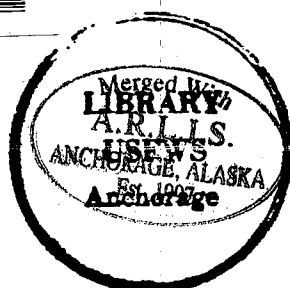


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Waterbirds and Their Wetland Resources at
Storkersen Point, Alaska
1978 Final Report



David McDonald and Robert C. Kenyon

On Reserve

U. S. Fish and Wildlife Service
Special Studies
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INTRODUCTION

Trans-Alaska pipeline investigations, begun in 1970, have collected data on migration, breeding distribution and habitat requirements of birds on the Beaufort Sea, Arctic Coastal Plain, Prince William Sound and other areas that would be influenced by the pipeline.

Storkersen Point (70°25'N, 148°15'W) lies on the Arctic Coastal Plain 20 km northwest of the producing oil fields of Prudhoe Bay. The 18 km² Storkersen Point study area has been the site of a seven year investigation with three major objectives: 1) develop a wetland classification system; 2) determine the importance of the coastal plain to waterbirds and 3) determine the abundance of aquatic macroinvertebrates in tundra ponds, and identify use of invertebrates by waterbirds in order to evaluate the impact of oil spills and petroleum development on waterbirds (Bergman et al. 1977; Howard 1974; Abraham 1975; Derksen et al. 1976; Heinz and Koob 1977). Specific objectives of the 1978 field season at Storkersen Point were: 1) determine breeding populations of birds by weekly ground censuses on established transects; 2) monitor waterbird use of wetlands and maintain an avian phenology chart; 3) sample macroinvertebrates in small tundra ponds (subjected to experimental oil spills in 1974 and 1975) in order to assess long-term recovery rates; 4) prepare detailed cover maps of plots in Loon and Phalarope Lakes to serve as ground truth for low-level aerial photographs to be taken in August; 5) compile a species list and collection of plants found in Loon and Phalarope Lakes; 6) do vegetation line transects in Loon and Phalarope Lakes to determine frequency of occurrence of plant species; 7) record caribou movement, herd size and composition, and record Arctic fox activity; and 8) determine population levels of small mammals on four trapping grids established in 1976.

The 1978 field season extended from 4 June until 20 August. Field personnel included D.V. Derksen, D.B. McDonald and R.C. Kenyon. Snow cover

upon arrival was estimated at 75%. By 12 June snow cover was 2%. Daily weather notes were kept and a summary of these appears in Appendix 1.

I. Birds

METHODS

Large birds (loons, waterfowl, Jaegers, gulls, terns and owls) were counted each week beginning 6 June. Two observers walked abreast north and south alternately so that four passes covered the study area. Each observer canvassed an 800 meter wide corridor. In previous years only the western half of the study area (R13E, T12N; sections 13, 24 and 25) was surveyed. The addition of the eastern portion (R14E, T12N; sections 18, 19 and 30) meant that the entire study area was observed at least once a week. Figure 1 is derived from an orthophoto map of the study area. Numbers of large birds seen, and sex when known, were recorded on prepared data forms (Appendix 2).

Small birds were censused 7 June and each week thereafter by two observers on nine separate plots. The plots, established in 1972 as recorded by Bergman et al. (1977) were 200 meters wide and totalled 1.6 km² (Figure 1). Birds observed were recorded on prepared data forms (Appendix 3). A helicopter survey of the Kuparuk and Sagavarirktok delta areas was conducted on 8 June. The flight route was not predetermined and coverage was intended as an index of birds present in the area rather than as a systematic census. Throughout the summer daily totals of all birds seen were tallied on a prepared chronology sheet.

No formal nest searches were made but nests found during other field work were marked with flagged stakes five paces north for small birds and ten paces north of the nest for large birds. Nests found were periodically rechecked for success, and for incubation period and timing of hatch when possible. Loon nests were recorded on a separate prepared form. All nests found were marked on an orthophoto map of the study area. Bird migration data was

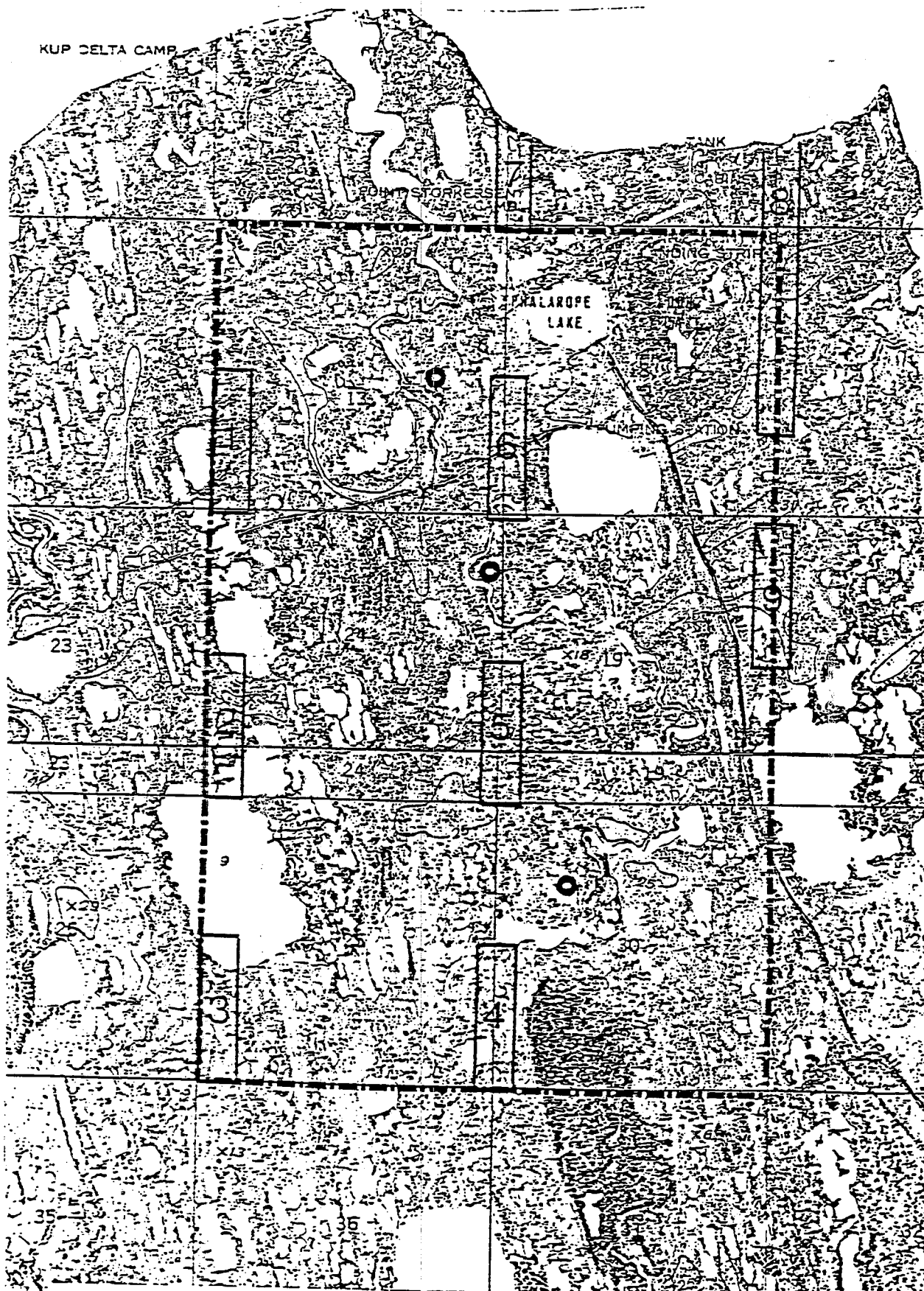


Fig. 1 Map of Storkersen Point study area showing large and small (1-9) bird survey plots, BP Pad "2" (◆) and location of pingos (●).

obtained on an opportunistic basis. Flocks were recorded noting species, numbers, composition, and direction of movement.

Wetland use by waterbirds was recorded on prepared data sheets (appendix 4). Wetland type was noted using the categories established by Bergman et al. (1977). As shorebirds began using wetlands more heavily in the late nesting and post-nesting season they were added to the species noted on the prepared forms.

Buff-breasted Sandpiper (Tryngites subruficollis) sightings were recorded. Information noted included: date, weather, location, habitat type (e.g. pingo, well-drained sedge meadow, stream-bank), number of birds seen, and activity of birds. Nest observations were conducted on two Buff-breasted Sandpiper nests. Observers sat on the ground or in a tend-blind 25-45 meters from the nest. Buff-breasted Sandpiper chicks were banded on an opportunistic basis. All birds received metal Fish and Wildlife bands and one or more red or blue plastic bands in different combinations so that each bird was individually identifiable.

RESULTS

Arrival and Snow Cover

All breeding species were present on the study area when observers arrived with the exception of loons which were not seen using the study area until 9 June (two Arctic Loons, Gavia arctica) and 10 June (thirteen Arctic Loons, six Red-throated Loons, Gavia stellata). Long-billed Dowitchers (Limnodromus scolopaceus) were not seen until 7 June, but there was no direct evidence of their nesting on the study area in 1978. Arrival dates in relation to snow cover differed somewhat for those given by Bergman et al. (1977) particularly for Buff-breasted Sandpipers (Tryngites subruficollis) which were observed both earlier and with greater snow cover than in previous years. Snow cover around the Prudhoe Bay oil developments was less than 25% on 4 June, compared with 75% at Storkersen Point, probably owing to albedo

effect as suggested by Benson et al. (1975) and Bergman et al. (1977). A helicopter survey of the Kuparuk and Sagavariirktok River deltas on 8 June (Appendix 5) indicated some use by waterbirds pending ice-melt on inland lakes as noted by Bergman et al. (1977) in previous years.

Large Bird Surveys

Density estimates for breeding birds derived from large and small bird surveys appear in Table 1. Pintails (Anas acuta) were the most abundant large bird on the average. On the first survey 6 June, however, Brant (Branta bernicla) were the most abundant as flocks moved over the study area. Pintail numbers declined in the latter half of July and King Eiders (Somateria spectabilis) were the most abundant large bird on the survey of 18 July while Oldsquaws (Clangula hyemalis) were the most abundant bird on 25 July. Numbers of King Eiders and Oldsquaws peaked in mid-June and fluctuated at lower levels through the summer as non-breeders or late migrants moved on, males left the study area and unsuccessful nesters left for their molt. Numbers increased ~~at~~ certain times due to brood sightings and, in the case of Oldsquaws, sightings of birds molting in large class V lakes. White-fronted Geese (Anser albifrons) were most abundant when observers arrived, declined steadily such that they were absent from three consecutive surveys in late July and early August, and then increased in August as post-molting birds began staging in wetlands on the study area.

Small Bird Surveys

Density estimates for shorebirds derived from small bird surveys indicate that Red Phalaropes (Phalaropus fulicarius) were the most abundant shorebird on the average followed by Pectoral Sandpiper (Calidris melanotos), Semipalmated Sandpiper (Calidris pusillus) and Dunlin (Calidris alpina). Relative abundance fluctuated with Red Phalaropes most abundant on five surveys, Dunlins

Table 1. Breeding bird densities per km². Derived from large and small bird surveys.

Species	5-7 June	11-14 June	20-21 June	27-28 June	4-5 July	11-12 July	18-19 July	25-26 July	1-2 August	8-9 August	15-16 August	Average
Arctic loon (<i>Gavia arctica</i>)	0.0 (0.0)	1.31 (0.31)	2.42 (2.69)	1.74 (2.18)	1.41 (1.92)	1.74 (1.13)	1.41 (1.23)	1.21 (1.79)	2.21 (3.08)	2.08 (2.31)	2.21 (1.67)	1.59 (1.69)
Red-throated loon (<i>Gavia stellata</i>)	0.0 (0.0)	0.74 (0.26)	0.31 (0.38)	1.07 (0.38)	0.94 (0.64)	0.34 (0.13)	3.31 (1.15)	0.07 (0.13)	0.50 (0.64)	0.13 (0.26)	0.34 (1.28)	0.57 (0.48)
Whisking swan (<i>Olor columbianus</i>)	0.27 (0.0)	0.13 (0.0)	0.13 (0.0)	0.20 (0.13)	0.27 (0.0)	0.13 (0.0)	3.0 (0.0)	3.0 (0.0)	0.0 (0.0)	0.13 (0.26)	0.0 (0.0)	0.11 (0.04)
Canada goose (<i>Branta canadensis</i>)	0.13 (0.0)	0.20 (0.0)	0.0 (0.0)	0.07 (0.0)	0.27 (0.0)	0.20 (0.0)	3.0 (0.0)	3.0 (0.0)	3.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.08 (0.0)
Brant (<i>Branta bernicla</i>)	5.30 (5.90)	0.87 (0.38)	0.60 (0.0)	0.34 (0.0)	0.0 (0.0)	0.0 (0.0)	3.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.63 (0.57)
White-fronted goose (<i>Anser albifrons</i>)	5.23 (3.33)	4.63 (4.10)	3.13 (1.15)	3.62 (3.72)	1.31 (0.26)	0.13 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.81 (1.54)	4.77 (4.10)	2.20 (1.63)
Pintail (<i>Anas acuta</i>)	1.01 (0.64)	10.00 (3.97)	11.58 (6.15)	6.64 (5.00)	6.31 (4.23)	1.95 (1.41)	0.07 (0.0)	0.0 (0.0)	2.33 (1.41)	12.42 (9.49)	15.23 (8.83)	6.17 (3.74)
King eider (<i>Somateria spectabilis</i>)	2.89 (2.03)	5.30 (3.38)	2.21 (1.41)	1.14 (0.90)	2.42 (1.54)	1.01 (1.41)	2.48 (1.41)	1.34 (1.41)	0.27 (0.51)	0.0 (0.0)	1.48 (2.82)	1.37 (1.71)
Spectacled eider (<i>Somateria fischeri</i>)	0.0 (0.0)	0.47 (0.90)	0.40 (0.64)	0.47 (0.90)	0.0 (0.0)	0.0 (0.0)	0.27 (0.51)	0.07 (0.13)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.15 (0.23)
Oldsquaw (<i>Clangula hyemalis</i>)	0.27 (0.51)	3.36 (3.59)	2.28 (2.56)	3.22 (3.97)	2.28 (2.31)	1.41 (1.54)	2.38 (1.79)	1.48 (1.79)	2.28 (3.46)	1.07 (1.92)	0.40 (0.77)	1.77 (2.20)
Willow ptarmigan (<i>Lagopus lagopus</i>)												
American golden plover (<i>Pluvialis dominica</i>)	6.88	4.38	5.00	3.75	1.25	1.25	1.88	21.38	1.88	1.25	2.5	4.72
Black-bellied plover (<i>Pluvialis squatarola</i>)	1.25	0.63	2.50	2.50	2.50	1.88	0.63	8.75	0.0	0.0	0.0	1.88
Long-billed dowitcher (<i>Limnodromus scolopaceus</i>)	1.88	0.0	0.0	2.50	0.63	0.63	1.25	1.25	0.63	0.0	0.0	0.80
Buddy turnstone (<i>Arenaria interpres</i>)	5.00	1.25	4.38	5.00	3.75	3.75	0.63	1.88	0.63	0.0	0.0	2.39
Buff-breasted sandpiper (<i>Tringoides subruficollis</i>)	3.13	6.25	11.88	6.88	1.88	1.25	1.25	1.25	3.13	0.63	3.13	3.70
Pectoral sandpiper (<i>Calidris melanotos</i>)	13.75	14.38	26.25	25.00	16.88	17.50	16.25	41.88	12.50	28.75	10.0	20.29
Dowlin (<i>Calidris alpina</i>)	23.13	11.25	16.25	7.50	19.38	13.75	18.13	10.63	21.25	21.25	10.0	15.68
Saunders' sandpiper (<i>Calidris bairdii</i>)	3.75	2.50	1.88	2.50	3.13	3.13	6.25	5.63	2.50	0.0	0.0	2.34
Semipalmated sandpiper (<i>Calidris pusilla</i>)	20.00	13.13	11.88	13.75	13.75	17.50	11.25	71.88	11.88	3.75	0.63	17.22
White-rumped sandpiper (<i>Calidris fuscicollis</i>)	0.0	0.0	0.0	0.0	0.0	1.88	0.63	0.0	0.0	0.63	0.0	0.29
Red phalarope (<i>Phalaropus fulicarius</i>)	9.38	10.00	25.63	35.00	18.13	40.00	22.50	13.75	11.88	39.38	45.0	26.42
Northern phalarope (<i>Lobipes lobatus</i>)	0.0	1.88	6.88	5.00	0.63	6.25	5.00	8.75	3.13	1.25	0.63	3.58
Parasitic jaeger (<i>Stercorarius parasiticus</i>)	1.34 (0.90)	0.68 (0.64)	0.27 (0.38)	0.47 (0.77)	0.40 (0.26)	0.34 (0.0)	0.47 (0.13)	0.40 (0.38)	0.34 (0.26)	0.34 (0.26)	0.27 (0.26)	0.48 (0.39)
Long-tailed jaeger (<i>Stercorarius longicaudus</i>)	0.07 (0.13)	0.27 (0.38)	0.27 (0.51)	0.13 (0.26)	0.13 (0.26)	0.0 (0.0)	0.20 (0.0)	0.20 (0.13)	0.13 (0.0)	0.0 (0.0)	0.0 (0.0)	0.13 (0.15)
Glaucous gull (<i>Larus hyperboreus</i>)	0.81 (0.26)	0.43 (0.26)	0.60 (0.26)	0.34 (0.13)	1.14 (0.64)	0.27 (0.13)	0.47 (0.18)	0.27 (0.26)	0.81 (0.77)	0.47 (0.77)	0.13 (0.26)	0.52 (0.37)
Lapland longspur (<i>Calcarius lapponicus</i>)	70.00	39.38	35.63	38.75	47.50	17.50	13.75	20.63	61.88	28.75	30.0	36.71
Snow bunting (<i>Plectrophenax nivalis</i>)	4.38	0.0	1.25	3.13	0.63	1.25	1.25	0.0	0.0	0.0	0.0	1.08

on three surveys, Pectorals on two and Semipalmated Sandpipers most abundant on one survey in which they outnumbered the combined total of the other three. No definite decrease in numbers was noted in late July and early August as in previous years (Derksen et al. 1976, Heinz and Koob, 1977). Rather, distribution appeared to be clumped in the post-nesting period as shorebirds gathered at drying class II wetlands (small shallow ponds). The relative abundance of the four most common shorebirds is shown in Figure 2. Lapland Longspurs (Calcarius lapponicus) were the most abundant bird on six of the eleven surveys. They were the most abundant bird on the average of censuses and were always the most abundant passerine.

Non-breeding Birds

A single Peregrine Falcon (Falco peregrinus) was seen very briefly 17 July as it flew eastward between the camp buildings and the coast. Appendix 6 shows the daily tally for all birds seen. Details of unusual sightings for the 1978 season are on file with the University of Alaska Museum.

Nest, Clutch and Brood Data

One hundred and two nests of 23 species were found during the field season. Clutch and success data appear in Table 2 and Appendix 7. Loon nests were not approached so as to minimize disturbance. Loon nests and broods sighted are shown in Figure 3. A Canada Goose (Branta canadensis) nest on an island in a class V (deep open) lake was a new breeding record for Storkersen Point as were two Hoary Redpoll (Acanthis hornemanni) nests around the buildings at camp. A White-rumped Sandpiper (Calidris fuscicollis) with two downy young, observed on the small bird survey of 12 July, also constituted a new breeding record for Storkersen Point. Breeding behavior (courtship or distraction displays, agitated circling) was observed on two occasions in the same location for Long-billed Dowitchers (Limnodromus scolopacus) and on

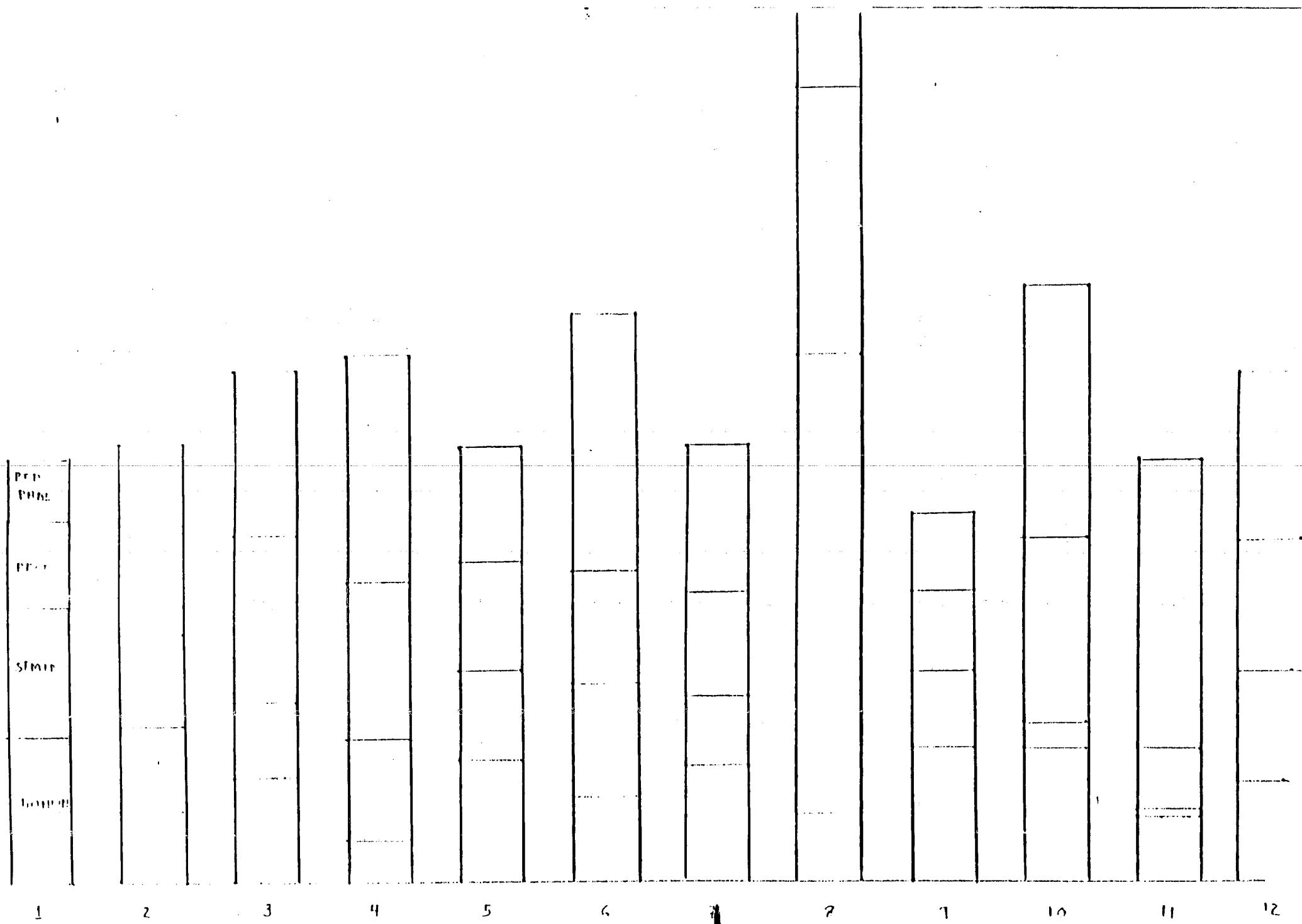
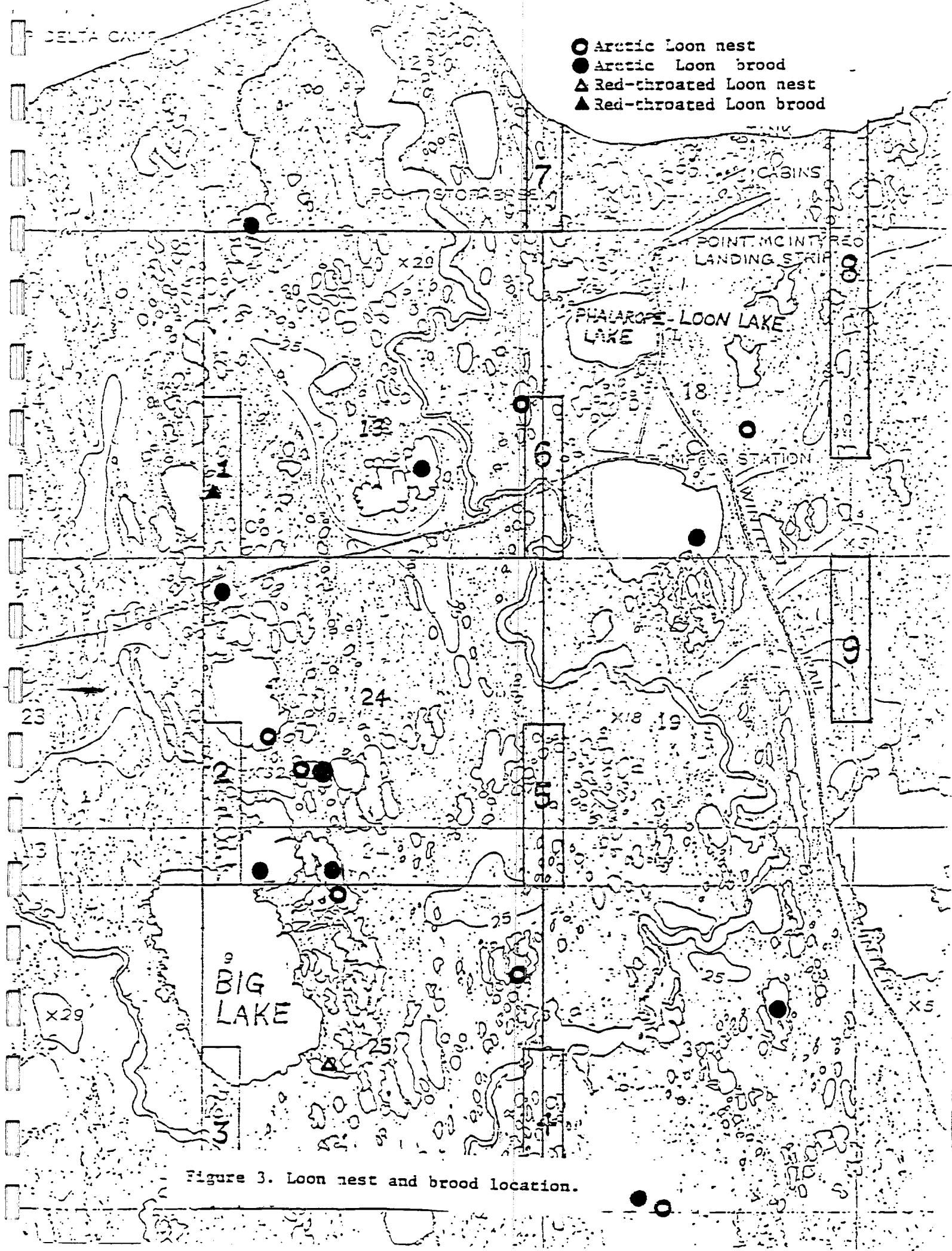


Figure 1. Percent of different bird species at 12 locations. Legend: FIVE, TEN, FIFTY, HUNDRED. Data were collected at Stokkern Point, 1978.

Table 2. Nest data compilation for Storöarsen Point, 1978.

Species	Number of nests	Nest number from form	Range of Clutch size	Range of incubation dates	Range of hatching dates	% success	Remarks
Canada goose	1	42	3	-	7/12/78	100	New breeding species for Storöarsen Point
White-fronted goose	3	18, 25, 37	4, 2, 0	-	-	0	All clutches may have been incomplete
Oldsquaw	4	35, 38, 38, 39	2, 1, 0, 0	-	-	0	One nest abandoned before laying, one after 2 eggs laid
King eider	7	26, 27, 53, 61, 74, 78, 92	5, 4, 1	6/17/78	7/15-7/23	43	Most hens not flushed
Spectacled eider	2	39, 40	5, 5	-	-	0	
American golden plover	4	21, 45, 33, 34	2, 4, 4, 4	-	7/12-7/25	67	Two egg clutch was complete but evaluation inconclusive
Black-bellied plover	2	64, 73	4, 4	-	7/15	50	
Ruddy turnstone	3	15, 16, 30	4, 4, 4	-	7/2	100	
Northern phalarope	2	70, 93	4, 4	-	7/17	100	
Red phalarope	9	5, 9, 22, 29, 66, 68, 72, 36, 91	4 (8), 3 (1)	6/11-6/17	7/2-7/8	30	2 success based on 3 nests 4 had insufficient data
Semipalmated sandpiper	7	2, 4, 19, 23, 33, 44, 51	All 4	-	7/5	30	2 success based on 3 nests 2 had insufficient data
Baird's sandpiper	13	7, 24, 31, 43, 46, 47, 54, 67, 77, 85	All 4	6/11	7/3-7/29	100	One had insufficient data
Pectoral sandpiper	1	62	4	-	7/16	100	Chick and pipped egg photograph taken
Dunlin	5	37, 38, 50, 60, 79	All 4	-	-	100	Based on 4 nests, 1 had insufficient data
Buff-breasted sandpiper	4	59, 65, 30, 31, 82, 90	All 4	-	7/12-7/24	100	See specific nest form
Parasitic Jaeger	1	35	2	-	-	0	Another pair nested and failed, nest never checked
Long-tailed Jaeger	1	17	2	-	-	0	
Glaucous gull	1	41	3	-	Between 7/8 and 7/14	100	
Heary vireo	2	56, 75	3, 5	7/3 (1)	Before 6/30 ~ 7/22	100	First nesting records for Storöarsen Point
Lapland longspur	17	1, 1, 6, 3, 10, 11, 12, 14, 20, 32, 34, 48, 49, 52, 57, 63, 69	3 (2), 5 (9), 6 (3) 0 (2), 3 (1)	-6/9 (1) 6/10 (1)	6/25-between 7/5 and 7/12	53	One late 3 egg clutch was successful
Snow bunting	5	13, 23, 36, 71	4, 5, 6, 7	6/12 (1)	Before 7/11	60	
21 species	93			6/11-7/3	6/25-7/26	67	Success - 53 nests Failure - 27 nests Insufficient data - 11 nests



several occasions at scattered locations for Willow Ptarmigan (Lagopus lagopus). No other species were believed to have nested at Storkarsen Point in 1978 except those species listed above and those for which nests were found. Whistling Swans (Olor columbianus) which have nested in previous years, used study area wetlands regularly and a pair, including a collared individual (light blue collar, yellow characters: A-black-7-5), molted on a class V (large open) lake which adjoined a large class IV (deep-Arctophila) lake. Brant (Branta bernicla) also noted as a breeding bird in previous years, were not seen on the study area after late June although a few broods were seen along the coast east and west of the study area. Pintails (Anas acuta) were notably less abundant than in 1977 - the census average for 1977 was 14.10 birds/km² while in 1978 it was 6.17 birds/km². No Pintail nests were found and no broods were seen. Heinz and Koob (1977) noted a Rock Ptarmigan (Lagopus mutus) brood but in 1978 two males in winter plumage circling the cabins on 11 June were the only Rock Ptarmigan seen.

Migration

Data from migration forms (Appendix 8) indicate that peaks of movement were most noticeable for Brant (Branta bernicla), Oldsquaws (Clangula hyemalis), Pomarine Jaegers (Stercorarius pomarinus) and Golden Plovers (Pluvialis dominica). Brant moved both east and west across the study area and along the coast from observer arrival on 5 June until 8 July. Much of the movement appeared to be local movements of flocks moving back and forth between feeding areas. Flocks were noticed as much as three miles inland which may have been owing to the fact that there was still sea ice over the Beaufort Sea. Between 8 July and 17 August no Brant flocks were seen although Brant broods were sighted as noted above. On 17 August a heavy westward movement began which continued until observers left on 20 August. In August Brant flocks were sighted moving only along the coast or over the Beaufort Sea and not

inland. They were moving westward in all cases. Flocks of several hundred birds used coastal wetlands east of the study and to the west in the Kuparuk River delta area. D.V. Derksen saw Brant still moving westward on a brief visit to Storckersen Point.

Oldsquaws moved along the coast in small groups (<10) during June and until mid-July. The preponderance of movement was eastward but westward movement was also observed. Beginning on 17 July and continuing until 2 August a generally westward movement was noted with as many as 168 birds counted per day. During July Oldsquaw rafts were noted along the barrier islands. A heavy driftline of feathers indicated that these were breeding birds. Oldsquaw numbers were low both on the study area and in salt water during August.

Pomarine Jaegers moved through the study area from observer arrival on 5 June until 28 June after which there were only two more sightings, the last, on 13 July, of a single bird. No direction of movement prevailed. Golden Plovers were observed moving east on three days between 26 July and 5 August. On 18 August 75 birds were seen in six flocks averaging 12 birds. One hundred and seventy-seven birds were noted on 19 August in 12 flocks. The great majority appeared to be birds of the year and some birds were seen flying with Black-bellied Plovers (Pluvialis squatarola) whose movements coincided closely with those of Golden Plovers although totals were always lower.

Wetland Use

A summary of wetland use data appears in Appendix 9. The following narrative summary of bird use of wetlands uses the classification developed by Bergman et-al. (1977) which is summarized in Appendix 9. Conclusions are drawn from wetland use forms and other observations by field personnel.

Class I (flooded tundra): Phalaropes fed in these wetlands and they were used by Pintails and other waterfowl before other wetlands melted.

Class II (shallow Carex ponds): These wetlands received heavy use in the post-nesting season. Phalaropes and Pintails fed in the waters in which macroinvertebrates were concentrated by lowering water levels as noted by Bergman et al. (1977). In late July shorebirds began feeding heavily along the drying edges of these ponds. An influx of Stilt Sandpipers (Micropalama himantopus) occurred in August. Flocks of 5-15 birds were noted on class II wetlands throughout the study area. Plovers, Pectoral Sandpipers (Calidris melanotos), Dunlin (Calidris alpina) and Semipalmated Sandpipers (Calidris pusillus) also used class II wetlands after mid-July.

Class III (shallow-Arctophila): Pintails and phalaropes used these wetlands fairly heavily. On 1 July a flock of 102 Red Phalaropes (Phalaropus fulicarius) was noted on a class III pond and young of the year used these ponds for food and cover. Oldsquaws (Clangula hyemalis), Eiders (Somateria sp.) and Loons (Gavia sp.) also used class III wetlands throughout the summer.

Class IV (deep Arctophila): These wetlands were important feeding and resting areas for Arctic Loons (Gavia arctica). Four of seven nests and seven of nine broods sighted were on class IV wetlands. Eiders used class IV wetlands throughout the reproductive cycle as noted by Bergman et al. (1977). Both of the two Spectacled Eider (Somateria fischeri) nests and the only Glaucous Gull (Larus hyperboreus) nest found on the study area were located on islands in the same class IV wetland. Oldsquaws, Pintails and Red Phalaropes were also noted as using these wetlands.

Class V (deep open): Whistling Swans (Olor columbianus), Canada Geese (Branta canadensis) and Oldsquaws molted on class V lakes on or adjacent to the study area. On 7 August 79 Canada Geese, including flightless adults and at least one brood, were seen using a series of class V lakes south and east of the study area. The first Canada Goose nest found at Storkersen Point was on an island in Pump Lake, a class V wetland. This same lake served as

a feeding and loafing ground for Arctic Loons (Gavia arctica) which were seen in groups of up to 11 birds. An Arctic Loon brood was seen on the lake and Red-throated Loons (Gavia stellata) were observed there on occasion.

Class VI (basin complex): Sixty-four percent of all Pintails observed using wetlands were seen in basin complexes. Paired King Eiders (Somateria spectabilis) used basins extensively during the first half of June. Red-throated Loons may have nested in a basin complex on the study area and were frequently noted using these wetlands. Phalaropes used class VI wetlands next most heavily after class II ponds. During the latter half of July and into August Pectoral Sandpipers (Calidris melanotos) and Red Phalaropes (Phalaropus fulicarius) flocked and fed in basins and Long-billed Dowitchers (Limodromus scolopaceus), Plovers (Pluvialis sp.) and Dunlin (Calidris alpina) also used these wetlands. Whistling Swans (Olor columbianus) were observed feeding in Carex/Arctophila beds fairly frequently. Staging White-fronted Geese (Anser albifrons) grazed heavily in Carex beds in Loon Lake, and probably in other basin complexes on the study area, during the last few days of the field season.

Class VII (beaded stream): Arctic Loons (Gavia arctica) and Oldsquaws (Clangula borealis) were frequently sighted along Fawn Creek. Eiders and Pintails also used class VII wetlands particularly flooded portions and areas vegetated by Arctophila. Phalaropes fed along flooded edges early in the season. Shoreline feeding by Phalaropes and Semipalmated Sandpipers (Calidris pusillus) occurred from the creek mouth to more than a mile upstream during periods of low water in late July. This zone was affected by tide and was measurably brackish (T. Rothe USFWS, vocal communication).

Class VIII (coastal wetlands): Coastal wetlands were used extensively by Brant in both spring and fall. Spring movement appeared to include local flights from one feeding ground to another. Fall movement, which began on 17 August, was exclusively westward but flocks of up to 200 birds stopped to

feed at coastal wetlands adjacent to the study area. Shorebirds also used coastal wetlands late in the season. Semipalmated Sandpipers, Stilt Sandpipers, White-rumped Sandpipers and Dunlins were observed using brackish ponds and lagoons. On 18 August a flock of 52 Dunlin was seen feeding at the mouth of a creek east of the study area.

Beaufort Sea: All four species of Loons were observed on the waters of the Beaufort Sea during the summer. Arctic and Red-throated Loons were often seen carrying food items inland from the bay. Rafts of sea ducks, presumably mostly Oldsquaws, were seen out by the barrier islands in July but were usually too distant for positive identification. On 20 July 45 Glaucous Gulls (Larus hyperboreus) were observed feeding very actively within 500 meters of shore. On 18 August 52 Glaucous Gulls were observed following an Eskimo fishing boat and they were later seen loafing on a barrier island. Gulls were regularly seen along the barrier islands and small numbers flew the coastline on most days. Small numbers of King Eiders and Oldsquaws were seen on inshore waters (< 1 km) from time to time and Common Eider flocks of up to 34 birds were seen on several occasions flying across the bay. Small groups (< 15) of Red Phalaropes used the surf-zone in August but no large flocks were seen on salt water. When disturbed Brant moved from coastal spits and wetlands out into the bay with their broods.

Buff-breasted Sandpiper (Tryngites subruficollis) observations: Two hundred and forty-nine sightings of Buff-breasted Sandpipers were recorded on prepared forms. Locations of single and double wing displays are plotted on an orthophoto map in Appendix 10. The displays are concentrated along Fawn Creek particularly in the area around the two pingos which rise from the high, dry stream-bank in sections 24 and 13. The affinity of displaying birds for dry raised areas is clearly demonstrated by this distribution. The combined total of displays for sections 18, 25 and 30 is 14. The total for

sections 13, 19 and 24 is 56. The first three each have extensive wetlands including basin complexes and deep open lakes; they also have little high, dry stream-bank and the pingo in section 30 is bounded on three sides by moist tundra. The second three sections have less extensive wetlands and contain most of the high dry streambank habitat as well as two pingos surrounded by dry tundra or streambank. Buff-breasted Sandpipers were never seen feeding in ponds or at pond margins but exclusively on dry ridges, dry meadows or well-drained raised areas such as pingos or streambanks.

Two Buff-breasted Sandpiper nests were watched for a total of approximately 50 hours, including one continuous 24 hour watch. For the majority of the time the incubating birds were visible on the nest. General conclusions include the following: 1) only one bird presumably the female incubated the eggs; 2) with one exception the bird flew off the nest and zig-zagged back on foot as much as 50 meters and never less than 5 meters; 3) foraging distances were usually less than 250 meters and foraging habitat was typical of the species - dry ridges of polygons, streambanks, dry meadows; 4) attendance ranged from as little as 10 minutes at mid-day to almost three hours during the night when temperatures were lower and light intensity decreased.

Twenty-seven Buff-breasted Sandpiper chicks were banded with metal USFWS bands and various combinations of red and blue plastic bands. A list of band combinations and a map of banding locations is given in Appendix 11. It is worth noting that 18 of the banded birds and three of the nests were located in a zone one half mile wide by one mile long (north - south). Since coverage of the study area was generally fairly uniform this was not felt to be an artifact of observer effort. The apparent grouping is not centered on the display grounds and may reflect a habitat/resource partitioning as suggested by Pitelka et al. (1974). This zone is delineated on the orthophoto map in Appendix 11.

II. Aquatic macroinvertebrate sampling

METHODS

Six experimentally oiled ponds, three oiled in 1974 and three oiled in 1975, three established control ponds (Abraham 1973) and a contaminated pond near Storkersen Well were sampled for aquatic macroinvertebrates. Each pond was sampled four times during the summer, 22-24 June, 30 June - 2 July, 13-15 July and 27-29 July. Techniques used to sample the ponds were identical to those used by Howard (1974) and Abraham (1975). Macroinvertebrates were tentatively identified, counted and stored in a 5% formalin solution. Temperature, pH and specific conductivity were measured in each pond at the time of sampling. Temperature was measured with a hand held thermometer, pH was measured with a Hach Chemical Company Kit and specific conductivity was measured with a Hatch Conductivity Meter. During the fourth sampling period, 27-29 July, temperature and specific conductivity were measured with a Yellowsprings Model conductivity meter.

Notes were taken on all ponds noting ice cover, water clarity, amount of oil present or released from sediments, vegetative growth characteristics, wind effects, and drainage to other wetlands. Pond notes were taken on 9, 15, 22-24 June, 13-15 July and 14 August. Black and white photographs of the control and experimentally oiled ponds were exposed twice during the summer on 11 June and 16 July.

Samples of surface water and bottom sediments were taken from Storkersen Well Pond on 19 August. These samples are to be analyzed to determine the amount of hydrocarbons and heavy metals present in this pond.

The six oiled ponds and three control ponds were marked permanently with metal tags and stakes for future reference. Stakes were placed on the north shore of each pond.

RESULTS

The physical and chemical characteristics of the experimental ponds are given in Table 3. Nineteen taxa of macroinvertebrates were found in control ponds in 1973 (Table 4). Nineteen taxa were also found in ponds oiled in 1974, while only ten taxa were found in ponds oiled in 1975. Taxa found in ponds oiled in 1974 were similar to those found in control ponds, but numbers of invertebrates found were lower (Figure 4). Cladocera, an abundant taxa in 1974 oiled ponds and control ponds, were not found in 1975 oiled ponds. A single Plecoptera nymph was found in a 1975 oiled pond. Plecoptera have not been found in ponds oiled in 1975 in previous years. Total numbers of invertebrates collected in each of the three types of ponds are shown in Figure 2. Numbers of macroinvertebrates found in control and 1975 oiled ponds are consistent with those found by Heinz and Koob (1977), but numbers of invertebrates found in ponds oiled in 1974 were considerably lower than those found in 1977 (Heinz and Koob 1977). A complete listing of the numbers of invertebrates collected from the nine experimental ponds and Storkersen Well pond during each sampling period is presented in Appendix 12.

III. Vegetation analysis in Loon and Phalarope Lakes

METHODS

A collection of the vascular plants found in Loon and Phalarope Lakes was made. Depth of water, if present, and location within the lake basin was noted. Plants were identified with the help of Hulten (1968). Seven to ten specimens of each species found were pressed and dried to preserve them for verification and future use.

Vegetation line transects 400 and 200 m long were established in Loon and Phalarope Lakes respectively (Figure 5). Both transects were set up parallel to the road that divides the two class VI basin complexes. A 100 m

Table 3. Physical and chemical characteristics of control and experimental ponds.

Pond Number	Size (ha)	Mean water depth (cm)	Mean thickness of bottom sediments (cm)	pH mean	Mean temperature C°	Specific conductivity micromhos/cm mean (range)
<u>Control</u>						
23	0.2	16.9	20.6	8.31	8.60	345 (300-450)
30	0.1	18.5	30.9	9.0 ^b	9.48	550 (400-650)
33	0.15	18.7	28.6	8.63	6.48	416 (375-500)
<u>Oiled 1974</u>						
7	0.2	16.3	21.2	8.63	7.43 ^a	315 (225-400)
32	0.15	20.1	25.2	8.63	7.70	407.5 (350-510)
36	0.1	23.8	28.9	8.94	10.4 ^b	416.7 (300-500) ^{cs}
<u>Oiled 1975</u>						
31	0.1	21.3	28.8	8.88	8.38	375 (300-500)
37	0.1	18.1	23.4	8.63	7.55	375 (350-400)
39	0.04	9.7	35.0	8.94	8.5 ^a	571 (475-800)
Storkersen Well Pond	?	9.4	29.1	8.5	11.57 ^b	2725 (1800-3600)

^a data from second sample (30 June - 2 July) not available, mean averaged from other three samples

^b data from third sample (13-15 July) not available, mean averaged from other three samples

Table 4. Number of taxa in control and oiled ponds at Storckersen Point, 1978^a.

Taxa	Oiled 1975	Oiled 1974	Control
Turbellaria	X	X	X
Nemertea			X
Nematoda		X	X
Oligochaeta	X	X	X
Anostraca		X	X
Notostraca	X	X	X
Conchostraca		X	X
Cladocera		X	X
Copepoda	X	X	X
Ostracoda	X		X
Acari	X	X	X
Collembola		X	X
<u>Plecoptera</u>	X	X	X
Trichoptera		X	X
Coleoptera (1)		X	X
Dytiscidae		X	
Tipulidae		X	
Culicidae			
Tendipedidae	X	X	X
Muscidae	X	X	X
Diptera		X	X
Gastropoda	<u>X</u>	<u>X</u>	<u>X</u>
TOTALS	10	19	19

^a As determined by sweep and Ekman samples

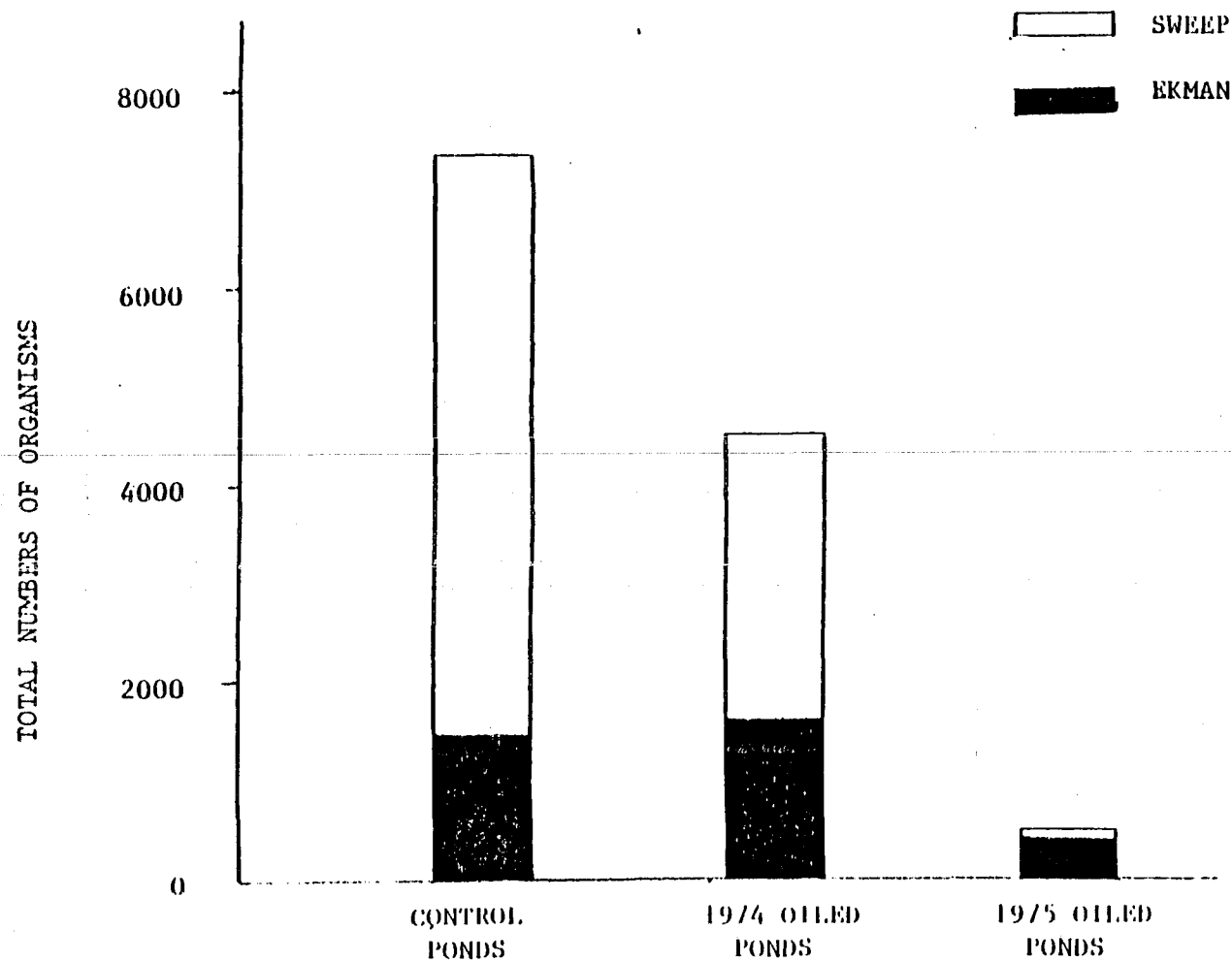


Fig. 4. Total number of macroinvertebrates collected in sweep and Ekman samples at Storkersen Point in 1978.

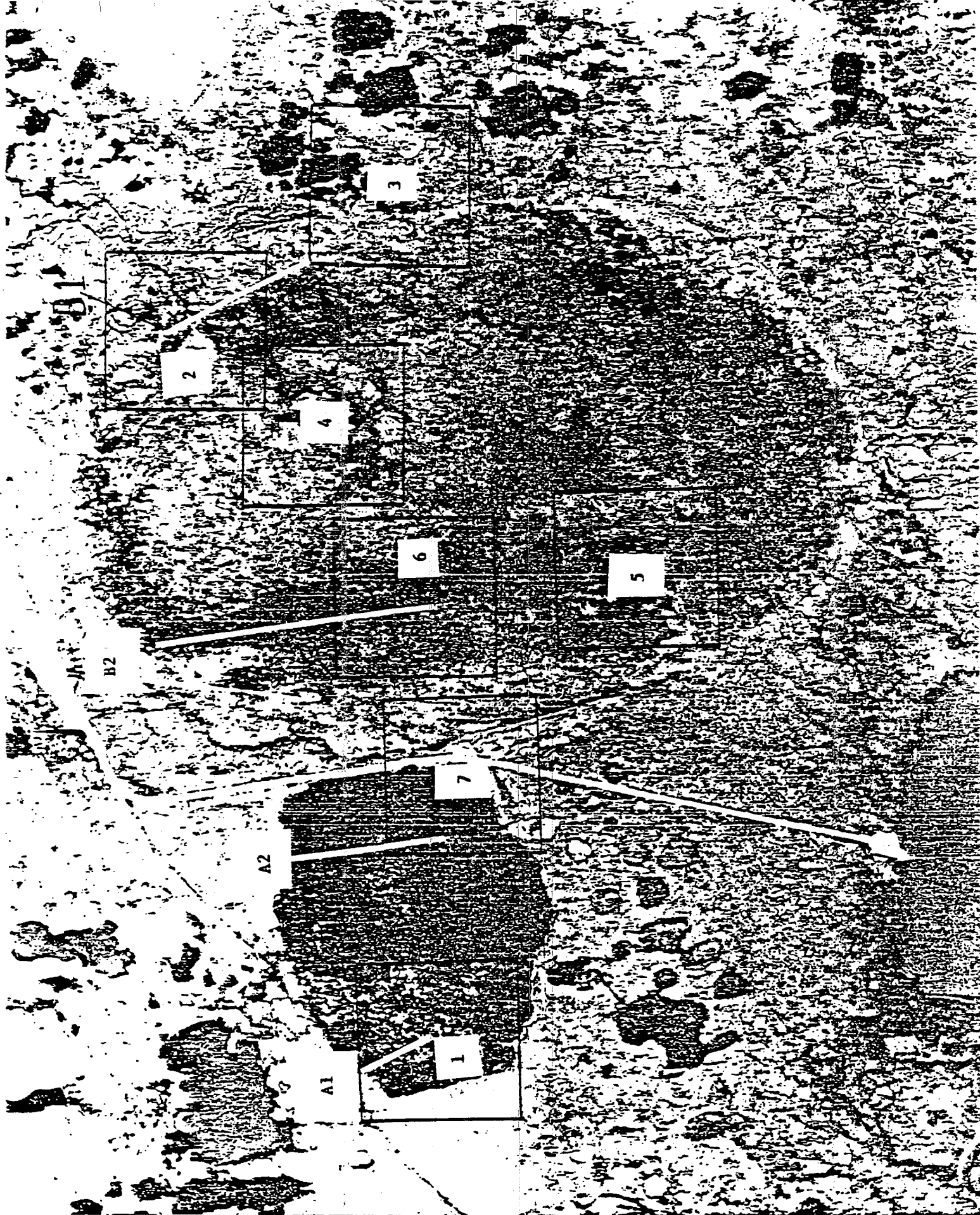


Fig. 5. Location of trend plots (1-7), Phalarope (A1-2) and Loon (B1-2) Lake vegetation line transects.

transect established in Loon Lake (Heinz and Koob 1977) was extended to 200 m. Four vegetation line transects were sampled at one meter intervals. Plant species (if present), water depth and depth of bottom sediments were recorded on prepared data sheets. Line transects were sampled in Phalarope and Loon Lakes on 3 and 4 August, respectively.

Black and white 35mm photographs of Loon and Phalarope Lakes were exposed to record ice and snow melt, changes in water depth and vegetation. A series of photographs of each basin were taken from a predetermined location each week.

Three of the seven trend plots established in 1977 (Heinz and Koob 1977) in Loon and Phalarope Lakes were cover mapped in the field. These cover maps are to serve as ground truth for low level aerial photography executed on 17 August. Cover mapping was done using a vegetation classification system developed by Webber and Walker (1975) with modifications by Markon (1977) and Heinz and Koob (1977). Techniques used to cover map trend plots in the field were identical to those used by Heinz and Koob (1977). The two north corners of all trend plots were permanently marked with metal stakes for future reference.

RESULTS

Vascular plants found in and collected from Loon and Phalarope Lakes and their relative abundance are presented in Table 5. Results of the vegetation line transect sampling are presented in Table 6. Diversity of plant species was found to be lower in Phalarope Lake, where normal drainage is blocked by a road constructed when the DEW-line site was in operation, than in Loon Lake where drainage is not restricted.

IV. Mammal observations

METHODS

Small mammals were trapped on four grids established by Derksen et al.

Table 5. Plant species found in Loon and Phalarope Lakes and their relative abundance^a.

Species	Loon Lake	Phalarope Lake
<i>Equisetum arvense</i>	S	X
<i>Alopecurus alpinus</i>	M	X
<i>Poa arctica</i>	S	X
<i>Dupontia fischeri</i>	M	X
<i>Arctophila fulva</i>	A	A
<i>Eriophorum angustifolium</i>	A	S
<i>Eriophorum scheuchzeri</i>	M	S
<i>Carex aquatilis</i>	A	A
<i>Juncus biglumis</i>	S	X
<i>Salix rotundifolia</i>	M	X
<i>Salix arctica</i>	S	X
<i>Salix ovalifolia</i>	M	X
<i>Polygonum viviparum</i>	S	X
<i>Stellaria laeta</i>	S	X
<i>Cerastium jenisejense</i>	S	X
<i>Melandrium apetalum</i>	S	X
<i>Caltha palustris</i>	S	S
<i>Ranunculus gmelini</i>	S	M
<i>Ranunculus pallasii</i>	S	X
<i>Papaver macourii</i>	S	X
<i>Cardamine pratensis</i>	S	X
<i>Draba nivalis</i>	S	X
<i>Draba caesia</i>	S	X
<i>Saxifraga hirculus</i>	A	X
<i>Saxifraga cernua</i>	A	X
<i>Saxifraga hircifolia</i>	S	X
<i>Dryas integrifolia</i>	S	X
<i>Hippuris vulgaris</i>	S	S
<i>Primula borealis</i>	S	X
<i>Pedicularis langsдорffii</i>	S	X
<i>Pedicularis sudetica</i>	S	X
<i>Senecio atropurpureus</i>	S	X

^a
A - abundant
M - moderately abundant
S - sparse
X - absent

Table 6. Frequency of occurrence of plants in Loon and Phalarope Lake vegetation line transects.

	Percent in Loon Lake transects			Percent in Phalarope Lake transects		
	B ₁ (200)	B ₂ (400)	Total	A ₁ (100)	A ₂ (200)	Total
<i>Equisetum arvense</i>	1.0	-	0.33	-	-	-
<i>Aleopecurus alpinus</i>	1.5	-	0.5	-	-	-
<i>Poa arctica</i>	0.5	-	0.17	-	-	-
<i>Dupontia fisheri</i>	7.5	-	2.5	-	-	-
<i>Arctophila fulva</i>	1.5	13.0	9.17	32.0	36.5	35.0
<i>Eriophorum angustifolium</i>	12.0	-	4.0			
<i>Eriophorum scheuchzeri</i>	4.0	0.25	1.5			
<i>Carex aquatilis</i>	31.0	30.0	30.33	52.0	5.0	20.67
<i>Salix rotundifolia</i>	20.0	-	6.67			
<i>Salix arctica</i>	1.5	-	0.5			
<i>Salix ovalifolia</i>	6.0	-	2.0			
<i>Polygonum viviparum</i>	0.5	-	0.17			
<i>Cerastium tenuisetense</i>	1.5	-	0.5			
<i>Ranunculus gmelini</i>	-	-	-	-	0.5	0.33
<i>Saxifraga hirculus</i>	2.5	-	0.83			
<i>Saxifraga cernua</i>	4.0	0.25	1.5			
<i>Senecio atropurpureus</i>	1.0	-	0.33			
Moss	2.5	-	0.83	1.0	1.5	1.33
Lichen	1.5	-	0.5			
Open water	1.5	56.5	38.17	15.0	56.0	42.67
Drained pond basin	2.0	-	0.66			
Bare ground	0.5	-	0.17			

(1976), to compare populations on high-center polygon and upland tundra areas. Grids, trap locations and baiting techniques were identical to those described by Derksen et al. (1976) and Heinz and Koob (1977). Grids A1 and A2 (Figure 6) were trapped from 28 June to 5 July. Traps were checked twice daily for a total of 672 trap nights. Traps on grids B1 and B2 were checked twice daily from 17-22 July for a total of 576 trap nights. Snapped traps and signs of lemming hair or removal by predators was noted.

Arctic Fox (Alopex lagopus) dens were located from Derksen et al. (1976) and field observations. Activity and food items found at den sites were noted. Observations of fox during regular field work were recorded to get home range information.

Caribou (Rangifer sp.) herd size, composition, and movement were noted.

RESULTS

No lemmings were trapped on the four grids. Fourteen and 13 snapped traps were found on high center polygon and upland tundra grids, respectively. One snapped trap, from a high center polygon area (Grid A1), contained traces of lemming hair. One Lapland Longspur was trapped. Nine lemmings, three Green-collared lemmings (Dicrostonyx groenlandicus), three brown lemmings (Lemmus trimucronatus), and three unidentified lemmings, were seen on the study area during daily field work.

Five active Arctic Fox dens were found on and near the study areas (Figure 7). Pups were observed at all dens except one, where fresh digging, scats, food items and adult animals were observed. Food items identified at active den sites included remains of Arctic Loon, White-fronted Goose, King Eider, Oldsquaw, unidentified waterfowl, waterfowl eggs, Lapland Longspur, lemmings, Arctic Ground Squirrel (Spermophilus parryi) and caribou. A Fish and Wildlife Service leg band was found on the leg of a White-fronted Goose at an active fox den.

POINT STORKERSEN

DELTA CAMP

TANK

POINT STORKERSEN
CAMP

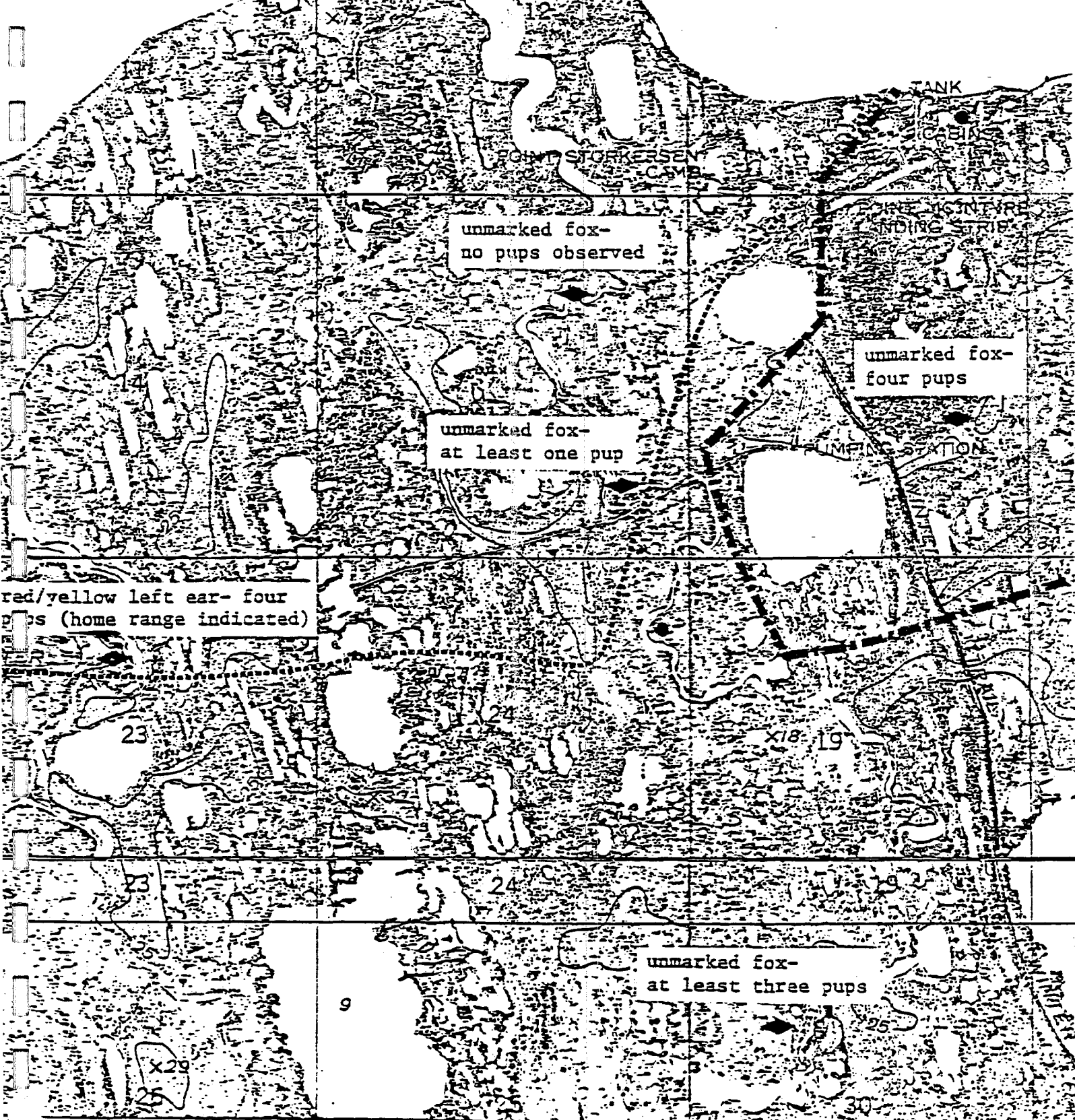
INDIAN STRIP

MINING STATION

Fig. 6. Location of small mammal trapping grids.

POINT STORKERSEN

KUP DELTA CAMP



7. Home range (dotted and dashed lines) of arctic fox and locations of active (◆) and unused (●) dens at Storkersen Point.

Caribou were observed on the study area in small groups (1-20) through June and most of July. Larger herds (30-100) were observed on warm days in July when mosquitoes caused the caribou to move along the coast. Herd size increased in late July and early August (100-500). Through the remainder of August only small groups (1-15) were observed. Caribou movement across the study area seemed random. No patterns in herd composition were seen during the summer. Observations of neck-collared caribou are presented in Appendix 13.

DISCUSSION

The Alaska Pipeline was completed in 1977. Oil development activities were scheduled to encroach on the Storkersen Point study area in 1978 but had not done so by the end of the 1978 field season. During July and August, however, heavy barge traffic included many modular buildings for expansion of existing developments. Further construction could create more wetland changes such as those that have occurred in Phalarope Lake which resulted in lower plant species diversity and different bird use patterns.

Macroinvertebrate sampling in experimentally oiled ponds indicated that effects of spills were most pronounced for column-dwellers and less drastic for benthic organisms. Four years after initial spillage oiled ponds still had lower numbers of column-dwellers although benthic numbers and total taxa were comparable. Three year old spills, all of which involved larger initial doses, showed highly depressed column-dweller populations, significantly lower benthic populations, and just over 50% of the taxa when compared to control ponds. The extremely heavy accidental spill at Storkersen Well pond still had not allowed any column-dwellers to return after 11 years and only a very few benthic organisms, all apparently one species of Tendipedidae, were found. Both oil spills and construction effects would have their most deleterious effects on basin complexes (Bergman's Class VI). These effects would be due to the large size of the complexes and their heavy use by many species such as

Pintails, Geese and shorebirds. Shorebirds were seen probing in weathered oil on Storkersen Well pond indicating that birds might undergo primary effects by contact as well as secondary effects through depletion of macroinvertebrate food resources such as those shown above.

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APPENDIX 1

Weather data and phenology of events at Storkersen Point, 1978

Average temperature (°C) per week

Week	Low	High
6-10 June	0.9	5.1
11-17 June	-1.3	3.3
18-24 June	-1.5	1.7
25 June-1 July	0.9	7.8
2-8 July	2.2	7.4
9-15 July	1.1	4.1
16-22 July	2.4	7.7
23-29 July	4.8	12.1
30 July-5 August	3.9	12.4
6-12 August	-0.1	3.5
13-19 August	-0.8	3.4
Overall averages	1.1	6.2
Extreme	-4.4	18.9

Wind

Prevailing direction - NE

Mean velocity (km/hr) - 13.1 km/hr^a

Sky conditions (percent)

Clear - partly cloudy	42
Overcast	41
Fog	17

Phenology of events

- 75 percent snow cover - 5 June
- 50 percent snow cover - 8 June
- Snow gone from buildings and Fawn Creek banks - 9 July
- Class II pond ice free - 15 June
- Phalarope and Loon Lakes ice free - 18 June
- Largest lake (60 ha) ice free - 6 July
- Beaufort Sea ice free - 5 July

DATE/TIME:

WEATHER:[illegible]

DATE/TIME: _____
WEATHER: _____

[illegible]

परमेश्वर

211

100

Helicopter Bird Survey (6/3/78)

Derksen, Kenyon, MacDonald

Weather - clear, slight breeze (NE <5 mph)
42°F

Kup. Delta

Whistling swan	4
Oldsquaw	31
White-fronted geese	48
Spectacled eider	6
Brant	44
King eider	78
Pintail	19
Mallard	2
Glaucous gull	4
Arctic tern	2
Sabine's gull	1
Arctic loon	8
Ruddy turnstone	2
Ptarmigan	3
Arctic ground squirrel	2
Caribou	2

Lake # 40

Pintail	1
White-fronted goose	3

Ptarmigan	1
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Lake # 39

Canada goose	1
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Caribou	2 (cow & calf)
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River - 98-100% ice free,
strong current- water over ice along the
perimeter on the SE and E
(3-5 m wide) and NE (10-15 m
wide channel)- pools in middle of pond
small (5-10 m diameter)

- 95% ice cover

- water over ice forming and
channel around the perimeter of
the lake on the NE and E sides
(8-10 m wide)- water over ice forming and
channel around the perimeter of
the lake on the NE and E sides
(8-10 m wide)- few pools over ice in middle
3-5 m diameter

- 98% ice cover

APPENDIX 5 (con't.)

Sag. Delta and coast E of Storkersen

White-fronted geese	8
Whistling swan	7
Snow goose	26
Brant	373
Pintail	7
King eider	2
Oldsquaw	22
Glaucous gull	14
Arctic tern	4
Unidentified jaeger	1
Sabine's gull	1
Arctic loon	4
Pectoral sandpiper	20 (1 flock)
Caribou	4
Arctic ground squirrel	1

Class VIII wetlands (W of Kup. river)

White-fronted geese	7
Pintail	1
Caribou	3

Date	Status	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Yellow-billed loon									2						1		2	1						2		
Arctic loon					1		1	13	16	11	15	18	2	27	9	13	14	36	18	x	x	x	9	12	26	16
Red-throated loon								6	13	3	11	7	6	6	6	3	5	12	7	x	x	x	4	4	16	7
Whistling swan				7	5	5		2	5	2	2	5	11	5	2	5	3	4	8	17	2	3	3	2	3	4
Canada goose			2	2	2	2	1	2	3		3			3		2	3		4		2	1		6	1	
Lesser snow goose			13	2	13				2										6	55					12	
Black brant			291	125	34	33	25	49	201	11	46	74	21	12	25	54	27	33	16	19	24	111	40	126	10	148
White-fronted goose	E		16	83	26	8	22	21	42	41	69	39	21	43	4	21	18	47	36		6	x	19	31	54	36
Pintail			4	26	17	28	52	61 ²⁷	72 ²³	78 ⁷	113 ³⁰	117 ⁹	124 ⁷	131 ¹⁰	25	47 ¹¹	76 ¹⁰	161 ²¹	74	x	x	x	24	73	82 ²	111 ¹¹
Mallard																		1 ⁶	1 ¹							
American wigeon												2 ⁶	2 ¹	2 ²	2 ²	2 ²	2 ¹	2 ¹					2 ²			
Common eider				8		2		2	2										7							2 ³
King eider			17	43	34	16	54	72 ²³	60	23	71	59	37	99	37	28	27	23	32	x	x	x		17	17	21
Spectacled eider			4				2	6	4		7	11	4	4		3 ¹	3 ²	5 ¹	1 ³				1 ⁶	2 ⁵	1 ³	
Oldsquaw			2	6	52	10	33	49	101	39	55	32	13	34	87	11	36	32	27	x	x	x	9	20	48	83
Black scoter																										
Surf scoter																										
Red-breasted merganser										9 ²																
Amer. golden plover	E		8	x	11	x	12	15	18	16	24	13	10	11	3	12	12	28	10	x		x	6	21	28	12
Black-bellied plover			2	8	2	11	2	2			1	4		3		1	3	6	6				4	1	4	7
Ruddy turnstone	E		8	11	13	12	11	6	8	5	4	4	4	4	3	1	4	5	9	1	1		5	5	4	8
Buff-breasted sandp.			87 ³⁸	38	9	13	12	9	11		9	16	8	23	18	10	14			1		1	8	15	29	15
Pectoral sandpiper			16 ⁷	x	22	x	x	10	11	14	x	24	x	23	x	13	16	43	42	x	x	x	22	19	72	50
Dunlin			16 ⁷	x	37	x	x	24	x	x	x	18	x	22	x	8	17	32	24	x		x	11	15	41	17
Baird's sandpiper			4	3	16	2			2	2		5		1	3		4		7		x	2	2	4	4	4
Semipalmated sandpiper	E		16 ⁷	x	34	x	x	x	x	x	x	22	x	x	x	x	x	x	14	x	x	x	24	14	44	34
Red phalarope	E		2	6	35	10	32	31	42	42	31	59	21	63	x	43	32	53	54	x	x	x	19	35	108	65
Northern phalarope			17	13		2	2		4	1	1	5	3	15	7	8	14	12	15	11	8		11	5	39	12
Pomarine Jaeger			9	4	15	7	17	5	20	5	2	3		2	3	3	2	3	3		4			1	3	1
Parasitic Jaeger			7	20	17	6	6	11	11	11	9	5	5	5	5	2	3	4	3	1	2	2	5	3	7	5
Long-tailed Jaeger	E		1	11	3		1	1	1	2	4	1	2	2		1	1	4	2		2			3	2	10
Glaucous gull			10	13	18	7	11	8	18	4	7	11	8	6	6	8	8	9	11	15	5	4	13	13	5	10
Sabine's gull								2											1				1		1	
Arctic tern					2	3		2	2		2	5	5	2	4	1	3		1	1			1		1	2

Status: N-nest, E-egg, B-breeding behavior, Y-young

[illegible]

Camp:

CHRONOLOGICAL CHART

1911

PERSONNEL:

1911

Date	Status	21	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23													
Yellow-billed loon															1								1																
Arctic loon	A	15	3	11	5	7	21	6	10	11	8	9	3	26	14	4	5	19	8	12	21	16	18	21	8	17													
Red-throated loon	H	8	1	5	3	7	14	6	7	3	1	2	1	5	7	2	3	9	2	14	12	2	14	9	7	7													
Whistling swan		3	1	5	2	1	4	8			9		2	2	1			1		1	1			1		2													
Canada goose	EY		1	2	1	3	4	3	1	1	1		2	3	2	5		2	5	2																			
Lesser snow goose																																							
Black brant	Y	110	163	X	60	43	60	77	103	44	110				10				2	4			2																
White-fronted goose	L	57	4	28		10	27	14	1	16	13		4	2	2		6			4	0	0	0		6														
Pintail		175	X	22	8	32	94	26	9	6	6	2	2	33	17	1		5			0	0	0	10															
Mallard																																							
American wigeon																																							
Common eider								19	2	16									0	1				34	0														
King eider	EY	21	X	14	6	3	14	56	2	11	2	2	10	6	7	0	1	2	15	1	16	0	11	2	5	5	6	3	4	0	7	0	16	2	23	1	4	18	11
Spectacled eider	E			2	5													0	4			0	1	0	7	0	6												
Oldsquaw	E	17	25	17	8	15	35	54	8	32	7	11	6	26	33	2	2	2	4	16	38	6	8	15	3	8	8	4	6	1	6	1	6	1	6	1	6	1	
Black scoter																																							
Surf scoter																																							
Red-breasted merganser																			1	0																			
Amer. golden plover	EY	15	2	10	6	9	19	8	11	3	6	7	3	18	4	6	4	6	2	8	27	14	10	13	12	17													
Black-bellied plover	EY	1		4	2	4	2	6		4	2			3	4	2		2	2		5	2	2	19	8	2													
Ruddy turnstone	EY	1	3	2	1	6	2	1	11	3	1	4		1	5	4		1	5	3	3	3	2	4	8	2	4												
Buff-breasted sandp.	EY	1	3	16	6	13	8	16		2	3	2	2	1	5	4	10	2	3	4	1	1	4	5	5	2	3	1											
Pectoral sandpiper	E	X	X	X	X	11	31	71	21	X	1	X	22	39	2	X	X	X	5	X	27	42	X	28	3	8													
Dunlin	EY	X	X	X	X	20	11	51	11	X	5	X	13	34	26	X	X	X	X	X	13	42	X	20	12	9													
Baird's sandpiper	EY	3	X	7	6	10	3	8	8	X		3		6	6	1	2	6	10	2	11	11	5	7	3	1													
Semipalmated sandpiper	EY	16	1	X	X	28	47	16	3	X	X	X	X	53	34	X	X	X	X	X	29	55	X	X	X	21													
Red phalarope	EY	30	X	22	13	35	85	71	110	50	3	1	18	X	10	77	48	8	27	X	X	84	54	29	17	6	7												
Northern phalarope	E	15	X	32	17	12	24	71	17	1	21	21	X	7	10	8	28	13	4	5	15	11	9	27	11	15													
Pomarine jaeger							3																																
Parasitic jaeger	E	2	2	5	4	21	6	2	5	6	5	4	3	5	9	5	2	6	0	2	7	4	6	5	3	2													
Long-tailed jaeger	E	13		1	2	2	12			3	3	2	2		1	3	3		1		3	2	1																
Glaucous gull	EY	1	1	1	2	12	18	6	8	14	8	7	5	4	12	3	7	15	23	15	22	12	55	7	11	12													
Sabine's gull									2	2	2																												
Arctic tern				2																				2															

Station: N-nest, E-egg, B-brooding behavior, Y-young

45 Gulls fed
not - a boy

[illegible]

Camp: STOPKENSEN PT

JULY

CHRONOLOGY CHART

1955

Personnel:

Sighting
days

Date	Status	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Yellow-billed loon				1				1								1										
Arctic loon	Y	29	1	24	X	4	3	20	19	36	15	14	9	8	6	26	32	19	9	14	2	28	4	47	17	23
Red-throated loon		4	1	8	X	2	3	2	5	6	7	3	3	1	6	4	2	11	2	5	2	7	2	18	9	15
Whistling swan		1	2	4						2	2					2	2									
Canada goose																79								14	14	11
Lesser snow goose																										
Black brant						12						7	8			6						8		18	12	117

10

7

Date	Status	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Black scoter																										
Amer. golden plover		26	10	61	X	6		12	40	21	4	11		33	1	6	10	4	2	1	1			6	1	1
Black bellied plover		15	13	14		6		12	16	24	4		3	26		1	3	1					1		15	
Puddy turnstone		1	8	9		4		3	1	2	3	5	5			3				1						
Ruff-breasted sandp.		14	5	7		3		7	3	13	5	3		3		2	3	2	3		1	8		5	6	2
Pectoral sandpiper		20	125	135		X		4	20	18	35	7		10	17	34	217	69	15	19	15	29	15	60	35	47
Dunlin		19	50	31		X	X	47	14	65	46	1	X	6	5	28	54	41	7	2	16	11	3	38	28	7
Baird's sandpiper			7	11	X			5	9	7	5	10	3	1										2		2
Semipalmated sandpiper		21	72	131	X	X	X	55	72	44	24	51	X	X		12	12	8	2	1	2		3	7	1	3
Red phalarope		23	35	27		3		6	2	24	22	10	18	42		103	252	165	8		1	13	9	287	108	61
Northern phalarope		13	17	16	X	6	12	7	9	13	5	3	2	9	1	3	13	2	1		1	2			1	
Pomarine Jaeger																										
Parasitic Jaeger		6	6	4	1	1	3	4	6	5	2	2	2	2	2	6	5	2	3	2	2	2	2	4	4	4
Long-tailed Jaeger		1	3		3			1	1	2												1				
Glaucous gull		5	13	13	X	X	7	5	4	12	9	5	3	11	5	11	8	5	4	2	4	7		5	4	4
Sabine's gull																										
Arctic tern																	1								4	

22

7

20

Status: N-nest, F-fegg, B-breedling, behavior, Y-young

Date	Status	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Snowy owl			1							2						2	1							1		
Short-eared owl																										
Common raven		1																								
Lapland longspur		x	x	33	x	x	x	x	x	x	99	x	x	x	x	x	>60	45	x	x	x	x	x	x	48	x
Snow bunting		7	6	10	x	10	x	4	9	5	4	5	9	4	5	4	5	16	10	12	6	14	21	18	16	8
HARRY REDPOLL		1 ³	3	7	1	3	1 ⁴	1	4	3	1	3	1	2	3	4	3	2	3	2	4	3	2	3	3	2
COMMON LOON				1																						
GOLDEN EAGLE								1			1			1												
STILT SANDPIPER								46	42	60	26		13	40	18	58	119	18		1				70	17	6
LONG-BILLED DOWITCHER				2						5	1						1									2
WILMBREL										4																3
WHITE-RUMPED SANDPIPER																4		1	1		2			11		3
GREEN-WINGED TEAL																								1		3
LEMMING										1				2												
Arctic fox		1	1	1						3			1			3	3						1	2		43
Caribou		19	86	6	3	179	1		508	142	44	1	2	1		10	1	5			3	9				
Caribou calves		4	19	2	2	54			x	50	11					2		1			2	2				
ARCTIC GROUND SQUIRREL			6							5						1	2	1				1			1	1

[illegible]

POINT STORKERSEN

KUP DELTA CAMP



Appendix 7 (cont.)

✓ Off the study area
• Marked on Darter map.

NEST, CLUTCH AND FLEDGING DATA

	SPECIES	DATE FOUND EST. HATCH	NO. EGGS	FATE/FLEDGING
D	Lapland longspur	6/12/78	3	No eggs 6/12/78 X
D	Semipalmated sandpiper	6/12/78	4	No eggs or sign during 6/26/78 0
D	Lapland longspur	6/12/78	4	Successful - at least 4 young 6/26 Six eggs 6/19/78 ✓
D	Semipalmated sandpiper	6/12/78	4	OK 6/26/78 ✓
D	Red Phalarope	6/12/78	1	2 eggs 6/13/78 7/1/78 OK ✓ 4 eggs 6/14/78 7/1/78 ✓
D	Lapland longspur	6/13/78	6	No eggs 6/26/78 X (none hatched)
D	Baird's sandpiper	6/13/78	3	3 eggs 7/1/78 1 hatched 2 eggs 7/3/78 4 young in nest 1530 7/4/78 ✓
D	Lapland longspur	6/13/78	3	0
D	Red Phalarope	6/13/78	4	No sign of nest 6/27/78 X
D	Lapland longspur	6/13/78	4	5 eggs 6/16/78 Predicted, all eggs gone, no shell fragments left 6/18
D	Lapland longspur	6/14/78	5	Successful - at least 3 young 6/26 ✓
D	Lapland longspur	6/14/78	5	Successful 6/26 ✓
D	Snow Bunting	6/15/78	4	Eggs 6/14/78 Fledged 7/12/78 ✓ Downy young
D	Lapland longspur	6/15/78	5	Successful - at least 4 young 6/26 ✓
B	Puddle Turnstone	6/15/78	4	Successful - 6 downy young near nest 7/2 ✓
B	Puddle Turnstone	6/15/78	4	Successful - 4 downy young in near nest 7/2 ✓
D	Lesser-tailed Jaeger	6/15/78	2	7/1 - Nest destroyed, egg shell fragments in nest X
D	White-browed Gull	6/16/78	4	Nest destroyed by Arctic Fox (crushed shell + eggs). Checked 7/10/78
D	Semipalmated sandpiper	6/16/78	4	7/4 - Nest destroyed, egg shell near nest X
B	Lapland longspur	6/16/78	6	1 egg 7/1/78 X
B	Golden Plover	6/16/78	4	7/12 - Nest predicted possible success X
F	Red Phalarope	6/16/78	4	0
F	Snow bunting	6/17/78	6	No eggs or sign during 6/26 X
E	Baird's sandpiper	6/17/78	4	OK Proven success ✓
B	White-browed Gull	6/18/78	2	7/5 - Nest destroyed, unknown predator X
B	King eider	6/18/78	1	Predicted (6/29/78) no egg sign known location X
B	King eider	6/18/78		7/5 - Nest destroyed, egg sign known location X
B	Semipalmated sandpiper	6/19/78	4	7/5 - Downy young, 1 egg ✓

NEST, CLUTCH AND FLEDGING DATA

EST NO.	SPECIES	DATE FOUND EST. HATCH	NO. EGGS	FATE/FLEDGING
29	Red Phalarope	6/19/78	3	4 eggs 7/1/78 0 eggs presumed success 7/2 ✓
30	Roddy Turnstone	6/19/78	4	7/2 - 1 egg in nest, assume other 3 hatched ✓
31	Baird's sandpiper	6/19/78	4	7/3 3 eggs hatched, 1 dead chick in egg ✓
32	Lapland longspur	6/19/78	6	0
33	Semipalmated sandpiper	6/20/78	4	0
34	Lapland longspur	6/20/78	0	x
35	Parasitic Jaeger	6/20/78	2	7/4 - nest destroyed, shell intact, nest possibly intact ✓
36	Snow Bunting	6/20/78	0	4 abandoned
37	Dunlin	6/21/78	4	7/5 - no eggs or egg shells, seen incubated ✓
38	Dunlin	6/21/78	4	7/5 no eggs or egg shells, seen incubated, assumed incubated ✓
39	Spectacled eider	6/21/78	5	No eggs 7/11/78 x
40	Spectacled eider	6/21/78	5	No eggs or signs thereof 7/20 presumed failed
41	Glaucous gull	6/21/78	3	O.K. 7/7/78 At least 2 chicks 7/15 ✓
42	Canada goose	6/21/78	5	3rd on nest 7/11/78 SUCCESS 5 goslings 7/12/78 ✓
43	Baird's sandpiper	6/24/78	4	O.K. 7/7/78 presumed success 7/11/78 ✓
44	Semipalmated sand.	6/25/78	4	Could not find avian 7/11/78 Hatched? ✓
45	American golden plover	6/27/78	2	O.K. 7/11/78 O.K. 7/18/78 No eggs 7/26 C
46	Baird's sandpiper	6/27/78	4	O.K. 7/14/78 O.K. 7/11/78 No eggs, agitated adults 7/15 ✓
47	Baird's sandpiper	6/27/78	4	7/4 - 3 downy young, 1 egg ✓
48	Lapland longspur	6/26/78	5 3 eggs	Two hatched 3 not 6/26/78 (near #4 but not marked) ✓
49	Lapland longspur	6/27/78	5 (hatched)	3 young at least, Not marked
50	Dunlin	6/28/78	4	7/11/78 O.K. 7/15/78 Presumed success, agitated adults ✓
51	Semipalmated Sandpiper	6/28/78	4	No eggs no shells 7/11/78. ✓
52	Lapland longspur	6/28/78	0	Predated? x
53	Kino eider	6/30/78	4	Successful 4 young 7/23 ✓
54	Baird's sandpiper	6/30/78	4	7/3 - 2 downy young 2 eggs ✓
55	Oldsquaw	6/21/78	0	6/24/78 No eggs, no run x
56	Harry Redpoll	6/30/78	3 young	Hatched Fledged 7/10/78 ✓

NEST, CLUTCH AND FLEDGING DATA

EST NO.	SPECIES	DATE FOUND EST. HATCH	NO. EGGS	RATE/FLEDGING
57	D. <i>haskland longspur</i>	7/1/78	5	7/13/78 No nest noted but seen to remember hatch 7/12/78 ✓
58	S. <i>oldsquaw</i>	7/1/78	2	FAILED
59	B. <i>buff-breasted sandpiper</i>	7/1/78	4	4 young 7/12/78 1m. from nest
60	S. <i>Dunlin</i>	7/1/78	4	No eggs 7/4/78
61	D. <i>Kura Eider</i>	7/1/78		No. Hatched, o.k. 7/13/78, 7/18/78 Predated, egg shell seen 7/13/78
62	D. <i>Pied-billed Grebe</i>	7/1/78	4	o.k. 7/14/78 o.k. 7/15/78 1 downy chick 1 pipped egg 7/16 ✓
63	D. <i>haskland longspur</i>	7/2/78	3	3 eggs 7/4/78 3 downy young 7/13/78 ✓
64	D. <i>Black-bellied Plover</i>	7/2/78	11	No eggs 7/9/78. Presumed FAIL (no adult in area) ✗
65	D. <i>Buff-breasted Sandpiper</i>	7/2/78	4	o.k. 7/12/78. 1 egg 7/14/78 ✓
66	D. <i>Red Phalarope</i>	7/2/78	4	1 egg pipped 7/7/78 Success 1 unhatched egg (eaten) o.k.
67	D. <i>Baird's Sandpiper</i>	6/29/78	4	7/15 no eggs, no sign of predation or hatch C
68	B. <i>Red Phalarope</i>	7/3/78	4	Checked 7/4 o.k. O
69	B. <i>Lowland Longspur</i>	7/3/78	5	7/12 5 downy young ✓
70	D. <i>Northern Phalarope</i>	7/4/78	4	7/15/78 o.k. No eggs 7/18/78 no adult in area ✓
71	B. <i>Snow Bunting</i>	7/5/78	4	7/12 Downy young in nest
72	D. <i>Red Phalarope</i>	7/5/78	3	No eggs 7/12/78. As of 7/12 checked. Presumed SUCCESS
73	D. <i>Black-bellied Plover</i>	7/5/78	4	o.k. 7/12/78 2 downy young 2 eggs 7/15/78 ✓
74	D. <i>King Eider</i>	7/7/78	(3 young)	No. Hatched, o.k. 7/14/78 Brood seen 7/15/78 may have been
75	D. <i>Heavy Redpoll</i>	7/3/78		No. Hatched Successful hatch
76	B. <i>Snow Bunting</i>	7/7/78	5	Downy young 7/12/78 SUCCESS ✓
77	B. <i>Baird's sandpiper</i>	7/9/78	4	o.k. 7/11/78. o.k. 7/16/78 o.k. 7/17/78 No eggs 7/24 Presumed success
78	B. <i>King eider</i>	7/11/78	5	7/18 Unsuccessful - predation unknown predator, no eggs seen
79	D. <i>Dunlin</i>	7/10/78	4	Checked 7/14/78 o.k.
80	D. <i>Buff-breasted Sandpiper</i>	7/11/78	11 downy young	STILL IN NEST, PICTURES TAKEN ✓
81	D. <i>Buff-breasted Sandpiper</i>	7/12/78	4	4 eggs all equally pipped 7/15 00:40 ✓
82	D. <i>Buff-breasted Sandpiper</i>	7/12/78	4	7/16 o.k. 7/23 o.k. 7/24 Hatched, eggs gone ✓
83	B. <i>American Golden Plover</i>	7/12/78	4	Downy young - 3 eggs 1 egg pipped 7/12 ✓
84	D. <i>American Golden Plover</i>	7/15/78	4	2 eggs pipped 7/25 13:25 ✓ 2 downy young 1 just hatched 7/25 14:45

Appendix 3 : Bird migration observed at Storckersen Point, 1978.

DATE/TIME	SPECIES	FLOCK SIZE	DIRECTION
11 June, -	Arctic Loon	5	East
1410	"	1	West
1140	Whistling Swan	1	East
-	Black Brant	179	East
-	"	25	West
1140	Pintail	11	East
-	"	14	West
0800-0900	Oldsquaw	84	East
1210	"	18	West
-	King Eider	26	East
1630-1730	Pomarine Jagear	14	East
"	"	3	West
12 June, 1205	Black Brant	10	East
1445	"	4	West
1330	Pomarine Jagear	4	East
1725	"	1	West
13 June, 1125	Black Brant	33	West
14 June, 1630	Black Brant	8	East
1700	"	4	West
15 June, 1630	Black Brant	17	West
16 June, 0935	Loon sp.	6	East
1030	Oldsquaw	10	West
1255	King Eider	48	West
17 June, 2115	Whistling Swan	1	West
2030	Oldsquaw	9	East
2330	"	65	West
2245	Pomarine Jagear	3	West
18 June, 1530	Black Brant	54	West
19 June, 1540	Black Brant	23	East
20 June, 1800-2030	Black Brant	29	East
21 June, 0815	Snow Goose	6	East
22 June, -	Snow Goose	55	West
23 June, 2045	Black Brant	24	West
2050	Pomarine Jagear	4	West
24 June, 1610	Black Brant	16	East
2255	"	90	West
26 June, 1900-2100	Black Brant	58	East
1830	"	31	West
1650	American Golden Plover	9	South
27 June, 1920	Black Brant	18	East
2030	"	54	West
28 June, 1700-1730	Black Brant	80	West
1700-2030	Oldsquaw	47	East
"	"	13	West
0830	Common Eider	12	West
1600	Pomarine Jagear	1	West
1300-1500	Long-tailed Jagear	10	East
29 June, 1700-2100	Black Brant	149	East
"	"	251	West
-	Oldsquaw	8	East
1630	King Eider	3	East

Appendix 8 :Bird migration observed at Storkersen Point, 1978.

DATE/TIME	SPECIES	FLOCK SIZE	DIRECTION
30 June, 2340-2350	Black Brant	56	East
0635	"	65	West
2 July, 1220-1230	Black Brant	60	West
3 July, 1220	Black Brant	9	East
1930	"	19	West
1320	White-fronted Goose	4	East
1553	Glaucous Gull (immature)	5	East
4 July, 2330	Black Brant	16	East
2115-2130	"	41	West
2125	Oldsquaw	3	East
1200	Glaucous Gull (immature)	-	East
5 July, -	Black Brant	90	West
2305	"	7	East
2200	Oldsquaw	6	East
6 July, 2110-2115	Black Brant	93	West
7 July, 1645	Black Brant	36	East
0815	Oldsquaw	4	East
8 July, 1930-2400	Black Brant	110	West
10 July, 0610	Oldsquaw	12	East
20 July, 1345	Oldsquaw	9	East
21 July, 2210	Oldsquaw	61	West
2210	Common Eider	34	West
22 July, 1220	Oldsquaw	7	West
23 July, 1035	Oldsquaw	3	East
1955	Oldsquaw	32	West
24 July, 2030-2130	Oldsquaw	77	West
25 July, 1915-2115	Oldsquaw	6	East
1900-2115	"	168	West
2100-2215	Eider sp.	12	West
1025	Common Eider	22	West
2323	Semipalmated Sandpiper	22	East
2230	Plover sp.	10	East
27 July, 1925	Oldsquaw	10	West
28 July, 2210-2235	King Eider	22	West
2235	Eider sp.	18	West
29 July, 1830	Oldsquaw	15	West
30 July, 1735	Oldsquaw	6	East
2100	King Eider	10	West
31 July, 2050-2400	Pintail	44	East
2250	"	70	West
2 Aug. 2315	Oldsquaw	12	West
2325	Eider sp.	100	West
3 Aug. 2245	Pintail	14	West
2230	Buff-breasted Sandpiper	3	East
-	American Golden Plover	27	East
4 Aug. -	Pintail	25	East
2145	Red Phalarope	14	West
2225	Black-bellied Plover	3	East

Appendix 8 : Bird migration observed at Storkersen Point, 1978.

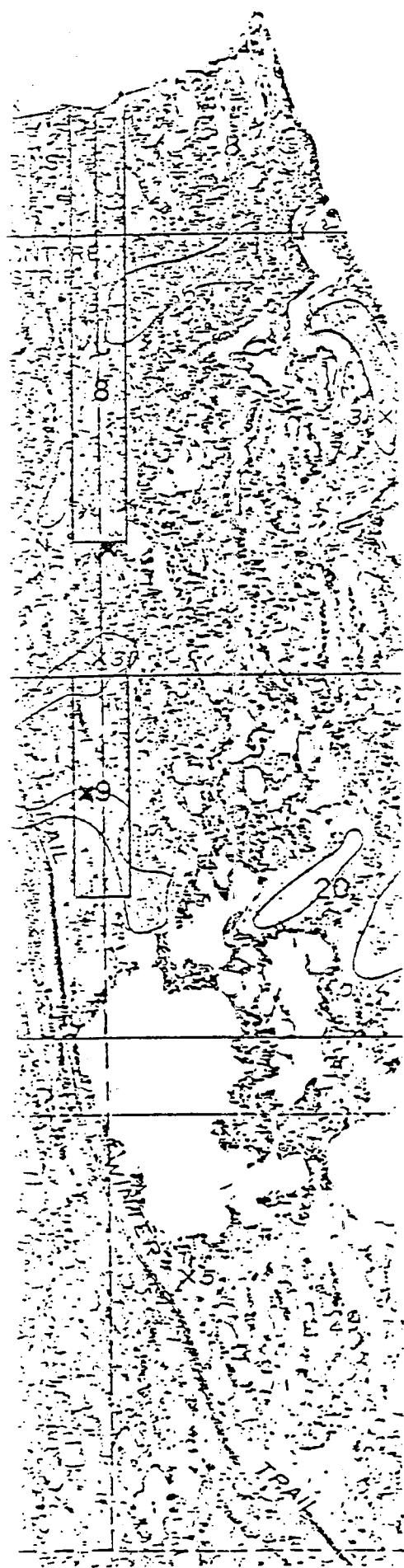
DATE/TIME	SPECIES	FLOCK SIZE	DIRECTION
5 Aug. 1545	American Golden Plover	33	East
1730	Black-bellied Plover	24	East
6 Aug. 2325	Pintail	31	East
7 Aug. 1030-1230	Pintail	13	East
17 Aug. -	Black Brant	962	West
18 Aug. 1930-1945	Black Brant	306	West
-	Semipalmated Sandpiper	11	East
1000-1115	Pectoral Sandpiper	32	East
1815-1945	American Golden Plover	75	East
1616	Black-bellied Plover	9	East
19 Aug. 2000-2145	Black Brant	877	West
1000-1600	Pectoral Sandpiper	109	East
"	Long-billed Dowitcher	19	East
"	Buff-breasted Sandpiper	3	East
"	American Golden Plover	177	East
"	Black-bellied Plover	28	East

^aindicates times of peak migration observations and may not include times of all observations.

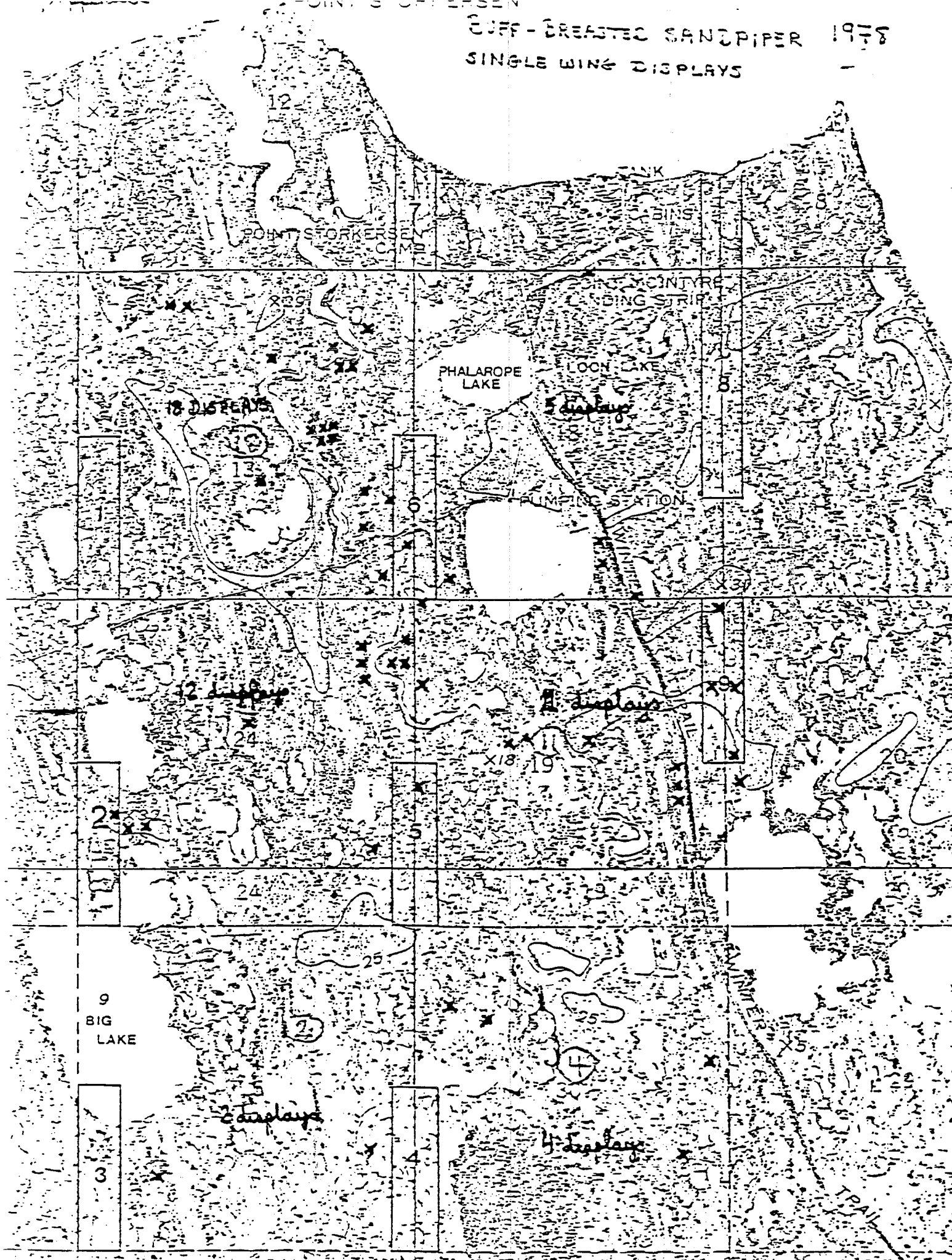
APPENDIX 9

Wetland classification according to Bergman 1977.

Wetland designation	Dominant emergents		Conductivity	Common size
	Shore zone	Central zone		
Flooded Tundra (Class I)	<i>Eriophorum angustifolium</i> or <i>Carex aquatilis</i>	<i>E. angustifolium</i> or <i>C. aquatilis</i>	Fresh or slightly brackish	Pond
Shallow-Carex (Class II)	<i>C. aquatilis</i>	Semi open to open	Fresh or slightly brackish	Pond
Shallow-Arctophila (Class III)	<i>C. aquatilis</i> or <i>Arctophila fulva</i>	<i>A. fulva</i>	Fresh or slightly brackish	Pond
Deep-Arctophila (Class IV)	<i>A. fulva</i>	Open	Fresh or slightly brackish	Pond or lake
Deep-open (Class V)	Open	Open	Fresh or slightly brackish	Lake
Basin-complex (Class VI)	Basin interspersed with <i>C. aquatilis</i> , <i>A. fulva</i> , and open water		Fresh or slightly brackish	Lake
Beaded Streams (Class VII)	<i>C. aquatilis</i> , <i>A. fulva</i> , or Open	Open or <i>A. fulva</i>	Fresh or slightly brackish	Pond=Bead
Coastal Wetlands (Class VIII)	<i>Puccinellia phryganeodes</i> , <i>C. subspatheacea</i> , or Open	Open	Brackish or subsaline	Pond or lagoon

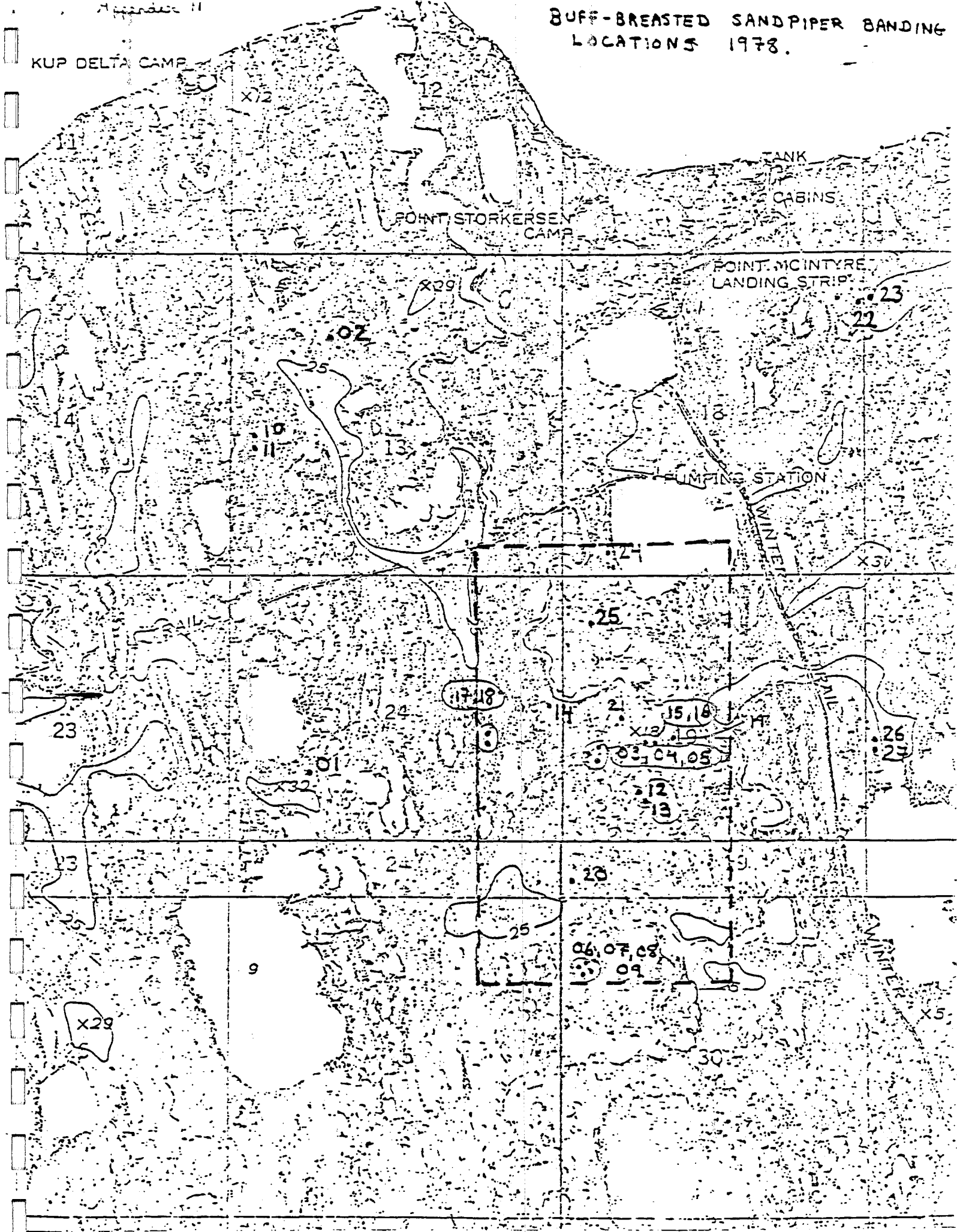


SHOOTING OF CHIMNEY BUFF-BREASTED SANDPIPER 1978 SINGLE WING DISPLAYS



BUFF-BREASTED SANDPIPER BANDING LOCATIONS 1978.

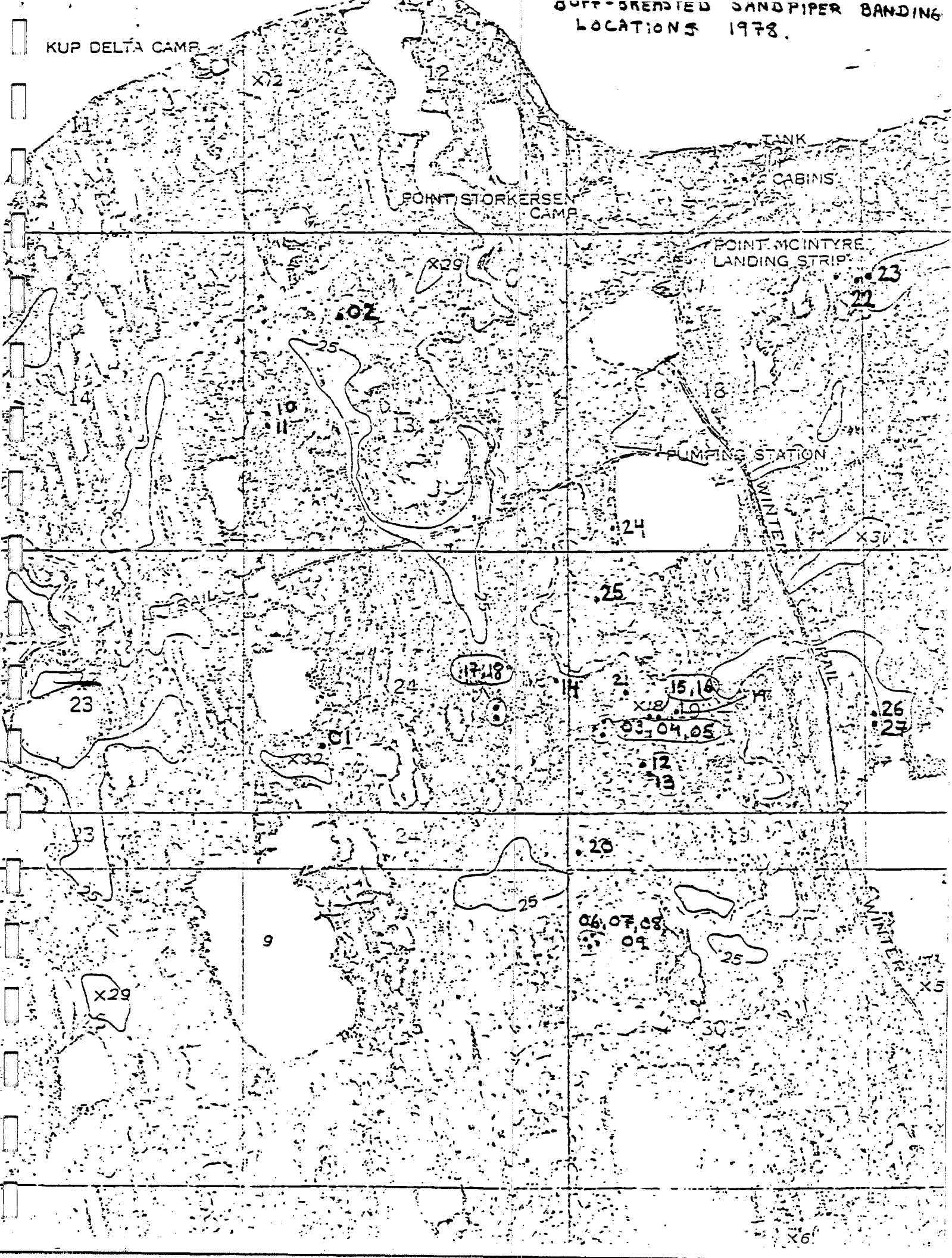
KUP DELTA CAMP



01	Local 7/20	Right BLUE Left METAL	14	10	24	With headlight the bird seems very small but seemed fine. Walked as O.K.
02	Local 7/20	Right METAL Left RED	32 (7/24) 45	15 5	29 inside 32 outside	On recapture bird seemed healthy. Same brood as #10, 11
03	Local 7/21	LEFT { BLUE above METAL below	34	15	27 inside	
04	Local 7/21	RIGHT { RED above METAL below	38	16		
05	Local 7/21	LEFT { RED above METAL below	43*	15		Scale loose weight may be inaccurate - 4 gms over at least
06	Local 7/21	RIGHT { BLUE above METAL below		14	31	Same brood as 07, 08, 09
07	Local 7/21	Right METAL Left Blue	46*	15	31	Scale loose weight may be inaccurate - 4 gms over at least Same brood as 06, 08, 09
08	Local 7/21	Right RED Left METAL	46*	15	31	Scale loose weight may be inaccurate - 4 gms over at least Same brood as 06, 07, 09
09	Local 7/21	LEFT { METAL above RED below	32	14	29	Same brood as 06, 07, 08
10	Local 7/24	LEFT { METAL above BLUE below	45	15	28 inside 30 out	Same brood as #02, 11
11	Local 7/24	RIGHT { METAL above BLUE below	42	14	27 inside 29 back to toe	Same brood as #02, 10
12	Local 7/24	Right RED Left { BLUE above METAL below	42 45 (7/25)	14 14.5	27 inside 32 (side)	Same brood as #10, 13, 16 Remeasured 7/25/78
13	Local 7/24	Right METAL Left { BLUE above RED below	46	15	29 inside	Frightened 7/25 Resighted flying on 7/30 in company with #16
	Local 7/24	Right { BLUE above METAL below Left RED	43	14.5	27 inside	
	Local 7/25	Right BLUE Left { RED above METAL below	54	17	36 inside 31 outside	Same brood as #12, 13, 16

DUFF-BREASTED SANDPIPER BANDING
LOCATIONS 1978.

KUP DELTA CAMP



DATE OF BAND		WEIGHT	WING	TARSUS	REMARKS
local 7/25	Right { BLUE above RED below left METAL	49	15	32 side 27 inside	Resighted flying on 7/30 in company with #13.
local 7/26	Right { RED above METAL below left Red	34	14	31 side 25 inside	Same brood as #18
local 7/25	Right RED Left { METAL above RED below	34	14	32 side 27 inside	Same brood as #17
local 7/28	Right BLUE left { METAL above RED below	54	17.5	33 side 31 inside	Wing 144 mm. from side to tip outstretched. Bird barely fledged; flew but hard - came picture taken before banding.
local 7/30	Right BLUE left { BLUE above METAL below	37	15	32 side 27 inside	
local 8/1	Right BLUE left { METAL above BLUE below	44	16.5	33 side 31 inside	Wing 120 mm. Chest and parotid were well inflated. No brown "flood" from another brood. 2-10-12 days in incubation.
local 8/2	LEFT METAL (no plastic bands)	25		31 side 25 inside	Wing 115 mm. Same brood as #25
local 8/2	RIGHT METAL (no plastic bands)	26	14	33 side 27 inside	Wing 115 mm. Same brood as #25. Same as #22 and #27 which were in same brood.
local 8/5	Right METAL left { RED above BLUE below	28 33	14 15	32 side 25 inside 33 side 30 inside	Small under incubation. May be from nest 8. Re-measured 8/10/78
local 8/8	Right { METAL above BLUE below left RED	32	14.5	32 side 29 inside	Obvious discrepancy 8/13 - suspect this is same brood as band #24
local 8/16	Right RED left { RED above METAL below	35	13	32 side 27 inside	Bill-weight discrepancy is not all due to inaccuracy. Birds may be light due to cold weather + lack of food. Tarsus lengths harder
local 8/16	Right RED Left { METAL above	33	13	31 side 26 inside	to explain. #26 + #27 are of same brood

APPENDIX 12

Macroinvertebrates collected from Ponds 23, 30, 33 on 22-24 June 1978

Taxa	P 23	<u>Sweep</u>		Total	P 23	<u>Ekman</u>		Total
		P 30	P 33			P 30	P 33	
Turbellaria	5			5				
Nemertea								
Nematoda					1			1
Oligochaeta			1	1	35	18	30	83
Anostraca						6		6
Notostraca								
Conchostraca								
Cladocera								
Copepoda		1		1				
Ostracoda								
Hydracarina		1		1				
Collembola		3		3				
<u>Plecoptera</u>	49	62	18	129		1		1
Trichoptera							2	2
Coleoptera (1)								
Dytiscidae								
Tipulidae								
Culicidae								
Tendipedidae	32	19	7	58	41	159	96	296
Muscidae						3		3
Gastropoda	7			7		3		3
Diptera					1			1
TOTALS				205				393

APPENDIX 12

Macroinvertebrates collected from Ponds 7, 32, 36 on 22-24 June 1978

Taxa	F 7	<u>Sweep</u>		Total	P 7	<u>Ekman</u>		Total
		P 32	P 36			P 32	P 36	
Turbellaria	1		1	2				
Nemertea								
Nematoda								
Oligochaeta					41	8	10	59
Anostraca		2	2	4		1		1
Notostraca								
Conchostraca								
Cladocera		24	13	37				
Copepoda								
Ostracoda								
Hydracarina			2	2	4	3		7
<u>Collembola</u>								
Plecoptera	16	14	54	84			1	1
Trichoptera						1		1
Coleoptera (1)								
Dytiscidae								
Tipulidae								
Culicidae								
Tendipedidae		1	4	5	275	38	35	348
Muscidae					1			1
Diptera						1		1
Gastropoda	4			4				
TOTALS				138				419

APPENDIX 12

Macroinvertebrates collected from Ponds 31, 37, 39 on 22-24 June 1978

Taxa	P 31	<u>Sweep</u>	P 39	Total	P 31	<u>Ekman</u>	P 39	Total
		P 37				P 37		
Turbellaria								
Nemertea								
Nematoda								
Oligochaeta			1	1	15	11	9	35
Anostraca								
Notostraca								
Conchostraca								
Cladocera								
Copepoda	9			9				
Ostracoda								
Hydracarina							1	1
Collembola								
Plecoptera		1		1				
Trichoptera								
Coleoptera (1)								
Dytiscidae								
Tipulidae								
Culicidae								
Tendipedidae	3			3	25	3	3	31
Muscidae								
Diptera								
Gastropoda			1	1				
TOTALS				15				67

APPENDIX 12

Macroinvertebrates collected from Ponds 23, 30, 33 on 30 June, 1-2 July 1978

Taxa	P 23	<u>Sweep</u>		Total	P 23	<u>Ekman</u>		Total
		P 30	P 33			P 30	P 33	
Turbellaria	18	25	16	59				
Nemertea								
Nematoda					3			3
Oligochaeta					35	21	5	61
Anostraca	33	6	7	46				
Notostraca								
Conchostraca								
Cladocera	250	284	8	542				
Copepoda			1	1				
Ostracoda								
Hydracarina					1	1		2
Collembola								
Plecoptera	8	38	26	72				
Trichoptera	10	3	4	17				
Coleoptera (1)	1			1				
Dytiscidae								
Tipulidae								
Culicidae								
Tendipedidae	10	9	4	23	33	219	45	297
Muscidae								
Diptera								
Gastropoda								
TOTALS				761				364

APPENDIX 12

Macroinvertebrates collected from Ponds 7, 32, 36 on 30 June, 1-2 July 1978

Taxa	P 7	<u>Sweep</u>		Total	P 7	<u>Pickup</u>		Total
		P 32	P 36			P 32	P 36	
Turbellaria	21	15	16	52				
Nemertea								
Nematoda						1	2	3
Oligochaeta					19	19	8	46
Anostraca	35	4	7	46				
Notostraca								
Conchostraca								
Cladocera	44	9	60	113				
Copepoda	1		6	7				
Ostracoda								
Hydracarina							1	1
Collembola								
Plecoptera	23	12	24	59		1		1
Trichoptera	1	2	4	7		1	1	2
Coleoptera (1)						1		1
Dytiscidae								
Tipulidae							1	1
Culicidae								
Tendipedidae	2	6	9	17	122	38	112	272
Muscidae								
Diptera					1	1		2
Gastropoda								
TOTALS				301				329

APPENDIX 12

Macroinvertebrates collected from Ponds 31, 37, 39 on 30 June, 1-2 July 1978

Taxa	P 31	<u>Sweep</u>		Total	P 31	<u>Ekman</u>		Total
		P 37	P 39			P 37	P 39	
Turbellaria	1			1				
Nemertea								
Nematoda								
Oligochaeta			2	2	22	27	6	55
Anostraca								
Notostraca								
Conchostraca								
Cladocera								
Copepoda								
Ostracoda								
Hydracarina								
Colembola								
Plecoptera								
Trichoptera								
Coleoptera (1)								
Dytiscidae								
Tipulidae								
Culicidae								
Tendipedidae	21	1	5	27	26	16	7	49
Muscidae					1			1
Diptera								
Gastropoda								
TOTALS				30				105

APPENDIX

Macroinvertebrates collected from Ponds

13-15 July 1978

Taxa	P 23	<u>Sweep</u>		P 33	P 30	P 33	Total
		P 30	P 33				
Turbellaria	21	19	5				
Nemertea							
Nematoda					1		1
Oligochaeta					50	8	78
Anostraca	3	98	5				
Notostraca							
Conchostraca	4	2					
Cladocera	910	215	1154				
Copepoda	6	24	18		12		14
Ostracoda							
Hydracarina					3		5
Cerambola		2					
Plecoptera	31	42	15				
Trichoptera	6	2	1				1
Coleoptera (1)							
Dytiscidae							
Tipulidae							
Culicidae							
Tendipedidae	3		11		234	73	333
Muscidae							
Diptera	1						
Gastropoda							
TOTALS							432

APPENDIX 12

Macroinvertebrates collected from Ponds 7, 32, 36 on 13-15 July 1978

Taxa	P 7	<u>Sweep</u>		Total	P 7	<u>Ekman</u>		Total
		P 32	P 36			P 32	P 36	
Turbellaria	14	11	16	41				
Nemertea								
Nematoda					2			2
Oligochaeta		1		1	26	8	19	53
Anostraca	59	72	23	154				
Notostraca								
Conchostraca	1	3	2	6			1	1
Cladocera	284	224	543	1051				
Copepoda		6	5	11		1		1
Ostracoda								
Hydracarina						4	4	8
Collembola								
Plecoptera	7	28	14	49			1	1
Trichoptera		3	6	9				
Coleoptera (1)								
Dytiscidae					2			2
Tipulidae								
Culicidae								
Tendipedidae	7	8	6	21	148	49	211	408
Muscidae							3	3
Diptera								
Gastropoda								
TOTALS				1343				479

APPENDIX 12

Macroinvertebrates collected from Pond 31, 37, 39 on 13-15 July 1978

Taxa	<u>Sweep</u>				<u>Ekman</u>			
	P 31	P 37	P 39	Total	P 31	P 37	P 39	Total
Turbellaria								
Nemertea								
Nematoda								
Oligochaeta					7	22	10	39
Anostraca								
Notostraca								
Conchostraca								
Cladocera								
Copepoda	2			2				
Ostracoda								
Hydracarina					1			1
Collembola								
Plecoptera								
Trichoptera								
Coleoptera (1)								
Dytiscidae								
Tipulidae								
Culicidae								
Tendipedidae	10	1	1	12	31	17	5	53
Muscidae								
Diptera								
Gastropoda			1	1				
TOTALS				15				93

APPENDIX 12

Macroinvertebrates collected from Ponds 23, 30, 33 on 17-29 July 1978

Taxa	P 23	<u>Sweep</u>		Total	P 23	<u>Ekman</u>		Total
		P 30	P 33			P 30	P 33	
Turbellaria	95	83	39	217				
Nemertea			1	1				
Nematoda	1			1				
Oligochaeta	1		1	2	5	25	19	49
Anostraca	11	24	18	53				
Notostraca	1			1				
Conchostraca	15		2	17	2	2	7	11
Cladocera	684	123	500	1307				
Copepoda	31	130	39	200	4		3	7
Ostracoda	67	2		69	4			4
Hydracarina	2	1	1	4	3			3
Collembola	2	7	1	10				
Plecoptera	92	102	38	232	2		1	3
Trichoptera	9	4	11	24	1		1	2
Coleoptera (1)	2			2	1			1
Dytiscidae								
Tipulidae								
Culicidae								
Tendipedidae	7	20	3	30	39	144	65	248
Muscidae							2	2
Diptera								
Gastropoda	1		1	2				
TOTALS				2172				330

APPENDIX 12

Macroinvertebrates collected from Ponds 7, 32, 36 on 27-29 July 1978

Taxa	P 7	<u>Sweep</u>		Total	P 7	<u>Ekman</u>		Total
		P 32	P 36			P 32	P 36	
Turbellaria	57	31	62	150				
Nemertea								
Nematoda		1		1				
Oligochaeta					22	16	12	50
Anostraca	28	1	3	32				
Notostraca	1			1		1		1
Conchostraca	8	1	2	11			7	7
Cladocera	146	235	379	760				
Copepoda		23	17	40		7	4	11
Ostracoda								
Hydracarina						1	2	3
G ammaridea	3			3				
Plecoptera	11	30	36	77				
Trichoptera	1	3	5	9				
Coleoptera (1)								
Dytiscidae								
Tipulidae								
Culicidae								
Tendipedidae	9	1	4	14	110	65	168	343
Muscidae						1	1	2
Diptera								
Gastropoda								
TOTALS				1098				417

APPENDIX 12

Macroinvertebrates collected from Ponds 31, 37, 39 on 27-29 July 1978

Taxa	P 31	<u>Sweep</u>		Total	P 31	<u>Ekman</u>		Total
		P 37	P 39			P 37	P 39	
Turbellaria	2			2				
Nemertea								
Nematoda								
Oligochaeta		2		2	39	18	43	100
Anostraca								
Notostraca		1		1				
Conchostraca								
Cladocera								
Copepoda	1			1				
Ostracoda	1			1				
Hydracarina						1		1
Collembola								
Plecoptera								
Trichoptera								
Coleoptera (1)								
Dytiscidae								
Tipulidae								
Culicidae								
Tendipedidae	1	8		9	35	30	14	79
Muscidae						2		2
Diptera								
Gastropoda								
TOTALS				16				182

APPENDIX 12

Macroinvertebrates collected from Storkersen Well Pond in 1978

Taxa	<u>Sweep</u>				Total	<u>Ekman</u>				Total
	6/23	7/2	7/15	7/29		6/23	7/2	7/15	7/29	
Turbellaria										
Nemertea										
Nematoda										
Oligochaeta										
Anostraca										
Notostraca										
Conchostraca										
Cladocera										
Copepoda										
Ostracoda										
Hydracarina										
Collembola										
Plecoptera										
Trichoptera										
Coleoptera (1)										
Dytiscidae										
Tipulidae										
Culicidae										
Tendipedidae	0	1	0	0	1	0	4	92	26	122
Muscidae										
Diptera										
Gastropoda										
TOTALS					1					122

APPENDIX 13

Observations of neck collared caribou at Storkersen Point, 1978

Date	Number	Collar Color	Sex of animal	Bulls	Herd composition Cows and yearlings	Calves	Direction of movement
7/25	63	red with yellow number	cow with calf	6	43	14	East
7/28	41	red with yellow number	cow	14	185	54	West
8/1	44	blue with yellow number	cow with calf	14	84	30	West
8/1	63	red with yellow number	cow with calf	14	84	30	West