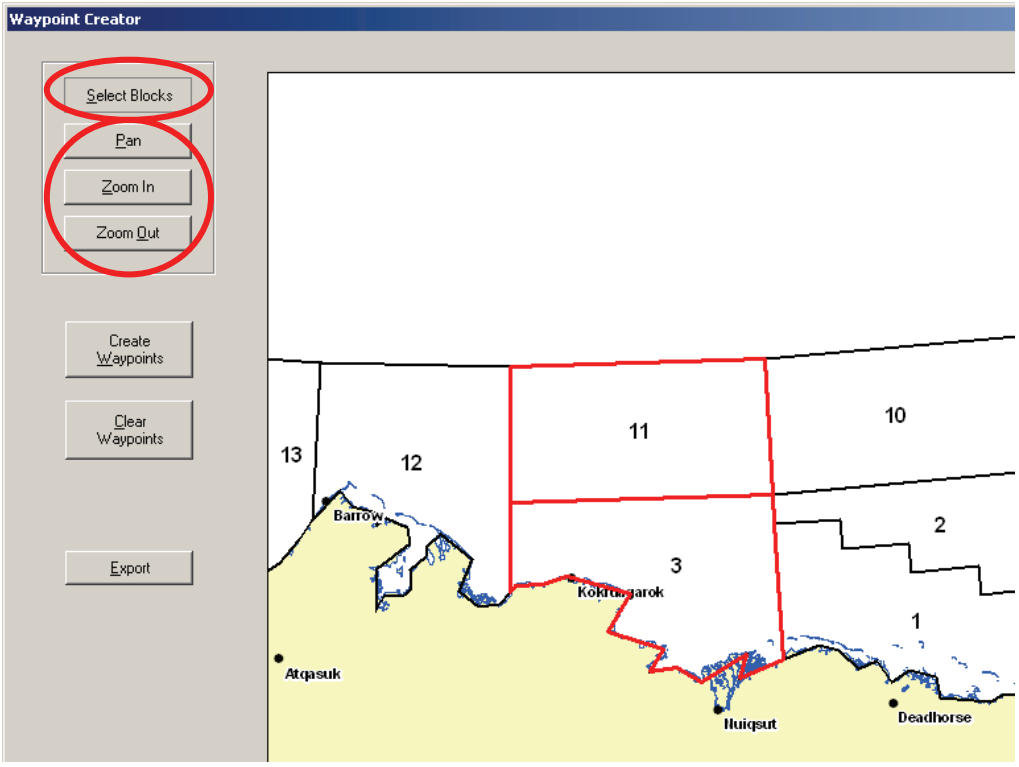
4.1.2.1 Double click the icon for the *Shortcut to WaypointCreator.exe* on the desktop.

4.1.2.2 In Windows Explorer select C:\BWASPTools\bin\ WaypointCreator.exe. Note that the path is in the bin folder, not directly in BWASPTools.

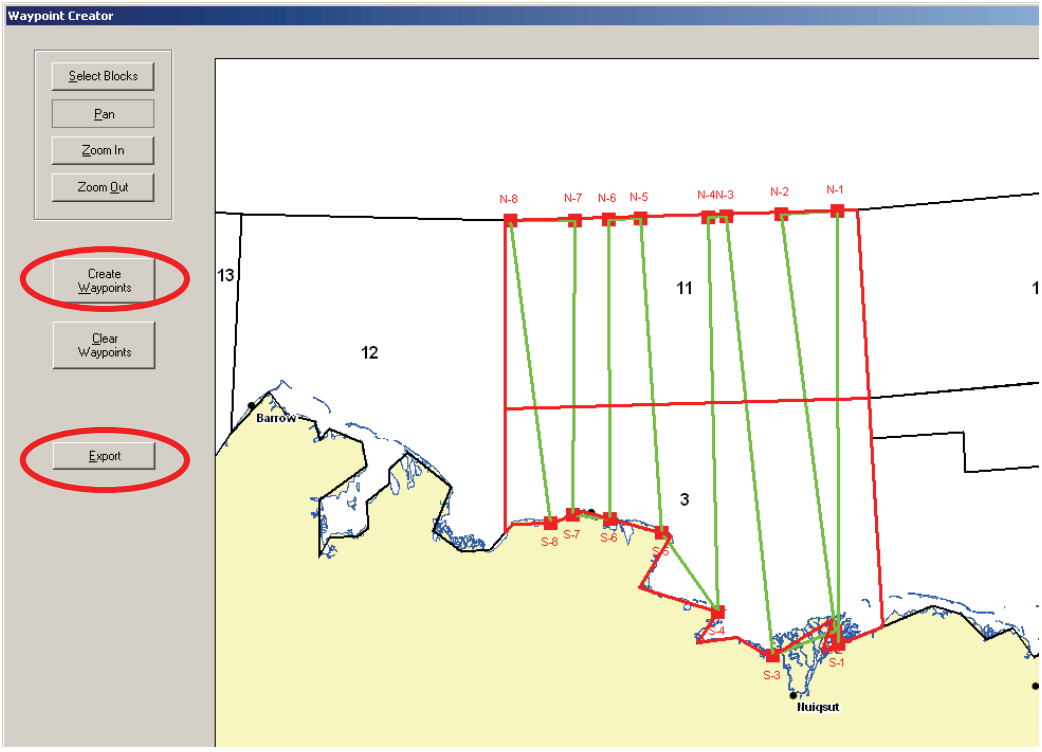
4.2 Instructions for creating Waypoints

4.2.1 Select the *Select Blocks* button, then place the cursor anywhere in the block for which waypoints are needed. The survey block outline will highlight in red. If waypoints for more than one block are needed (e.g., 3 and 11), after selecting the first block, hold down the *Shift* key and select a second block. Both block outlines will be highlighted in red.

4.2.2 Use the **Zoom In, Zoom Out and Pan** buttons to move around the map and set the ratio to a viewable/printable aspect. The Zoom In tool requires you to click and drag a box around the area you want to zoom in on, and the Zoom Out tool is just a single click in the center of the area you want to zoom out on.



4.2.3 When block(s) have been selected for waypoint generation, select *Create Waypoints*. The waypoints will be identified on screen in red (south [S] and north [N]) and transect lines will be drawn in green.



4.2.3.1 To save the map and get the locations (lat and long) of each waypoint, select *Export*. Jpgs are saved to C:\Documents andSettings\BWASP\Desktop\BWASP waypoint maps.

4.2.3.2 Map files are automatically dated, and should be renamed to reflect the survey blocks (e.g., b3_11_waypoints_7-17-09.jpg depicts the waypoints for blocks 3 and 11 generated on 17 July 2009).

4.2.3.3 Print at least one copy of each waypoint map for the pilots; the team leader may want a copy as well.

4.2.3.4 As each survey block/block combo is flown, a new set of waypoints for that block/combo should be generated and provided to the pilots.

4.2.3.5 Waypoints are automatically generated from east to west (1S and 1N are easternmost), and most surveys should be flown west to east. The Team Leader should remind pilots to enter waypoints from west to east.

4.2.4 When waypoints have been created for a set of blocks and additional survey block waypoints are needed, select *Clear Waypoints*. All waypoints will be deleted.

4.3 Exiting WaypointCreator

4.3.1 Select *Exit* to close the program.

5.0 Installing a New Version of Survey Tool to Field Laptops

5.1. Download **BWASP_Survey_v##.exe** and the **data folder** from SharePoint's *Shared Documents/Software, etc* folder.

5.2. Add the new *BWASP_Survey_v##.exe* to the following directory in the field laptop: **C:\BWASPTools\bin**. Do not change the title of the new *BWASP_Survey_v##.exe* file because it is important to keep the version number (the "*_v##*" in the filename) associated with the file.

The data folder should replace the old version's data folder which will need to be deleted, but it could be renamed and kept at first until it is known that the new version is working correctly.

5.3. Delete the old *Shortcut to BWASP_Survey_v##.exe* icon on the laptop's desktop.

Delete the old *Shortcut to data* icon on the laptop's desktop.

5.4. Create a new shortcut for the new *BWASP_Survey_v##.exe and the new data folder*:

5.4.1. Go to Windows Explorer and navigate to *C:\BWASPTools\bin* folder. Right-click on the new *BWASP_Survey_v##.exe,* and select "Create Shortcut." A file named *Shortcut to BWASP_Survey_v##.exe* will appear in the *C:\BWASPTools\bin* folder.

5.4.2. Go to Windows Explorer and navigate to *C:\BWASPTools\data* folder. Right-click on the new *data* folder and select "Create Shortcut." A file named *Shortcut to data* will apprear in the *C:\BWASPTools/data* folder.

5.5. Drag this new shortcut to the desktop. Use this new shortcut to launch the new version of BWASP_Survey.exe.

IV. Data Collection Instructions

Introduction

The Data Collection Software instructions focus on data entry of the technical information associated with environmental conditions and marine mammal sightings. These are intended to supplement the BWASP Survey Tool Section, which contains information on program buttons, menus and screens, instructions for loading the software, and instructions on creating daily Waypoints for the BWASP survey area (COMIDA transect lines are set for the season). Users of the BWASP Tool should be familiar with that Section as well.

General Information

As soon as any Event Data Form button is selected (Flight type, Environmental Conditions, Sighting), spatial data (lat, long) and time are saved to the database for that entry. If for any reason the entry should not be saved (e.g., button pressed before sighting is abeam of the aircraft), select "Quit without saving", then select the Event Data Form at the correct time and location.

One date, one aircraft = one flight. Regardless of how many times the aircraft lands and takes off, the entire effort for one day is still one flight. Always. So a survey that originates in Deadhorse, completes transects in blocks 3 and 11, lands at Barrow to refuel, does two transect lines in block 12 before returning to Deadhorse at the end of the day is denoted by a single flight number. Use the "Resume Flight" button.

Any flights originating on the "COMIDA" aircraft will be designated as COMIDA during the Data Collection software start-up. Flights originating on the "BWASP" aircraft will be designated BWASP. This is true regardless of the type of aircraft (twin otter or aero-commander) or the area flown.

Several Event Data Forms can be open concurrently, and often are in situations where several sightings have occurred quickly or where environmental conditions have changed rapidly. The Data Recorder should rely on Primary Observers to keep track of some sighting data (in observer log books) in circumstances where several sightings have occurred quickly. See instructions under Sightings below.

All observers and the Data Recorder should feel free to prompt and remind each other (nicely!) about data entry, protocol, format, methodology, etc. BWASP/COMIDA biologists all have previous experience with aerial surveys on several projects worldwide, but each project is slightly different as far as how it is implemented, and it will be extremely important to keep

lines of communication open among all personnel to foster familiarity with our data collection procedures.

Flight Type

Select this button whenever the "Flight Type" changes, e.g., start transect, start search, deadhead at start of flight, etc.(descriptions below) The type of flight is important in determining effort and sightings on transect versus during other flight types. A transect ID number box is also located here for use on COMIDA flights. With each change in Flight Type, Environmental Conditions can also be updated, but if there are no changes, the data entered on the previous entry will trickle down to subsequent entries. Sightings are never entered via the Flight Type button.

Flight Type may be mis-entered during the course of the flight due to several reasons, resulting in inaccurate data summaries. Flight Type together with either a Sighting or an Environmental (position) update results in the combined field "Entry". The text data in the Entry field must match correctly with two numerical codes in the "Flt type" and "Ent tag" fields in the mdb file. These codes are included below, along with examples. The Field Data Manager and Project Manager will provide QA of the flight data to ensure that the codes are entered accurately, but Data Recorders are also encouraged to check for accuracy.

Code combinations are therefore:

Flt type	**Ent tag**	**Entry**
1	1	Deadhead (at start of flight)
1	2	Deadhead (during flight)
1	5	Deadhead (at end of flight)
2	1	Start transect or Resume (transect)
2	2	P(osition) on transect
2	3	S(ighting) on transect
4	1	(start) Search or Resume (search)
4	2	P(osition) on Search
4	3	S(ighting) on Search
5	1	Divert to Circling
5	2	P(osition) on Circling
5	3	S(ighting) on Circling

(Words within parentheses in the Entry column will not be displayed in the data set.)

Note: automatic location updates are included in the BWASP-COMIDA dataset – these events are not entered by the Data Recorder and do not have an Entry type associated with them. The Flt type/Ent tag codes will likely be inconsistent for these updates. There is no need for the Data Recorder or the Field Data Manager to try to adjust these codes; the Project Manager will deal with these inconsistencies.

Reason for Entry:

Deadhead – Used when the survey flight has just begun, areas over land (except for brief periods over during coastal transits), time periods when visibility is zero (e.g., transiting above cloud cover with no downward visibility), and at the end of a flight. If observers have any downward visibility over water and feel they could detect cetaceans, the survey type should be search, transect or circling. Any Environmental Condition data entered while on deadhead will be saved as "position on deadhead". Possible combinations for this type of entry are "start deadhead" and "position on deadhead". Note that each flight has to start and end with a deadhead.

Start transect – Used at the start of a transect line, which will be indicated by the pilots using their GPS and waypoint system. Any Environmental Condition data or Sighting data entered after this point will be saved as "p on transect" or "s on transect". Also, see the Transect_id information below.

End transect – Used to denote the actual end of the transect line, and indicated by the pilots. Each transect line requires an "end transect" prior to beginning any other survey type (search, deadhead). Should also be used to end a transect when a sighting is recorded by anyone other than a Primary Observer (this sighting should be entered as sighting on search so an End transect is required first).

Divert to Circling – Used when the flight is diverted away from a transect line or search to circle or otherwise investigate a sighting. Any data entered while on divert is logged as circling, therefore "s on circling" and "p on circling". Circling will generally occur in the direction of the original sighting, and be based on the original observer's directions to the pilots. As soon as the aircraft turns, "divert" should be entered (observers should assist the Data Recorder and remind them to enter "divert"). An "oval track" encompassing the original sighting is the preferred method of circling, but in reality circling will often be more haphazard (Figure 6). During circling, it is often useful for the Data Recorder to zoom in tightly on the local area and use the *5-second marks Tool* and the *Temporary Point* and *Text Tools* to better track the location of the aircraft in relation to sightings. See Section III for instructions on using these tools.

Resume – Used when the flight resumes either a transect line or search survey when circling is completed. The flight will automatically resume to the flight type prior to the Divert (e.g., if on transect, will resume to transect).

Search – Used during any non-deadhead, non-transect or non-circling survey type; data entered during this survey type is logged as "p on search" or "s on search".

Transect_id:

The Transect_id is entered into its own field in the Flight Type window, which is located to the right of the Reason for Entry drop down. For COMIDA area flights only, a value should be entered in this field on any "Start transect" event. Transect_ids are either numeric (corresponding to the ID number of the offshore transect) or "C" (for coastal transect). No Transect_id is needed for flight in the BWASP area.

Note: The only way to change the Transect_id once a COMIDA transect is underway is by editing the original "Start transect" event and changing the value using Edit Table.

Environmental Conditions

Environmental Conditions can be updated when Flight Type is changed, but are also entered whenever conditions change by selecting the "Environmental Conditions" button. The data entry is the same under both circumstances. Env. Conditions are not saved until the form is closed. Once the form is saved, Env. Conditions will trickle down to subsequent entries until changed again. An Env. Conditions window will pop up automatically every 5 minutes as a prompt to update. Save this regardless of whether there any changes are made.

Remember that Env. Conditions should be averaged over the entire viewing area (forward, out and backward), and not limited to the precise location of the aircraft at any given time. Env. Conditions should not be rapidly changing within the course of a single minute.

Fields to be entered:

Sky Conditions – choices include overcast, partly cloudy and clear; all responses refer to cloud cover above the aircraft; this particular data selection will trickle down to all subsequent entries until changed by the Data Recorder.

Sea State – refers to sea conditions as they relate to Beaufort wind scale (Table 4) – note that in ice-covered waters the Beaufort state is likely not related to the wind strength as ice will dampen sea conditions. N/a should be used only when absolutely no water is visible (100% ice or over land) and will be entered automatically when Deadhead is entered. The sea state entered will trickle down to all subsequent entries until changed by the Data Recorder.

Visibility Left and Right – choices are unlimited, 5-10 km, 3-5 km, 2-3 km, 1-2 km, <1 km, 0 km; refers to downward and outward visibility as it relates to being able to see marine mammals. A horizontal distance table (Table 5) provides distances (meters) associated with clinometer angles at various altitudes between 1000' and 1500', and can be referenced for visibility assessment. For example, at 1300' altitude, if an observer could realistically see marine mammals essentially to the horizon (1 degree), then visibility is 9.5 km. At 1500' altitude, if an observer could realistically see mammals out to an angle of 20°, then visibility is 1.3 km. Note that under high wind/no ice conditions, visibility is reduced for marine mammals and should be entered as such, due to the higher sea states. Visibility is entered automatically as "0 km" when a Deadhead is entered. Visibility data will trickle down to all subsequent entries until changed by the Data Recorder. Several things can affect visibility, including low clouds and fog, snow squalls, glare and others. These impairments to visibility are entered in a separate field.

% ice cover – choices include 0, 1, 2, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 99 and 100; if there is no ice, select "0". Any amount of ice present, regardless of type, will need to be averaged between left, right and in front of the aircraft (as noted through bubble windows). Ice cover should be averaged for the area in which marine mammals can effectively be seen, which should be the same area for which visibility was estimated. Therefore, at 1000' and visibility effective out to a clinometer angle of 20 (~ 1 km), then ice cover should also be estimated for that area. If the ability to see marine mammals extends out to 5 km, then the % ice cover should also be estimated for that area. Only one value is entered for % ice cover, averaged for all sides of the aircraft. This field is entered automatically as "0" when a Deadhead is entered as Flight Type. Ice cover % also trickles down to subsequent entries so if ice cover changes noticeably, new information should be entered. A % ice cover of "0" always needs to be entered with type of ice = "no ice".

Type of ice –choices are no ice, broken floe, grease/new, new+broken floe, floe, shorefast, lead, pack/floe, frazzle (frazil) and pack. Ice type categories have evolved over several years (since 1982) of BWASP surveys, and were originally based on the Naval Hydrographic Office Publication Number 609 (USDOD,Navy, 1956). While ice types can be and often are the subject of numerous discussions onboard the survey aircraft (and elsewhere), we will maintain consistency among 25 years of data collection by keeping the historic ice categories. The definitions have been updated using the "Observers Guide to Sea Ice" prepared by O.P. Smith of University of Alaska Anchorage for NOAA in 2000. Several of these categories consist of one or more type of ice; some ice type entries will have to be judgment calls based on experience of the survey team. When disagreement occurs, the Team Leader will make the ultimate call on ice type. Remember that the one of the main objectives to estimating ice is determining the overall habitat in which marine mammal

species are sighted. Additional information on ice types along with photographs can be viewed at:

http://www.gi.alaska.edu/~eicken/he_teach/GEOS615icenom/iceglossary/iceglossary.htm.

Categories:
No ice – No ice of any type within area of marine mammal effective visibility.
Shorefast – Ice which forms and remains fast along the coast
Grease/new – Thin, soapy-looking surface layer of coagulated frazil ice; this category would also include ice known as Nilas which is defined as a thin, elastic crust of ice, easily bending on waves and often with a striped or chevron appearance.
Frazzle (Frazil) – Separate fine needles or plates suspended in the water (difficult to distinguish from >1000 ft altitude); subcategory of Grease/new ice
Floe – Any relatively flat piece of ice 20 m or more across
Broken floe – Floe ice that has been broken into smaller pieces usually from wave or wind action
New+broken floe – New ice interspersed with thicker older sections of broken up floe ice
Pack – Multiyear ice that has survived at least one melting season, characterized by undulating weather ridges and meltwater drainage patterns
Pack/floe – Sections of multiyear ice interspersed with solid floe ice (such as that which has formed in previously open water leads).
Lead – open water area that occurs with floe or pack ice pulls apart

Visibility Impairment Left and Right – choices include fog, haze, low ceiling, glare, precip and none; refers to significant impairment (affecting at least 50% of entire 180° viewing area from each side of aircraft) affecting ability to observe marine mammals. If there are no visual impairments, select "none"; this particular data selection will trickle down into all subsequent entries until changed by the Data Recorder. However, if fog, haze, low ceilings, glare or precipitation are significant, then the impairment should be noted. The usefulness of noting visual impairments is the potential for including or not including this data into future analysis.

Observers – on the very first event of the flight, enter the names of the Data Recorder, Left and Right Observers, and 4th Observer, if necessary. The names can be selected from the drop-down menu, or can be typed in for one-time visitors. These names will trickle down to all succeeding events unless they are manually changed during the flight.

Notes – This field should be reserved for short notes that might assist the Data Recorder later when the flight is being QA'd, e.g., any odd weather factor or if something needs to be fixed on a previous entry.

Save Data – if the entry is legitimate (new updated data were entered) always be certain to hit "Save Data", as data are not saved to the hard drive or backup drive until this step is complete.

Quit without Saving – if for some reason the entry is not legitimate and/or does not need to be entered, select "Quit without Saving". The entry will not be saved, although the entry numbering system will make it appear as if it has been (disregard this).

Sighting

Select this button when the observer who has made the sighting indicates that the aircraft is abeam of the sighting by saying MARK. For pinnipeds and bears, one can assume that the sighting is nearly always abeam of the aircraft when they are seen, but cetacean sightings may not be abeam when first detected so do not hit the Sighting button until the observer indicates that they are. In the event that the Sighting button is selected early or at the wrong time, simply hit "Quit without saving" to exit the entry.

Sightings are **never** entered when a Flight Type is being entered. Sightings must be independent of any Flight Type entry.

Only sightings taken while actually "on transect" and from a Primary Observer should be entered as such. Once the aircraft has diverted off the transect line (for any reason), "divert to circling" should be used and subsequent positions/sightings will be recorded as "circling" until "resume" is entered. Any sightings made during this circling will be recorded as "sighting on circling", with the only exception being whales that are closely associated with the original sighting (within five body lengths) or a calf that is clearly associated with the original sighting. While this may be different from methods used on other projects, this has been consistently maintained over the life of this project and therefore will continue to be maintained. Observers should continue to search for animals on their respective sides of the aircraft. During circling, it is preferred that cetacean sightings be entered individually if possible, although the reality of several sightings in one area may preclude individual entries. Pinniped sightings (other than walrus) have lower priority than other marine mammals, and will be entered at the discretion of the Data Recorder. More than one pass might be required to obtain adequate group size and assess number of calves present. Abnormal behaviors or unexpected sightings should be photographed, if possible. Circling should not exceed 10-15 minutes in most cases, as the main objectives of surveys are to assess a large area.

Sightings made by someone other than a Primary Observer (Data Recorder, Pilot, 4th observer) should not be entered as "on transect". In the event that a sighting is missed by the Primary Observers, an "end transect" should be entered via the Flight Type menu followed by entering the sighting. Then a "start transect" should be entered to continue the transect effort.

For each animal/object type, all possible data that can be entered is highlighted in red which indicates that, whenever possible, each of these fields should be updated. A "cheat sheet" (Table 3) will be provided to each observer to remind them of species and data priority.

It is the Data Recorder's responsibility to prompt the observer for the needed information.

Information does not need to be entered in the order of the drop-down menus.

Several sighting windows can be open concurrently, so if additional sightings are made in a short period of time simply open additional sighting windows.

It is easier to enter the data while the sighting window is open initially than to go back and re-enter the info in the edit mode.

NOTE: general species information is included in Appendix C, and was taken from the COMIDA IA (does not include references).

The Guide to Marine Mammals of Alaska (Wynne, 2007) provides additional information and some aerial photographs of some Arctic specie. (Third Edition, Alaska Sea Grant. 80 pp.). Available from: http://seagrant.uaf.edu/bookstore/pubs/MAB-44.html#web.

There are aerial photos of several Arctic cetacean species at: http://www.afsc.noaa.gov/nmml/gallery/. Unfortunately, there are not many aerial shots of pinniped species.

Fields to be entered:

<u>Observer</u> - whoever called out the sighting. For cetacean sightings, the Data Recorder should immediately notify the observer of the sighting event number (located on the top blue bar) so that the observer can keep track of information if the Data Recorder is unable to enter the information quickly enough during a high sighting period.

Observers are responsible for keeping track of event number, species, group size, calf #, clinometer angle and heading in observer green notebooks, which will be provided. In circumstances where several sightings occur quickly, this information will be used as back-up data for the Data Recorder, whether during or after the flight. Notebook information

should be clear and concise. Notebooks are not intended to be repositories of complete sighting information per observer. If an observer would like additional information on their sightings, they are welcome to ask the Field Data Manager after the flight summaries and reports have been completed. Querying the Data Recorder for specific sighting information during the flight is generally not a good idea – they are busy enough already.

Side of Plane – left or right. Seems redundant to Observer but must be entered.

Sighting Data – divided into type of animal/object seen – choices are cetacean, pinniped, polar bear, vessel and land mammal. Select type of animal/object using drop down menu.

Cetaceans:

Species –

Choices include bowhead, beluga, gray, small unid. cetacean, small unid. marine mammal, unknown cetacean, narwhal, humpback, orca whale, Dall's porpoise, harbor porpoise, minke, fin, N. Pacific right whale, which represent the species most likely to be seen in the Beaufort or Chukchi seas. If another species is seen, use the NOTES field to add this info and **GET PHOTOS**. Also use the NOTES field to enter any additional information if unknown cetacean is entered (e.g., probable species if unable to determine).

Clino (clinometer) –

Enter the angle of the sighting (0 is horizon, 90 is directly beneath plane); angle must always be read when aircraft is level. If the angle is greater than 90, enter 90. Never use "0" for the angle because that will result in no data in the x of whale, y of whale fields of the survey program, and the calculation of actual location will not compute. If an animal is at the horizon, the angle should be "1" instead.

Swim direction –

Choices are 1 o'clock to 12 o'clock and No Dir; the nose of the plane is 12 o'clock, the tail is 6 o'clock; observer should call out straight clock readings (not 1:30 or 1415); the program software automatically calculates the heading of the whale based on the heading of the plane and clock reading**. DO NOT** enter swim direction while the aircraft is circling as the GPS cannot catch up quickly enough. If the swim direction cannot be entered at the time of the initial entry when the aircraft heading is consistent, wait until the aircraft has resumed the same heading as when the initial sighting was made. No Dir should be entered if swim direction was not noted; or leave the entry blank.

Swim Speed –

Choices are:

Still – estimated speed of 0 km/hr; essentially not moving; behavior resting

Slow – estimated speed of >0-2 km/hr, which is equal to ~ one body length per 30 seconds
Medium – estimated speed of >2-4 km/hr, which is equal to ~ one body length per 15 seconds
Fast – estimated speed of >4 km/hr; which is equal to ~ one body length per 1 second
Unknown – unable to discern speed

Group Size Data Entry –

Group_Size -

What: The *total number* of cetaceans initially observed prior to circling. The relative area within which animals should be considered a single group is five (5) whale lengths from closest animal. Therefore, sightings on opposite sides of the plane could be considered a single group.

Important: A Group_Size must be entered or the record will not save. If circling is initiated, an initial Group Size estimate should be entered prior to diverting to circling.

Final_group -

What: That total number of cetaceans observed within a group after circling to confirm numbers. Initial Group_Size is still entered into the Group_Size field.

Important: Final_group field does not need to be populated for a sighting event to be saved. Final_group and Group_Size can be the same number, and Final_group can also be larger or smaller than Group_Size. Note: when data are summarized at the end of the flight, any sighting record that does not have a Final_group will be automatically populated with the number from Group_Size. Final_group is the literal group size in the data.

Low_estimate -

What: Estimate of minimum group size, and used mostly for larger aggregations of bowhead and gray whales, and beluga.

Important: Low_estimate field does not need to be populated for a sighting to be saved.

High_estimate-

What: Estimate of maximum group size and used mostly for larger aggregations of bowhead and gray whales, and beluga.

Calf_no -

What: *total number of calves* seen during the sighting; does not need to be co-indicated by Cow-Calf behavior.

Calf_on_circle -

What: Number of calves seen after circling has commenced.

Important: Calf_on_circle field does not need to be populated for a sighting event to be saved.

Sight Cue –

Choices are:
Body – back, head, flukes, flipper
Splash – water disturbance is first indication of activity

Track – "footprints" can be seen in new ice or very calm water
Blow – exhalation vapor
Slick – oily area on surface
Mud plumes – distinct muddy area that is clearly defined from the rest of the water
Whale towed by boat – in this case the sighting is the vessel, not the whale so do not use for cetacean sightings
Birds or fish – disturbance on the surface which may indicate feeding opportunities for marine mammals as well

Behavior – Every cetacean sighting should have a behavior entered.
Choices are:
Swim – proceeding forward through water propelled by fluke movement; "footprints" may be seen where the body breaks the water's surface
Rest – animal floating at surface with no discernible movement
Dive – body orientation changes relative to surface resulting in submergence; may or may not include flukes lifting clear of surface
Mill – swimming slowly at surface in close approximation to other whales, with varying headings
Feed – several indications including repeated diving in small general area; mud streaming from mouth, defecation, synchronous diving or echelon-swimming formation at surface; surface swimming with mouth agape, flukes-out dive; for gray whales, presence of mud plumes is excellent cue to feeding behavior
Breach – animal launching body upwards and out of water such that half to nearly all of the body is above the surface before falling back into the water, resulting in a large splash
Unknown – unable to discern behavior
Cow with calf – adult whale and obvious calf (1/3 to 1/2 size of adult) within two whale lengths of each other; use only in circumstances where there is a 1:1 ratio between adult and calf; if larger group of several adults and several calves is recorded the behavior should be more general (swim, mill, feed, etc) and the calves should be recorded via the entry for Calf No.; calves should be determined based on combination of factors, including relative size to adult, coloration (often but not always gray, sometimes black), behavior (close swimming to adult, underneath adult).
Flipper slap – whale on side, striking water surface with pectoral flipper one or many times
Tail slap – whale slapping surface water with tail; whale body usually under water
Dead – deceased, bloated, stinker
Mate – ventral-ventral orientation of two whales; usually occurs in groups of whales that are milling; may see large penis
Spy hop – head extended vertically out of water without lunging
Underwater blow – exhalation while submerged, creates visible bubble
Roll – rotating on longitudinal axis; may be associated with mating

Run – not seen in large cetaceans unless they are de-evolving; [do not use] except possibly with Dall's porpoise or orca (very fast swimming)
Thrash - rapid flexure or gyration in water
Log play – milling or otherwise associating with log in water; most often seen with calves

Group Classification –
Choices include:
Single (use for any size animal; if calf, indicate via Calf No)
Pair (use for any size animal; if single cow-calf pair, this will be indicated via Cow-Calf behavior as well as in Group Size and Calf No)
Adult group (adults only)
Mixed group (adults and calves; indicate number of calves via Calf No)

Habitat –
Choices are: open water, leads or lead system, large broken floe, med-lg floes, polynya, bay or lagoon, river mouth, tide rip. Of limited use because it does not provide information that is not already provided in Env. Conditions. This should be the lowest priority information for entering for cetaceans.
Note: Should be entered for any carcass sightings to determine if floating or on land/ice

Certainty –
This field has to do with effort related to detecting calves. Choices include low, medium, and high, as described below:
Low – no effort to account for presence of calf; sighting made somewhat offline of track and flight continues, no circling
Medium – flew directly over; relatively high probability of detection; sighting made very close to track line but no circling
High – circled numerous times; highest probability of calf detection.

Repeat Sighting –
Current choices are:
No – any new sighting (transect or search); initial sightings made on search should never be changed to repeats if potentially resighted during transect survey at a later time. Unless an animal can be positively re-identified based on coloration or scarring, it should not be entered as repeat.
Yes – should be entered only if certainty of repeat is extremely high, based on position of whale and ability to re-identify based on color or scarring patterns.
Unknown – should likely be used in situations where an animal or group of animals is resighted after some period of time within a single flight and in a general area but not positively re-identified.

Aircraft Response –

Choices include no, yes and unknown, as described below:

No – no change in expected behavior of cetacean, such as abrupt swim direction change or steep dive; dependent on type of whale and behavior (e.g., feeding gray whales often turn abruptly at surface as evidenced by curved mud plumes; whales dive abruptly when approaching edge of ice, etc); surveys conducted >1000' would not be expected to elicit aircraft response in most cetaceans

Yes – abrupt and unexpected change in behavior. Note that diving, change in swimming direction or speed, rolling, tail slapping, etc, may be in response to aircraft but are also behaviors that cetaceans normally exhibit. Each observer will need to determine if such behavior was a response to the aircraft

Unknown – sighting too brief to be able to determine A/R

Environmental Conditions – these will trickle down from the previous entry, but can be changed if needed within a sighting record; Environmental Condition data that is entered for a sighting will also trickle down to subsequent records that have not yet been opened. Any sighting records that are concurrently open will not automatically update to the new Env. Cond., and will need to be updated as well.

Observers – can be modified with any sighting if observer positions have changed (due to rotation, relief break, etc).

Notes – use this field to enter information that might be useful to the Data Recorder during the QA process, e.g., to clarify sighting data or remind to update Env Cond.

Photos - Check this box if photos are taken. There is also a photo tracking Excel sheet that needs to be filled out.

Be SURE to ***Save the Data***!

Pinniped:

Nearly all data types are highlighted for pinnipeds as were for cetaceans, with the exception of Certainty. In reality, far less data are recorded for pinnipeds because pinnipeds are usually seen for less time and it is more difficult to make species determinations from >1000'. Walrus sightings have the highest priority for pinniped sightings; pinnipeds that cannot be identified to species have the lowest priority regarding data entry.

Species –

Includes ringed, small unid pinn, unknown pinn, walrus, bearded, spotted, northern sea lion, northern fur seal, harbor, and ribbon. Only some of these are likely to be seen in the

Chukchi or Beaufort seas (ringed, bearded, spotted seals and walrus), while some are possible (ribbon seal) and some are highly unlikely (northern sea lion, northern fur seal, harbor seal).

Clino (Clinometer) -
Same as for Cetaceans

Swim Direction –
Same as for Cetaceans

Group Size Data Entry –
Group_Size -

What: The total number of pinnipeds *initially estimated*. For walrus and other pinnipeds that might be aggregated in an area, it is acceptable to clump sightings from both Primary Observers over a short time period, perhaps 30 seconds or one minute (i.e., not necessary to enter individual groups on ice). Use the Comments to indicate a 30-second count and record individual observer counts.

Important: A Group_Size must be entered or the record will not save.

Final_group -

What: The *best estimate* of pinnipeds after circling or pass is complete. Initial Group_Size is still entered into the Group_Size field.

Important: Final_group field does not need to be populated for a sighting event to be saved. Final_Group and Group_size can be the same number, and Final_Group can also be larger or smaller than Group_Size.

Low_estimate -

What: Estimate of minimum group size (or running count), and used mostly for larger aggregations of walrus.

Important: Low_estimate field does not need to be populated for a sighting to be saved.

High_estimate-

What: Estimate of maximum group size (or running count) and used mostly for larger aggregations of walrus.

Calf_no -

What: *total number of pups* seen during the sighting; does not need to be co-indicated by Cow-Calf behavior.

Calf_on_circle – VERY LOW PRIORITY for pinnipeds as pups are difficult to see from higher altitudes (i.e., data is likely not of high confidence)

What: Number of pups seen after circling has commenced.

Important: Calf_on_circle field does not need to be populated for a sighting event to be saved.

Sighting cue –
Choices are:
Body
Splash
Track
Birds or fish

Behavior – Walrus should have behavior entered; low priority for other pinnipeds
Choices are:
Swim
¾ to entire body exposed; resting/lying on surface of water
Dive
Feed
Lying, resting or alert on ice – make sure that environmental conditions indicate ice in area
Dead

Group Classification –
Same as for cetaceans

Habitat – High Priority for walrus; low priority for other pinnipeds
Choices are:
On land (barrier island or beach)
On ice (near lead or on floe)
Open water

Repeat –
Same as for cetaceans.
With the exception of large haulouts on ice or land of walruses and perhaps spotted seals on haulouts, repeat sightings of pinnipeds would be extremely rare.

Aircraft Response –
Same as for cetaceans
Note: if aircraft response is observed in walrus aggregation, answer "yes" and use Notes to indicate the % of group that reacted.

Environmental Conditions –
Same as for cetaceans

Observers – can be modified with any sighting if observer positions have changed (due to rotation, relief break, etc).

Notes – use this field to enter information that might be useful to the Data Recorder during the QA process, e.g., to clarify sighting data or remind to update Env Cond.

Photos - Check this box if photos are taken. There is also a photo tracking Excel sheet that needs to be filled out.

Be SURE to ***Save the Data***!

Polar Bear:

Polar bear data are increasingly important as the relationship to sea ice continues to evolve. Every effort should be made to record as much data as possible on polar bear sightings.

Clino (clinometer) –
Same as for cetaceans

Swim Direction –
Same as for cetaceans; do not enter if bear is onshore.

Swim Speed –
Same as for cetaceans; do not use if on land

Group Size Data Entry –

Group_Size -

What: The total number of polar bears *initially estimated*.

Important: A Group_Size must be entered or the record will not save.

Final_group -

What: The *best estimate* of polar bears after circling or pass is complete. Initial Group_Size is still entered into the Group_Size field.

Important: Final_group field does not need to be populated for a sighting event to be saved. Final_Group and Group_size can be the same number, and Final_group can also be larger or smaller than Group_Size. Likely to be used only near Cross Island, Barter Island or near whale carcasses.

Low_estimate -

What: Estimate of minimum group size, and likely used only near known polar bear aggregation areas such as Cross or Barter Islands.

Important: Low_estimate field does not need to be populated for a sighting to be saved.

High_estimate-

What: Estimate of maximum group size, and likely used only near known polar bear aggregation areas such as Cross or Barter Islands.

Calf_no -

What: *total number of cubs* seen during the sighting; does not need to be co-indicated by Cow-Calf behavior.

Calf_on_circle – VERY LOW PRIORITY for polar bears as cubs are difficult to see from higher altitudes (i.e., data is likely not of high confidence)

What: Number of pups seen after circling has commenced.

Important: Calf_on_circle field does not need to be populated for a sighting event to be saved.

<u>Sighting cue</u> –

Choices are:

Track – tracks seen on ice or beach before bear is actually seen; do not enter if bear is not seen

Kill site – seen before bear is seen; does not include bowhead carcasses that are known to be in place near villages or Cross Island

Body

Splash

Birds or fish

<u>Behavior</u> –

Choices are:

Walk

Run

Swim

Sitting or lying on ground or ice

Feeding at bone pile – near land, particularly near Kaktovik, Barrow and Cross Island

Feeding on seal on ice

Dead

<u>Group Classification</u> –

Choices are:

Single adult or subadult

Female with cub(s)

Mixed group

<u>Habitat</u> –

Choices are:

On land (barrier island or beach)

On ice (near lead or on floe)

Open water

<u>Repeat</u> –

Same as pinnipeds

Aircraft Response –
Choices are:
No – no significant change in behavior as initially observed.
Yes – abrupt and prolonged change in behavior clearly attributable to the presence of the aircraft; such as starting to run, stopping abruptly, change of direction in running or swimming, looking at plane, etc.
Unknown –

Environmental Conditions –
Same as for cetaceans

Observers – can be modified with any sighting if observer positions have changed (due to rotation, relief break, etc).

Notes – Enter Pre- and post-overflight behavior – rest, run, sit, stand, walk

Photos - Check this box if photos are taken. There is also a photo tracking Excel sheet that needs to be filled out.

Be SURE to ***Save the Data***!

Vessels and Aircraft:
Species –
Choices include:
Small craft – includes whalers
Small recreational vessel – e.g., sailboat
Large recreational vessel – e.g., cruise ship
Commercial vessel – drill ships/platforms and accompanying vessels
Seismic vessel
Icebreaker
Aircraft
If vessel is not identifiable, make best guess and write any information in Notes

Clino (clinometer) –
Same as for cetaceans
Swim Direction –
Same as for cetaceans

Group Size –
Total number of vessels; if seismic vessel is indicated, note if other small vessels are nearby. Reminder that streamers towed behind seismic vessels have a tail buoy that might resemble a small boat from some distance.

Final_Group, Low_estimate, High_estimate – not necessary

Sighting Cue –
Choices are:
Vessel – includes wake

Behavior –
Choices are:
Fishing
Whaling
Seismic
Breaking ice
Other – include info in Notes if possible

Habitat –
Choices are:
Open water
Leads in ice
Bay or lagoon (or inside barrier islands)
River mouth
Unconsolidated ice
Very low priority data

Repeat –
Choices are:
No
Yes – if seen on same flight
Unknown

Environmental Conditions –
Same as for cetaceans

Observers – can be modified with any sighting if observer positions have changed (due to rotation, relief break, etc).

Notes –
Description of vessels, type of aircraft, relative size, name, activity, etc.

Be SURE to ***Save the Data***!

Land Mammals:
Most effort over land will be "on deadhead" so sightings are not entered. However, on occasion, the survey will venture briefly over land. In those circumstances, there is no need to "start deadhead", and land mammal sightings can be entered.

Species –
Choices include: brown bear, sea otter, caribou, musk ox, arctic fox, other

Clino (clinometer) –
Same as for cetaceans

Swim direction –
Of limited use for land mammals – can indicate overall direction of heading of herd

Swim speed –
Choices are: still, slow, medium, fast, unknown

Group size –
Total number of animals

Final_Group, Low_estimate, High_estimate, Calf no, and Calf on Circle – can be used for larger herds of animals, but very low priority

Sighting Cue –
Choices include:
Body
Tracks
Kill site

Behavior –
Choices are:
Walk
Run
Swim
Rest

Group Classification –
Choices are:
Single animal
Mother-pup
Multiple adults
Mixed group

Habitat –
Choices include:
Tundra
Beach
Rocky cliff
Other – indicate via Notes – e.g., an animal swimming between mainland and barrier islands

Repeat –
Choices include:
No – likely response for all land mammal sightings
Yes
Unknown

Aircraft Response –
Same as for polar bears

Environmental Conditions –
Same as for cetaceans

Observers – can be modified with any sighting if observer positions have changed (due to rotation, relief break, etc).

Notes –
Enter any pertinent data to the sighting that has not been entered elsewhere.

Be SURE to ***Save the Data***!

V. COMIDA/BWASP Field Data Manager Instructions

Introduction

One member of each survey team will be responsible for initial quality assurance and control of the daily flight data, prior to passing the files to the Team Leader. This person must have good MS-ACCESS skills and be detail-oriented. The Field Data Manager may or may not also serve as Data Recorder on the aircraft. Flight data must be checked daily, after each flight is completed (only one flight per day, regardless of how many flight segments there are). The review of the flight data has to occur before the daily report can be generated and posted.

Field Data Processing Sequence:

1. Survey flight data can be edited during the flight itself, if the Data Recorder has the time and skills to do so.
2. When the Data Collection Program is terminated (when the aircraft has crossed over land enroute to landing), several summary programs should be initiated. These programs will result in the processing of a Summary Table, Cetacean Sightings Table, and Flight Track Map. The Summary Tables and Map should be considered "drafts" initially, because data revisions may be required which could revise each. The Ice Summary should not be initiated on the aircraft as it takes too long to compile; this summary should be undertaken at a later time.
3. After the flight is completed and summary files have been initially generated, the Field Data Manager will upload the raw flight data (the Master Access File, either 2010_COMIDA or 2010_BWASP) to the NMML SharePoint website. This begins the data editing/tracking process. Refer to the SharePoint Section for information on how to use SharePoint.
4. To start the editing, the Master Access Table should be "checked out" from the NMML SharePoint site – this indicates to other users of SharePoint that the data are currently undergoing revision.
5. The first level of Data Quality Check on the daily flight data consists of reviewing three tables within the Master Access File.
    a. Flight Data Table
    b. Update to FlightInfo Table
    c. Update to SummaryInfo Table
6. If significant changes are made to the Master Access mdb file, the flight may need to be summarized again. Refer to the BWASP_SurveyTool_Help document for instructions on how to do this.
    a. Run the Ice Summary Tool at this time.
7. The edited Master Access File should be uploaded to SharePoint once all revisions have been completed. Changes to the Flight Data Table should be noted in the Comments section on SharePoint during the upload.

Basic responsibilities of the Field Data Manager include:

a. Checking the daily flight data, which may include cross-checking observer notebooks for missing information and working with the Data Recorder to confirm all data have been entered and saved correctly.
b. Providing the Team Leader with a "clean" version of all data files, including the Access mdb and updated Summary tables and map, if necessary. This information will be transferred to the Project Manager via the NMML SharePoint website, which will allow the Project Manager to make any necessary final revisions, while keeping track of versions. (The Team Leader may opt to have the Field Data Manager conduct the SharePoint step as well).
c. Track MS-Access file versions to ensure that only one version is the "final" copy.
d. Notify the Team Leader of any problems inherent in the data collection process, and whether they are related to apparent software problems or inconsistencies with how data are being collected.

To maintain as much consistency both intra-year (2010) and inter-year (historical database goes back to 1979), please do not ever hesitate to contact the Project Manager for clarification. (janet.clarke@saic.com). The data are the heart of this project; it is essential that they be collected and recorded as consistently as possible.

Data Quality Check

A. Flight Data Table

Each flight is stored as a unique table within the Master Access file. This file is found in C:/BWASPTools\data. On each field computer, there will be two Access files, 2010_BWASP.mdb (for BWASP flights) and 2010_COMIDA.mdb (for COMIDA flight. Once the Access mdb has been uploaded to the SharePoint website and checked out, the Flight Table needs to be opened to allow for review and editing. The table is quite "wide" and cumbersome, as there are 60 fields. The data fields do not follow "logical" patterns because new data fields (many added in 2009) needed to be added onto the end of the database. When conducting QA/QC, it is helpful to "hide" those fields not currently being checked.

The following information provides guidance on what should or should not be in each of those fields, what to look for regarding consistency, and suggestions on how to look at "subsets" of data.

The first eight columns of data are entered automatically via the computer program and interface with the GPS. If there are errors in these first columns, it could be indicative of bugs in the software and the Team Leader should be informed. Values in these columns should be sequential for the most part, with exceptions noted below.

HINT: Review these first eight columns as a set, as if the rest of the data is not even present.

OID – Primary Key – do not change. Should be identical to **Event**.

Event – Survey events from start to finish. Should always be in chronological order. Events that were not saved during the course of the flight are still included in the database (**Saved** = 0). Do not delete any events, even if they are unsaved or appear to have no data, as this will very negatively impact the mapping and other summary processes. If an event is accidentally deleted, a record will need to be added to the end of the flight with the appropriate data (use the previous event for location, time, altitude, etc), then re-sorted to be inserted into the proper order.

Flt_No – COMIDA flights will start with 201 and will be chronological over the course of the annual field season; BWASP flights will start with 1 and also be chronological. The flight number should remain the same throughout entire flight. Verify that Table flight number matches the flight number in the table (sounds like a no-brainer but it has been problematic in the past).

GMT_Minus8_DateTime – combined field. Verify that date is correct (should be one date per flight unless flight goes past midnight local time). Times are local AK DST.

ArcLat – Latitude in decimal degrees.

ArcLong – Longitude in decimal degrees. All longitudes in the western hemisphere are (-) numbers. Verify that all longitudes are negative.

Alt – Altitude in feet. Verify that no altitudes appear unrealistic (e.g., too low [~200'] or too high [>5000']. Low altitudes during take offs and landings are acceptable (and encouraged!). Higher than normal altitudes during deadheads or transits may also be acceptable.

Air_Head – heading of aircraft as determined by data from the GPS. This information is used for determining actual positions of animals along the trackline, together with clinometer angle, altitude and side of plane. If an event has not been saved (**Saved** = "0"), there will not be an **Air_Head** and the field will be empty.

The Data Recorder inputs to the computer program start with **Entry**.

*HINT: if there is no data between the **Alt** field and the **Block** field and the event is saved (**Saved**=1), that event is an automatic location update generated by the computer. No additional review is required of these data points. There will also be events that are not saved (Saved=0). If there appears to be a sighting on an unsaved event, double-check with observer notebooks that the event really IS supposed to be not saved. Otherwise, ignore the unsaved events at this point, but do not delete them. Deleting events within the database corrupts the database.*

Entry – Choices here are deadhead, p on deadhead, search, p on search, s on search, start transect, p on transect, s on transect, end transect, divert to circling, p on circling, s on circling, resume. Every flight must begin with a "deadhead" and end with a "deadhead".

Deadheads should also be entered in the data whenever both **Visleft** and **Visright** both report "0 km" and whenever the aircraft is over land.

The next several fields of data are related to events which are sightings (cetaceans, pinnipeds, polar bears, vessels, and land critters) during the course of the flight. Different amounts of information will be entered depending on what the sighting is (refer to Table 3). If the event is not a sighting, all of the following rows will be either "." or "-1".

Note that there are several data fields "to the right" in the database that are also related to sighting events (Final_group, Low_estimate, High_estimate, CalfonCircle). "Hiding" fields that are not sighting-related may assist data editing.

Species – only an Event that is designated "s on *" should have anything in this column. If a **Species** is entered (and supporting data such as group size are also entered) and the **Entry** is not "s on *", the **Entry** needs to be changed to reflect a sighting. If no **Species** is entered and the **Entry** is "s on *", then the Data Recorder and observer notebooks need to be checked to clarify what the correct intention is. In the event that **Species** and **Entry** do not seem to agree, check the **Saved** column – if a "0" is entered in **Saved** then the data have not been saved and may not be real. In those circumstances, always check observer books to make sure the data truly should not be saved. If there is no **Species** (e.g., on non-sighting events), there should be a ".". *If a **Species** has been entered on a "start transect" or "end transect", an event will need to be added to incorporate the sighting without losing the correct survey data. If this circumstance arises, note where this needs to occur and notify the Project Manager.

Sightcue – if the **Species** is a cetacean, there should be something in this column, but it is not absolutely necessary. Any **Species** other than cetaceans may or may not have data entered. If there is no **Sightcue**, there should be a ".".

Habitat – this is low priority data for all **Species** except polar bears and walrus. If no **Habitat** has been entered, see if other data on this sighting is of assistance (e.g., **Behavior** of "swimming" would indicate "in open water" while a **Behavior** of "running" in an area of 80% ice would indicate "on ice". Also check observer log books. If there is no **Habitat** entered, there should be a ".".

Behavior – this is a high priority for cetaceans, polar bears and walrus, lower for pinnipeds other than walrus. If there is no **Behavior** entered, there should be a ".".

Size – this field is obsolete and is a holdover from earlier data formats within this project. It should not be populated automatically via the data collection program. No data should be in this field unless entered manually by the Field Data Manager.

Totalno – total number of animals/vessels initially attributed to this **Event**. If there is anything entered in the **Species** column, there must be a **Totalno**. If there is no **Species**, the value should be "-1".

Calfno – total number of calves or pups observed in the group. If no calves/pups were entered for this Event, then the value will be "-1", not 0.

Clinometer – high priority on cetaceans, polar bears, walrus and vessels. If there are no data in the field, double check with observer notebooks to see if anything was written down. No values >90. If there is no **Clinometer** angle, the value should be "-1".

Sop – Side of plane. Designated with "l" or "r". Must be entered for all **Species** types. If nothing is entered, see if other data field can be used to determine which side of the plane (e.g., cross-check **Observer** with **Obsleft** and **Obsright).** If there is no **Sop** entered, there should be a ".".

Swimdir – always indicated (in this field) as a clock position, whole numbers only. High priority for cetaceans and vessels. If there is no **Swimdir** entered, there should be a ".".

Swimspeed – low priority for all **Species**. If there is no **Swimspeed** entered, there should be a ".".

Response – high priority for cetaceans, polar bears and walrus. Check observer logbooks if there is no response recorded for those **Species** types; if **Response** is consistently not recorded for those **Species** types, notify Team Leader so that the importance of this field can be reiterated to the survey team. If there is no **Response** entered, there should be a ".".

Repeat – low priority for all **Species** types, unless **Repeat** is "yes". Therefore, most rows will be ".".

Observer – mandatory for all events that have a **Species**. If for any reason this is missing, use other data fields (e.g., **Obsleft, Obsright**) and observer log books to determine the Observer. For non sighting-events that have no **Observer**, there should be a ".".

The following fields are physically located at the end of the database (because they were added in 2009), but they are discussed here because they are part of sighting-related data.

Family – these codes represent the sighting "family", where "1" is cetacean, "2" is pinniped, "3" is polar bear, "4" is vessel, "5" is land mammal, and "0" is any event that is not a sighting. These codes are also in the Access database, lut_Family.

Final_group – may be the same, higher or lower value than **Totalno**. If this field is populated, this number was included in the sum for the Summary Table, in lieu of the number in the **Totalno** field. This field does not have to be populated; there should be a "-1" if nothing was entered.

Low_estimate – may be the same or lower than the value in **Totalno** or **Final_group**. This field does not have to be populated; there should be a "-1" if nothing was entered.

High_estimate – may be the same or higher than the value in **Totalno** or **Final_group**. This field does not have to be populated; there should be a "-1" if nothing was entered.

Calf on Circle – should only be populated if 1) calves are also entered in the **Calfno** field, and 2) the aircraft diverted to circling. Should not be higher than the number entered in the **Calfno** field.

The next eight fields are environmental data. Every saved event (**Saved** of "1") should have data in nearly every one of these fields, with the exception of deadheads

Skycon – sky conditions should always have some type of data entered, with the exception of "deadhead" events which should be ".".

VisImpLeft – visual impairment left should always have data entered, with the exception of "deadhead" events which should be ".".

VisImpRight - visual impairment right should always have data entered, with the exception of "deadhead" events which should be ".".

Vis_left – visibility left should always have data entered; events that are "deadhead" will automatically have "0 km" entered. "0 km" can also be on events other than "deadhead".

Vis_right – visibility right should always have data entered; events that are "deadhead" will automatically have "0 km" entered. "0 km' can also be on events other than "deadhead".

Icepercent – ice percentage should always have data entered; events that are "deadhead" will automatically have a "0" entered. "0" **Icepercent** can also be on events other than "deadheads". An **Icepercent** of "0" must have an **Icetype** of "no ice". If **Icepercent** other than "0" is entered, there must also be an **Icetype** that is not "no ice".

Icetype – ice type should always have data entered; events that are "deadhead" will automatically have "no ice" entered. "no ice" can also be on events other than "deadhead". An **Icetype** of "no ice" must have an **Icepercent** of "0". If **Icetype** is "no ice", there must also be a number entered for **Icepercent**.

Seastate – should always have data entered; events that are "deadhead" will automatically have an "n/a" entered. "n/a" can also be entered for areas where **Icepercent** is "100%". If **Icepercent** is <100%, there must be a **Seastate** entered.

Most of the remaining fields are either generated automatically within the data collection program or are a result of information entered by the Data Recorder during the initial flight startup.

Block – survey block in which the location (as determined by **ArcLat** and **ArcLong**) occurs. Locations over land or outside of the study area (e.g., north of 72°N) will have a "0" entered.

Depth_m – no data; all field are left blank. This info is automatically entered during data manipulation.

Aerial_Survey – name of survey, either "BWASP" or "COMIDA".

Swimdir_True – swim direction is calculated automatically based on data in the **Air_head** and **Swimdir** fields. Any events that do not have data entered in both of those fields should have "-1".

Magvar_gps – magnetic variation data directly from the GPS. All saved events should have data in this field.

Magvar_dir – magnetic variation direction will always be "E".

Airhead_gps – no idea what this is but it appears to have the same input as **Air_head**.

Certainty – data will be entered only on some sighting events (mainly cetaceans); all other fields will have "-1".

Group – these codes are tied to the Group Composition codes in the Access database; look at lut_GroupClassification table to determine what the codes represent and if they are reasonable to the sighting. Note than only codes 13-16 should be for cetaceans, 31 and 37-39 should be used for pinnipeds and 51-53 used for polar bears. Non-sighting events should be "-1".

Saved – any events that should be saved are "1" and events that do not need to be saved are "0". All events should have either "0" or "1"; none should be null.

Notes – can be entered for any event, but most often for sightings; check that **Notes** make sense; check observer notebooks for additional clarification if needed.

FltType – code is tied to **Entry** type, whereby deadhead = "1", transect = "2", search = "4" and circling = "5". These codes are automatically generated by the program, but if **Entry** is manually changed during or after the flight, the **FltType** code also needs to be manually changed.

Enttag – code is tied to **Entry** type, whereby start, end, divert or resume = "1", position is "2", sighting is "3" and end of flight is "5". These codes are automatically generated by the program, but if **Entry** is manually changed during or after the flight, the **Enttag** code also needs to be manually changed. "5" will also be entered on all automatic updates generated by the computer.

Xofwhale – actual longitude of sighting, based on **ArcLong, Alt, Sop, Clinometer** and **Air_head**.

Yofwhale - actual latitude of sighting, based on **ArcLat, Alt, Sop, Clinometer** and **Air_head**.

Dist_from_Shore – no data; all field are left blank. This field is calculated during data manipulation.

DataRecorder – info entered at beginning of flight and perhaps modified during flight if observers rotate; rotation of Data Recorder is not recommended to maintain consistency of data recording throughout flight.

ObsLeft – info entered at beginning of flight and perhaps modified during flight if observers rotate.

ObsRight - info entered at beginning of flight and perhaps modified during flight if observers rotate.

ObsFourth – only populated if a fourth observer is on flight.

PhotoTaken – "1" if photos were taken of a sighting, "0" for all other events

Lattemp – values in this field are taken from **Yofwhale** and, if no value in that field, **ArcLat**. This field, together with **Longtemp**, is used by the Summary Mapping program to map cetacean sightings. Sightings that do not have values in these two fields will not be plotted.

Longtemp – values in this field are taken from **Xofwhale** and, if no value in that field, **ArcLong**. This field, together with **Lattemp**, is used by the Summary Mapping program to map cetacean sightings. Sightings that do not have values in these two fields will not be plotted.

Transect_id – for COMIDA flights only, any events with **FltType** = "2" should have a number or "C" entered. All other events will be blank. On BWASP flights, the fields will be blank or may have a "0".

B. SummaryInfo Table, Sighting Summary Table and Summary Map

The SummaryInfo Table within the Master Access file is updated when the summary programs run at the termination of the flight. Each flight becomes a new record in the SummaryInfoTable. Summary files are located in C:\BWASPTools\SummaryFiles.

The information in the SummaryInfo Table should match exactly the Summary Table generated at the end of each flight, which becomes part of the daily report (see Figure 5).

Everything in the Summary Table should be checked against Flight Table Data. If any of the **Entry** codes in the Flight Table have been changed during the review process, it is likely that the Summary Table will need to be re-generated.

Daily Report Summary Table:

Total bowheads: total number of bowheads observed (does not include repeat sightings but does include "unknown" repeats). Use **Species, Totalno** and **Final_group** fields in Flight Table to count. The value in **Final_group** takes precedence over the **Totalno** when it has been entered.

Bowhead sightings: total number of sightings (does not include repeat sightings but does include "unknown" repeats). Use **Species** field in Flight Table to count sightings.

Bowheads on transect: total number of bowheads observed "on transect" only; does not include bowheads seen on search or during circling (does not include repeat sightings but does include "unknown" repeats). Use **Species, Entry, TotalNo** and **Final_group** fields to count.

Bowhead cow-calf pairs: total number of bowhead cow-calf pairs observed (does not include repeat sightings but does include "unknown" repeats). Use **Species** and **CalfNo** field in

Flight Table to count. Do not rely on **Behavior** field of "Cow-calf pair" as this will not always be recorded when a calf is seen.

Bowhead cow-calf pairs on transect: total number of bowhead cow-calf pairs observed "on transect" only; does not include calves seen on search or during circling (does not include repeat sightings but does include "unknown" repeats). Use **Species, Entry** and **CalfNo** field in Flight Table to count. Do not rely on **Behavior** field of "Cow-calf pair" as this will not always be recorded when a calf is seen.

Bowhead repeats: total number of bowheads seen that were considered "repeats" (**Repeat** = "yes". Use **Species** and **Repeat** to count.

Possible repeats: total number of bowheads seen that were entered as possible repeats (Repeat = "unknown"). Use **Species** and **Repeat** to count.

Total gray whales: total number of gray whales observed (does not include repeat sightings but does include "unknown" repeats). Use **Species, Totalno** and **Final_group** fields in Flight Table to count. The value in **Final_group** takes precedence over the **Totalno** when it has been entered.

Total belugas: total number of belugas observed (does not include repeat sightings but does include "unknown" repeats). Use **Species, Totalno** and **Final_group** fields in Flight Table to count. The value in **Final_group** takes precedence over the **Totalno** when it has been entered.

Other whale sightings: total number of cetaceans other than bowheads, grays and belugas observed (does not include repeat sightings but does include "unknown" repeats). Use **Species, Totalno** and **Final_group** fields in Flight Table to count. The value in **Final_group** takes precedence over the **Totalno** when it has been entered.

Total walrus: total number of walrus observed (does not include repeat sightings but does include "unknown" repeats). Use **Species, Totalno** and **Final_group** fields in Flight Table to count. The value in **Final_group** takes precedence over the **Totalno** when it has been entered.

Total bear: total number of polar bears observed (does not include repeat sightings but does include "unknown" repeats). Use **Species, Totalno** and **Final_group** fields in Flight Table to count. The value in **Final_group** takes precedence over the **Totalno** when it has been entered.

The second and third columns of the Summary Table include data on total time and distance for the survey flight. These numbers and distances cannot be easily checked against the Flight Table, however, the total amounts can be "eyeballed" to make sure that the totals look reasonable.

Start and End time: date and time should match the first and last saved entry in the Flight Table.

Transect, Search, Circling, Deadhead minutes and km: this one needs to be eyeballed. If the survey flight consisted of mostly time on transect and transect minutes and km are fairly

low, there is likely something wrong. If the flight was mostly a search survey and transect minutes and km are low, it is probably okay. Use the Flight Map as a reminder for time spent in different survey modes. Note that the flight map colors do not denote survey type but rather Beaufort sea state, so do not use the colors as a guide to survey type. Remember that the coastal route in the Chukchi is transect, not search. HINT: most survey effort that is east-west will be "search". Most effort in the BWASP areas (blocks 1-12) that is north-south is transect; survey effort in the COMIDA area that is northwest-southeast is likely transect.

Search blocks: blocks in which search effort (anything not transect) was conducted.

Transect blocks: blocks in which transect effort was conducted.

The Daily Summary Sightings Table:

This table should be cross-checked with the Daily Summary Flight Table to ensure that all sightings that should be included actually are. Only cetacean sightings (all species) are included in this table. Event numbers are provided in the first column of the table and are also plotted on the Summary Map. Sightings designated as repeats (**Repeats** = "yes") are not included (sightings where **Repeat** = "unknown" are included in the table). Sightings that are on transect will be reflected in the last column (*On effort*) as "True".

The Daily Summary Map:

This Summary Map will automatically size to the extent of the flight. Flight lines are color-plotted based on sea state. Only sightings of cetaceans are plotted, as circles with stars around them, and the event number associated with the sighting will plot nearby. The Map should be reviewed for errors, such as flightlines that appear out of place (e.g., heading off the map) which may indicate a location error in an event, or sightings that have not plotted correctly.

C. FlightInfo Table

The FlightInfo Table within the Master Access file is updated when the summary programs run at the termination of the flight. Each flight becomes a new record in the Table. This information was entered by the Data Recorder at the beginning of the flight. Not much to check in this table except to make sure that it has recorded accurately. There must be an entry in this table for each flight.

D. Ice Data Table

The Ice Summary should be done after initial quality checks are completed. This task must be carried out on the Field laptop. Refer to the BWASP_SurveyTool_Help document for instructions on compiling this info. Note that only those events that have an **Entry Type** will be included in the Ice Summary.

E. Re-summarize Tables and Regenerate Map

If any revisions were done to the Flight Data Table, likely all Tables should be re-summarized and a new map generated. These should replace the original files for that flight day, both on the field computer and on SharePoint. This is especially important for the SummaryInfo Table, which includes all of the pertinent summary data for the day. If this table is not updated on SharePoint, the erroneous (= unrevised) values remain and will affect future data analyses.

F. Compacting the Access Database

In Access 2007, the database will automatically compact each time it is closed if the correct Access Option is selected. On each project laptop and for each project mdb (2010_BWASP and 2010_COMIDA, make sure the following has been selected:

Open Access.
Using the MS Office Button (upper left corner of display), select Access Options.
Go to Current Database.
Check Compact on Close, and hit OK.

G. Upload Edited Data and Summary Tables/Maps to SharePoint

Go to Section VI, SharePoint Instructions.

H. Replacing the Active Access File

When too many flights are included in the active Access file (either 2010_BWASP or 2010_COMIDA, the file becomes too large and takes quite long to upload onto SharePoint.
To remedy this, the Access mdb will be emptied of flight data after **every fourth flight**.

1. Download the active mdb from the SharePoint site and make any revisions required.
2. Make a copy of the active mdb (2010_COMIDA or 2010_BWASP).
3. Rename the copy using the following format: first flight_fourth flight_project name.mdb (e.g., 201_204_COMIDA.mdb).

4. Upload the new mdb to the SharePoint site within the same project directory – it will be designated as "New" (indicated in green text) for a few days.

Then:

5. Open the active mdb in Access and delete the old flight data tables only (e.g., Flight_201-Flight_204). Do not modify the SummaryInfo or FlightInfo tables as that information needs to remain intact for flights to continue to be logged in sequence.
6. The mdbs will automatically compact to get rid of hidden files, if step VI (above) has been completed. (If step VI is not completed, please follow those instructions and do so).
7. Upload the active mdb to the SharePoint site, where it will automatically replace the previous mdb as a new version (because this version has not been renamed).

VI. USING SHAREPOINT –The Basics

SharePoint is a web-based application, maintained at AFSC. The NMML Arctic Marine Mammal Research site is password-protected and allows for document management and versioning for tracking edits. Nearly every BWASP or COMIDA flight will require data editing after the flight has ended. Other than those minor edits that are made during the flight itself, all edits made to the flight data will be made to the Master Access databases maintained on SharePoint. SharePoint will allow each set of flight data edits to be saved as a new version, so that the original "off the flight" version remains intact regardless of specific edits necessary to clarify the flight data.

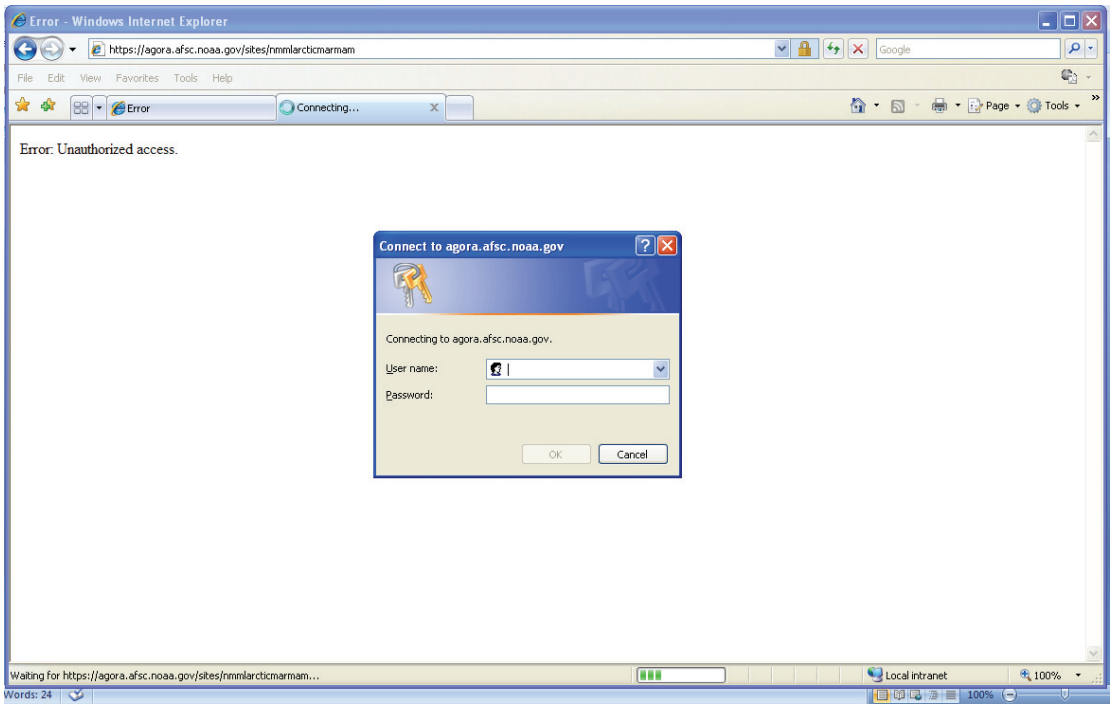
The most up-to-date version of each flight will always be maintained in the Master Access databases on SharePoint, and not necessarily on the field laptops. This is the best way for the COMIDA-BWASP management team to ensure that versions are not overwritten or that multiple copies of flight data are not co-existing. To ensure that the most recent versions remain on SharePoint, the following instructions have been established. This process is a bit cumbersome, but experience in 2008-2009 has shown it to be the best way forward at this time.

The preferred browser and software for accessing SharePoint is **Internet Explorer** and **Office 2007**. Other internet browsers and software versions will require different approaches, and are not recommended; instructions for accessing SharePoint via Mozilla are included at the end of this Section.

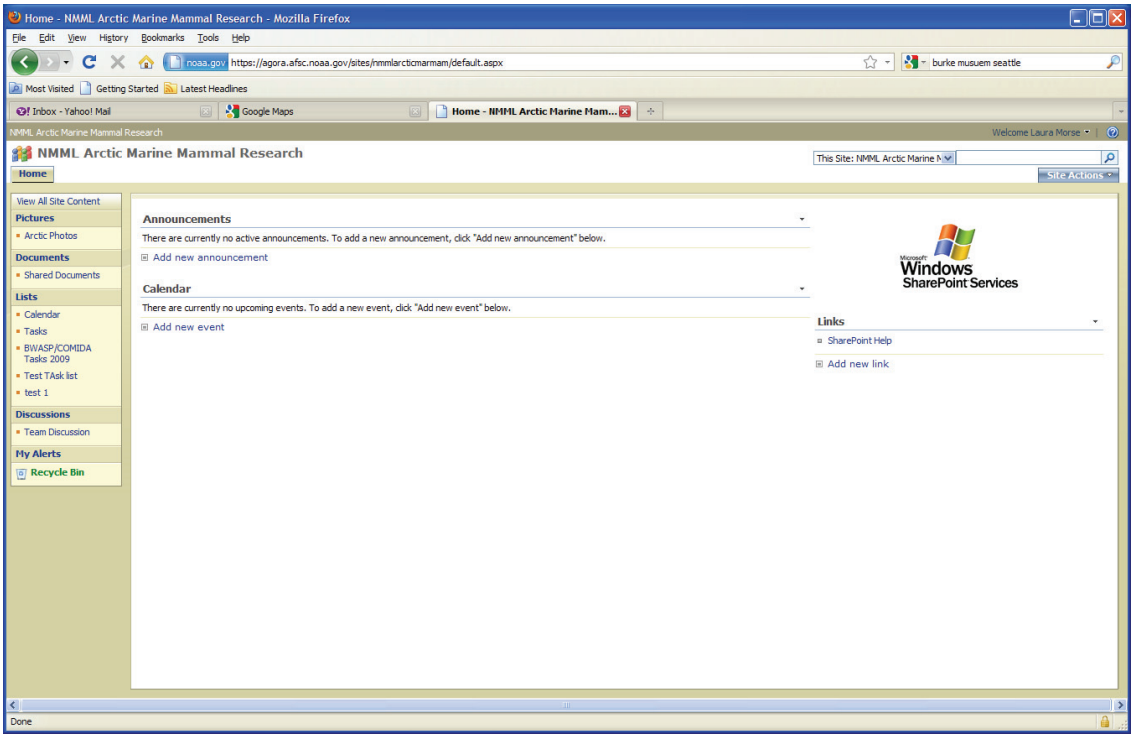
I. Internet Explorer (IE)

Opening SharePoint via IE

1) Go to the following website address (If the default browser on the computer is set to Mozilla, then IE needs to be opened and have the SharePoint site as a favorite within IE in order to access SharePoint correctly):
   https://agora.afsc.noaa.gov/sites/nmmlarcticmarmam
2) The following screen will appear. Enter user name and password.



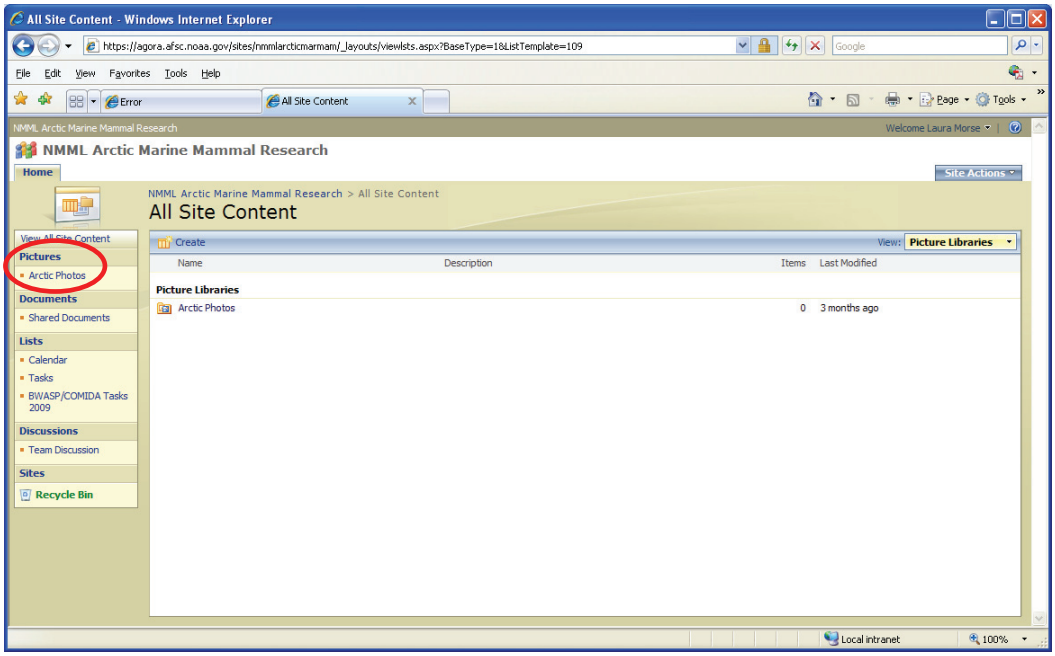
3) The NMML Arctic Marine Mammal Research site will open to the following screen:



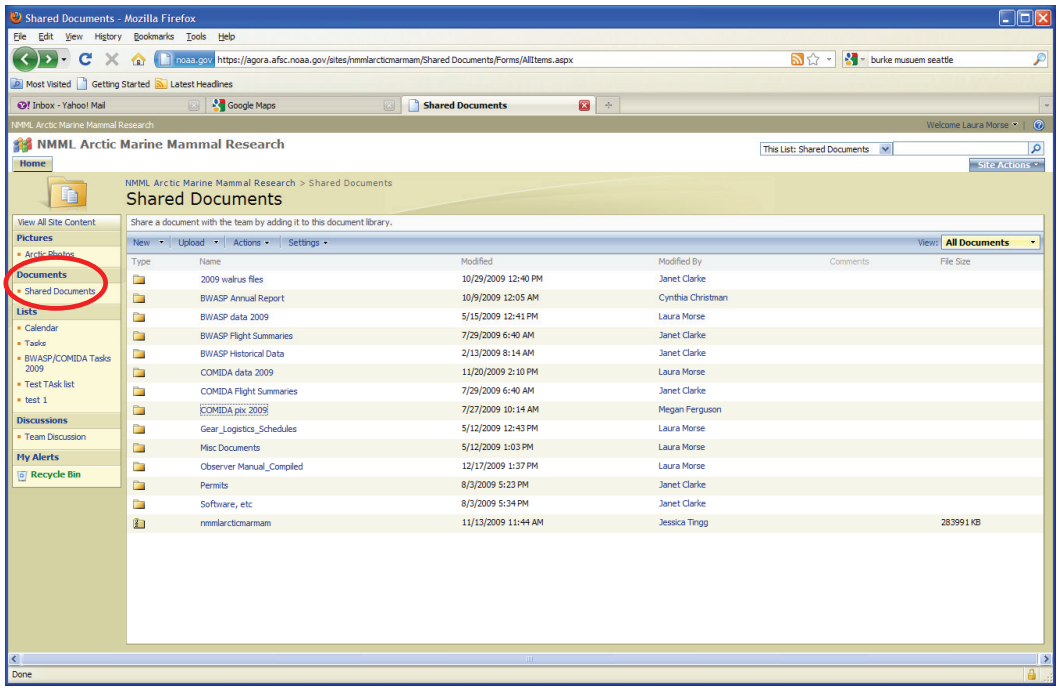
Navigating SharePoint via IE

1) Along the left margin are links to the site's content.

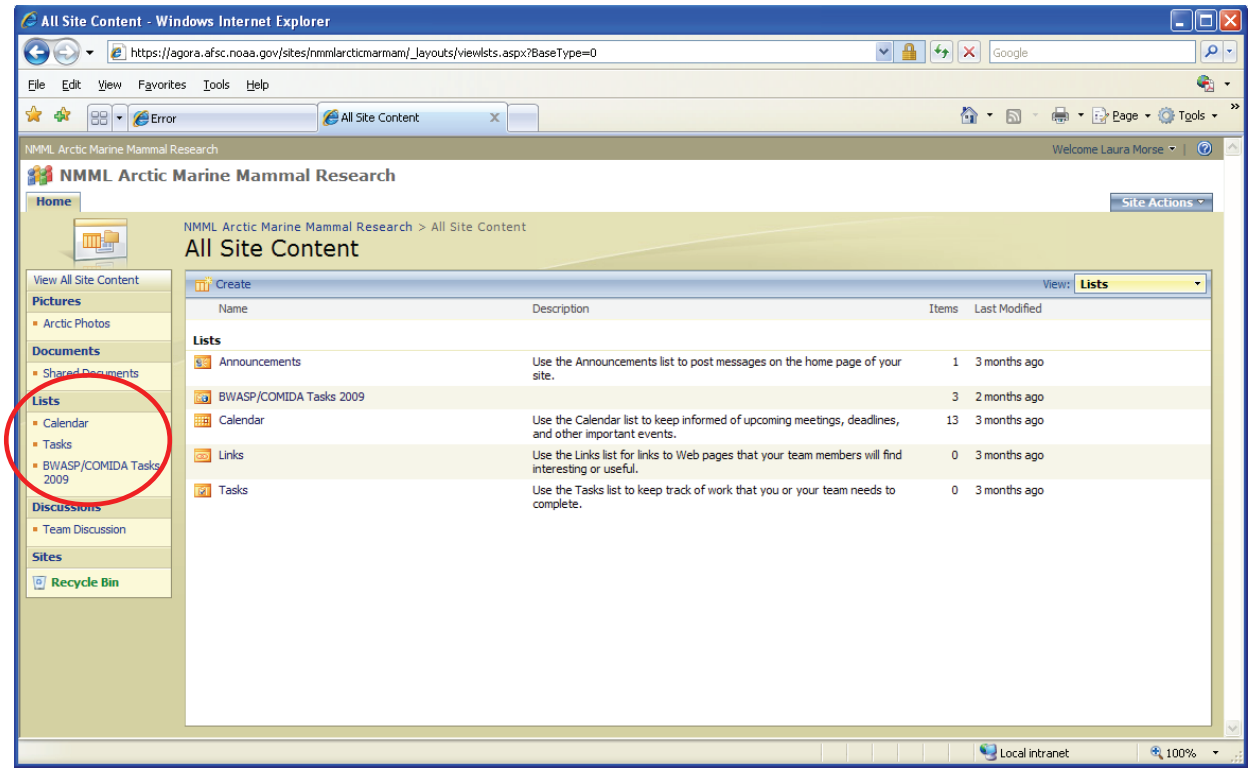
a) **Pictures**: Share relevant images (useful for reports, etc.).



b) **Documents**: Includes Shared Documents, which is the main folder for BWASP and COMIDA data (discussed below).



c) **Lists**: Used for organizational purposes.



d) **Discussions**: Not currently in use.

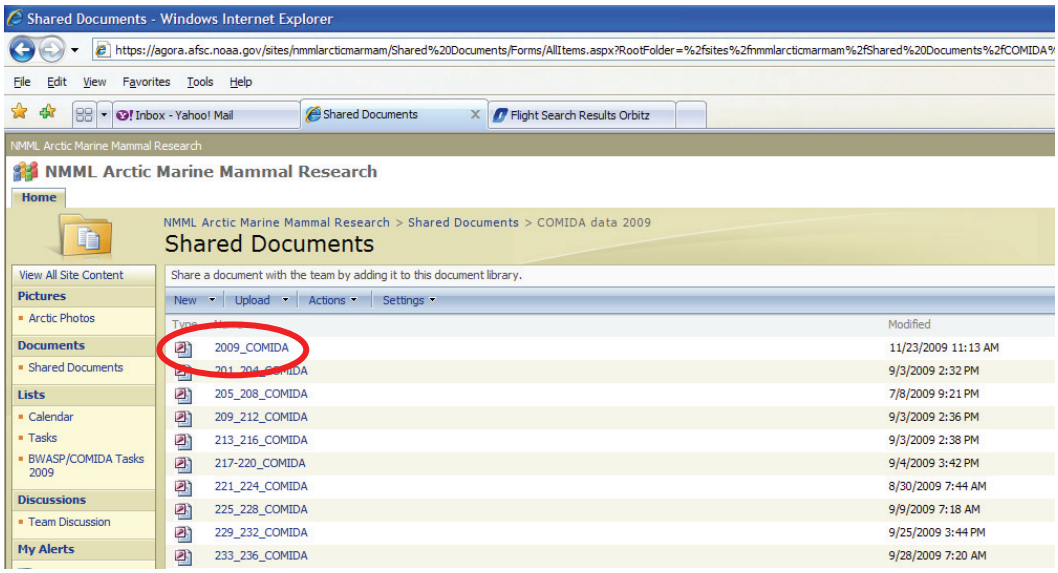
e) **Sites**: Not currently in use.

Uploading Data via IE

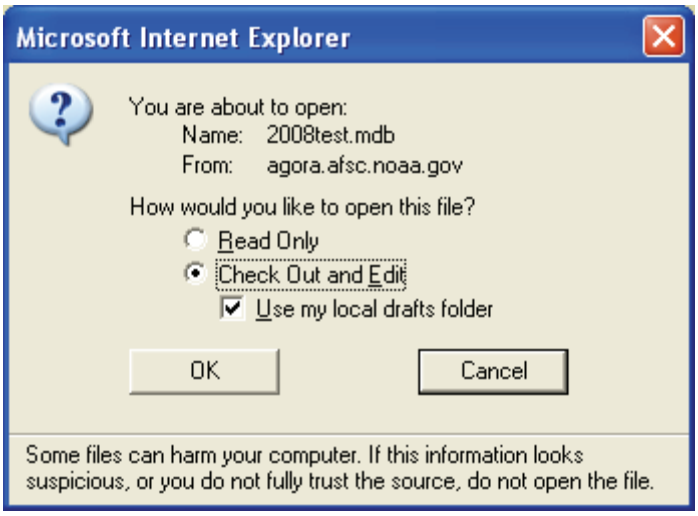
After a flight and before edits are made to the flight data**, the Field Data Manager or Team Leader will upload the newest flight data to the appropriate Master Access file, located in the **Shared Documents** folder on SharePoint. The COMIDA Master Access database is in the **COMIDA data 2010** folder and the BWASP Master Access database is in the **BWASP data 2010 folder**. One table (**Flight #**) and two records of data (one each from **SummaryInfo** and **FlightInfo** tables) will be uploaded. The upload is limited to this table and specific records to ensure that the Master Access file on SharePoint (and all versioning) is not overwritten by a new Access file.

Upload/amend the master file as follows:

1) Open the appropriate survey data folder (**BWASP data 2010** or **COMIDA data 2010**) on SharePoint. There are 2 ways to do this:
    a) **Double click** on the Master Access mdb file.

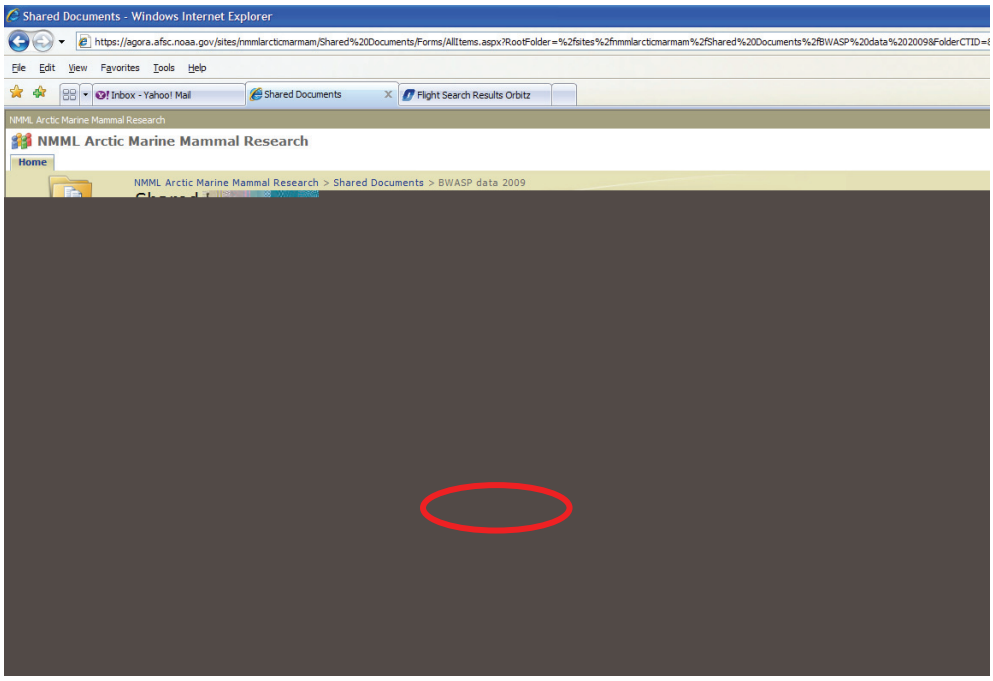


The following window will open. Select **Check Out and Edit**, with **Use my local drafts folder** checked. Hit **OK**.

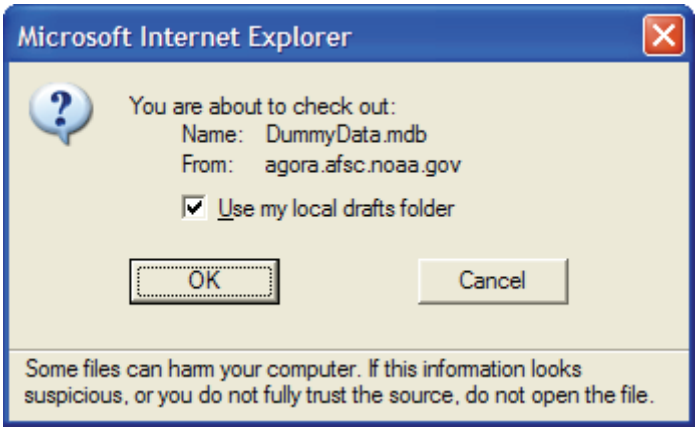


OR:

b) Click on the drop down menu to the right of the file name and select **Check Out**.



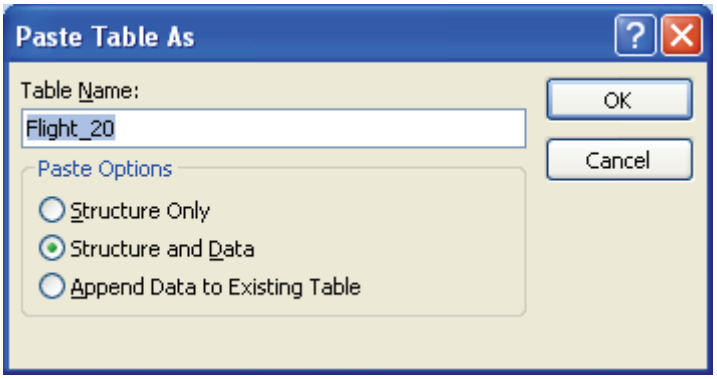
The following window will open. Check **Use my local drafts folder** and hit **OK**.



2) The Master Access file on SharePoint will open automatically and be saved temporarily in the local SharePoint Drafts folder on the laptop (please consult with the primary data manager for help locating this folder if you have problems).

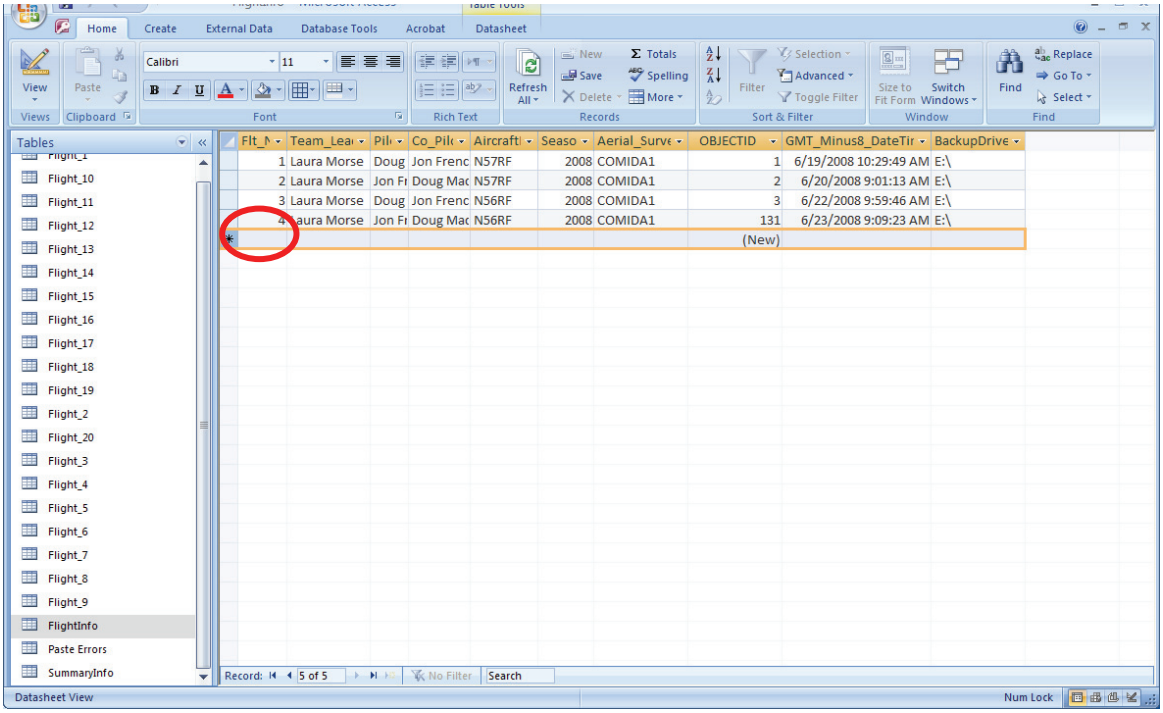
3) Open the working (field) Access file and select the **Flight Table** to be added to the Master Access file on SharePoint. Hit **Ctrl + C (copy)** or **right mouse click** and select **Copy**.

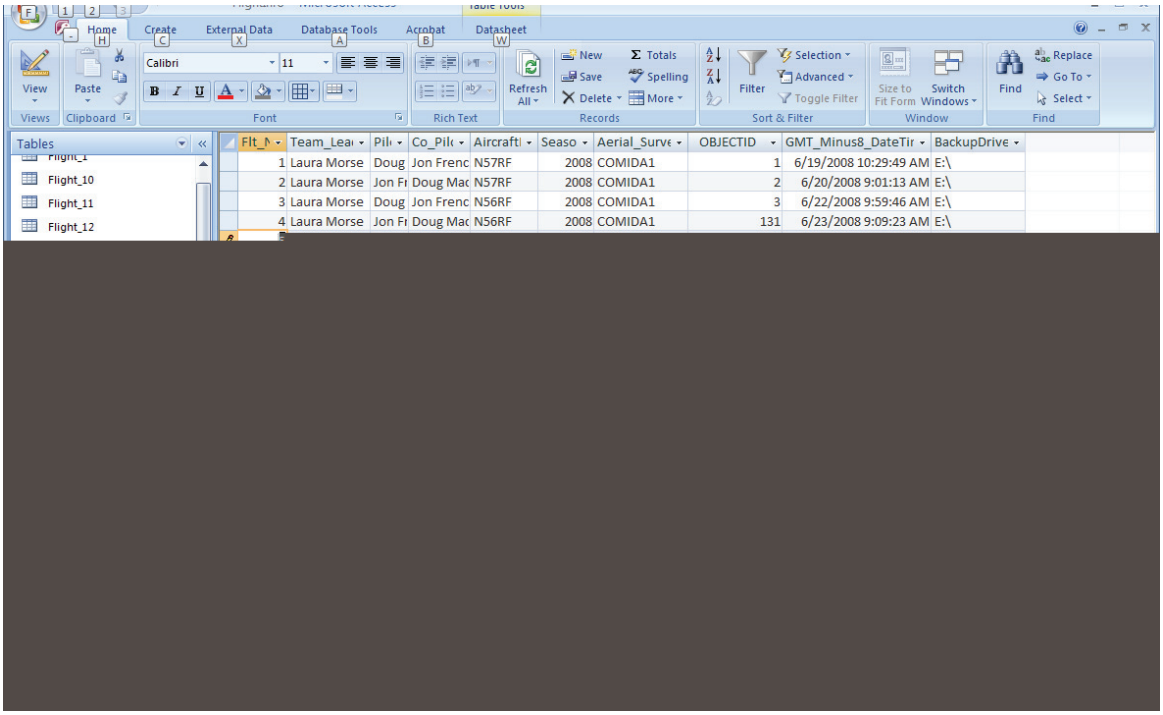
4) Go back to the Master Access file in the SharePoint drafts folder, and, in the upper left margin under the Tables navigation pane, **right mouse click** and select **Paste.** The following screen prompt will pop up. Select **Structure and Data** and click **OK**.



5) In the working (field) Access file, open the **FlightInfo Table**, select the last entry (flight data for that day), then copy using **Ctrl + C (copy)** <u>or</u> **right mouse click** and select **Copy**.

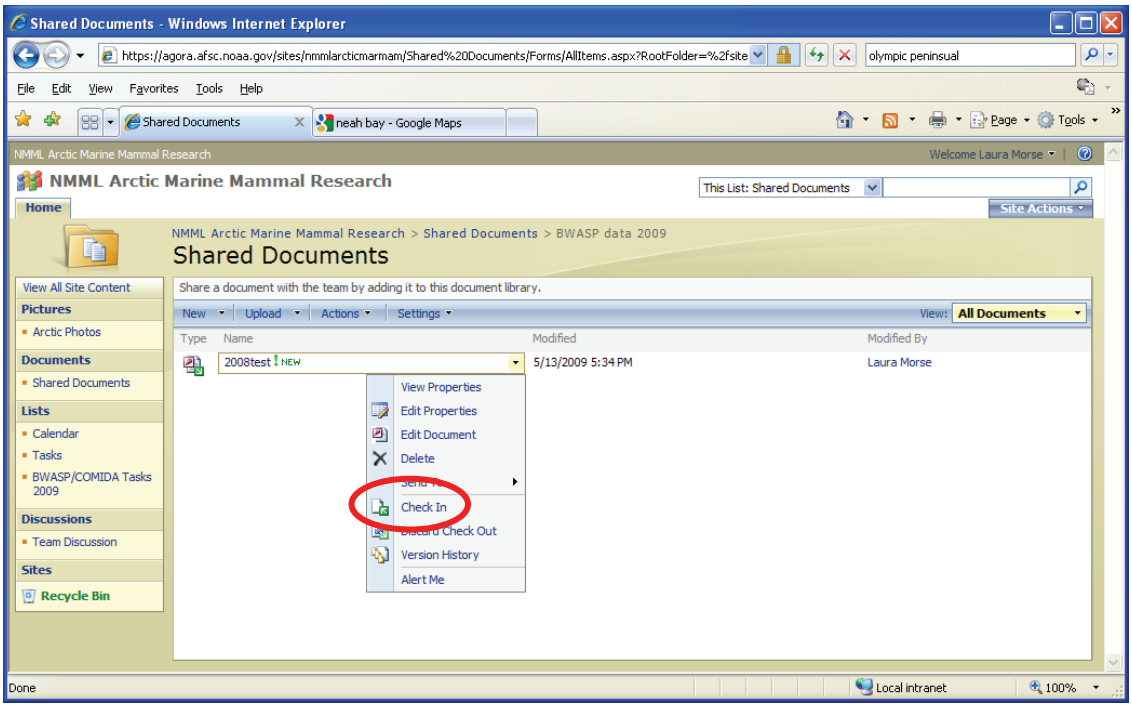
6) Go back to the Master Access file in the SharePoint drafts folder, open the FlightInfo Table, and select the last blank row denoted with an asterisk. Hit **Ctrl + V** (**paste**) <u>or</u> **right mouse click** and select **Copy**.





7) Go back to step 5 and repeat for data in the **SummaryInfo Table**.

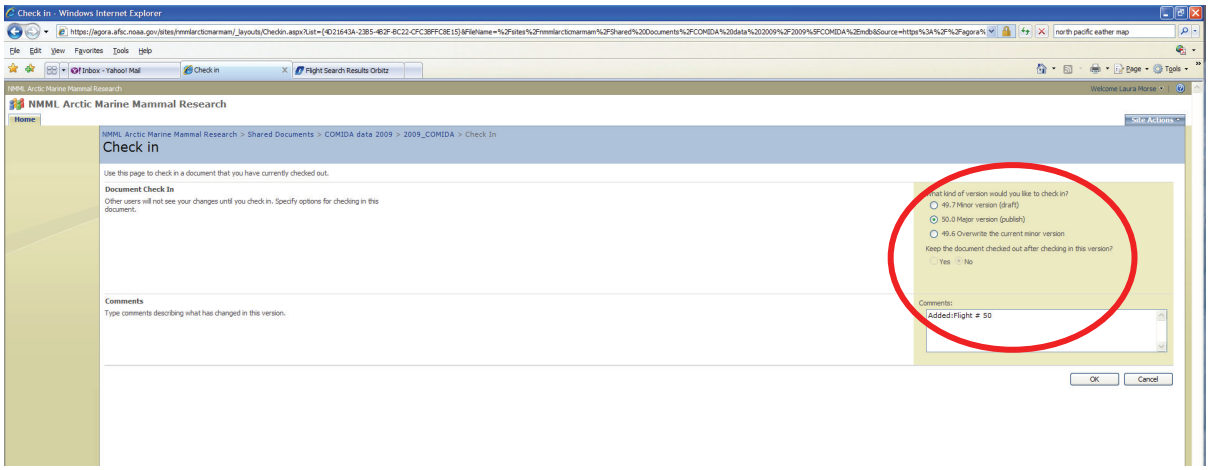
8) After the daily **Flight Table** has been added and the **FlightInfo** and **SummaryInfo** Tables have been updated in the Master Access file in SharePoint drafts folder, close the Master Access file and upload it from the SharePoint Drafts folder back to SharePoint. To do this, go to the SharePoint window and click on the drop down menu of the Master Access file and select **Check In**.



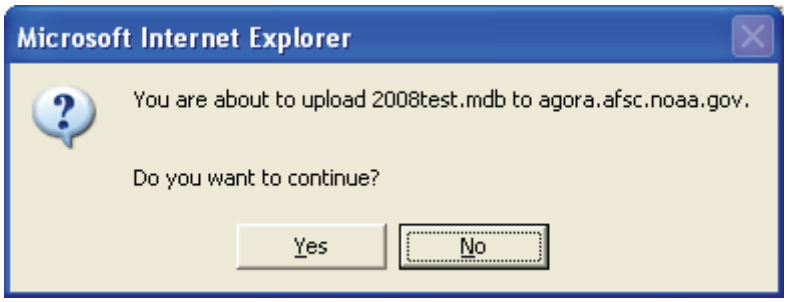
9) In the window that appears, select **Major version** because the upload includes a new flight table. Versioning choices are as follows:

<u>Minor versions</u> will be used for **edits** made **to existing tables** of the Master file. These will be designated as decimals (x.1, x.2, etc.).
<u>Major versions</u> will be used when **new flight tables** are added. These will be designated as whole numbers (1.x, 2.x). *If done correctly, the flights should correspond to a version number (i.e. Flight 1 = version 1.0, Flight 2 = version 2.0), so please be careful when designating versions!*
<u>Overwrite</u> ***DO NOT USE!!!!*** We want to track all changes made.
Check **NO** on keeping the document checked out**.**

<u>Comments</u> - Note all changes that were made to the file (e.g., "Flight 2 has been added to the file" or "The following edits have been made to Flight 2"). The Program Manager will advise during the season on how specific these comments should be. The objective is to track how data is edited throughout the season, and when and why changes were made.

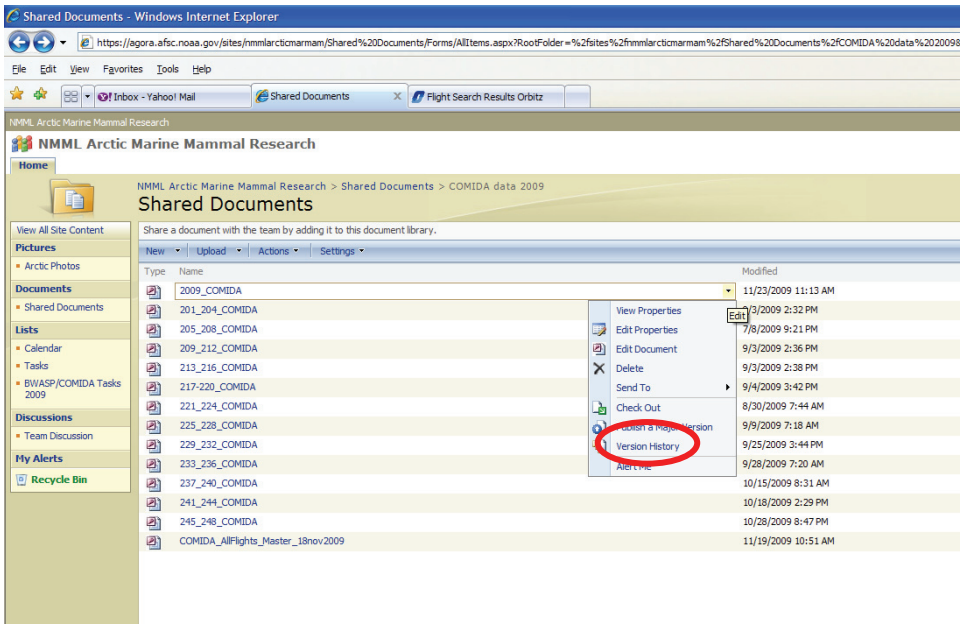


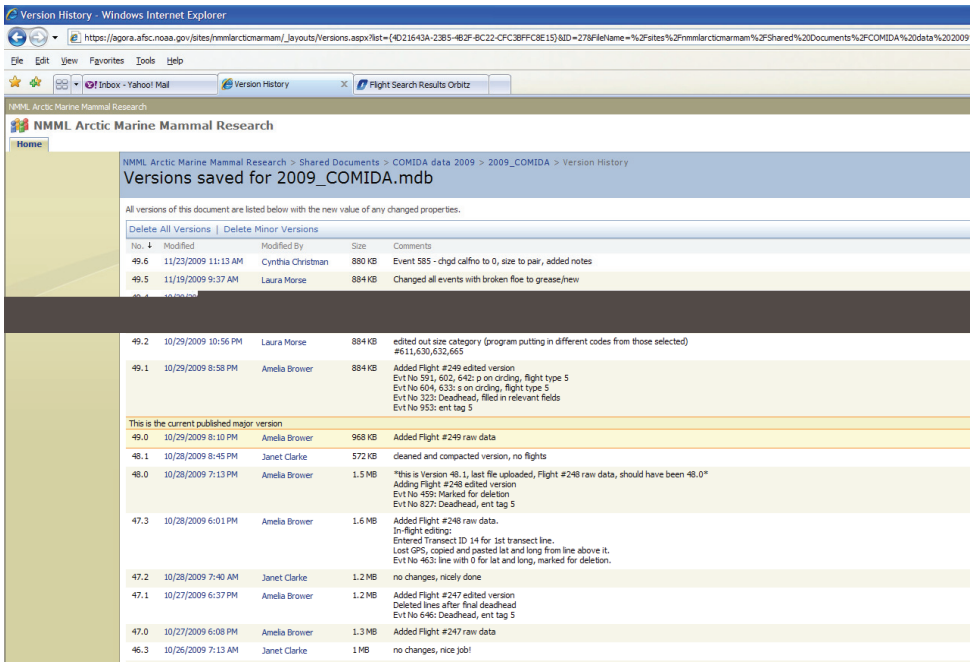
Click **OK**. When prompted to upload the document, hit **Yes**. The document is now checked back in.



10) The file in the SharePoint Drafts folder should disappear after uploading.

11) To confirm that the file versioning is correct, click on the drop down menu of the Master Access file and select **Version History**. A list of all file versions will open. Check that the version number (major/minor) is correct. The size of the file should have changed as well.


Shared Documents - Windows Internet Explorer
https://agora.afsc.noaa.gov/sites/nmmlarcticmarmam/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fsites%2fnmmlarcticmarmam%2fShared%20Documents%2fCOMIDA%20data%2020098
File Edit View Favorites Tools Help
Inbox - Yahoo! Mail
Shared Documents
Flight Search Results Orbitz
NMML Arctic Marine Mammal Research
NMML Arctic Marine Mammal Research
Home
NMML Arctic Marine Mammal Research > Shared Documents > COMIDA data 2009
Shared Documents
View All Site Content
Pictures
Arctic Photos
Documents
Shared Documents
Lists
Calendar
Tasks
BWASP/COMIDA Tasks 2009
Discussions
Team Discussion
My Alerts
Recycle Bin
Share a document with the team by adding it to this document library.
New
Upload
Actions
Settings
Type
Name
Modified
2009_COMIDA
11/23/2009 11:13 AM
201_204_COMIDA
205_208_COMIDA
209_212_COMIDA
213_216_COMIDA
217-220_COMIDA
221_224_COMIDA
225_228_COMIDA
229_232_COMIDA
233_236_COMIDA
237_240_COMIDA
241_244_COMIDA
245_248_COMIDA
COMIDA_AllFlights_Master_18nov2009
View Properties
Edit Properties
Edit Document
Delete
Send To
Check Out
Version History
Edit
9/3/2009 2:32 PM
7/8/2009 9:21 PM
9/3/2009 2:36 PM
9/3/2009 2:38 PM
9/4/2009 3:42 PM
8/30/2009 7:44 AM
9/9/2009 7:18 AM
9/25/2009 3:44 PM
9/28/2009 7:20 AM
10/15/2009 8:31 AM
10/18/2009 2:29 PM
10/28/2009 8:47 PM
11/19/2009 10:51 AM


Version History - Windows Internet Explorer
File Edit View Favorites Tools Help
Inbox - Yahoo! Mail
Version History
Flight Search Results Orbitz
NMML Arctic Marine Mammal Research
NMML Arctic Marine Mammal Research
Home
NMML Arctic Marine Mammal Research > Shared Documents > COMIDA data 2009 > 2009_COMIDA > Version History
Versions saved for 2009_COMIDA.mdb
All versions of this document are listed below with the new value of any changed properties.
Delete All Versions | Delete Minor Versions
No. Modified Modified By Size Comments
49.6 11/23/2009 11:13 AM Cynthia Christman 880 KB Event 585 - chgd calfno to 0, size to pair, added notes
49.5 11/19/2009 9:37 AM Laura Morse 884 KB Changed all events with broken floe to grease/new
49.2 10/29/2009 10:56 PM Laura Morse 884 KB edited out size category (program putting in different codes from those selected) #611,630,632,665
49.1 10/29/2009 8:58 PM Amelia Brower 884 KB Added Flight #249 edited version Evt No 591, 602, 642: p on circling, flight type 5 Evt No 604, 633: s on circling, flight type 5 Evt No 323: Deadhead, filled in relevant fields Evt No 953: ent tag 5
This is the current published major version
49.0 10/29/2009 8:10 PM Amelia Brower 968 KB Added Flight #249 raw data
48.1 10/28/2009 8:45 PM Janet Clarke 572 KB cleaned and compacted version, no flights
48.0 10/28/2009 7:13 PM Amelia Brower 1.5 MB *this is Version 48.1, last file uploaded, Flight #248 raw data, should have been 48.0* Adding Flight #248 edited version Evt No 459: Marked for deletion Evt No 827: Deadhead, ent tag 5
47.3 10/28/2009 6:01 PM Amelia Brower 1.6 MB Added Flight #248 raw data. In-flight editing: Entered Transect ID 14 for 1st transect line. Lost GPS, copied and pasted lat and long from line above it. Evt No 463: line with 0 for lat and long, marked for deletion.
47.2 10/28/2009 7:40 AM Janet Clarke 1.2 MB no changes, nicely done
47.1 10/27/2009 6:37 PM Amelia Brower 1.2 MB Added Flight #247 edited version Deleted lines after final deadhead Evt No 646: Deadhead, ent tag 5
47.0 10/27/2009 6:08 PM Amelia Brower 1.3 MB Added Flight #247 raw data
46.3 10/26/2009 7:13 AM Janet Clarke 1 MB no changes, nice job!

Editing Data and Resummarizing Data via IE

If additional edits are required to the flight data, follow the steps above to edit flight data, however, select **Minor version** with each uploaded edited version instead of major version (see step 9 above). Check the versioning history as described above to be sure comments and version numbers are as expected. Depending on the edits made, file size may also change.

If the editing process necessitates that the data be resummarized using the BWASP_Tool, copy the edited Master Access file (**2010_COMIDA.mdb** or **2010_BWASP.mdb)** into the **C:\BWASPTools\data** folder (a shortcut to this folder is located on the project laptop) and run the summary for the edited flight via the BWASP Survey Tool program before uploading the edited file. This step updates the **SummaryInfo** Table located in the Master Access file for the edited flight, which is information required for the Daily Report.

If SharePoint is Not Accessible

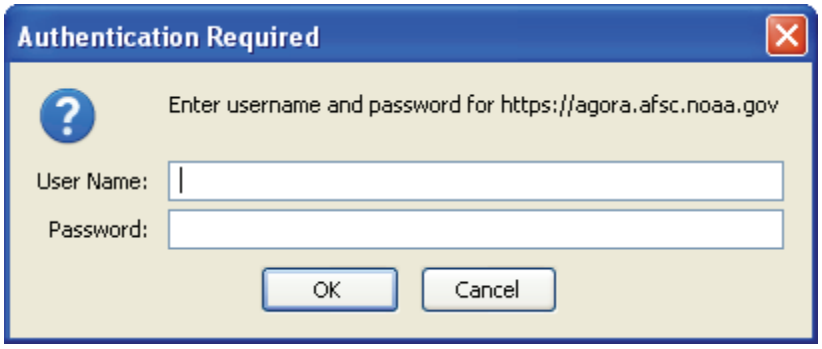
In the event that SharePoint is not available due to network or remote access problems, data files will be emailed back and forth to the Program Manager. File naming will follow the versioning history. For example, **2010_BWASP_v11.1.mdb** corresponds to BWASP Flight 11, minor version 1. When SharePoint becomes available, then files can be uploaded.

II. Mozilla Firefox (MF)

Mozilla Firefox requires a different approach to accessing files, but many of the same principles apply. Familiarity with the first part of this Section, including the rationale behind data versioning and saving of files, is important.

Opening SharePoint via MF

1) Go to the following website address:
   https://agora.afsc.noaa.gov/sites/nmmlarcticmarmam
2) The following screen will appear. Enter user name and password.

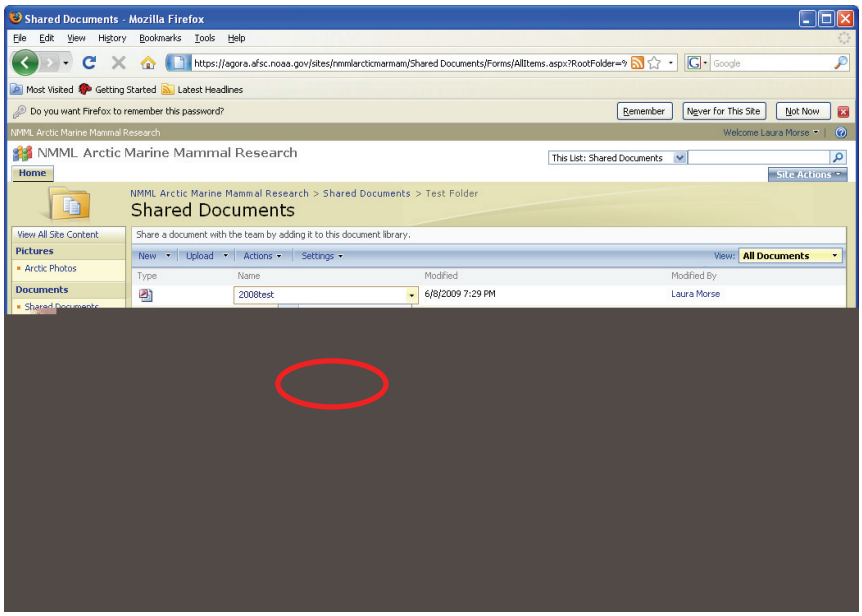


3) Refer to the Internet Explorer Section for Navigating SharePoint.

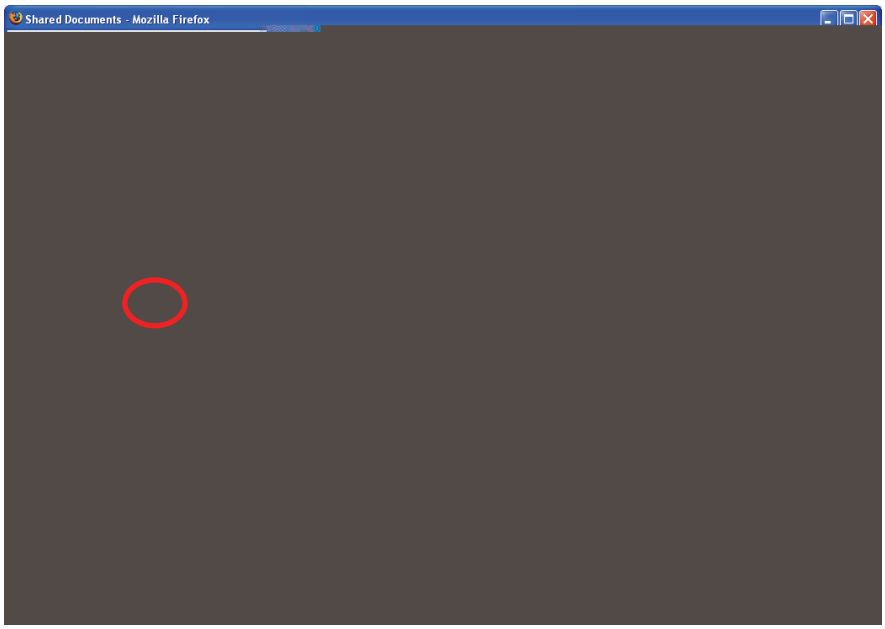
Uploading Data via MF

1) Open the appropriate survey data folder (**BWASP data 2010** or **COMIDA data 2010**) in the **Shared Documents** folder on SharePoint.

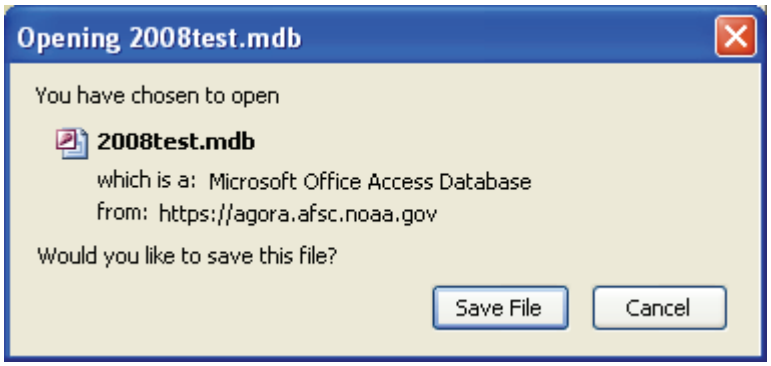
2) Click on the drop down arrow to the right of the Master Access file and select **Check Out**.



3) A document that is checked out will be indicated as such by a small green arrow in the lower right corner of the file icon.



4) Double click on the document. In the window that appears, select **Save File**, and save to the desktop for ease of locating. *Be sure you do this step **after** you have checked out the document!!!!*

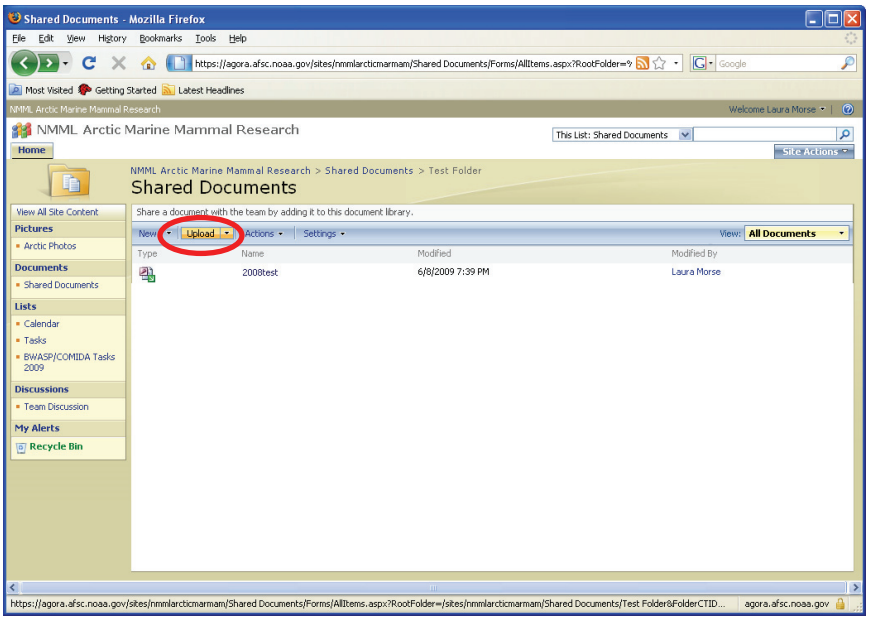


5) Open the Master Access file that was saved to the desktop.

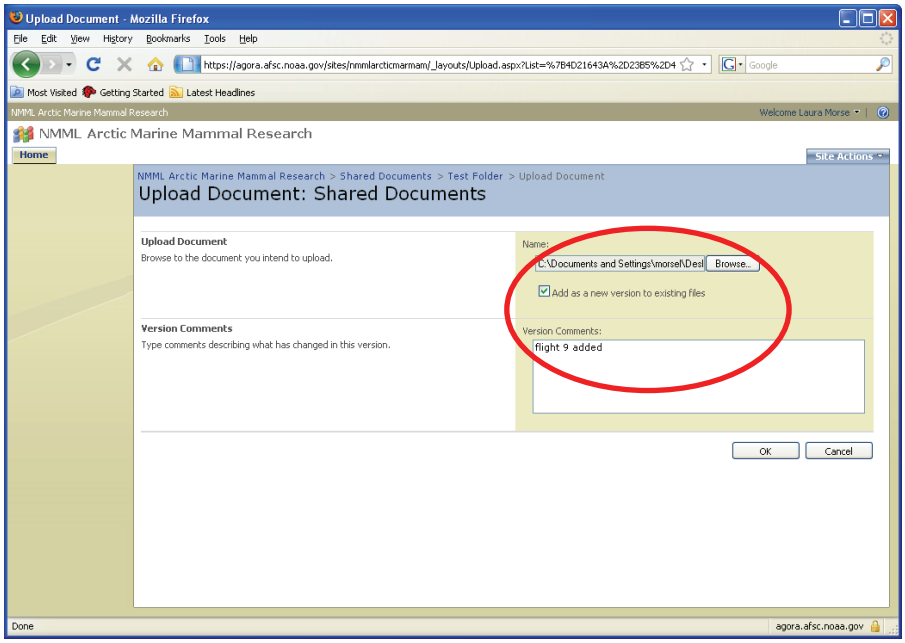
6) Open the working (field) Access file and select the **Flight Table** to be added. Hit **Ctrl + C (copy)** <u>or</u> **right mouse click** and select **Copy.**

7) Follow steps 4 through 7 in the Internet Explorer part of this Section to add the flight table and new records to the **FlightInfo** and **SummaryInfo** tables in the Master Access file.

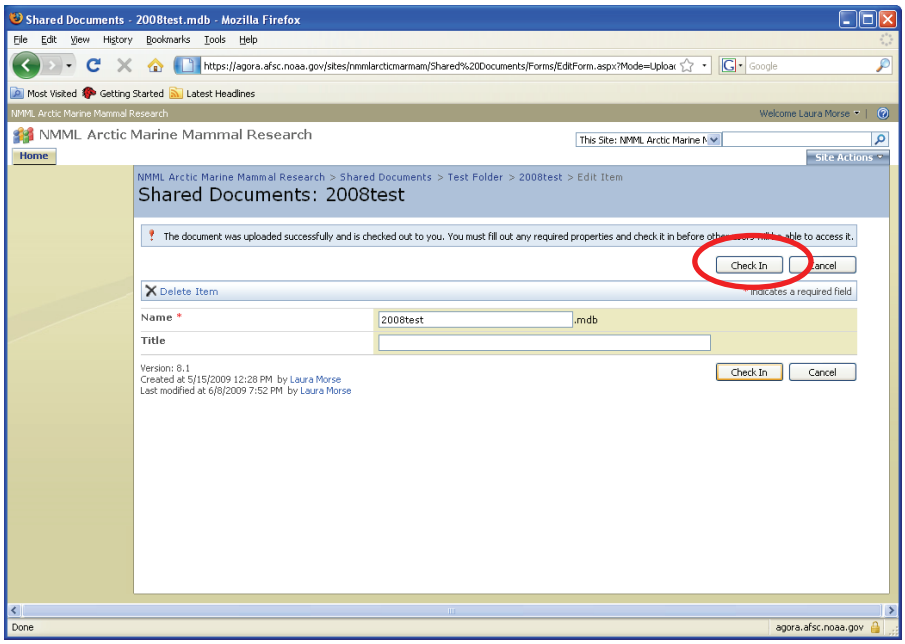
8) When the **Flight Table** has been added and the **FlightInfo** and **SummaryInfo** Tables have been updated in the Master Access file, close that file and upload it back to SharePoint. Click on the **Upload** button along the top menu bar and then **Upload Document**.



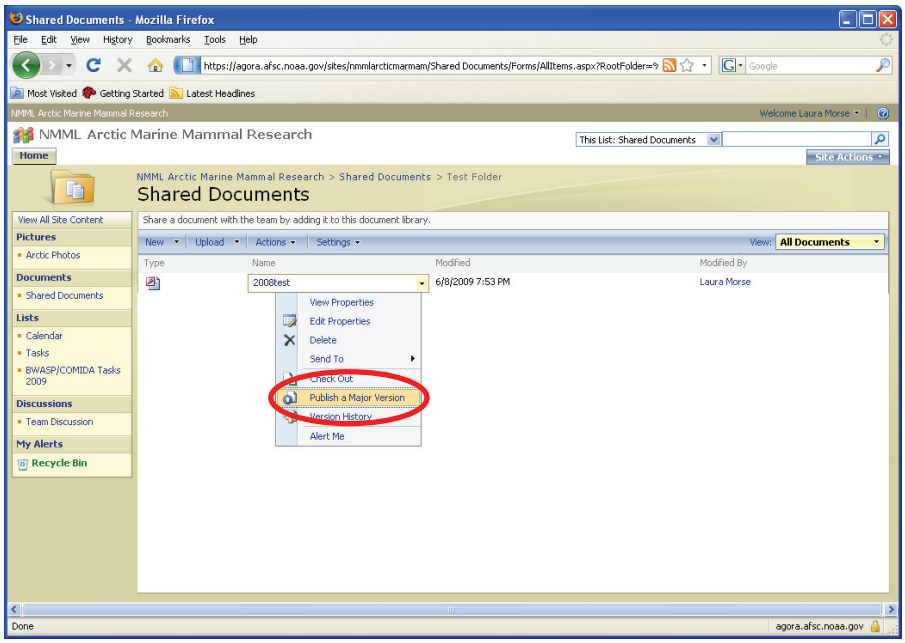
9) Click **Browse** and locate the edited document located on the laptop computer. Make sure that "**Add as new version to existing file**" is checked. Add version comments as needed (e.g., flight # added, etc.) and click **OK**.



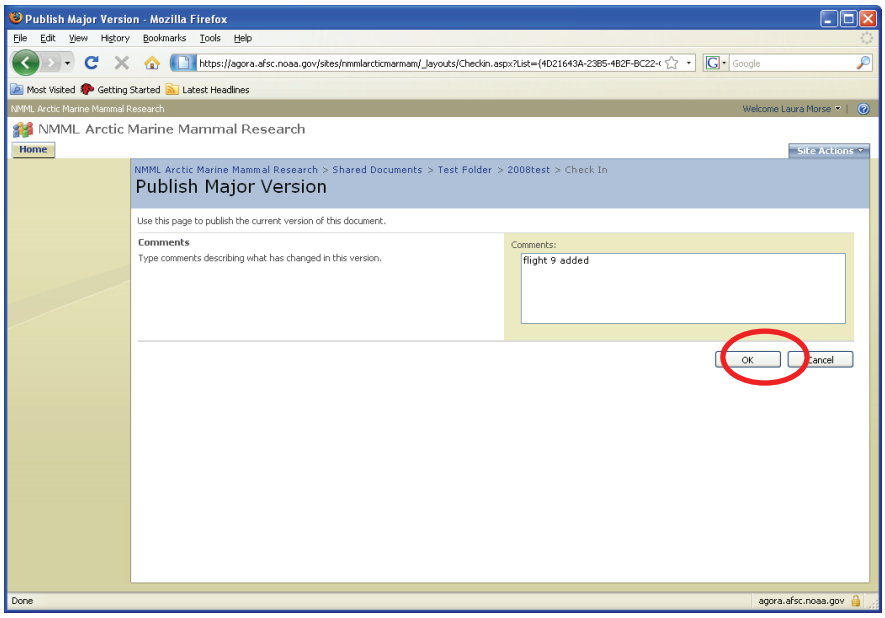
10) Click **Check In** on the next screen. No further information should be entered.



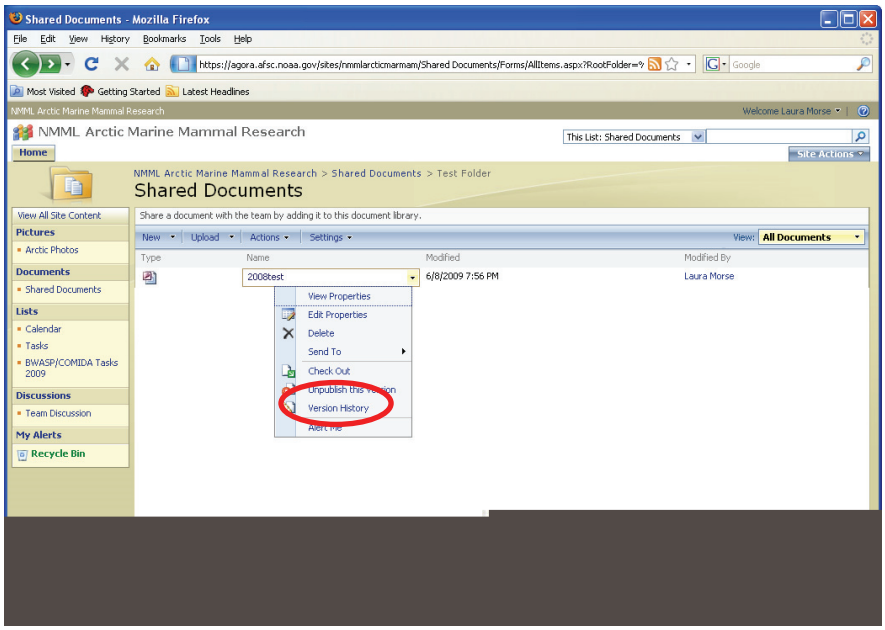
11) The document needs to be published as a Major version. Click the drop down arrow to the right of the file name and select **Publish a Major Version**.



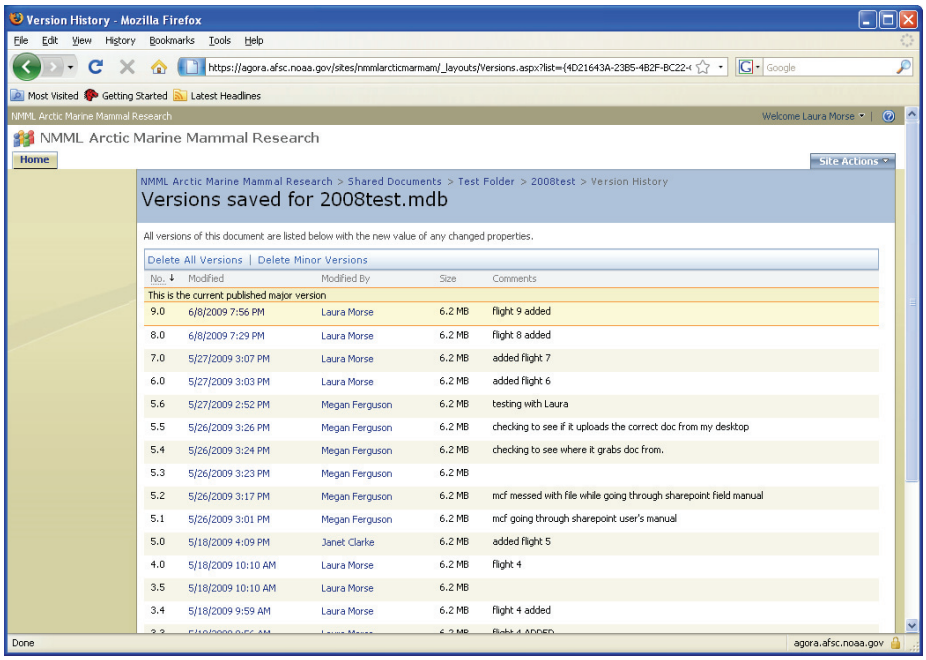
12) Click **OK**.



13) Click on the right drop down arrow and select **Version History.**



14) Verify that the latest version is correctly numbered to match the flight number added. The file size should change as well.



15) **Delete** the Master Access file that was downloaded to the laptop from SharePoint.

Editing Data and Re-summarizing Data via MF

Follow the steps as for using Internet Explorer to edit flights, but **do not create major versions**. Do look at the versioning history as described in step 11 to ensure that comments and version numbers are correct. Depending on the edits made, the file size should typically change as well.

If the editing process necessitates that the data be resummarized using the BWASP_Tool, copy the edited Master Access file (**2010_COMIDA.mdb** or **2010_BWASP.mdb)** into the **C:\BWASPTools\data** folder (a shortcut to this folder is located on the project laptop) and run the summary for the edited flight via the BWASP program before uploading the edited file. This step updates the **SummaryInfo** Table located in the Master Access file for the edited flight, which is information required for the Daily Report.

If SharePoint is Not Accessible via MF

Use the same procedures as for Internet Explorer.

VII. COMIDA/BWASP Daily Weather Check and Reporting

Introduction

Weather data is important for several reasons, including incorporation into annual reports as well as more in-depth analyses that may occur in the future.

Duties include:

1. Saving (as pdf or html) basic weather information pages
2. Compiling files into a single document and sending to the Program Manager periodically during the season.

What to Save

Files should be saved to folders using structure such as: **BWASP/Month/Day** or **COMIDA/Month/Day.** The Weather Data Manager(s) will be responsible for compiling weather and environmental information each day of the COMIDA and BWASP field seasons, regardless of whether or not a survey flight is undertaken. Once all files are saved, the COMIDA2010StationWeather or BWASP2010StationWeather Excel spreadsheet should be filled in. This spreadsheet will include all months of the survey season. It can be found on the desktop of the project laptop and should be transferred back to the project laptop when the Weather Data Manager leaves. The spreadsheet should be backed up periodically to Sharepoint.

1. Airport Observations

Source: Alaska Aviation Weather Unit website, http://aawu.arh.noaa.gov/

What: Save selected stations in 24 to 48 hour increments. Weather data should be saved as **STNID_DayMonthYear. pdf** or **html ,** <u>every day</u> of the active season, even mandatory pilot rest days or aircraft maintenance days. This can be done at the end of the day, as most stations display data for the previous 48 hours. This information <u>does not need to be printed</u>.

a. Beaufort region – weather reports should be obtained from Kaktovik (PABA), Deadhorse (PASC), Kuparak (PAKU), Alpine (PALP) and Barrow (PABR)
b. Chukchi region – weather reports should be obtained from Barrow (PABR), Wainwright (PAWI), Pt. Lay (PPIZ), Lisburne (PALU), and Pt. Hope (PAPO).

Frequency: A weather table should be populated with basic information from these observation reports (Table 6). This should be filled in, at minimum, three times a day (morning, afternoon, and end of day) for the major stations (Barrow, Deadhorse, Kaktovik, Pt. Lay, Wainwright), as possible. This table will be used for a "quick look" review of seasonal weather. This can be a running table; subsequent days can be added onto the end of the table. The Team Leader will advise on additional "opportunistic" data to be added to the

table as it is available, e.g., pilot/survey team/ship reports. The e-table should be sent to the Project Manager every three weeks.

2. Forecast Surface Map

Source: Located on the bottom of the AAWU page, http://aawu.arh.noaa.gov/
What: Click to open, then right click to save the forecast surface map as **sfc.DayMonthYear.gif.** Save to the appropriate Month/Day folder.
Frequency: Once per day

3. Hourly Weather Bookmark

Source: http://aawu.arh.noaa.gov/Sigwx.php
What: Open the **Northern Alaska (1:6 million)** link. Right click and save the image as **NOAK6.DayMonthYear.**
Frequency: Once per day, and is best to grab in the morning. This provides a visual snapshot of the weather conditions for the entire survey region.

4. POES Polar Satellite-Radar Images

Source: http://www.arh.noaa.gov/poes.php
What: Scroll down to **ACF -Visual 1280x1024** Image, open, right click and save as **GOES-V.DayMonthYear.** Do the same for **ACF-Infrared 1280x1024** and save as:**GOES-IR.DayMonthYear**
Frequency: Once per day.

5. MODIS Images

Source: http://rapidfire.sci.gsfc.nasa.gov/subsets/?subset=AERONET_Barrow
What: Select **MODIS AQUA True color/500m**, and download **JPG image with ancillary files (.zip).** *Do not alter the filename!!* This data may be used to plot "real-time" sightings with ice imagery.
Frequency: Once per day. Only one image is generated per day, and the images are archived and retrievable on the website.. Note that the files are numbered in a Julian calendar format which means days of the year are sequentially numbered.

6. Sea Ice Analysis and Sea Surface Temperature Maps

Source: http://pafc.arh.noaa.gov/ice.php

What: This page includes links to **Sea Ice Analysis** and **Sea Surface Temperature Analysis.** Open each, right click and save as a PNG image: **SeaIce.DayMonthYear.png** or **SST.DayMonthYear.png.** If unable to save as a .png file, save as a web archive file.

Frequency: These do not update on a daily basis, so it is not necessary to check every day; check regularly to retrieve all available updates.

7. NDBC-Station PRDA2 Buoy (BWASP ONLY)

Source: http://www.ndbc.noaa.gov/station_page.php?station=prda2

What: Right click and save as a **Web Archive, single file (*mht)** or other file type such as .pdf if you have the capability.

Frequency: Best saved at the end of the day, so that data for the entire day are available.

Weather Websites of Interest (in no particular order)

General:

http://pafc.arh.noaa.gov/marfcst.php - National Weather Service Forecast Office out of Anchorage, AK, for Alaska Region Marine Zones. Primarily for forecasted winds.

http://aawu.arh.noaa.gov/ - National Weather Service Alaska Aviation Weather Unit. Click on yellow polygon across the north slope to view current weather as reported from several airports (also shows where alternate strips are for landing in inclement weather). This is also a good site to find IFR/VFR conditions and icing levels. In the left legend under Map Data, select Hourly Depiction Charts or Graphic Area Forecast.

http://www.arh.noaa.gov/wmofcst.php?wmo=FPAK51PAFG&type=public – National Weather Service, Alaska Region Headquarters forecasts, including aviation and marine forecasts.

http://pafg.arh.noaa.gov/ - National Weather Service, Fairbanks, AK – map of current hazards including marine.

http://www.wunderground.com – Weather Underground website, general weather.

http://www.sunrisesunset.com/usa/Alaska.asp - provides information on sunrise and sunset for several locations in Alaska; especially useful in late fall when daylight is dropping by ~1.5 hrs/wk.

http://www.athropolis.com/map2.htm - Arctic site with links to current weather for several sites as well as other fun Arctic stuff.

http://www.buoyweather.com/index.jsp - Buoyweather website by region, scroll over United States and click on Alaska for a "virtual buoy" report, based on model predictions using wave height, wave direction, wind speed, and wind direct data extracted from NOAA. Useful for remote areas where there are few real buoys.

http://www.ndbc.noaa.gov/station_page.php?station=PRDA2 – National Data Buoy Center, home page of PRDA2, which is a weather station located at the desalinization plant northwest of Deadhorse. Excellent info for current and recent winds.

http://climate.gi.alaska.edu/ - Alaska Climate Research Center includes links to Alaska weather conditions and forecasts, as well as links to hydrologic and sea ice information.

http://pafc.arh.noaa.gov/ice.php?img=sst - National Weather Service forecast office – map of sea surface temperatures.

http://www.gi.alaska.edu/snowice/sea-lake-ice/barrow_webcam.html - University of Alaska Fairbanks, Floating Ice Group – cool ice-related stuff out of Barrow and elsewhere.

http://adds.aviationweather.noaa.gov/metars/index.php - Aviation Digital Data Service – provides METARs and TAFs in translated form for any airport.

Sea Ice Websites

ftp://polar.ncep.noaa.gov/pub/history/ice/alaska - daily constructed images of sea ice extent in GIF format.

http://pafc.arh.noaa.gov/ice.php - NWS ice desk page.

http://rapidfire.sci.gsfc.nasa.gov/ - files/images from the MODIS satellite for use in ArcMap. The protocol for this is in prep.

http://nsidc.org/data/seaice/ - another potential ice data source.

http://polar.ncep.noaa.gov/seaice/Analyses.html - MMAB Sea Ice Analysis Page – click on Alaska Region Sea Ice to get a view of latest ice concentrations from passive microwave sensors.

http://www.nersc.no/Seaice_archive/background.php - Nansen Environmental and Remote Sensing Center archived sea ice info.

http://www.arctic.noaa.gov/detect/ice-seaice.shtml - NOAA Arctic Change website with info on Ice and sea ice.

http://www.gi.alaska.edu/snowice/ - University of Alaska Fairbanks snow, ice and permafrost website

http://www.gi.alaska.edu/~eicken/he_teach/GEOS615icenom/form/types.html - University of Alaska Fairbanks website of ice nomenclature.

NOTE: If you locate any newer/additional ice data products please let the Project Manager or Team Leaders know.

Additional websites of interest:

Chlorophyll:
http://oceancolor.gsfc.nasa.gov/PRODUCTS/chlo.html

SST:
http://www.weather.gov/gis/shapepage.htm

VIII. COMIDA/BWASP Field Reports

Introduction

Multiple field reports are required during the season. The process for summarizing and distributing information from COMIDA/BWASP on a regular basis is described below.

Daily Report

The Daily Report is the principal means by which BWASP and COMIDA results are dispensed during the field season. A Daily Report (Figure 5) is required by Interagency Agreements to be posted to the web within 24 hours of the completion of each flight for COMIDA and within 48 hours of the flight for BWASP. The Team Leader is responsible for submitting the draft Daily Report to the Program Manager (or designee) within ~4-5 hours of the flight ending. The Daily Report has been automated as much as possible so that it is not a burden for the Team Leader to develop on a daily basis.

The review process is extensive and begins with the Project Manager or Project Coordinator, but there are several additional levels of review before the Daily Report is approved for distribution via the AFSC website (Figure 6). Therefore, every effort should be made to meet the established field deadline (<5 hours). Delays due to flight processing, late return to base, or computer/internet technical issues are always a possibility. In the event of delays to the Daily Report, the Program Manager or designee should be alerted by email or phone. This will be especially important in situations of unusual sightings or circumstances (e.g., many bowheads seen near seismic activity, large numbers of whales feeding in a small area, large walrus haulouts, etc.). In those cases, the Team Leader should be ready to relay information, via phone or email, to the Program Manager who will in turn phone MMS (Chuck Monnett) and NMFS (Brad Smith) representatives with the pertinent information. A follow-up email to Monnett, Smith, Robyn Angliss and Phil Clapham will also occur.

On days when no flights are conducted, a Daily Report shall still be prepared and should indicate the reason why no surveys were flown (e.g., high winds, fog, or aircraft problems).

Daily Reports will be posted on the AFSC NMML website: http://www.afsc.noaa.gov/nmml/cetacean/bwasp/index.php.

<u>Text for Daily Report</u>:

On days when aerial surveys are conducted, a report shall be prepared containing a brief text description of what happened on that day. As shown in Figure 5, the text will include:

- comments describing the survey area flown (such as, "Transects 1, 3 and 5, complete and a coastal transect from Wainwright to Barrow" or "Blocks 1 and 2, westernmost half"),

- number of hours flown,
- number of hours on systematic transect survey effort,
- number of bowhead whales seen, and number of bowhead cow/calf pairs,
- general information on weather and visibility,
- all species sighted plus other relevant information on unusual sightings (e.g., humpback whales) or unusual circumstances (e.g., many bowheads seen near seismic activity, or large numbers of whales feeding in a small area, large walrus haulouts on land).

The text should not identify vessel numbers or locations, as industrial activity has been interpreted by the Alaska OCS Region, MMS to constitute proprietary data. Vessels that should be listed are if whalers or subsistence hunters in boats were out and transects had to be truncated around them to avoid impacts.

Properties for Daily Report:

Properties on Daily Report should be:
Title: Project Name Flight # - Daymonthyear (eg., BWASP Flight 1 – 1September2009)
Subject: Bowhead Whale Aerial Survey
Author: National Marine Mammal Lab

No other properties should be filled in.
In Word 2007, these properties can be set/changed by doing the following:

- Click on the red/yellow/green/blue "Office Button" icon at the very top left corner of the MS Word window
  - Select "Prepare"
    - Select "Properties"
      - Edit the properties

Daily Flight Summary Table, Sighting Table and Sighting Map:

Data tables and flight maps are produced automatically by the MMS Survey Data Collection Program (see Sections III and V) and are designed to be included in the Daily Report.

Photographs

A relevant photograph can be added to the end of the Daily Report with appropriate **photographer/agency/permit number** credit included per NMML media distribution requirements (see Appendix A). The photo should already have been renamed via the photo renaming protocol (see Renaming Photos) and the file name of the photo should be included. A low resolution image is advised to minimize file size. A photograph is not necessary every flight, and is meant as a “value added” feature (e.g., cow/calf, unusual species such as fin whale, or unusual event such as a walrus haulout).

Other Field Reports

If large walrus haulouts are located along the Chukchi coastline, the information should be relayed as quickly as possible by the Team Leader to colleagues at USFWS and USGS listed below, with copies to Cynthia Christman (COMIDA/BWASP walrus data liaison), the Project Manager and Project Coordinator. Information should include date, time and location of haulout sighting, approximate number of animals, reaction to aircraft overflight, and any useful photos obtained.

USFWS:
Joel Garlich-Miller – 907 786 3820; joel_garlichmiller@fws.gov

USGS:
Chad Jay, 907 786 7404; chad.jay@usgs.gov
Tony Fischback, 907 786-7145; afischback@usgs.gov
Dan Monson, 907 786-7161; dmonson@usgs.gov

There are several additional reports/tables that will be submitted by the Project Manager throughout the field season to specific parties. These include ship reports, and walrus and polar bear sighting locations (also required as part of the FWS Research Permit). These tables will be compiled from the Master Access database, and will normally not require inputs from field team members. Sample tables are included here to illustrate the type of information that will be shared (Tables 7, 8 and 9).

Dead Animals

All dead animals sighted during aerial surveys will be documented to the best ability possible. Data collected should include date and time, location (latitude and longitude), species, and number (this can and should all be reported in the flight data). Large whales should be photographed, if possible. Team Leaders should immediately (after landing) report carcasses located along shore or close to shore (within 10 nm) to the NSB Department of Wildlife Management.

Cetaceans and pinnipeds other than walrus should also be reported to the NMFS Stranding Network Coordinator (Kaili Jackson, 907 586 7209, kaili.jackson@noaa.gov, and Barb Mahoney, 907 271 3448, barbara.mahoney@noaa.gov), with copies to the Project Manager and Project Coordinator. A copy of the Marine Mammal Stranding Report – Level A Data form (Appendix D) should be filled out by the Team Leader for any large animal stranding.

Walrus carcasses should be noted in the flight data, and will be reported to FWS as part of the regular walrus sighting report from the Project Manager. A Level A should be filled out and sent to: joel_garlichmiller@fws.gov.

Dead polar bears should be noted in the flight data, and photographs taken if possible. FWS will be notified of any dead polar bear sightings. A Level A should be sent to: Karyn.rode@fws.gov.

IX. Photo Protocol

- All photos should be shot in **RAW** when possible.
- All cameras used to shoot species photos should be synced with the project computer to ensure correct time and date.
- Pictures should be put on the computer and processed the day they are taken. They should be put in the appropriate folder (outlined below) on the NMML-BWASP-COMIDA computer.
- Before any renaming, a copy of the raw photos should be backed up on the external hard drive. These photos will be placed in folders according to the date they are taken.
- No marine mammal photos taken under permit should be posted to the web in any fashion, this includes to Facebook or any media sharing site.

<u>Photo folder and naming structure for the 2010 COMIDA/BWASP field season</u>

COMIDA/BWASP Photos 2010 (folder on desktop)
→COMIDA (subfolder)
    →Bowhead (subfolder)
        →Bowhead10_1001 (file name)
    →COMIDA Misc
        →COMIDA Misc10_1001
    →Walrus
        →Walrus10_1001
    →Other Cetaceans
        →Beluga (subfolder)
            →Beluga10_1001
        →Gray
            →Gray10_1001
    →Other Species
        → Folders to be added and named as needed

→BWASP
    → Bowhead
        →Bowhead10_0001
    →Other Cetaceans
        →Beluga
            →Beluga10_0001
    →BWASP Misc
        →BWASP Misc10_0001
    →Polar Bear

APPENDIX D

Level A Stranding Form (PDF version available)

MARINE MAMMAL STRANDING REPORT - LEVEL A DATA

FIELD #: _____ **NMFS REGIONAL #:** _____ (NMFS USE) **NATIONAL DATABASE#:** _____ (NMFS USE)

COMMON NAME: _____ **GENUS:** _____ **SPECIES:** _____

EXAMINER Name: _____ Affiliation: _____

Address: _____ Phone: _____

Stranding Agreement or Authority: _____

LOCATION OF INITIAL OBSERVATION

State: _____ County: _____

City: _____

Body of Water: _____

Locality Details: _____

Lat (DD): _____ . _____ N

Long (DD): _____ . _____ W

Actual Estimated

How Determined: (check ONE)

GPS Map Internet/Software

OCURRENCE DETAILS Restrand GE# _____ (NMFS Use)

Group Event: YES NO

If Yes, Type: Cow/Calf Pair Mass Stranding # Animals: _____ Actual Estimated

Findings of Human Interaction: YES NO Could Not Be Determined (CBD)

If Yes, Choose one or more: 1. Boat Collision 2. Shot 3. Fishery Interaction

4. Other Human Interaction: _____

How Determined (Check one or more): External Exam Internal Exam Necropsy

Other: _____

Gear Collected? YES NO Gear Disposition: _____

Other Findings Upon Level A: YES NO Could Not Be Determined (CBD)

If Yes, Choose one or more: 1. Illness 2. Injury 3. Pregnant 4.Other: _____

How Determined (Check one or more): External Exam Internal Exam Necropsy

Other: _____

INITIAL OBSERVATION

Date: Year: _____ Month: _____ Day: _____

First Observed: Beach or Land Floating Swimming

CONDITION AT INITIAL OBSERVATION (Check ONE)

1. Alive
2. Fresh dead
3. Moderate decomposition
4. Advanced Decomposition
5. Mummified/Skeletal
6. Condition Unknown

LEVEL A EXAMINATION Not Able to Examine

Date: Year: _____ Month: _____ Day: _____

CONDITION AT EXAMINATION (Check ONE)

1. Alive
2. Fresh dead
3. Moderate decomposition
4. Advanced Decomposition
5. Mummified/Skeletal
6. Unknown

INITIAL LIVE ANIMAL DISPOSITION (Check one or more)

1. Left at Site
2. Immediate Release at Site
3. Relocated
4. Disentangled
5. Died at Site
6. Euthanized at Site
7. Transferred to Rehabilitation: Date: Year:_____ Month:_____Day:___ Facility:_____
8. Died during Transport
9. Euthanized during Transport
10. Other:_____

CONDITION/DETERMINATION (Check one or more)

1. Sick
2. Injured
3. Out of Habitat
4. Deemed Releasable
5. Abandoned/Orphaned
6. Inaccessible
7. Location Hazardous
   a. To animal
   b. To public
8. Unknown/CBD
9. Other_____

MORPHOLOGICAL DATA

SEX (Check ONE)

1. Male
2. Female
3. Unknown

AGE CLASS (Check ONE)

1. Adult
2. Subadult
3. Yearling
4. Pup/Calf
5. Unknown

Whole Carcass Partial Carcass

Straight length:_____ cm in actual estimated

Weight:_____ kg lb actual estimated

PHOTOS/VIDEOS TAKEN: YES NO

Photo/Video Disposition: _____

CARCASS STATUS (Check one or more)

2. Buried
3. Rendered
5. Sunk: Lat_____Long_____
6. Frozen for Later Examination
8. Unknown
9. Other_____

TAG DATA Tags Were:

Present at Time of Stranding (Pre-existing): YES NO

Applied during Stranding Response: YES NO

SPECIMEN DISPOSITION (Check one or more)

ADDITIONAL REMARKS

ADDITIONAL IDENTIFIER: _____ (If animal is restranded, please indicate any previous field numbers here)

DISCLAIMER

THESE DATA SHOULD NOT BE USED OUT OF CONTEXT OR WITHOUT VERIFICATION. THIS SHOULD BE STRICTLY ENFORCED WHEN REPORTING SIGNS OF HUMAN INTERACTION DATA.

DATA ACCESS FOR LEVEL A DATA

UPON WRITTEN REQUEST, CERTAIN FIELDS OF THE LEVEL A DATA SHEET WILL BE RELEASED TO THE REQUESTOR PROVIDED THAT THE REQUESTOR CREDIT THE STRANDING NETWORK AND THE NATIONAL MARINE FISHERIES SERVICE. THE NATIONAL MARINE FISHERIES SERVICE WILL NOTIFY THE CONTRIBUTING STRANDING NETWORK MEMBERS THAT THESE DATA HAVE BEEN REQUESTED AND THE INTENT OF USE. ALL OTHER DATA WILL BE RELEASED TO THE REQUESTOR PROVIDED THAT THE REQUESTOR OBTAIN PERMISSION FROM THE CONTRIBUTING STRANDING NETWORK AND THE NATIONAL MARINE FISHERIES SERVICE.

PAPERWORK REDUCTION ACT INFORMATION

PUBLIC REPORTING BURDEN FOR THE COLLECTION OF INFORMATION IS ESTIMATED TO AVERAGE 30 MINUTES PER RESPONSE, INCLUDING THE TIME FOR REVIEWING INSTRUCTIONS, SEARCHING EXISTING DATA SOURCES, GATHERING AND MAINTAINING THE DATA NEEDED, AND COMPLETING AND REVIEWING THE COLLECTION OF INFORMATION. SEND COMMENTS REGARDING THIS BURDEN ESTIMATE OR ANY OTHER ASPECT OF THE COLLECTION INFORMATION, INCLUDING SUGGESTIONS FOR REDUCING THE BURDEN TO: CHIEF, MARINE MAMMAL AND SEA TURTLE CONSERVATION DIVISION, OFFICE OF PROTECTED RESOURCES, NOAA FISHERIES, 1315 EAST-WEST HIGHWAY, SILVER SPRING, MARYLAND 20910. NOTWITHSTANDING ANY OTHER PROVISION OF THE LAW, NO PERSON IS REQUIRED TO RESPOND, NOR SHALL ANY PERSON BE SUBJECTED TO A PENALTY FOR FAILURE TO COMPLY WITH, A COLLECTION OF INFORMATION SUBJECT TO THE REQUIREMENTS OF THE PAPERWORK REDUCTION ACT, UNLESS THE COLLECTION OF INFORMATION DISPLAYS A CURRENTLY VALID OFFICE OF MANAGEMENT AND BUDGET (OMB) CONTROL NUMBER.

NOAA Form 89-864 (rev. 2007) OMB No. 0648-0178; Expires 10/31/2010

APPENDIX E

2010 Observer & Pilot Schedule (updated each year)

APPENDIX F

COMIDA/BWASP Master Contact List (updated each year)

Appendix G

Additional Reference Materials – available on SharePoint

Aviation Safety Policy
Aviation Health Module
Aviation Safety Policy and Procedures Module
Basic Aviation Safety & Survival Module
OMAO Crewmember Guidelines and Information
Disclosure Statement for Crewmembers and Qualified Non-Crewmembers
Survival in Cold Waters – Staying Alive
NOAA Observers Guide to Sea Ice
Bowhead Whale Subsistence Harvest: 2008-2012
Bear Awareness and Defense Training Manual, LTR Training Systems
Efficacy of Bear Spray in AK
Dalton Highway Visitor Guide

Appendix H

Suggested personal gear for arctic aerial surveys in the summer

Wristwatch
Good pair of sunglasses with UV and glare protection
Clothing: prepare for temps from the 30s to the 60sF, sometimes with drizzle or light snow and wind.

- Slippers for use at the King Eider Inn (shoes are not allowed); socks are OK; the inn provides slippers.
- Walking shoes/boots that can tolerate mud and puddles but still be comfortable for over a mile; sneakers or running shoes are OK.
- Shoes good enough to wear at a restaurant (very casual is OK).
- Clean aircraft shoes or down booties for use in the aircraft (outdoor shoes will be shed to keep the plane clean); some booties are provided by our project. Hard soled shoes or boots will protect your feet in the event of a ditching and ending up on land or ice.
- Rugged pants, jeans, pant shells (overpants) for walking around town.
- T shirts, long-sleeve shirts, comfortable attire for wearing in the hotel, restaurants, and at the NARL offices, including going to business meetings.
- Light, water resistant jacket.
- Warm coat good for a walk in a cold wind; two light jackets (wind shell plus fleece) doubled can serve as well or better than a big coat.
- Light hat with visor for drizzly days, and a heavier hat (wool) for cold, windy, wet days.
- Scarf or neck gaiter.
- Light gloves (e.g., fingerless) that can allow you to work at the computer in the plane.
- Overmitts that can go over the gloves for times when you are standing around in the cold.
- Sweatpants or shorts and sweatshirt for working out at the gym.
- Sneakers for use in the gym (not used for walking outdoors).
- Variety of socks – tough enough for shuffling around in the hotel (with or without slippers) and warm enough for sitting in a cold airplane.
- Drysuit for flying (NMML provided); wear long jons (preferably wool, not synthetic material) underneath - the amount of undergarments depends on personal temperature sensitivity, but it may be better to dress lightly under the drysuit so that it is easier to get in and out, and then add scarf, hat, and gloves if chilly.
- Parkas and blankets will be available in the aircraft.

Goo gel or other sort enclosed package of high calorie carbohydrate for emergency energy in the event of a ditching
Trash bag for use as warmth in the event of a ditching
Spare eyeglasses or contact lenses

Contact lens solution
Day pack with all the things you need during an aerial survey plus enough to make it through the night at a different place (wallet, credit card, snacks, toothbrush/paste, pants)
Cash – estimate $100 to $200/month for taxis, souvenirs, etc.
Meals, groceries, and hotel costs can be paid for with credit cards.
Hard candy or Tums for munching while flying
Bonine/Dramamine for motion sickness (the long, straight tracklines and no mountains make for pretty smooth sailing for the most part)
Cell phone (not all contract plans work in the Arctic)
Certificate of egress training
Personal medicines/vitamins/aspirin
Dental stuff
Laundry bag (laundry machines might be available in the hotel or it might be across town; this is "misc. expense" on your voucher, not "laundry")
Shampoo
Hand cream
Scissors, hair stuff
Foot powder
Hankies
Plastic bags to cover dirty shoes when packing
Water bottle
Penknife (but do NOT have it in your pack when going through security!)
Favorite snacks/teas/coffee
A few books
Music with player (the other option is humming)
Movie DVDs
Personal camera
Binoculars and bird book (binos are provided for use in the aircraft, but it's nice to have your own pair for birding and touring)
Lady Jane adapters for downloading while in flight
Sleeping mask and/or earplugs (for light sleepers)
Bug repellant
There are stores in Barrow where many essentials can be purchased (snacks, sunglasses, hats, toothbrush, etc.) but things are more expensive than in Seattle.
It's good to take a cloth/reusable grocery bag when shopping.
Bear repellant (spray) and "bear bangers" will be available. Walks within Barrow are considered safe from bears and usually safe from dogs (most are tied up), but walks along the beach can be risky, especially north of NARL. Rabies is common in the Arctic. Don't pet dogs, lemmings, foxes, or wild wolves.

Guns were standard issue in the past, complete with professional training. However, policies have changed to the point that guns are no longer carried on NOAA aircraft and might even be disallowed. Guns can be more dangerous than bears.

In regard to long walks in the Barrow area, Point Barrow, north of the dock on Elson Lagoon, is Native land and is off limits to tourists without a guide. In part, this may be a safety concern because polar bears often visit the Point looking for dumped whale parts.

Appendix I

Flight Suit Tracker (some names to change)

Date	Flight #	Janet Suit 11	Megan Suit 9	Cynthia Suit 1	Millie Suit 20	Stephanie Suit 21	Brendan Suit 8	Becky Suit 6	Brenda Suit 5	Dee Suit 5	Amy Suit 10	Mike Suit 19	Heather Suit 22	Kim Suit 22	XL Suit 15
*Please enter date, flight #, and X the box of who was on the flight. Thanks!															

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Appendix 5: Poster and Oral Presentation Abstracts Related to COMIDA Aerial Surveys

Marine Mammal Occurrence in the Northeastern Chukchi Sea, Alaska – Comparison of Data from Autumn 1989-91 and Autumn 2008

Broadscale aerial surveys in the northeastern Chukchi Sea for marine mammals were conducted in autumn 2008 after a hiatus of 17 years. The study area extends from the northwestern Alaskan coast westward to the International Dateline at 169°W, between 68° and 72°N (surveys were previously conducted north to 73°N). The area overlays Lease Sale 193 of the Chukchi Sea Planning Area, and surveys are being conducted to collect information on marine mammals undergoing seasonal migrations through these lease areas and associated waters. Broadscale surveys were previously conducted in this area from 1989-91. Changes in late autumn prevailing sea ice between 1991 and 2008 have been monumental, and there are concerns over the effect of later-developing sea ice on marine mammal populations. Sightings of cetaceans, including bowhead (*Balaena mysticetus*), gray (*Eschrichtius robustus*), and beluga (*Delphinapterus leucas*) whales, walrus (*Odobenus rosmarus*) and polar bears (*Ursus maritimus*) in autumn 2008 are compared to sightings of the same species in autumn 1989-1991. Observations of sea ice development during both time periods are also included. Results presented here are preliminary, as the 2008 survey season finished on 10 November. This is the first year of a multiyear study sponsored by the Minerals Management Service, Alaska OCS Region.

Marine Mammal Occurrence in the Northeastern Chukchi Sea, Alaska – Summer 2008

Broadscale aerial surveys in the northeastern Chukchi Sea for marine mammals were conducted in summer 2008. This study represents the first effort to document the occurrence of marine mammals from mid-June through late August in this large geographic area. Previous survey efforts have occurred during the spring bowhead migration in April and May (although efforts have been confined to areas relatively close to shore) and during the early autumn migration from mid-September through October. The study area extends from the northwestern Alaskan coast westward to the International Dateline at 169°W, between 68° and 72°N. The survey area overlays Lease Sale 193 of the Chukchi Sea Planning Area, and surveys are being conducted to collect information on marine mammals undergoing seasonal migrations through and to lease areas and nearby waters. Sightings of cetaceans, including bowhead (*Balaena mysticetus*), gray (*Eschrichtius robustus*), fin (*Balaenoptera physalus*) and beluga (*Delphinapterus leucas*) whales, walrus (*Odobenus rosmarus*) and polar bears (*Ursus maritimus)* are summarized. Observations of summer sea ice breakup are also included and discussed with historical context. Results presented here are preliminary. This is the first year of a multiyear study sponsored by the Minerals Management Service, Alaska OCS Region.

Swimming polar bears in the Alaskan Chukchi Sea – the REAL story

On 16 August 2008, ten polar bears (*Ursus maritimus*) were observed west and northwest of Point Barrow, Alaska, during an aerial survey for marine mammals. All ten bears were swimming. The "swimming polar bear" story was advanced by the popular press and used by various organizations to further discussion on global warming and the loss of sea ice. In the process, several facts were misstated, probably both accidentally and deliberately. This poster presents the facts of the swimming polar bears, including details of sightings and objectives and methodology of the study. Historical data on polar bear sightings in the western Alaskan Arctic are also presented.

Bowhead Whale Aerial Survey Project (BWASP) Status Update in 2009

The Bowhead Whale Aerial Survey Project (BWASP) has been ongoing in the Alaskan Beaufort Sea since 1979 under funding from the Minerals Management Service (MMS). Since 2007, these surveys have been coordinated through the National Marine Mammal Laboratory (NMML NOAA Fisheries Service). The objectives for BWASP include determining the annual fall migration path and relative abundance of bowhead whales (*Balaena mysticetus*), spatio-temporal variability of their distribution as a function of habitat features, and their behavior. Sighting data are also collected on other marine mammals. The study area encompasses 150,000 km^2 of the Alaskan Beaufort Sea from 140°W to 157°W between shore and 72°N and is subdivided into twelve survey blocks. These blocks are surveyed using randomly-selected survey lines, one per 30 minutes of longitude. A DeHavilland Twin Otter aircraft with six- to eight-hour flight range is currently used for these surveys, allowing for safe and effective survey coverage. The timing of the field season has been relatively consistent, currently commencing 31 August and ending 20 October, with surveys flown every day, weather and logistics permitting. The thirty-year time series of the BWASP dataset provides a unique opportunity to investigate changes over time in the distribution, relative abundance, and behavior of bowhead whales and other marine mammals in relation to environmental conditions. For example, ice conditions during historical BWASP surveys have ranged from very heavy (in some years during this study, ice was heavy enough to prevent vessel traffic from entering the Beaufort Sea) to very light. In 2007, 2008 and 2009, there was essentially no ice in the study area in summer and early fall, as sea ice receded to historical minimums. Bowhead distribution and relative abundance in these low-ice years appeared similar to that previously documented in light to moderate ice years, likely because bowheads are strongly associated with shelf habitat, although there is some evidence that bowhead whales are feeding more in the Western Alaskan Beaufort Sea. Beluga distribution and relative abundance in the BWASP study area has decreased in recent years, perhaps due to the absence of ice cover and belugas migrating farther north.

Aerial Surveys for Marine Mammals in the Northeastern Chukchi Sea: 2009

COMIDA (Chukchi Offshore Monitoring in Drilling Areas) aerial surveys for marine mammals were conducted in the northeastern Chukchi Sea from mid-June through the end of October 2009, providing survey coverage of the Chukchi Sea Planning Area during the ice-free season. COMIDA aerial survey objectives include determining the distribution of cetaceans, pinnipeds and polar bears and documenting areas of importance for specific behaviors such as calving/pupping, feeding, migrating and hauling out. The 125,000 km^2 study area, encompassing the region from 68°N to 72°N and from shore to 169°W, is subdivided into 10 survey blocks. A revised survey design was adopted in 2009, with offshore transect lines oriented perpendicular to the coastline instead of oriented north-south. In addition, there was a coastal transect (one km offshore) from Pt. Barrow to Pt. Hope. Surveys were flown in DeHavilland Twin Otters and an Aero Commander. A total of 240 hours were flown in 2009, with 175 hours actively surveying in good conditions and 59% of that time spent on transect effort. Good survey coverage of the study area was achieved despite frequent time periods of inclement weather which prevented flying. Marine mammals recorded included bowhead whales (*Balaena mysticetus*), gray whales (*Eschrichtius robustus*), belugas (*Delphinapterus leucas*), one humpback whale (*Megaptera novaeangliae*), polar bears (*Ursus maritimus*), walrus (*Odobenus rosmarus*), and several smaller pinnipeds. Bowheads were seen feeding near Pt. Franklin from 30 June through 11 July, and southwest of Pt. Barrow on 19 September. Gray whales were documented feeding in the nearshore area between Pt. Barrow and Wainwright from mid June through early September; after mid-September, few gray whales were seen. The lone humpback whale was spotted feeding among four gray whales in mid-July near Wainwright. Belugas were seen in the study area in summer and late fall. Walrus distribution was closely associated with ice when ice was present in the study area; after which walrus were seen close to and on shore. Four polar bears were seen.

Pacific walrus sightings documented by aerial surveys of the northeastern Chukchi Sea in 2009

In the summer and fall of 2009, aerial surveys were conducted in the northeastern Chukchi Sea as part of the Chukchi Offshore Monitoring in Drilling Area (COMIDA) project. The surveys were designed to document the distribution of marine mammals in the northeastern Chukchi Sea and identify areas important for migration, foraging, and reproduction. In addition, the surveys were designed to encompass the Chukchi Sea Planning Area, which contains areas of potential industrial activity. Surveys were conducted from June 24 to October 29, from 72°N to 68°N between 169°W and 157°W. Offshore and coastal transect lines were flown in a fixed-wing airplane at an altitude of 1,000-1,600 feet. A total of 49 flights were conducted over 240 survey hours. Pacific walruses (*Odobenus rosmarus*) were observed in all months of the study period from June to October, with the majority of sightings observed from July to September. Excluding known duplicate sightings, the survey team observed 667 sightings of walrus, comprising 15,994 individuals. More than three-quarters of the walruses observed were sighted in mid-summer and early fall, with 49% of individuals observed in July and 30% of individuals observed in September. There were very few walruses observed in October. Walruses were widely distributed and were sighted in open water or hauled out on ice or land. A shift in habitat usage occurred over the study period with more animals hauled out on ice from June-August, when sea ice was present, to more animals hauled out on land in September. In July, 90% of individuals sighted were hauled out on ice, whereas in September, 82% of individuals sighted were hauled out on land. In September, a haulout of approximately 2,500-4,000 walruses was documented on land near Icy Cape (70°19'N 161°46'W). The haulout was observed on three separate flights between September 2-13, and was not seen again despite subsequent surveys in the area. The increase in walruses hauled out on land in the fall is likely due to the complete lack of sea ice in the northeastern Chukchi Sea.

Efficiency of unmanned aircraft systems (UAS) relative to manned aircraft for surveying bowhead whale distribution and density in the Arctic.

Manned aircraft have been successfully used to survey the distribution and abundance of the Bering-Chukchi-Beaufort (BCB) stock of bowhead whales (*Balaena mysticetus*) in the western Arctic since 1979. In recent years, interest in the use of Unmanned Aircraft Systems (UAS) as an aerial survey platform for studying BCB bowheads has grown. The effectiveness of UAS in surveying cetaceans has yet to be demonstrated. We used analytical methods to address the following question: Given a UAS platform that is capable of reliably operating in the Arctic, how much effort (measured in distance and time) would be required for the UAS to conduct a survey designed to estimate bowhead whale density, in order to achieve the same precision as a density estimate derived from a manned aircraft survey? Specifically, we conducted a relative efficiency analysis that accounted for differences between the platforms' field of view and probability of detecting objects located directly on the trackline. The amount of UAS effort required to meet the target precision depended heavily upon the trackline detection probability and encounter rate variance for the UAS relative to the manned aircraft. A direct field comparison of UAS vs. manned aircraft surveys is essential for answering further questions.

Eastern North Pacific Gray Whale Distribution and Habitat Use in the Chukchi Sea from Aerial Surveys: 1982-1991, 2008-2010

Marine mammal aerial surveys were conducted in the northeastern Chukchi Sea (68-73°N, 157-169°W) from June to October 1982-1991. Renewed interest in oil and gas activity in this area provided the impetus for the surveys to recommence in 2008; the recent surveys are part of the Chukchi Offshore Monitoring in Drilling Area (COMIDA) project, funded by the Minerals Management Service. These broad-scale surveys have documented the distribution of the Eastern North Pacific stock of gray whales on summer feeding grounds in the Chukchi Sea. Arctic waters comprise the northernmost part of their range, which extends southward along the west coast of North America down to wintering areas off California, the Baja Peninsula, and in the Gulf of California. Gray whales in the Chukchi Sea have been found in high densities in three different areas. First, the greatest number of gray whales (which have occurred during all months surveyed) were nearshore between Point Barrow and Point Lay. Second, gray whales were consistently seen in the area offshore of Point Hope in spite of relatively little survey effort in that area. Third, in autumn of 1989-1991, there was a high density area offshore over Hanna Shoal; however, few gray whales were seen in that area in autumn of 2008-2010. The recent lack of summer sea ice in the Chukchi may be affecting the location of high densities of prey, and hence the distribution of gray whales. Gray whale calves have been sighted mostly in nearshore shallow areas.

Pacific Walrus Sightings Documented by COMIDA Aerial Surveys of the Northeastern Chukchi Sea in 2010

In 2010, the National Marine Mammal Laboratory (NMML) (NOAA Fisheries), through an interagency agreement with the Minerals Management Service, conducted aerial surveys in the northeastern Chukchi Sea as part of the Chukchi Offshore Monitoring in Drilling Area (COMIDA) project. The surveys, which have been conducted annually by NMML since 2008, were designed to document the distribution of marine mammals in the northeastern Chukchi Sea during the ice-free months (June-October). Surveys were conducted from July 1 to October 27, from 72°N to 68°N between 169°W and 157°W. A total of 44 flights were conducted over 188 survey hours. Pacific walruses (*Odobenus rosmarus*) were widely distributed throughout the survey area and were observed in all months of the study period. Excluding known duplicate sightings of haulouts, NMML recorded 314 walrus sightings comprising 26,688 individuals. In July and August, walruses were observed in open water or hauled out on sea ice. On August 30, the first haulouts on land were documented, one located 3 miles northeast of Point Lay and three located 22 miles east of Cape Lisburne. The Point Lay haulout was observed on five subsequent surveys between September 6-24; group size estimates of the haulout varied between days and ranged from 800 to 15,000 individuals. Additional surveys were conducted near Point Lay from October 8-25 but no haulouts were sighted. The increase in walruses hauled out on land in the fall is likely a result of the lack of sea ice in the northeastern Chukchi Sea.

Distribution, Relative Abundance and Behaviors of Bowhead Whales in the Alaskan Beaufort and Northeastern Chukchi Seas - Autumn 2007-2010

Broad-scale aerial surveys for marine mammals were conducted annually under the auspices of COMIDA (Chukchi Offshore Monitoring in Drilling Area) and BWASP (Bowhead Whale Aerial Survey Project), sponsored by the Minerals Management Service. Survey objectives included determining the autumn (September and October) migration path, relative abundance, and behavior of bowhead whales (*Balaena mysticetus*). The combined survey area extended from 140°W to 169°W and 68°N to 72°N, and was divided into 22 survey blocks. Bowhead distribution and relative abundance were summarized based on survey blocks and depth zones. Results were limited to 2007-2010, corresponding to data collected since summer sea ice extent was at historical minimums. Bowhead distribution in the Alaskan Beaufort Sea was relatively close to shore and, based on sighting rate, habitat preference was strongly associated with the inner continental shelf (≤50 m depth zone). In the northeastern Chukchi Sea, distribution was southwesterly from Pt. Barrow. Highest sighting rates were in blocks 13 and 18, with sighting rates highest in the outer continental shelf (51-200 m depth zone). Feeding and milling (which may be indicative of feeding) were recorded across the Beaufort Sea, but seen only once in the Chukchi Sea. Mating behavior was also observed in one group of four whales located in the Beaufort Sea. A total of 53 calves were sighted.

A Tale of Two Seas: Lessons from Multi-decadal Aerial Surveys for Cetaceans in the Beaufort and Chukchi Seas

Three decades of aerial surveys have revealed apparent differences in the consistency of habitat partitioning between the dominant cetacean species in the Beaufort Sea compared to the Chukchi Sea. The Bowhead Whale Aerial Survey Project conducted annual line transect aerial surveys for marine mammals in the western Beaufort Sea from 1979-2010. Analogous surveys in the northeastern Chukchi Sea were conducted between 1982 and 1991, recommencing annually from 2008-2010 as part of the Chukchi Offshore Monitoring in Drilling Area project. In 2007, a landmark year for the Arctic, summer sea ice extent reached a record minimum. In the western Beaufort Sea, belugas and bowhead whales are the most abundant cetaceans; they exhibited consistent habitat partitioning during the pre- and post-2007 time periods: belugas have been found primarily in the outer continental shelf and basin, whereas bowheads have been found primarily in the inner continental shelf. In contrast, in the northeastern Chukchi Sea, gray and bowhead whales are the most abundant cetaceans. Prior to 2007, gray whales were found primarily in coastal or shoal waters, whereas bowhead whales were found primarily in the outer continental shelf. Since 2007, however, bowhead and gray whale distributions have overlapped substantially; although the depth zone of maximum encounter rate is temporally variable, this temporal variability appears synchronous in both species. We discuss oceanographic mechanisms that could potentially cause differences in temporal patterns of habitat use between the Beaufort and Chukchi Seas.

Appendix 6: Aerial Surveys of Large Whales in the Northeast Chukchi Sea, 2008-2009, with Review of 1982-1991 Data

Aerial Surveys of Large Whales in the Northeastern Chukchi Sea, 2008-2009, with Review of 1982-1991 Data

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ABSTRACT
Broad-scale aerial surveys of the northeastern Chukchi Sea off Alaska were conducted from June-October 2008-2009, after a hiatus since 1991. These surveys are now known as the Chukchi Offshore Monitoring In Drilling Area (COMIDA) project. Climatic changes in the Arctic between the early 1990s and the present have been well-documented, including (but not limited to) the dramatic reduction in summer sea ice cover in the Chukchi Sea. The 17-year lag between surveys in this region allowed for comparisons of large cetacean relative abundance and distribution over time, although comparisons were impacted due to the temporal and spatial variability of surveys in any single year. Results from the current study are still preliminary since only one partial season (2008) and one full season of data (2009) have been collected in recent years and the data have not been corrected for sighting and availability bias. In 1982-1991 and 2008-2009, 107 bowhead whales, 533 gray whales, 1 humpback whale (in 2009) and 1 fin whale (in 2008) were seen during 113,758 transect kilometers flown. Bowhead whales were observed in all months of the survey and were distributed mainly west and southwest of Pt Barrow, including sightings within the Chukchi Sea Planning Area. Bowhead distribution in light ice years remained similar between the 1980s and 2008-2009. Bowhead whale sighting rates (whales per unit effort) were highest in the 50-200m depth zone. Bowhead whales were observed feeding in the Chukchi Sea in October 1983 and in June, July and September 2009. Gray whales were observed in all months of the survey; they were distributed in nearshore, shallow water areas and offshore over Hanna Shoal. Most gray whales (73%) were feeding. The majority of the gray whale calves were seen in three years, 1982, 1985 and 2009, mainly in July of each year.

KEYWORDS: ARCTIC; NORTHERN ALASKA; CHUKCHI SEA; BOWHEAD WHALE; GRAY WHALE; FIN WHALE; HUMPBACK WHALE; HABITAT; SURVEY-AERIAL; FEEDING; OCEANOGRAPHY

INTRODUCTION

The U.S. Bureau of Land Management (BLM) commenced funding of aerial surveys of endangered whales in oil and gas lease areas offshore of Alaska in 1979. The U.S. Minerals Management Service (MMS) assumed these responsibilities in 1982. From 1979-1991, surveys in the northeastern Chukchi (68°-73°N, 157°-169°W) were conducted through a series of Interagency Agreements (IA) between MMS and the Naval Oceans Systems Center (Ljungblad *et al*., 1987) and directly with contractors (Moore and Clarke, 1992). No surveys were conducted in this broad area from 1992-2007, although localized surveys nearshore were conducted in 2006-2008 (Thomas *et al*., 2010). In 2008, MMS initiated an IA with the National Marine Mammal Laboratory (NMML) of the U.S. National Marine Fisheries Service (NMFS) to conduct broadscale aerial surveys in the Chukchi Sea Planning Area (CSPA), which encompasses the northeastern Chukchi Sea (68°-72°N, 157°-169°W). These aerial surveys are part of the Chukchi Offshore Monitoring In Drilling Area, or COMIDA, program, and they were designed to document distribution and abundance of cetaceans and pinnipeds and to monitor areas of importance for specific behaviors such as calving, pupping, feeding, hauling out and migrating. COMIDA surveys are of particular relevance now because there is renewed interest in offshore oil and gas activity in the Chukchi Sea, as evidenced by the record-breaking Lease Sale 193, which occurred in February 2008 (MMS, 2008).

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The spring migration of the Bering-Chukchi-Beaufort Sea stock of bowhead whales (*Balaena mysticetus*) in the northeastern Chukchi Sea passes through nearshore leads in the ice between Pt Hope and Pt Barrow (Moore and Reeves, 1993). Most of the stock migrates offshore to summer feeding areas in the Canadian Beaufort Sea. Although bowheads have been documented in the Chukchi Sea throughout summer (Moore, 1992; Moore *et al*., 2010), their presence there is thought to be low (Dahlheim *et al*., 1980; Miller *et al*., 1986). The return migration across the Alaskan Beaufort Sea in autumn is nearshore (Clarke and Ferguson, 2010), and commences at least as early as August (Rugh, 2010). The autumn migration of bowhead whales across the northeastern Chukchi Sea appears to follow both a west-northwesterly route along the ice edge (Quakenbush *et al*., 2010) and a broad southwesterly route towards the Chukotka coast, but autumn migration patterns are not well understood in this area (Moore and Clarke, 1993).

The Eastern North Pacific stock of gray whales (*Eschrichtius robustus*) undergoes one of the longest migrations of any mammal, from winter grounds near Baja California to summer feeding areas in the Bering and Chukchi seas. Recent evidence indicates that the Chukchi Sea has replaced the northern Bering Sea as the preferred feeding area for gray whales because amphipod biomass has decreased in the latter area (Bluhm *et al*., 2007; Coyle *et al*., 2007; Moore *et al*., 2003). Gray whales were reliably sighted in the northeastern Chukchi Sea during surveys conducted from 1982-1991 (Moore *et al*., 2000), when ice cover in summer and autumn was greater than at present.

Sightings of large whale species other than bowhead and gray whales are becoming more frequent in the northeastern Chukchi Sea (e.g., Haley *et al*., 2010). Therefore, we include a review of sightings of other large whales in the COMIDA database.

METHODS AND RESULTS

The study area was the northeastern Chukchi Sea from 68°N to 72°N latitude and from 157°W to 169°W, an area totaling 122,500 km^2, which was subdivided into 10 survey blocks (Figure 1). The historical data (1982-1991) incorporated results from four additional survey blocks located from 72° to 73°N latitude between 157° and 169°W, which were flown regularly from 1989-1991. Surveys were flown from 16 June to 31 October from 1982-1991 and 2008-2009, although effort varied temporally among years. Surveys were flown in a Grumman Turbo Goose from 1982-1991, deHavilland Twin Otter aircraft in 2008-2009 and an Aero Commander in 2009. Line transect aerial surveys were flown at 305 to 460 m altitude, maintaining a speed of 220 to 300 km/h. During the early period (1982-1991), the transects tended north/south and were located between randomly determined start and end points anchored to the survey block boundaries, The survey design changed dramatically in 2009 to transects oriented perpendicular to shore, thereby cutting across isobaths, prevailing currents, and expected gradients in marine mammal density. In 2009, a coastal transect was flown 1 km offshore and parallel to the coast between Pt Barrow and Pt. Hope. Two primary observers maintained a continuous watch for marine mammals, one on each side of the aircraft, while a third observer/data recorder entered data into a laptop computer for each sighting, whenever survey conditions changed or every five to ten minutes. The aircraft occasionally made brief (less than 10 minutes) diversions from the transect to investigate sightings for species verification, to determine group size and to confirm presence or absence of calves. Flightlines were considered to be "on effort" if the data were logged as on transect. In contrast, "off effort" flightlines included data collected while on search mode or when circling, connecting tracklines or deadheading to a location. Data routinely logged when cetaceans were seen included time, altitude, position, sea state, ice cover, visibility conditions, species, inclinometer angle (to determine distance from the trackline), number of whales, initial heading and behavior. Sea state was classified according to the Beaufort scale (Chapman, 1977), and ice cover estimated as a percentage of the sea surface. Additional details of survey protocol are provided elsewhere (e.g., Moore and Clarke, 1992; National Marine Mammal Laboratory, NMFS, NOAA, 2010).

Total transect distance (km) per survey block or depth zone for “on effort” flightlines only was calculated by clipping the transects to polygons (defined by either survey block boundaries or isobaths) using R version 2.10.1 (R Development Core Team, 2009) and packages *sp* (Pebesma and Bivand, 2005), *maptools* (Lewin-Koh *et al*., 2009), *rgdal* (Keitt *et al*., 2010), *gpclib* (Peng *et al*., 2009), and *PBSmapping* (Schnute *et al*., 2008). Transect distances differ slightly among the effort-by-year, effort-by-block, and effort-by-depth analyses due to slight differences in the region within which effort was summarized. Sighting rate (whales per unit effort) was calculated as the number of whales per transect kilometer (Tr-km) surveyed for survey blocks and depth zones. Sighting rates were not corrected for availability or perception bias. Sighting rates for survey blocks were calculated only for the

current study area; sighting rate per depth zone was calculated for the extended survey area, spanning 68°N to 73°N. Depths at sightings were taken from the International Bathymetric Chart of the Arctic Ocean (IBCAO; http://www.ngdc.noaa.gov/mgg/bathymetry/arctic/arctic.html).

Over 113,000 km of transect surveys were flown from 1982-1991 and 2008-2009 (Figure 1). Effort varied greatly among years and months (Table 1). The most annual effort was in 2009 (greater than 21,000 Tr-km), when the survey period extended almost nonstop from mid-June through the end of October. The least annual effort (approximately 3,000 Tr-km) was in 1990 and 1982, when effort in the study area occurred only in October. Monthly effort was highest in October (over 56,000 Tr-km) and lowest in June (approximately 4,000 Tr-km). Survey Block 13 had twice as much survey effort as any other block (27,425 Tr-km; Table 2), and Blocks 13, 14, 17 and 18 were surveyed the most frequently over all years combined (Figure 2).

Comparison of ice cover among years is difficult to assess from the survey data alone because effort was not evenly distributed. However, ice cover in autumn (September-October) was considered heavy in 1983 and 1988, moderate in 1984, 1985, 1987 and 1991, and light in 1982, 1986, 1989, 1990, 2008 and 2009 (Moore and Clarke, 1992; National Snow and Ice Data Center, 2008, 2009).

There were 77 on-effort sightings of 107 bowhead whales in the Chukchi Sea from 1982-1991 and 2008-2009 (Table 3). Bowhead whales were seen in all survey months in the Chukchi Sea (Figure 3), with the greatest number of sightings in October. Most whales were seen west and southwest of Pt Barrow, with a few sightings northwest. Bowhead sightings were within the CSPA and close to active leases. Highest sighting rates per block for all years combined were in Blocks 13 (WPUE=0.0023) and 18 (WPUE=0.0020; Table 2); sighting rates were highest in Block 13 in June through September and in Block 18 in October. Most of the whales (13 whales) observed in Block 18 were seen in October 1983 and 1988, both heavy ice years, but the other five whales in Block 18 were seen in ice-free water in 1989 and 2009. The highest bowhead sighting rate per depth zone for all months combined was in the 50-200m zone (WPUE=0.0012; Table 4). Bowhead whale sighting rate in June was highest in the shallowest depth zone (0-35m), but the highest sighting rates in all other months (considered individually) were either in 35-50m or 50-200m depth zones. Bowheads were not seen in waters >200m deep, but this depth zone was underrepresented in the study area (only a small area north of Block 13). In light ice years (1982, 1986, 1989, 1990, 2008 and 2009), surveys were consistently conducted in September and October only (i.e., there was no summer effort in most years). During light ice years, the distribution of bowhead whales was similar between the 1982-1991 period and the 2008-2009 period (Figure 4). There were no bowhead whale sightings in 2008 or 2009 north of 72°N because the recent survey area did not extend that far north.

Most bowhead whales were recorded as engaged in directional swimming (59%). Feeding behavior was rarely recorded on-effort and is likely underrepresented in the database due to the difficulty of identifying this behavior in the brief periods of time allowed during transects. Bowhead whale feeding behavior was recorded off-effort (while on search or circling) in two years during this study, under very different circumstances. In 1983, a heavy ice year, nine bowheads were observed feeding on 17 and 18 October (Figure 5) in 70-80% ice cover. In 2009, a light ice year, bowhead whales were observed feeding from 30 June to 11 July near Pt Franklin, and at least one easily re-identifiable whale was present during this 13-day period. Ice cover at this time ranged from 5% to 80%. A group of at least 12 bowheads was also observed feeding southwest of Pt Barrow on 19 September 2009 when no ice was present.

There were 254 on-effort sightings of 533 gray whales in the Chukchi Sea from 1982-1991 and 2008-2009 (Table 3). Gray whales were seen in all months in the Chukchi Sea (Figure 6), with the greatest number of sightings in September. Most whales were seen nearshore between Pt Barrow and Pt Lay, with an additional area of concentration in offshore shoal areas. Few gray whales were seen in the deeper water areas between the shallow nearshore continental shelf and Hanna Shoal (northern half of Block 14), except during August. Gray whales were seen offshore (in Block 14 and farther north) in autumn 1989-1991, but few were seen in that area in autumn 2008-2009, and few gray whales were seen within the CSPA or near active leases. The highest sighting rate per block for all years combined was in Block 22 (WPUE=0.0230; Table 2), where relatively high numbers of gray whales were seen in September and October during relatively little survey effort. Sighting rates were also high in Blocks 13 (WPUE=0.0096) and 17 (WPUE=0.0090; Table 2). In 2009, when survey effort was nearly nonstop from mid-June through the end of October, gray whale sighting rates were twice as high in August (WPUE=0.0154) as in July (WPUE=0.0078), and dropped off considerably in September (WPUE=0.0026) and October (WPUE=0.0033). The

highest sighting rate per depth zone for all years combined was in 0-35m category (WPUE=0.0063; Table 5). Gray whale sighting rate in all months except August was highest in the shallowest depth zone (0-35 m). In August, the sighting rate was highest in the 50-200m depth zone.

Most gray whales were recorded as feeding (73%) in all survey months. Feeding was evidenced by the presence of conspicuous mud plumes streaming out of the mouths of surfacing whales. Gray whale calves were often undetected during initial on-effort sighting events, and many would likely have remained undetected if brief diversions off-effort (in search or circling mode) were not initiated. Including all on-effort and off-effort sightings, a total of 50 gray whale calves were seen (Figure 7). Calves were seen mainly in nearshore areas, and most (n=34) were seen in Block 13, where the majority of survey effort was conducted. Most calves were observed in July of 1982 (n=18, all off-effort), 1985 (n=15) and 2009 (n=10). One calf was seen in August 2008, and six calves were seen in September. All calf sightings were in 0-10% ice cover. One cow-calf pair observed in July 2009 was in close proximity to feeding bowhead whales near Pt Franklin. That cow-calf pair exhibited protection of the calf wherein the calf moved under the cow so that only the calf's flukes could be seen.

One fin whale (*Balaenoptera physalus*) was seen on 2 July 2008 at 69.228°N, 165.675°W, in survey Block 20. The whale was swimming alone, and no other marine mammals were in the immediate area.

One humpback whale (*Megaptera novaeangliae*) was seen on 25 July 2009 at 70.384°N, 160.837°W, in survey Block 17. The whale was feeding very near shore and close to four gray whales.

DISCUSSION

Although bowhead whale sightings are still far fewer in the northeastern Chukchi Sea than in the Beaufort Sea, data collected in 2008-2009 corroborated data collected on bowheads from 1982-1991. Bowhead whale distribution in 2008-2009 suggested a southwesterly migration route across the northeastern Chukchi Sea, particularly in October. Results from satellite-tagged bowhead whales in 2006-2009 also confirmed a southwesterly migration route, as suggested in Moore and Clarke (1990), in addition to a more westerly route for whales presumably heading towards Wrangel Island and the Chukotka coast (Quakenbush *et al*., 2010). Bowhead distribution can also be inferred by the presence of bowhead whale calls on hydrophones deployed throughout the northeastern Chukchi Sea (Delarue *et al*., 2009).

The distribution of bowhead sightings from June to October is unexpected. Most of the summer bowhead sightings and the highest sighting rates occurred in Block 13, closest to the Beaufort Sea. Bowhead whales observed in the northeastern Chukchi Sea during summer may be late migrants to or early returnees from summer feeding areas in the Canadian Beaufort Sea. Conversely, some of the bowheads observed in the summer in the Chukchi Sea may not undergo a complete migration, similar to gray whales that do not migrate the entire distance from the Bering/Chukchi Sea to Mexico (Rugh *et al*. 2008). Summer observations of bowhead whales nearshore in the Chukchi Sea near Pt Franklin were recorded in July 2003 (Moore *et al*., 2010), and four bowhead whales were seen during nearshore surveys in 2008 (Thomas *et al*., 2010). Surveys conducted in summer 1984 (Moore *et al*., 1986), 1985 and 2008 (this study), and oil industry-sponsored aerial surveys in July 2006 and 2007, did not yield any bowhead whale sightings. Moore (1992) summarized summer records of bowhead whale sightings in the northeastern Chukchi Sea from 1975-1991 and listed only three sightings west of Pt Barrow in June or July. The sightings of bowheads feeding near Pt Franklin over a 13-day period in late June through mid July 2009 may be some of the first reported for this area during this time period and indicates that this area may sometimes be important to bowhead whales in the summer. Bowheads have been previously identified as feeding in September near the area in which they were seen feeding in 2009, although far fewer in number (Moore, 1992). Bowheads feeding nearshore in the northeastern Chukchi Sea may be taking advantage of euphausiids and other prey advected north in the Alaska Coastal Current. Feeding observed in 1983, a heavy ice year, was farther from shore and in deeper water. Heavier ice nearshore that year may have prevented feeding from occurring elsewhere along the bowhead whale migration route (e.g., nearer to shore east of Barrow). Alternatively, the ice might have affected the aerial marine mammal observers' ability to detect feeding whales.

Gray whale distribution in 2008-2009 remained primarily nearshore between Pt Lay and Pt Barrow, and underscores the continued importance of that area to gray whales in all months surveyed. Overall sighting rates were lowest in June, increased through August, then decreased through October, reflecting the migration timing of

gray whales in Alaskan waters (Rugh *et al*., 2001). This temporal pattern in sighting rates was repeated in data collected from 1982-1991 and also observed during oil industry-sponsored surveys in 2006-2008 (Thomas *et al*., 2010). Feeding remained the predominant behavior in 2008-2009. Mud plumes were often noted even when no whales were present at the surface. The lack of gray whale sightings in the Hanna Shoal area was unexpected. There was also no evidence of mud plumes over Hanna Shoal, which are generally seen in areas where gray whales are feeding. Feeding gray whales were regularly sighted offshore in the 1980s. Clarke *et al*. (1989) suggested that gray whales may forage along the coast as they first move into the Chukchi Sea in the summer and move to offshore areas in autumn after the ice recedes. The lack of summer sea ice cover in the Chukchi may have changed the location of high concentrations of prey or the overall density of prey. There was only one year (2009) of recent effort offshore from summer through autumn (surveys were not conducted there in September and the first half of October 2008), so it remains to be seen if the lack of offshore gray whales in 2009 was an unusual event or representative of a changing Arctic environment.

It is evident from these aerial survey data that the shallow coastal areas of the northeastern Chukchi Sea may serve as nursery habitat for gray whale calves in some years, particularly in July. Clarke *et al*. (1989) discussed the potential benefits of this habitat for cow-calf pairs, including less competition from other adults to allow the cow to feed more successfully and greater protection from potential predators, such as killer whales (*Orcinus orca*). Killer whales are occasionally observed in the Chukchi Sea (George *et al*. 1994), but their presence there may be less than in the Bering Sea. Gray whale calves have rarely been observed in offshore areas of the northeastern Chukchi Sea, and spatial segregation has also been reported for the Chukotka Peninsula (Krupnik *et al*., 1983; Yablokov and Bogoslovskaya, 1984).

Habitat partitioning between bowhead and gray whales, as described by Moore (2000) and Moore *et al*. (2000), remained evident in the 2008-2009 surveys. Bowheads showed a strong preference for outer shelf waters (50-200m) in all months except June, when results may have been biased by less survey effort and the repeated sightings of feeding bowhead whales very close to shore in 2009. Gray whales showed a strong preference for coastal/shoal areas (<35m) in all months except August, when they may move farther offshore to take advantage of newly uncovered feeding areas when the ice recedes.

While results from these analyses should be considered preliminary because they were based on raw sighting rates (uncorrected for perception or availability bias) they clearly underscore the seasonal importance of the northeastern Chukchi Sea to bowhead and gray whales. The COMIDA surveys are the only broad scale, offshore aerial survey effort underway in the northeastern Chukchi Sea, and the only effort that can reliably collect data that may be used to determine marine mammal density and abundance in areas of active oil and gas leases. Although the time series in the offshore Chukchi Sea does not benefit from the same long-term, uninterrupted surveys as the closely related BWASP study (Clarke and Ferguson, 2010), the data collected in the early years (1982-91) provide valuable insight into cetacean distribution and density patterns during more variable summer ice conditions, and provide a baseline for comparison with the current COMIDA study. Data from COMIDA, combined with information from other research efforts including physical, chemical, and biological sampling, satellite tagging, and passive acoustic monitoring, will continue to improve our understanding of the temporal and spatial nature of large cetacean distribution and density patterns in the northeastern Chukchi Sea, including documenting the impacts of climate change and anthropogenic activities.

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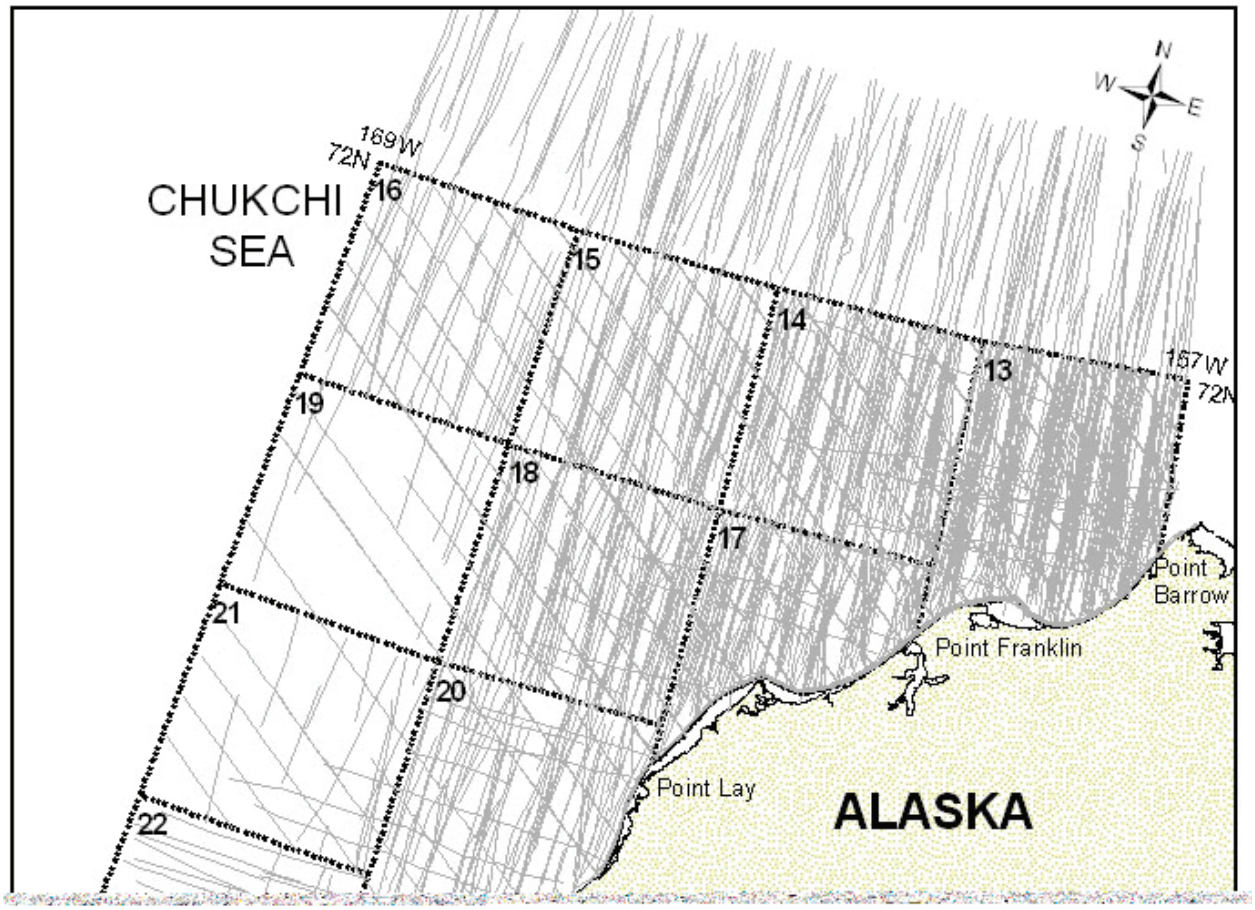

Figure 1. Chukchi Sea study area, survey blocks and aerial survey effort in 1982-1991, 2008, and 2009.

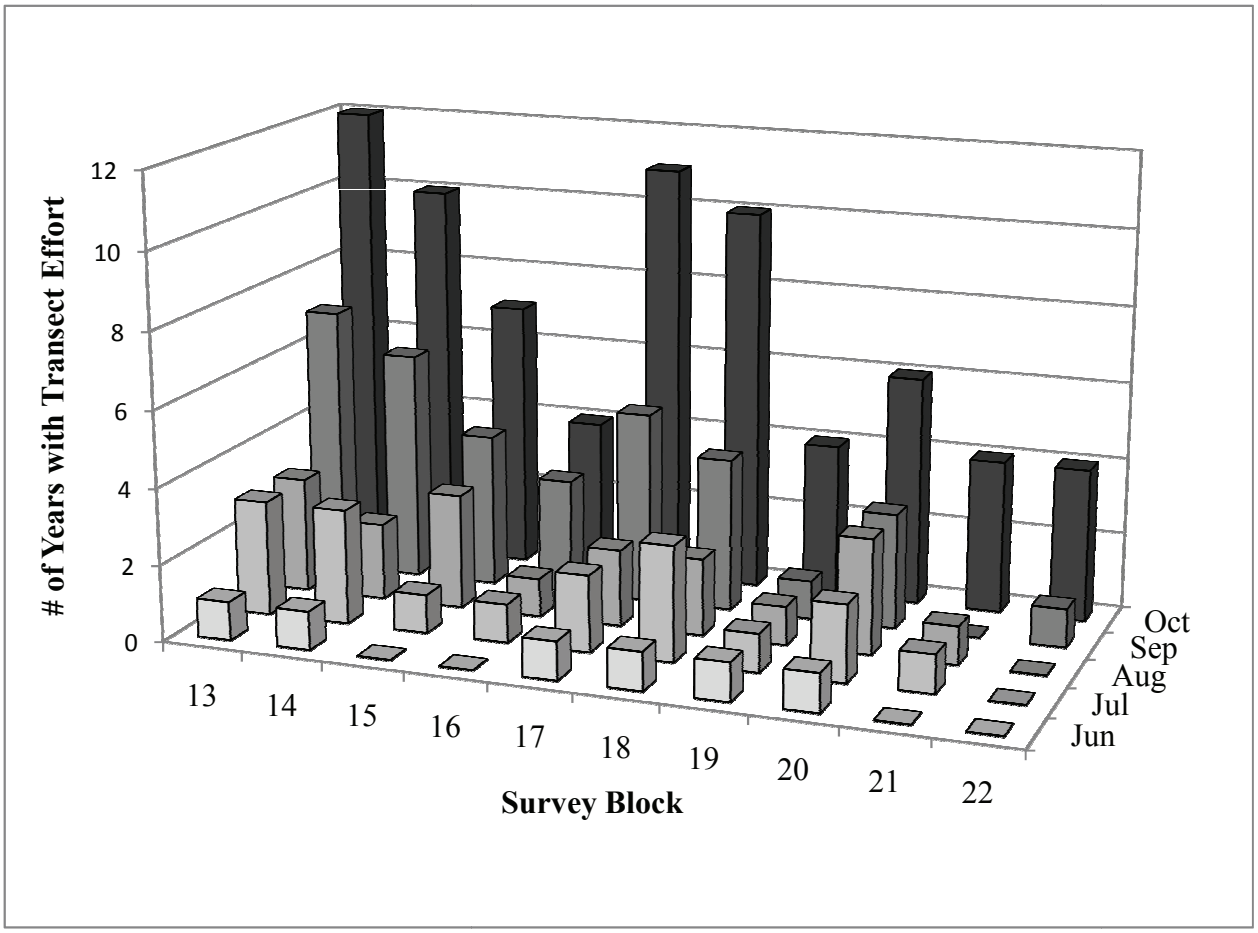

Figure 2. Distribution of transect effort in the northeastern Chukchi Sea by month, year, and survey block.

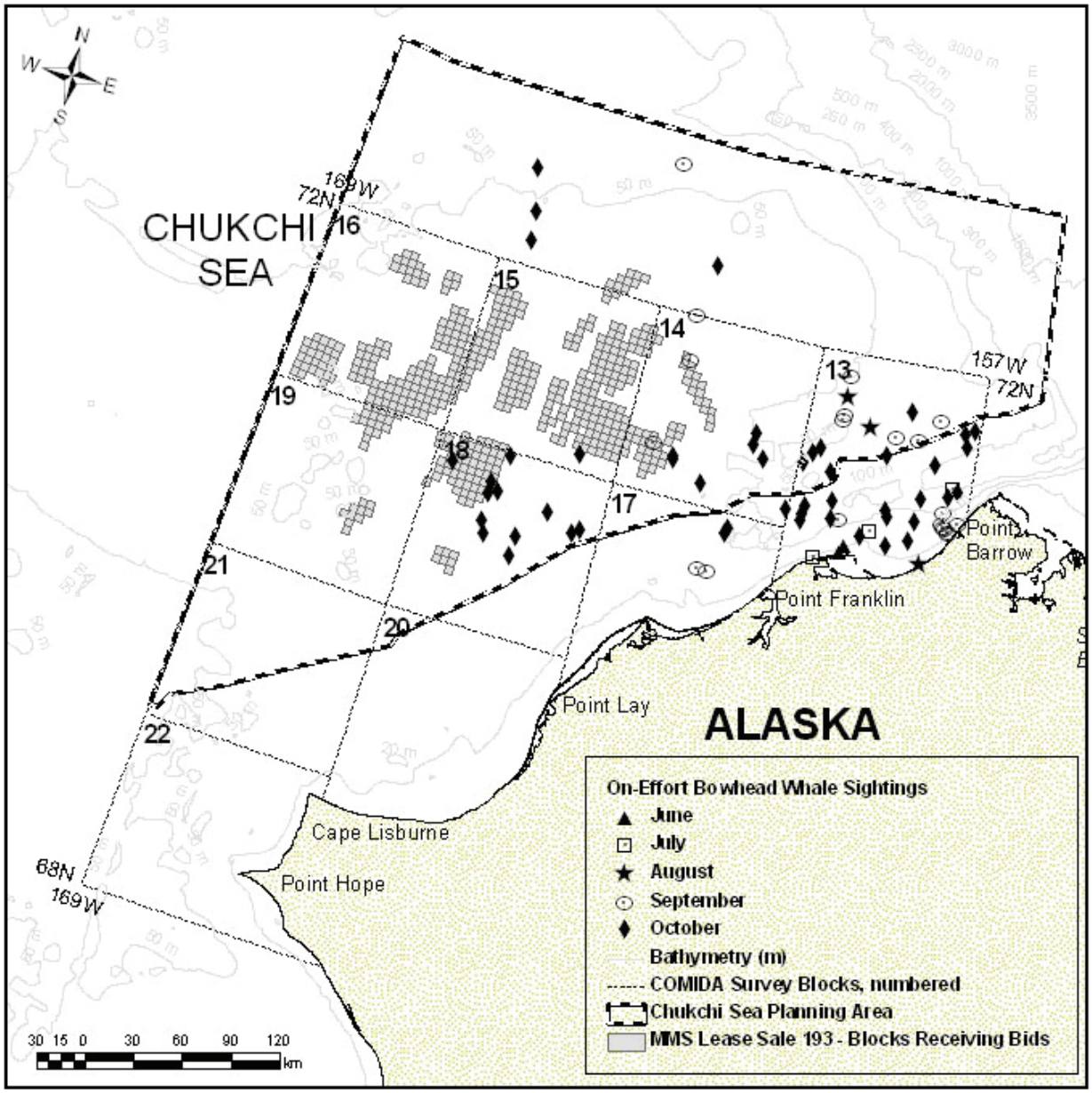

Figure 3. On-effort bowhead whale sightings per month, all years combined.

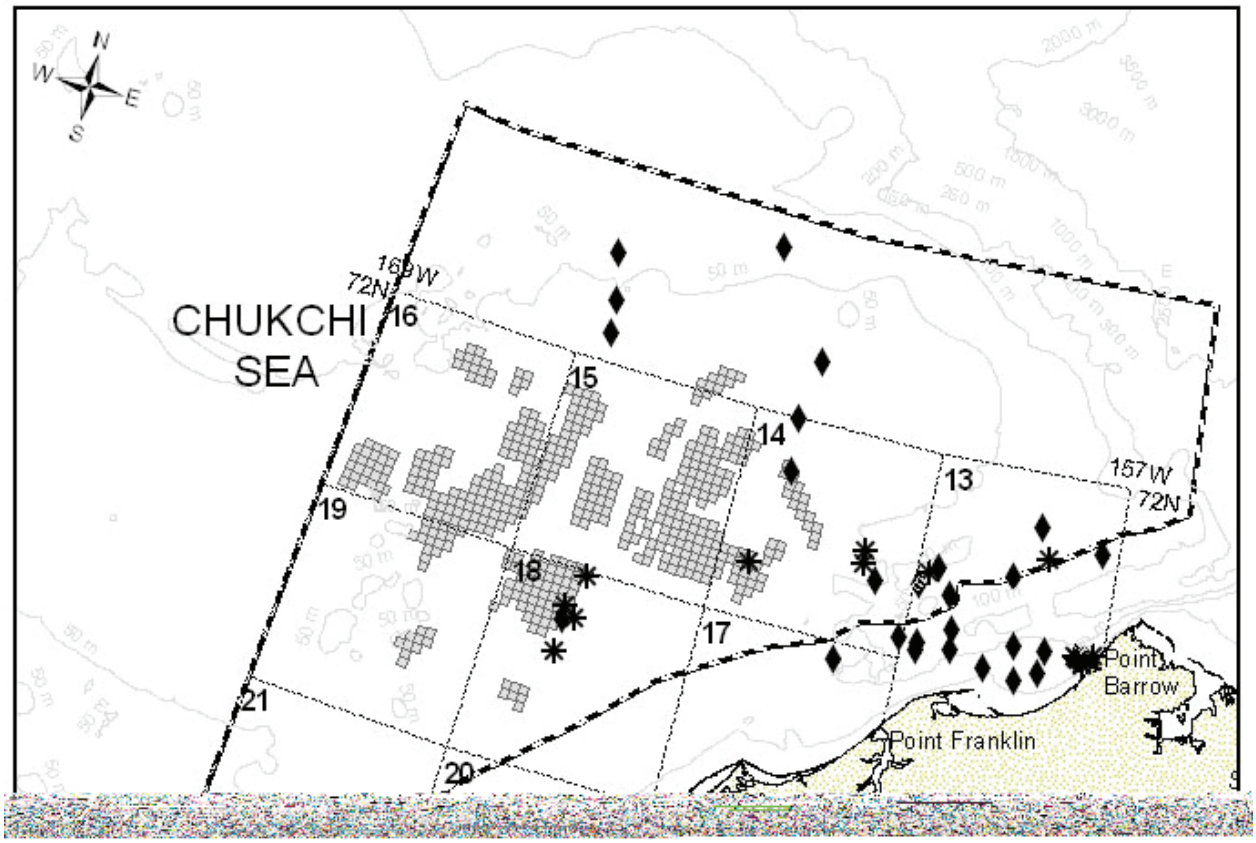

Figure 4. On-effort bowhead whale sightings in light ice years.

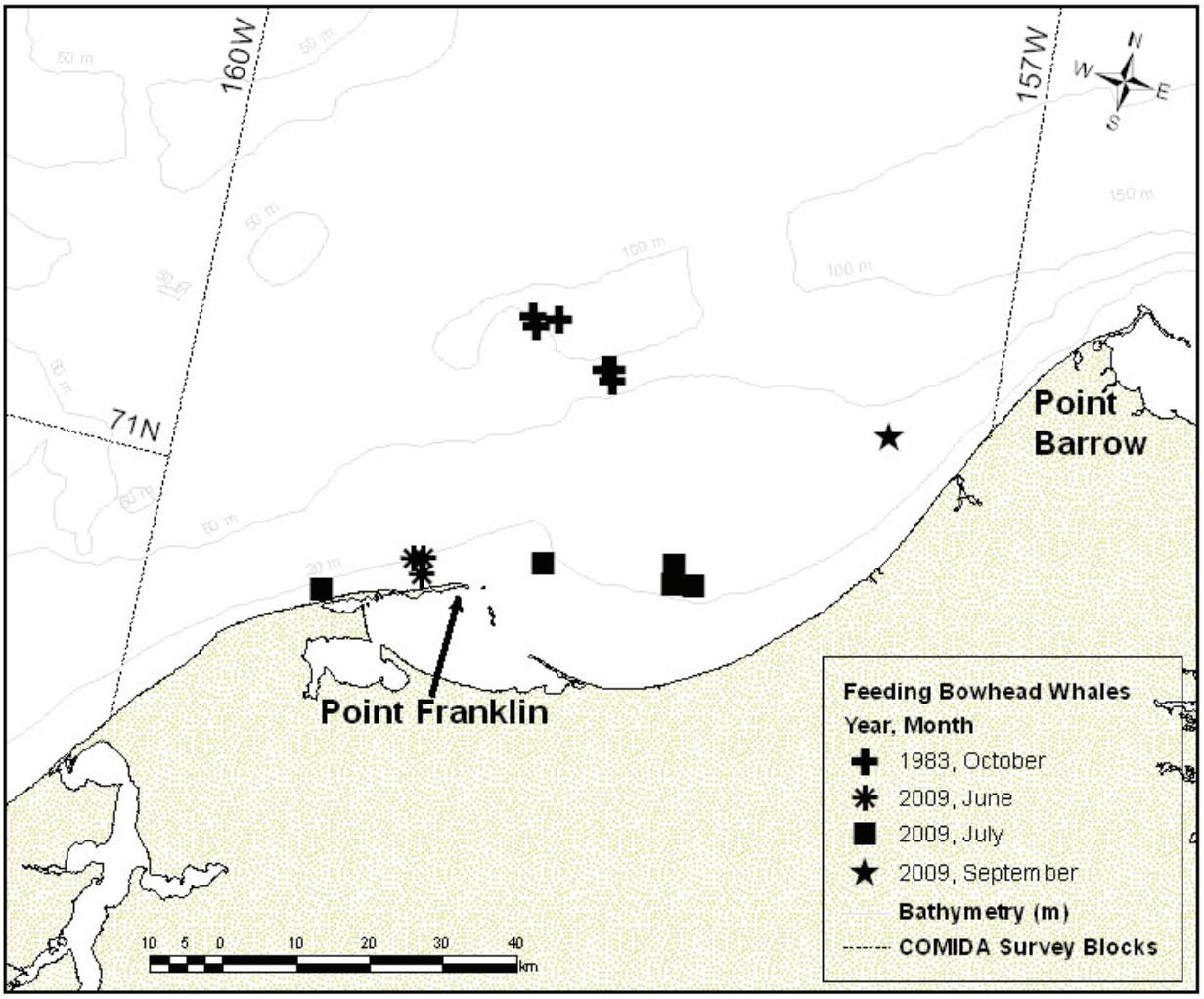

Figure 5. Locations of on- and off-effort feeding bowhead whales, 1983 and 2009.

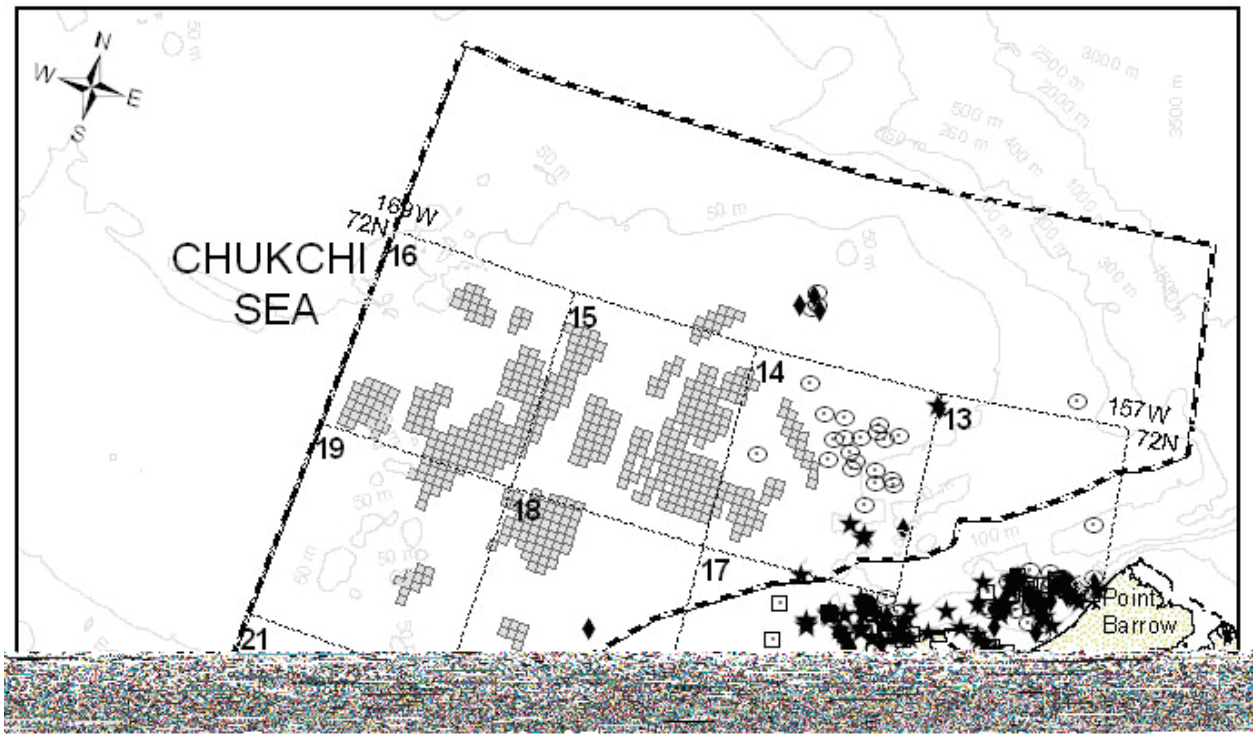

Figure 6. On-effort gray whale sightings per month, all years combined.

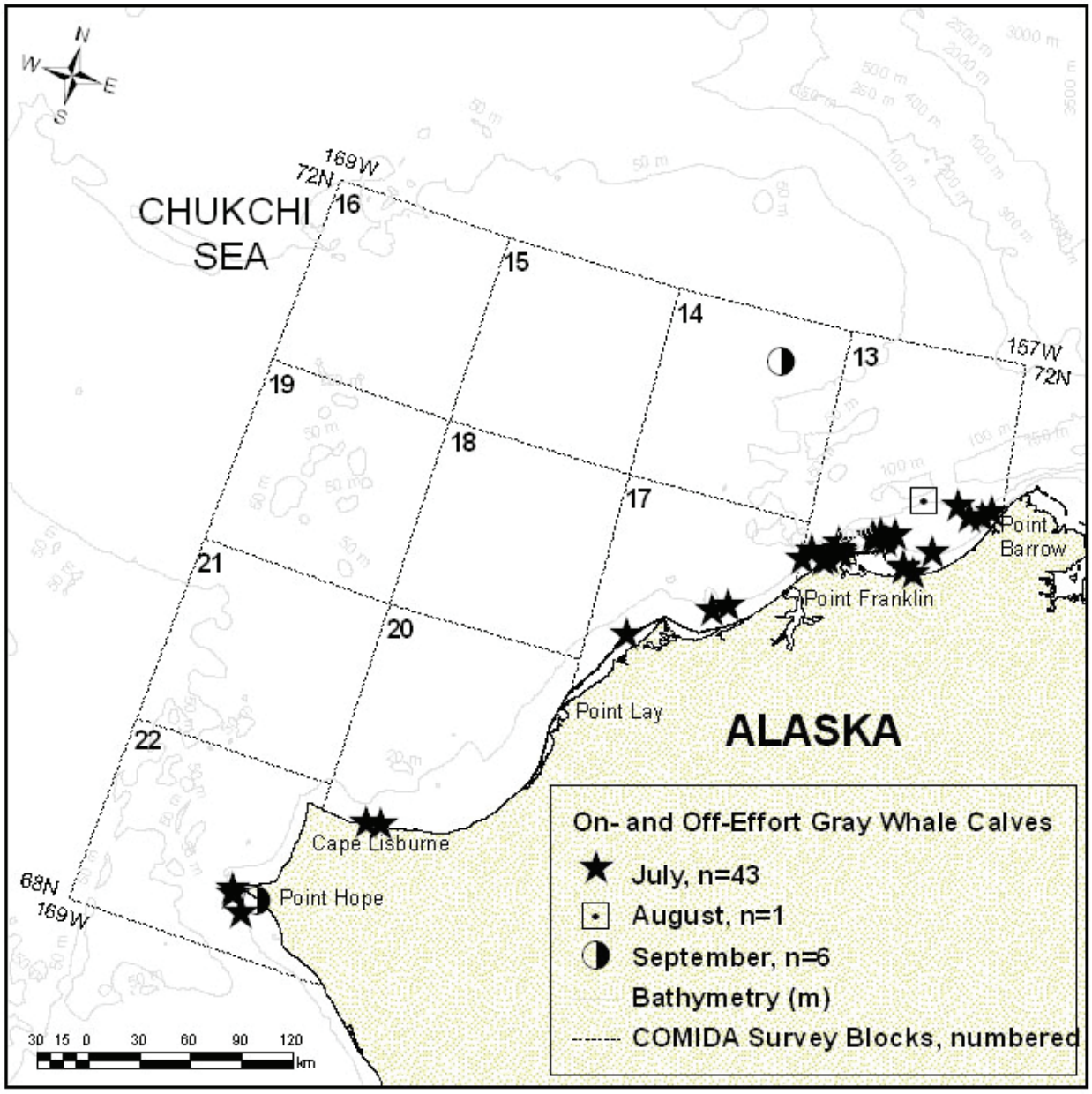

Figure 7. On- and off-effort gray whale calf sightings, by month.

Table 1. Summary of survey flights per month and year, with total kilometers flown on transect (Tr-km).

	June	July	August	September	October	Total Tr-km/Year
1982					x	3,461
1983				x	x	5,478
1984		x	x	x	x	6,713
1985		x			x	7,058
1986				x	x	11,025
1987				x	x	11,471
1988					x	6,337
1989				x	x	12,769
1990					x	3,084
1991				x	x	13,576
2008	x	x	x		x	11,647
2009	x	x	x	x	x	21,139
Total Tr-km/Month	3,998	13,275	10,675	29,123	56,686	113,758

Table 2. Bowhead and gray whale sightings (n) and sighting rate (whales per unit effort=WPUE) per survey block per month. Survey Effort (Tr-km) is included only for current survey blocks (13-22) and does not include effort between 72° and 73°N that was flown from 1989-91. Six bowheads and 16 gray whale sightings were north of 72°N and are not included here. The maximum WPUE per month and for all months combined is **bolded**.

Bowhead Whales

	JUN			JUL			AUG			SEP			OCT			TOTAL		
Block	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE
13	398	5	**0.0126**	3,713	7	**0.0019**	1,992	2	**0.0010**	9,022	15	**0.0017**	12,301	35	0.0028	27,425	64	**0.0023**
14	213	0	0.0000	2,050	0	0.0000	846	0	0.0000	5,039	2	0.0004	5,787	12	0.0021	13,936	14	0.0010
15	47	0	0.0000	1,235	0	0.0000	1,026	0	0.0000	2,668	0	0.0000	3,160	1	0.0003	8,136	1	0.0001
16	0			256	0	0.0000	1,463	0	0.0000	849	0	0.0000	2,016	0	0.0000	4,584	0	0.0000
17	318	0	0.0000	1,572	0	0.0000	925	0	0.0000	2,851	2	0.0007	5,462	2	0.0004	11,128	4	0.0004
18	225	0	0.0000	1,082	0	0.0000	112	0	0.0000	2,283	0	0.0000	5,506	18	**0.0033**	9,208	18	0.0020
19	5			298	0	0.0000	816	0	0.0000	422	0	0.0000	625	0	0.0000	2,165	0	0.0000
20	0			1,087	0	0.0000	671	0	0.0000	1,234	0	0.0000	2,753	0	0.0000	5,745	0	0.0000
21	0			568	0	0.0000	113	0	0.0000	0			908	0	0.0000	1,589	0	0.0000
22	0			611	0	0.0000	1			500	0	0.0000	2,503	0	0.0000	3,615	0	0.0000
TOTAL																**87,532**	**101**	**0.0012**

Gray Whales

	JUN			JUL			AUG			SEP			OCT			TOTAL		
Block	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE
13	398	1	0.0025	3,713	54	0.0145	1,992	65	0.0326	9,022	108	0.0120	12,301	35	0.0028	27,425	263	0.0096
14	213	0	0.0000	2,050	0	0.0000	846	4	0.0047	5,039	51	0.0101	5,787	1	0.0002	13,936	56	0.0040
15	47	0	0.0000	1,235	0	0.0000	1,026	0	0.0000	2,668	0	0.0000	3,160	0	0.0000	8,136	0	0.0000
16	0			256	0	0.0000	1,463	0	0.0000	849	0	0.0000	2,016	0	0.0000	4,584	0	0.0000
17	318	15	**0.0472**	1,572	31	**0.0197**	925	34	**0.0367**	2,851	9	0.0032	5,462	11	0.0020	11,128	100	0.0090
18	225	0	0.0000	1,082	1	0.0009	112	0	0.0000	2,283	0	0.0000	5,506	2	0.0004	9,208	3	0.0003
19	5			298	0	0.0000	816	0	0.0000	422	0	0.0000	625	0	0.0000	2,165	0	0.0000
20	0			1,087	10	0.0092	671	0	0.0000	1,234	0	0.0000	2,753	2	0.0007	5,745	12	0.0021
21	0			568	0	0.0000	113	0	0.0000	0			908	0	0.0000	1,589	0	0.0000
22	0			611	5	0.0082	1			500	23	**0.0460**	2,503	55	**0.0220**	3,615	83	**0.0230**
TOTAL																**87,532**	**517**	**0.0059**

Table 3. Summary of large whale sightings, 1982-1991 and 2008-2009.

	June	July	August	September	October	Total
Bowhead Whale	2/5	3/7	2/2	20/21	50/72	77/107
Gray Whale	9/16	51/101	75/103	68/199	51/114	254/533
Humpback Whale	0	1/1	0	0	0	1/1
Fin Whale	0	1/1	0	0	0	1/1

Table 4. Number of bowhead whale sightings (n) and sighting rate (whales per unit effort= WPUE) per depth zone. Tr-km=transect kilometer. The maximum WPUE per month and for all months combined is *italicized*.

TOTAL	**June**			**July**			**August**		
Depth Range (m)	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE
0 to 35	708	5	*0.0071*	3,723	3	0.0008	3,116	0	0.0000
35 to 50	1,736	0	0.0000	6,089	0	0.0000	4,775	0	0.0000
50 to 200	1,554	0	0.0000	3,464	4	*0.0012*	2,783	2	*0.0007*
>200	0	0		0	0		0	0	
Total	**3,998**	**5**	**0.0013**	**13,275**	**7**	**0.0005**	**10,675**	**2**	**0.0002**

TOTAL	**September**			**October**			**TOTAL**		
Depth Range (m)	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE
0 to 35	4,844	3	0.0006	9,582	5	0.0005	21,974	16	0.0007
35 to 50	13,033	8	0.0006	25,480	38	*0.0015*	51,113	46	0.0009
50 to 200	10,841	10	*0.0009*	20,253	29	*0.0014*	38,895	45	*0.0012*
>200	404	0	0.0000	1,371	0	0.0000	1,775	0	0.0000
Total	**29,123**	**21**	**0.0007**	**56,686**	**72**	**0.0013**	**113,758**	**107**	**0.0009**

Table 5. Number of gray whale sightings (n) and sighting rate (whales per unit effort= WPUE) per depth zone. Tr-km=transect kilometer. The maximum WPUE per month and for all months combined is *italicized*.

TOTAL	**June**			**July**			**August**		
Depth Range (m)	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE
0to35	708	5	*0.0071*	3,723	43	*0.0116*	3,116	27	0.0087
35to50	1,736	10	0.0058	6,089	45	0.0074	4,775	47	0.0098
50to200	1,554	1	0.0006	3,464	13	0.0038	2,783	29	*0.0104*
200+	0			0	0		0	0	
Total	**3,998**	**16**	**0.0040**	**13,275**	**101**	**0.0076**	**10,675**	**103**	**0.0096**

TOTAL	**September**			**October**			**TOTAL**		
Depth Range (m)	Tr-km	n	WPUE	Tr-km	n	WPUE	Tr-km	n	WPUE
0to35	4,844	38	*0.0078*	9,582	26	*0.0027*	21,974	139	*0.0063*
35to50	13,033	94	0.0072	25,480	38	0.0015	51,113	234	0.0046
50to200	10,841	67	0.0062	20,253	50	0.0025	38,895	160	0.0041
200+	404	0	0.0000	1,371	0	0.0000	1,775	0	0.0000
Total	**29,123**	**199**	**0.0068**	**56,686**	**114**	**0.0020**	**113,758**	**533**	**0.0047**

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