

Aerial population survey of common eiders and other waterbirds in nearshore waters and along barrier islands of the Arctic Coastal Plain of Alaska, 28 June-2 July 1999

By

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SUMMARY

An aerial survey of common eiders and other water birds in coastal habitats along the Arctic Coastal Plain of Alaska, including barrier islands, was conducted from 28 June to 2 July 1999. Observations were made from a Cessna 206 amphibian (N736) by the pilot and observer along approximately 1,050 km of shoreline from Omalik Lagoon north and east to the Canadian border and an additional 190 and 325 km, respectively of barrier island habitats off Kasegaluk Lagoon and from Point Barrow to Demarcation Bay. Extensive sea ice conditions in nearshore areas of the Chukchi Sea and seaward of all Beaufort Sea barrier islands as well as the mainland coast suggested spring phenology was delayed in 1999 which may have resulted in lower numbers of breeding Common Eiders.

A total of 1,353 common eiders were observed including an estimated 572 breeding pairs. Distribution generally corresponded to observations and surveys conducted on the ground over the past two decades. Preferred breeding areas along the barrier islands of the central Beaufort Sea coast and Kasegaluk Lagoon accounted for 39 and 13 percent of total common eider observations and 66 and 12 percent of indicated breeding pairs, respectively. Other numerous waterbird species observed in the overall survey area included oldsquaw 4890, glaucous gull 4462, Pacific brant 2329, surf scoter 2073, Canada goose 1554, northern pintail 1268, greater scaup 1011 and king eider 901.

PURPOSE

This survey was designed to provide baseline information necessary to monitor the status and trends of breeding common eiders in northern Alaska. Concerns that this population may have declined are based on an apparent overall decline in numbers as determined during migration past Barrow. The primary objectives are:

- 1) Assess the feasibility of annually obtaining accurate population indices for common eiders breeding along the coastline and islands of the Arctic Coastal Plain (ACP).
- 2) Provide an estimate of the population size and composition of common eiders breeding on all barrier islands along the central Beaufort Sea coast where potential impacts relating to petroleum development occur at increasing rates.
- 3) Determine appropriate phenological indices for timing an annual survey effort that will provide the best potential for understanding and quantifying annual and interannual variability in population size and nesting effort at specific sites.
- 4) Assess the feasibility of performing a companion videographic survey to estimate the number of common eider nests on central ACP barrier islands and provide ratios of breeding pairs to nests.
- 5) Provide an estimate of the species composition, numbers and distribution of other water birds along the coast of the ACP.

JUSTIFICATION

The population of common eiders breeding in habitats of the Chukchi and Beaufort seas of Alaska is poorly understood. This population is believed to be declining; however, insufficient management data are available to meaningfully address various potentially adverse impacts associated with oil and gas development in the Arctic.

This aerial survey is an initial effort to 1) collect baseline information on population size and distribution for common eiders along the ACP, 2) provide guidance for establishment of an annual, aerial monitoring program for breeding common eiders and 3) provide pertinent biological data on common eiders necessary for management decisions relative to expanding petroleum exploration and development or other impacts.

INTRODUCTION

The common eider is a species of concern in Alaska primarily due to indicated declines during migration and at subarctic and arctic breeding sites (Suydam et. al. 1997, USFWS 1999). Breeding distribution extends from southcentral Alaska and the Aleutian Islands north and east along the ACP to the Canadian arctic (Bellrose 1976, Gabrielson and Lincoln 1959, Johnson and Herter 1989, Palmer 1976). In Alaska, breeding is confined to exposed coastal wetlands and sparsely or unvegetated barrier beaches and islands with the highest concentrations along the coastline of the Yukon-Kuskokwim Delta and barrier islands along the Chukchi and Beaufort seas. Common eiders are resident and regular breeders in the Aleutian Islands and while their overall numbers are undetermined, there is evidence of declines at some sites (Byrd 1992, D. Irons, pers. comm.). Potential impacts on common eider populations in western and northern Alaska include predation, subsistence hunting and related lead poisoning and disturbance, habitat loss and impacts associated with petroleum exploration and development.

Migration studies at Barrow, Alaska provide population indices of a combined passage of eiders from both the Alaska ACP and the Canadian arctic mainland and islands (Myres 1958, Thompson and Person 1963, Johnson 1971, Timson 1976, Divoky 1978, Woodby and Divoky 1982) of which from 5 to 10 percent are common eiders (Barry 1986). Suydam et. al. (1997) estimated common eiders comprised 19.2 and 17.3 percent of the spring eider migrations at Barrow in 1987 and 1994, respectively. Although total population indices seem to indicate a decline in common eiders (Suydam et.al. 1997), it is not possible to determine status of distinct geographic breeding components. Cornish and Dickson (1997) reported declines in some larger common eider colonies of the western Canadian Arctic.

This report summarizes aerial survey data to estimate the breeding population size, sex and age composition and distribution of common eiders along the Alaska ACP from Omalik Lagoon along the Chukchi Sea to the Canadian border east of Demarcation Bay. Previous ground based studies conducted within the survey area provided site specific data on population size and/or number of nests which helped identify areas of emphasis (Moitoret 1998, Moitoret and Suydam 1997, Divoky 1978, Johnson and Richardson 1981, Johnson et. al. 1992, Johnson and Herter

1989). However, there have been no quantitative aerial surveys to annually estimate the common eider breeding population size and composition along the entire ACP of Alaska. Johnson and Herter (1989) estimated that probably no more than 2,000-3,000 common eiders nest along the Alaskan Beaufort Sea coast and Moitoret and Suydam (1997) reported 266 nests in a sample of plots at Kasegaluk Lagoon, Alaska. Ground surveys indicated considerable interannual variability in number of nests; however, variability in the numbers of breeding pairs is unknown.

METHODS

The survey, flown from 28 June to 2 July, was designed to coincide with the onset of incubation when pairs would be intact and in the vicinity breeding sites. This timing provides the best opportunity to provide an index of the number and distribution of breeding pairs. Ground observations of migration and nesting phenology at widespread localities along the Chukchi and Beaufort sea coasts over the past two decades were utilized to schedule the timing of this survey.

The survey was conducted in a amphibious Cessna 206 flown at approximately 110 knots and an altitude of 45 meters ASL/AGL. Observations, made out both sides of the aircraft by the pilot (left) and observer (right), were entered directly into laptop computers mounted in the baggage area of the aircraft using remote microphones. The computers received input from the aircraft Global Positioning System (GPS) and recorded coordinates for each observation using a program designed by Jack Hodges (USFWS-Migratory Bird Management, Juneau). A meandering flight route was followed usually 100 meters offshore with slight deviations to confirm species identification and numbers. Emphasis was placed on potential common eider breeding locations including exposed shorelines, sand and gravel spits and barrier islands and adjacent lagoons and bays. Flights were conducted in calm or light winds during mid-day to maximize height of the sun-angle and reduce glare and increase the visibility of birds on the water.

The survey area included 30 shoreline segments and 18 islands or island groups identified on 1:250,000 scale topographic maps (Figs. 1 and 2, Appendix 1). Insular areas along the central Beaufort Sea coast which were later included in the companion videographic nest survey were identified on 1:63,360 scale topographic maps. Maps were consulted primarily to identify segment start and stop points. General observations on habitat and survey conditions, opportunistically recorded by the pilot, were compared with sea surface analyses prepared by the National Weather Service (Fig. 3). For waterfowl species, sex and age of single birds and composition of flocks were determined whenever possible. Observations of common eiders and other species were summarized by barrier island and shoreline survey segments (Tables 1 and 2) and for the total survey area (Table 3). The distribution and composition of common eider observations and the number of indicated breeding pairs (single males+pairs) throughout the survey area was determined to estimate the proportion of breeding birds and total population size (singles+2x pairs+flocks) (Table 4). The number of indicated breeding pairs of common eiders along barrier islands of the central Beaufort Sea was compared with the average number of nests from ground nesting surveys of the same islands (Table 5).

A companion project in 1999 used aerial videography to sample of all barrier islands along a 160

km route from the Colville River to the Canning River to estimate the number of common eider nests. The videographic survey was flown on 4 July in the same aircraft used during the preceding population survey (Anthony 1999).

STUDY AREA/CONDITIONS

Omalik Lagoon to Point Barrow

Survey coverage in this area included shorelines and offshore waters within approximately 400 m of the beach. Inshore and offshore areas associated with barrier islands and spits were surveyed as were the outer half of Kasegaluk Lagoon and Peard Bay.

Wet marsh and rolling tundra with lakes and ponds characterized the mainland shoreline from Omalik Lagoon to the north end of Peard Bay. Numerous small rivers and creeks were present. Shore elevation varied from near sea level at river and creek mouths to an estimated 10 m along bluffs. Islands were present in some river deltas. Mostly unvegetated silt, sand and gravel barrier islands and spits enclosed most of Omalik and Kasegaluk lagoons and Peard Bay.

North of Peard Bay to Barrow, the shoreline was characterized by a sod bluff approximately 5-25 m in elevation and a narrow sand beach averaging approximately 30 m in width.

Shorefast ice was mostly absent from Omalik Lagoon to Point Lay and continuous north to Point Barrow. Open water was present approximately 8 km offshore of Icy Cape with no open water visible to the northwest. Open leads were present from Peard Bay north with about 1 km of shorefast ice and less than a 10 meter wide strip of open water along the beach. Kasegaluk Lagoon had open water in the middle and at the mouths with shorefast ice around the perimeter. Peard Bay had 60 percent ice cover in the larger bay and 80-90 percent in the inner portion.

Point Barrow to the Colville River Delta

Survey coverage in this area included barrier islands and spits off Elson Lagoon, shorelines and islands of Dease Inlet, Pogik Bay and near Kogru Inlet and the exposed shoreline to mid-Harrison Bay. The coastline of the Colville River Delta and wet marshes to approximately 1 km inland were flown.

The Plover Islands and associated spits were of low elevation and mostly unvegetated while islands in Dease Inlet and near Kogru Inlet appeared up to 2 m in elevation and mostly vegetated. The shoreline in Dease Inlet and east to the Colville River Delta was characterized by a sod bluff approximately 3-7 m in elevation except at river deltas and creek mouths. Wet marshes and numerous, often large waterbodies were inland of the shoreline. The Colville River Delta consisted of low, wet marshes with numerous small waterbodies and tide channels.

Elson Lagoon was primarily open water; however, northern Dease Inlet had 80 percent ice cover from Tiny and Oarlock islands south. Smith Bay was 50 percent ice covered with nearly continuous shorefast ice near Cape Simpson and east to Cape Halkett. Beyond the shore zone,

sea ice was continuous. Harrison Bay was ice free; however, Kogru Inlet was ice covered except for about 50 m along the south shore.

Colville River Delta to the Canning River Delta

Survey coverage included barrier islands of Simpson Lagoon, Gwydyr Bay and Stefansson Sound and the mainland shoreline from the Colville River Delta to the base of Brownlow Point.

Barrier islands in this area were of low elevation, estimated at <3 m except the eastern segment of Flaxman Island which appeared to have tundra bluffs of as much as 5 m. The islands appeared sparsely vegetated except for Tigvariak Island and the eastern segment of Flaxman Island which were mostly vegetated. The mainland shoreline was usually a low sod bluff several meters high and a narrow sand beach intersected by river mouths and deltas. Wet marsh with numerous waterbodies characterized onshore habitats.

Mainland and lagoon habitats in this area were mostly ice free. Some brash and broken ice was found south of the barrier islands with thicker but broken ice to the north. At Cross and Narwal islands, shorefast ice was present to about 0.5 km south and continuous to the north. East of the Sagavanirktok River, ice was mostly shorefast but broken.

Canning River Delta to the Canadian Border

Survey coverage in this area included barrier islands, spits, lagoons and mainland shorelines from the Canning River Delta to the Canadian border, including Demarcation Bay.

Barrier islands were low elevation, estimated at <1.5 m and mostly unvegetated. The mainland shoreline at Brownlow Point was a sod bluff 5 m in elevation and a narrow sand beach which decreased in elevation to approximately 1 m to the east side of the Canning River Delta and east to Kaktovik. East of Kaktovik, the mainland shoreline was a sod bluff up to an estimated 6 m in elevation with a narrow sand beach. Dryer tundra interspersed with wet marsh with fewer waterbodies characterized onshore habitats east of Kaktovik.

Approximately 100 m of open water occurred along the shoreline with continuous sea ice offshore. More open water was found near river mouths. Arey, Kaktovik and Jago lagoons contained mostly open water and Demarcation Bay was ice free.

RESULTS/DISCUSSION

Of 1,353 common eiders observed in the survey area, an estimated 572 were indicated breeding pairs (Figs. 1 and 2, Table 4). A total of 424 single adults (i.e. males 90.1%, females 9.9%) accounted for 31.3 percent of total observations. A total of 511 flocked adults accounted for 37.8 percent of total observations with females predominating in a ratio of 2:1. Subadult males made up only 1.3 percent of total observations based on the sightings of three singles and a flock of 15 along the Chukchi Sea coastline. Although it is likely that some single or flocked females were subadults, subtle plumage characteristics of subadult females (paler and more mottled) are

indistinguishable from the air. Johnson (1971) and Suydam et. al. (1997) found equal sex ratios during spring migration at Barrow suggesting that observations were composed primarily of breeding pairs. Schamel (1978) observed some non-breeding (possibly subadult) females at Egg Island but did not discuss their proportion in relation to breeding adults.

Totals and indicated breeding pairs of common eiders were distributed primarily along spits and barrier islands of the central Beaufort Sea coast (522 birds, 38.6% of total; 378 indicated pairs, 66.1% of total) and at similar sites at Kasegaluk Lagoon (176 birds, 13.0% of total; 69 pairs, 12.1% of total) (Tables 1, 2 and 4). Previous studies (Moitoret 1998, Moitoret and Suydam 1997, Johnson and Herter 1989) have identified these areas as important breeding sites. We observed other concentrations along barrier islands and spits of Peard Bay (36 pairs, 6.3% of total) and from the Canning River to Demarcation Bay (75 pairs, 13.1% of total). Remaining shoreline segments accounted for 17.2 percent of total common eiders (n=232) and 2.5 percent of indicated breeding pairs (n=14) (Table 4).

Climatic conditions, the extent of ice cover and predation can all interact to affect the number and distribution of nesting common eiders (D. Schamel, pers. comm.). Numbers of indicated breeding pairs along barrier islands of the central Beaufort Sea coast between the Colville and Canning rivers were compared to nearly 20 years of ground nest counts on most of these islands (Table 5). Considerable annual variation in nesting effort occurred throughout this period making comparisons from a single years aerial survey of questionable value. Coordinated annual aerial and ground surveys will help generate a visibility index for birds and to qualify breeding pair:nest ratios based on the companion videographic survey.

The phenology of snow melt and sea ice conditions based on the impressions of knowledgeable observers along the ACP suggest the spring of 1999 was delayed for a few days to one week (R. Suydam, pers. comm.; R. Richie, pers. comm.; B. Anderson, pers. comm.). It is unknown to what extent this delay may have affected the numbers and distribution of common eiders along the ACP. Climatically delayed springs can result in later migration timing, lower nesting effort, reproductive failures or direct mortality (Barry 1960, 1967, 1968).

RECOMMENDATIONS

The size and distribution of the common eider breeding population along the ACP will likely show annual variability in response to climate. However, other factors such as predator abundance and distribution and potential disturbance associated with offshore oil and gas exploration and development are likely important. Appropriately timed ground and aerial surveys are necessary to provide a useful index of annual population size and trend. Specific recommendations for further work are:

- 1) Continue to conduct annual aerial surveys timed to coincide with average onset of incubation to assess the distribution and abundance of total birds and indicated breeding pairs.

- 2) Collaborate with other researchers to obtain ground survey data of birds and nests within the survey area to provide visibility indices for ocular and videographic surveys.
- 3) Conduct annual aerial videographic surveys to estimate numbers of nests on barrier islands between the Colville and Canning rivers during years with variable environmental conditions .
- 4) Review plumage characteristics of subadult and adult common eiders to assess the capability of detection during aerial surveys.

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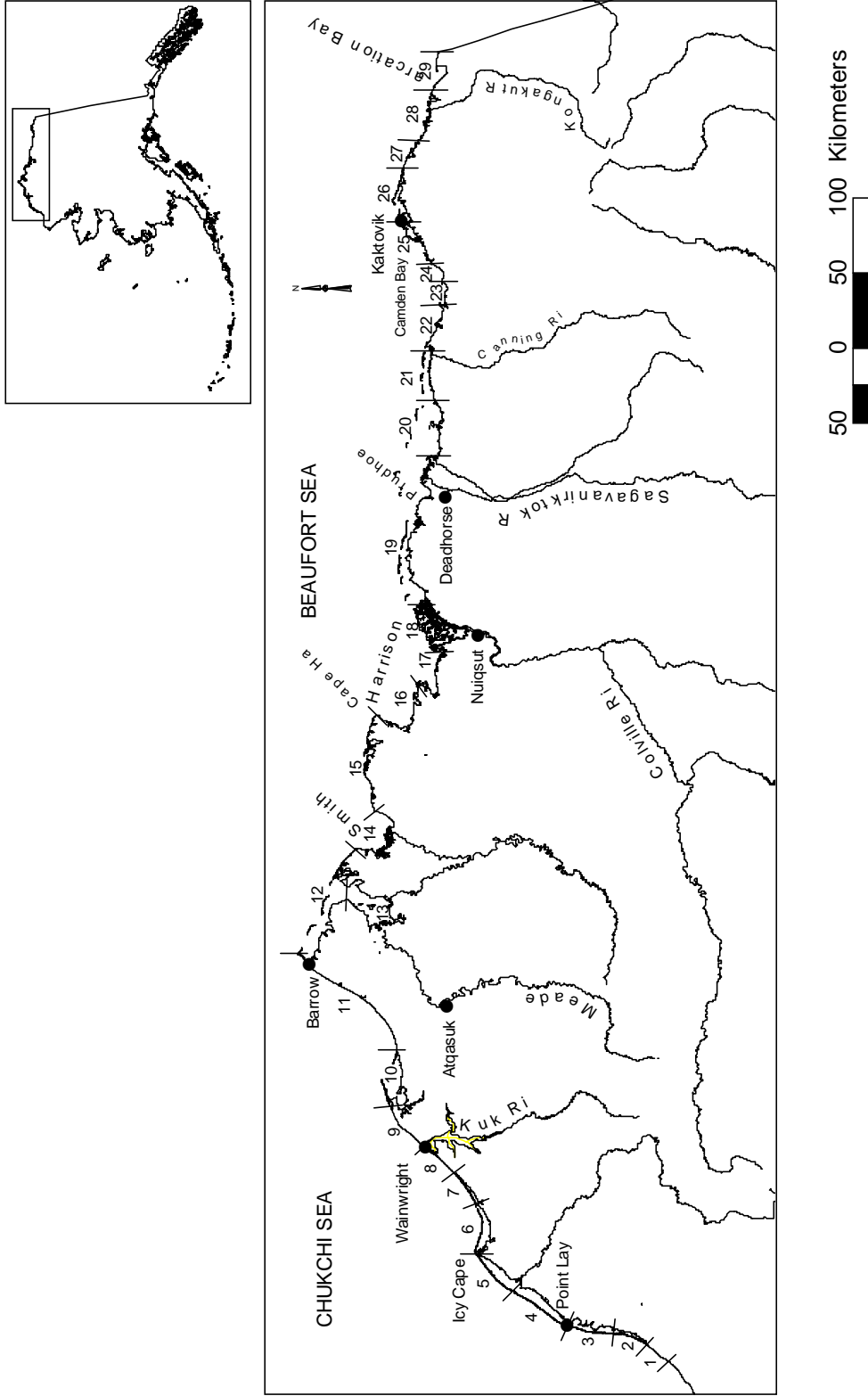


Fig. 1. Location of aerial survey segments searched for common eiders along the Arctic Coast, Alaska

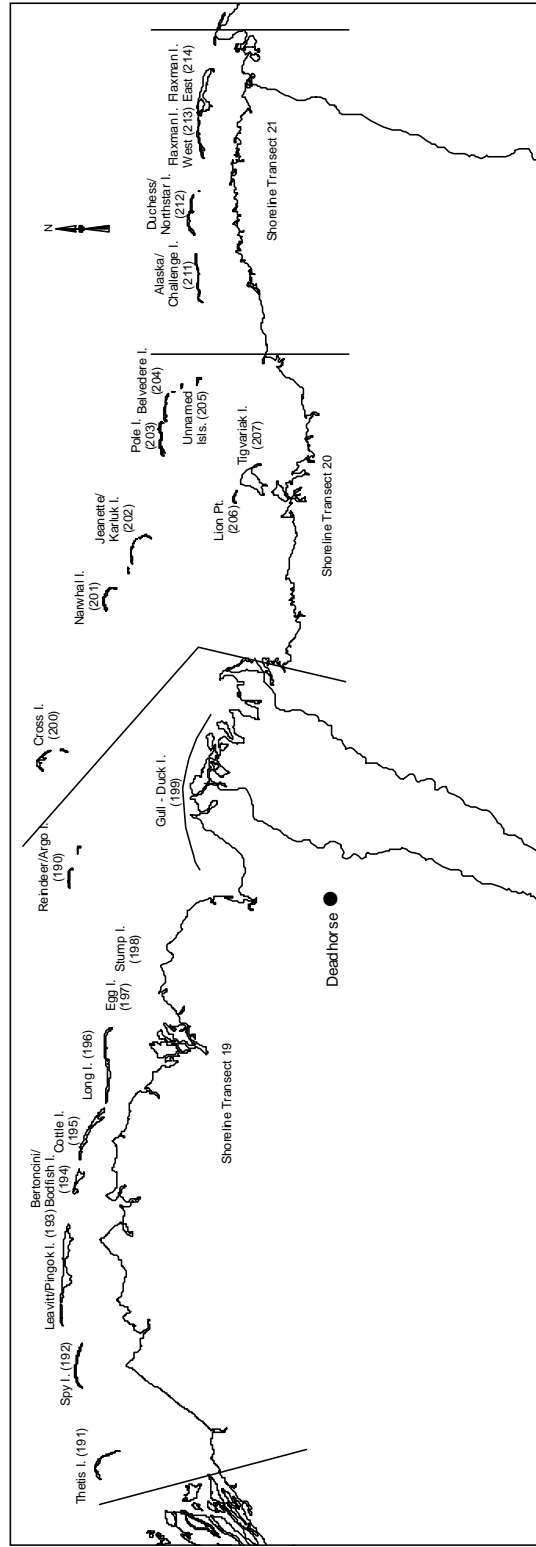
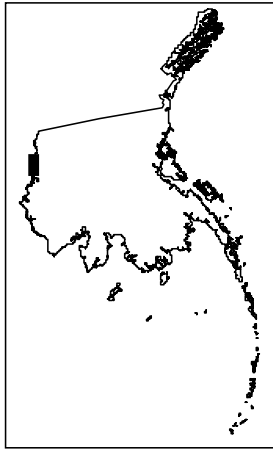
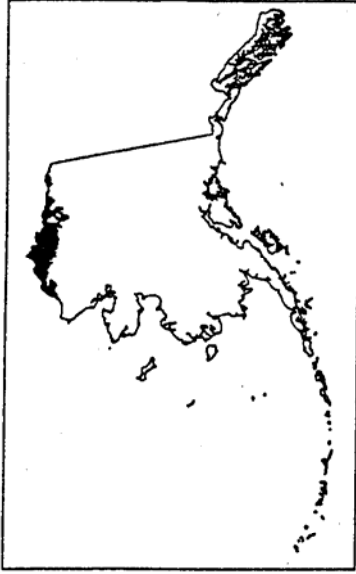
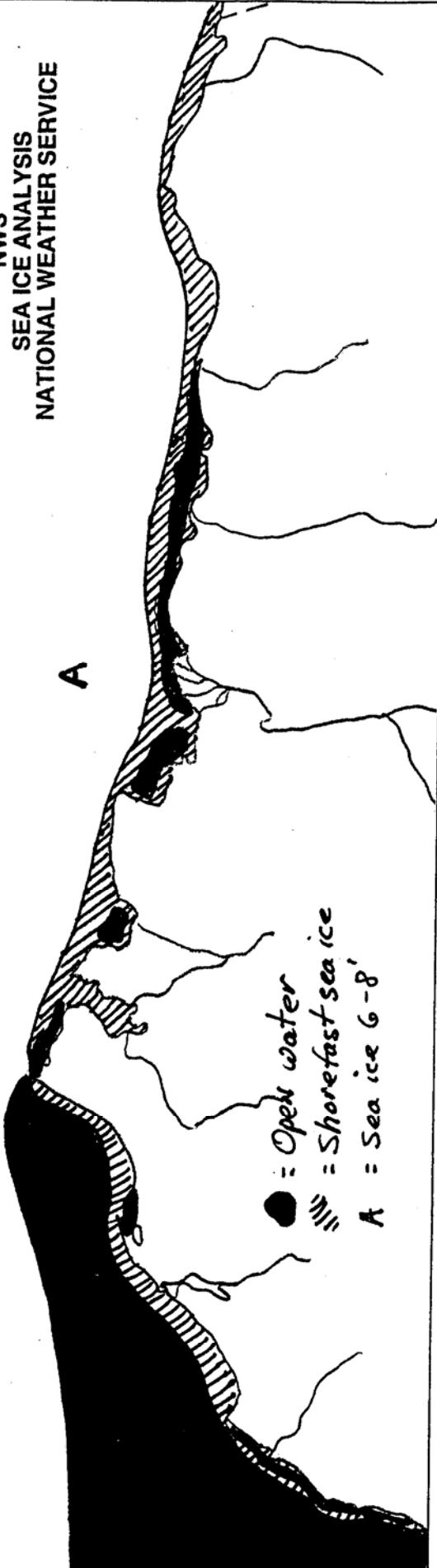


Fig. 2. Survey segments, including coastline and barrier islands, along the central Arctic Coastal Plain, Alaska.



From: NWS
SEA ICE ANALYSIS
NATIONAL WEATHER SERVICE

A



● = Open water
▨ = Shorefast sea ice
A = Sea ice 6-8'

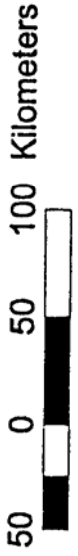


Table 2. Species totals by segment along ACP coastline, 28 June-2 July, 1999.

Species	Segment Number																													Total	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	20	21	22	23	24	25	26	27	28	29			
ARTE		136	439	70	7	74	32			20	1	74		1	4	3			10												871
BLBR	8	75			190	240	1	182		170	60	36	2		456	574	151	44	23					40			20	9	2281		
BLGU												1																		1	
BLSC																								1						1	
CAGO										4		29		9	829	620	25	9	6			15	4				2		1552		
COEI juv	1				1						15	1																	18		
COEI hen		4		5		2				2	8	3		2								3		16	13	7	1	66			
COEI	4	6	14	43	50	14	37		29	104	164	3							5	15	65	36	2	119	21	15	1	747			
GLGU	46	160	744	184	259	270	34	44	41	172	806	501		128	13	16	15	40	15	3	21	35	33	171	233	44	51	4079			
GRSC				7							35	15		380								50	75		23		95	260	940		
KIEH																5	1													6	
KIEI		2	2							2	607	42			14	4		9	3	17	2				27	5		736			
LTJA			1																										1		
NOPI		50		208				2			8	1		35	25	45	16	88	111	2			2	24	17	562	27	1223			
OLDS	5	44	20	23	16	2	1	35	20	156	2323	367		16	76	2		2	3	13	9	143	10	148	629	3	62	33	4161		
PAJA			1								2			1															4		
PALO			1		30	6	6	2	3	22	203	31	1	9	12	4	1		7	4	5	1	3	12	27	1	1	392			
RBME			5		1	27	12		3		12	4		10					1	3	9	40	13	18	240	3	244	645			
RTLO	9	2	1	9	4	1	1					24		1	2	2					1			4	8	4	5	78			
SACR																											2		2		
SAGU			15								1			46	35														97		
SNGO	6																	12	1	85								104			
SNOW								2			6		2	1	1	2													14		
SPEH											2																		2		
SPEI					1		1				9																		11		
SUSC				15										28				10			60	4	180	450	367	92	35	35	540	1816	
TUNE																		2	2								5	9			
TUSW		3				3								2			4	10	1				2	1		4		30			
WFGO	234	65		6	11					1			1	68	2	23	26	71	6					2	1		4	7	521		
WWSC											4											45		4	63				116		
YBLO						1	4	1		8	5		1	10	1	1					1	2				1		36			

Table 3. Species totals for all areas, ACP, 28 June-2 July, 1999

Species	Total birds observed		
	Shoreline	Barrier Isl.	Overall
ARTE	871	30	901
BLBR	2281	48	2329
BLGU	1		1
BLSC	1	2	3
CAGO	1552	2	1554
COEI juv	18		18
COEI hen	66	26	92
COEI	747	496	1243
GLGU	4079	383	4462
GRSC	940	71	1011
KIEH	6	3	9
KIEI	736	156	892
LTJA	1		1
NOPI	1223	45	1268
OLDS	4161	729	4890
PAJA	4		4
PALO	392	51	443
RBME	645	65	710
RTLO	78	7	85
SACR	2		2
SAGU	97	2	99
SNGO	104	20	124
SNOW	14		14
SPEH	2		2
SPEI	11		11
SUSC	1816	257	2073
TUNE	9		9
TUSW	30	2	32
WFGO	521		521
WWSC	116	12	128
YBLO	36	4	40

Table 4a. Common eider sex and age composition and totals by segment, ACP, 1999.

TRANSECT	SINGLES			PAIRS		FLOCKED BIRDS		TOTAL ³
	AdultMale	Juv. Male	Female	No.	Indicated Total ¹	Total	Male:Female ²	
1	4	1			4			5
2			4			6		10
3	2			2	4	8	2:06	14
4	13		3	11	24	10	0:02	48
5	16	1		3	19	28	16:12	51
6	2		2	6	8			16
7	3			11	14	12	9:03	37
8								0
9	1				1	28		29
10	23			13	36	57	17:38	106
11	3		3		3	181	25:45:00	187
12	1	1	1	1	2	2	0:02	7
13								0
14						2	0:02	2
15								0
16								0
17								0
18								0
20	3			1	4			5
21						15	4:11	15
22	13			11	24	30	5:25	65
23	6		3		6	30		39
24				1	1			2
25	9			10	19	106	51:55:00	135
26	5		6	8	13	7	0:07	34
27								
28	7			4	11	7	0:07	22
29	1		1		1			2

¹ Single males+pairs = Indicated total pairs.

² Flocks from which sex ratios were obtained.

³ Total= singles+2x pairs+ flocks.

Table 4b. Common eider sex and age composition and totals by segment, ACP, 1999.

TRANSECT	SINGLES			PAIRS		FLOCKED BIRDS		TOTAL ³
	AdultMale	Juv. Male	Female	No.	Indicated Total ¹	Total	Male:Female ²	
191	4			5	9			14
192	13			1	14	3	0:03	18
193								0
194								0
195								0
196	16			5	21			26
197	39			3	42			45
198	6			3	9			12
199	30		11	15	45			71
200	13			13	26	10		49
201	21		4	10	31			45
202	11			3	14			17
203	34			15	49			64
204	1				1			1
205								0
211	61		3	19	80	2	0:02	104
212	19			7	26			33
213	1		1	5	6			12
214	1			4	5	2	0:02	11

¹ Single males+pairs = Indicated total pairs.

² Flocks from which sex ratios were obtained.

³ Total= singles+ 2x pairs+ flocks.

Table 5. Historical observations of common eider nests on barrier islands of the central Beaufort Sea.

ISLAND/S	1970-76 ¹			1978-80, 82-91 ²			1995 ³
	Avg.	Range	n ⁴	Avg.	Range	n ⁴	No.
Thetis	22	14-38	7	66.4	27-112	8	
Spy	2.6	5-Jan	7	13.1	Feb-30	8	
Leavitt/Pingok	1.7	0-3	7	3.8	0-14	6	
Bertocini/Bodfish	0	0	7	0.4	0-1	5	
Cottle	3	0-6	7	3	0-7	7	
Long E/W	7.1	25-Feb	7	30	Jan-36	8	24
Egg E/W	16.9	Aug-35	7	59.3	Aug-87	9	60
Stump	2.6	0-10	7	61.5	5-152	10	80
Gull	0	0	6	1	0-2	3	
Niakuk	4.6	12-Jan	7	5	5	1	
Howe	0	0	6				
Duck	2.6	0-4	7				
Reindeer	0.6	0-4	7	3.3	0-9	6	
Argo	0	0	7	3.3	0-6	7	
Cross/Noname	87.9	27-139	7	181.6	60-256	7	
Narwhal	8.3	Feb-33	7	48.4	30-63	7	
Jeanette/Karluk	3.3	0-5	7	23.3	0-28	7	
Pole	29.1	Apr-64	7	113.9	0-215	7	
Belvedere	4.3	10-Jan	7	9.7	30-Jan	6	
Challenge/Alaska	3.1	0-12	7	39.8	Mar-45	8	
Duchess/Northstar	1.7	0-2	7	33.6	Apr-42	7	
Flaxman W	3.7	0-7	7	0.8	0-2	5	
Flaxman E							

¹ A. Gavin data 1970-75, G. Divoky data 1976.

² C. Moitoret data 1978-80, 1982-91.

³ D. Troy data.

⁴ Number of years surveyed.

Appendix 1. Survey segment descriptions, ACP coastal survey, 1999.

SEGMENT	DESCRIPTION
1	Omalik Lagoon to the south end of Kasegaluk Lagoon
2	South end of Kasegaluk Lagoon to Naokak
3	Naokak to Point Lay
4	Point Lay to Ututok Pass
5	Ututok Pass to Icy Cape
6	Icy Cape to Nokotlek Point
7	Nokotlek Point to Kilimanta (north end of Kasegaluk Lagoon)
8	Kilimanta to Wainwright
9	Wainwright to the start of Peard Bay
10	Peard Bay
11	Peard Bay to Point Barrow
12	Barrier islands from Point Barrow to Cape Simpson
13	Dease Inlet
14	Cape Simpson to Drew Point, including Smith Bay
15	Drew Point to Cape Halkett
16	Cape Halkett to Atigaru Point
17	Atigaru Point to Nechelik Channel (Colville River)
18	Colville River Delta
19	Coastline from the east end of Colville River Delta to the Sagavanirktok River Delta
20	Coastline from Foggy Island to Bullen Point, including Lion Point and Tigvariak Islands
21	Coastline from Bullen Point to Brownlow Point
22	Coastline and barrier islands from Brownlow Point to Konganevik Point
23	Konganevik Point to Collison Point
24	Collison Point to Anderson Point
25	Coastline and barrier islands from Anderson Point to Kaktovik
26	Coastline and barrier islands from Kaktovik to Pokok Lagoon
27	Pokok Lagoon to Angun Point
28	Angun Point to Siku Point
29	Siku Point to the Canadian border, including Demarcation Bay

Appendix 1 (con'd). Survey segment descriptions, ACP coastal survey, 1999.

SEGMENT	DESCRIPTION
190	Reindeer and Argo islands
191	Thetis Island
192	Spy Island
193	Leavitt and Pingok islands
194	Bertoncini and Bodfish islands
195	Cottle Island
196	Long Island E/W
197	Egg Island
198	Stump Island
199	Gull, Niakuk, Howe and Duck islands
200	Cross and unnamed island
201	Narwal Island
202	Jeanette and Karluk islands
203	Pole Island
204	Belvedere Island
205	Unnamed islands east of Belvedere Island
211	Challenge and Alaska islands
212	Duchess and North Star islands
213	Flaxman Island W
214	Flaxman Island E