ANNUAL REPORT ON THE ESKIMO CURLEW (*Numenius borealis*) RECOVERY PLAN PROJECT IN THE NORTHWEST TERRITORIES, CANADA, IN 1994:

Results of the Investigations into an Unconfirmed Eskimo Curlew Nest Site in the Northwest Territories.

by

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24 October 1994

ABSTRACT

In 1992, a geologist reported a probable Eskimo Curlew (Numenius borealis) nest in a confidential area in the southern District of Keewatin, Northwest Territories. He photographed the nest and eggs, and observed one bird of which he did not get a photograph.

In our investigation into the nest site area and analysis of the egg photographs in 1994, we concluded that the eggs and sighting were those of a Whimbrel (Numenius phaeopus), a closely related species easily confused with the Eskimo Curlew. This conclusion was based on the following:

1. The reconstructed size of the eggs on the unconfirmed egg photographs suited both the size of Eskimo Curlew and Whimbrel eggs.
2. By comparing photographs of known Whimbrel eggs with the unconfirmed egg photographs of 1992 it appeared that the shapes of the eggs in all photographs were distorted towards an oval shape from the originally pronounced conical shape. Whimbrel eggs have a conical shape, as opposed to the oval shape of Eskimo Curlew eggs. The dark olive-green color typical of Whimbrel eggs was also distorted on photographs towards a light, buff, olive-beige or olive-green which is similar to the color of Eskimo Curlew eggs.
3. The markings on the unconfirmed egg photographs of 1992 were the same as the large and blurry dark brown blotches on Whimbrel eggs photographed in 1994 at the same site.
4. The original sighting in 1992 was brief, and the observer was unfamiliar with the Eskimo Curlew and their characteristics at the time of the sighting. Under these conditions, the potential for mis-identification is high.
5. The unconfirmed Eskimo Curlew nest site area of 1992 was used by two nesting pairs of Whimbrel and surrounded by a dense population of another 42 pairs in 1994. Nest site fidelity is characteristic of Whimbrel and other shorebirds, so we expected that Whimbrels were present in 1992, and if Eskimo Curlews existed there, they would also be faithful to the site. The observer did not see Whimbrels in July 1992, possibly because most Whimbrel eggs had already hatched. Whimbrels are not obvious during hatchling and nestling periods. This would explain the apparent absence of Whimbrels in 1992. It is unlikely that predation, weather conditions, or food shortage caused the dispersal of all Whimbrels from the area in 1992.

The territorial behavior of the aggressive and larger Whimbrel leaves little opportunity for pairs of the smaller Eskimo Curlew to nest among them.

We discuss the results of the investigation and present data collected on birds and other wildlife.

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INTRODUCTION

In 1992, a geologist reported a probable Eskimo Curlew (Numenius borealis) nest in the District of Keewatin, Northwest Territories (NWT). His photographs of the nest and eggs, and the short but suiting description of an adult bird were promising. Two researchers were sent into the nest site area in 1994 for investigations. If the existence of a breeding ground of the Eskimo Curlew was to be confirmed, a management plan for the recovery of this species would be developed and applied.

This report presents the results of this investigation.

BACKGROUND

Discovery and Description of the Unconfirmed Eskimo Curlew Nest Site

In a confidential area in the southern District of Keewatin, NWT, Mr. K. A. L. Reading - a geologist with an expertise in botany and entomology - came across a probable Eskimo Curlew nest site during a geological ground survey. He took three photographs of the nest and eggs (Fig. 1 - 3) and observed one bird of which he did not get a photograph. The following description of the observation was provided by K. A. L. Reading (pers. comm.):

"Location of July 7, 1992, traverse during which this ground-nest was seen and photographed when a small curlew flushed from it and re-alit nearby. The only bird observed briefly was paler, less strongly marked and noticeably smaller than a Whimbrel. Its decurved bill was more slender than that of a Whimbrel and its size was casually estimated as being a little larger than a Robin's. Because one egg was actually hatching we departed quickly, realizing only that a curlew had been seen. In camp that night the Golden Guide [Robbins et al. 1983] implied that this bird must have been an Eskimo Curlew; I could find no other alternative in it !"

Developments after the Nest Site Discovery

In the fall of 1992, Mr. Reading reported his observation and sent the egg photographs (Fig. 1 - 3) to Canadian authorities familiar with the Eskimo Curlew and its status. The information was treated confidentially.

In December 1993, news of the Eskimo Curlew finding reached us - Dr. R. G. Bromley, waterfowl biologist and NWT representative on the Eskimo Curlew Recovery Team (ECRT), Wildlife Management Division, Dept. of Renewable Resources (DRR), GNWT; J. Obst, principal investigator of the Eskimo Curlew Recovery Plan Project (ECRPP) in the NWT; and A. Spaulding, field assistant of the ECRPP. R. G. Bromley and J. Obst met with Mr. Reading in January 1994. [We - R. G. Bromley, A. Spaulding, and J. Obst - met again with Mr. Reading in October 1994 and discussed the results and the draft report of this investigation].

Mr. Reading provided us with copies of prior correspondence up to date (17 Feb 93 - 25 Jan 94) concerning the unconfirmed Eskimo Curlew finding, a copy of a 1 : 50,000 scale topographical map with indications of the nest site location and the route of the ground survey, copies of the egg photographs (Fig. 1- 3), description of the observed bird, and the following additional information:

1. Mr. Reading said he is familiar with the Whimbrel (Numenius phaeopus), Stilt Sandpiper (Calidris himantopus), and other shorebirds. During his ground survey in 1992 he did not see any Whimbrels in the area.

2. Mr. Reading did not see the unconfirmed Eskimo Curlew when it was flushed from the nest by his assistant. After flushing the bird, his assistant, not familiar with bird identification, called Mr. Reading who was nearby.

3. He and his assistant were under time pressure when they found the nest because they had to meet the helicopter at an arranged pick up location. The fact that one egg was in the process of hatching was another factor which determined them to leave this site immediately after Mr. Reading took three photographs of the nest and eggs (Fig. 1 - 3). Mr. Reading explained that it is his habit to take photographs of every new bird nest he encounters during his explorations. He did not get a photograph of the attending bird.

4. Mr. Reading said he was unable to return to the nest site for further investigations because the nest site area was only accessible by helicopter.

5. Because of their extremely short nest visit Mr. Reading had only a casual look at the unconfirmed Eskimo Curlew sitting quietly nearby. He could not

recall with certainty the distance between himself and the bird. He did not hear any vocalizations from this bird (we find it is appropriate to mention that unfortunately Mr. Reading has hearing difficulties). He was unfamiliar with the Eskimo Curlew, and he was not aware of the endangered species status of the Eskimo Curlew at the time. Thus, he only noted that it was a 'small curlew'. A second bird was not observed.

6. Mr. Reading was certain that the eggs were lighter colored in the field than they appeared in the photographs (Fig. 1 - 3). He took the egg photographs under moderate light conditions (grey day) with a Nikon camera, 50 mm lens, and a Kodachrome 25 or 64 slide film.

7. The unconfirmed Eskimo Curlew egg photographs did not have any known size reference other than the blossom of a Rhododendron lapponica (Fig. 1). Mr. Reading assumed Rhododendron blossom diameters of 2 - 3 cm (cited from literature) and concluded that the eggs would range between 30 - 45 mm in diameter and were well within the size range of Eskimo Curlew eggs [but also within the size range of Whimbrel eggs].

8. Mr. Reading's description of the nest site habitat and the habitat shown in the photographs (Fig. 1 - 3) suited formerly known Eskimo Curlew nesting habitat and Whimbrel habitat (for details on habitats see 'Results' and 'Discussion').

Preliminary Conclusion

After examining the above information R. G. Bromley and J. Obst concluded that the short description of the bird was not sufficient to prove that an Eskimo Curlew was seen. The color and shape of the eggs on the photographs (Fig. 1 - 3), however, resembled Eskimo Curlew eggs (Fig. 11 - 12) illustrated in Harrison (1978) and Gollop et al. (1986). We concluded that they could be from the Eskimo Curlew or the Whimbrel. Eggs of other species could be excluded with certainty because of egg color, markings, shape, approximate size, nest site character, nesting type, location, and the description of the bird observed.

Because two authorities suggested in their correspondence to Mr. Reading that the eggs could be from the Eskimo Curlew the subject provided enough reason to justify further investigations.

Preparations for and Objectives of a Search

We decided to send a team of volunteers into the possible Eskimo Curlew nest site area in order to evaluate the reported sighting. In case a breeding ground of the Eskimo Curlew was discovered, the matter should be kept confidential, at least until an action plan had been developed by the ECRT. The Yellowknife based Canadian Wildlife Service (CWS); Dept. of Indian and Northern Affairs Canada (INAC); Wildlife Management Division, Dept. of Renewable Resources, GNWT (DRR); and Ecology North offered to support and sponsor a search team of volunteers to go into the nest site area in the spring of 1994.

The team consisted of the volunteers J. Obst, project leader; A. Spaulding, field assistant; and R. G. Bromley, project supervisor. Mr. Reading was supportive and agreed to assist the project however possible.

The objectives of the project were:

1. To collect additional data in the field to evaluate and hopefully confirm Mr. Reading's observation.

2. To determine the status of the Eskimo Curlew in the discussed area.

3. To collect biological data on the Eskimo Curlew, its habitats, and associated wildlife.

4. To identify possible threats to the Eskimo Curlew if any were found.

Detailed objectives of this project were outlined in Obst (1994b).

STUDY AREA

Description and Features

The unconfirmed Eskimo Curlew nest site (UEC nest site) is in a confidential area in the southern District of Keewatin, NWT. The size of the study area around the UEC nest site was defined in the field and encompassed an area of 140 km^2 which was a manageable size for a survey on foot. The longest distances within the study area were 20,5 km from NW to SE, and 14 km from W to E, with the UEC nest site area in the center.

The study area was in the forest-tundra transition zone (the transitional zone between subarctic forest and low arctic tundra) north of the northern limit of trees. The country is flat or rolling and elevation is 200 - 290 m above mean sea level.

About 25 % of the study area is covered with numerous small and several large lakes, mucky ponds, creeks and a river. An additional 15 % is covered with dense thickets, pockets of forests, rocky ridges and outcrops, small cliffs and hills, steep creek banks, swamps, and other obstacles. Therefore, we estimated that a total of 40 % of the study area did not offer suitable Eskimo Curlew or Whimbrel staging, feeding, and/or nesting habitat (description of Eskimo Curlew and Whimbrel habitats see 'Results' and 'Discussion', and below).

Habitats

About 85 % of the land of the study area is dwarf shrub - sedge - lichen tundra, 10 % is open - canopied black spruce (Picea mariana) and larch (Larix laricina) - lichen - shrub woodland, and 5 % is esker habitat. The most common habitat type is well drained upland tundra on rocky and/or sandy soil with scattered dwarf willow (Salix spp.) and birch (Betula glandulosa), lapland rose-bay (Rhododendron lapponicum), labrador-tea (Ledum decumbens), bear berry (Arctostaphylos rubra), bilberry (Vaccinium uliginosum), mountain cranberry (V. Vitis-idaea), crowberry (Empetrum nigrum), mountain avens (Dryas integrifolia), sedges, grasses, lichens, and mosses. The abundance of berries, especially the crowberry, was characteristic throughout the study area.

The above habitat type intermingled with areas containing wet or periodically flooded sedge meadows with cotton-grass (Eriophorum spp.), dry grass meadows, dense dwarf willow forests, hummock-bog, hummocky dwarf shrub - sedge tundra, and swamps. Scattered pockets of black spruce and larch forests were in valleys, depressions, and around lake shores.

Trees were up to 9 m tall in protected areas and usually 1 - 2 m tall in exposed terrain.

Chronology of Spring

On 24 May 1994, an estimated 80 % of the UEC nest site area was still snow covered with an average depth of 60 cm and drifts as deep as 120 cm. Temperatures increased steadily and on 30 May, the snow cover in the UEC nest site area was only 5 %, and 30 % in the surrounding tundra. On 02 June, the UEC nest site area was completely snow free and the surrounding tundra had 5 % snow cover. Small lakes had open water along shores on 29 May and break-up of creeks and the river started on 31 May. On 03 June, most small lakes had 50 - 60 % ice cover which disappeared around 08 June. Large lakes had still 50 % ice cover on 20 June and were almost ice free on 29 June. We believe that the spring of 1994 was early in this region (particularly in comparison to 1992; K. A. L. Reading, pers. comm.).

METHODS

Search Strategy

On 24 May 1994, we - A. Spaulding and J. Obst - arrived at the UEC nest site area by air plane on skiis. We investigated the UEC nest site and study area until 20 June when A. Spaulding left by float plane. J. Obst continued with the field work until 29 June when he left by float plane. If we were able to confirm an Eskimo Curlew sighting, however, J. Obst was prepared to stay until early September.

To identify the location of the UEC nest site, found in 1992 by the geologist K. A. L. Reading, we used his notes on 1: 50,000 scale topographical maps and compared the habitat shown in the nest site photographs (Fig. 1 - 3) with the habitat at the site. We also followed the hiking route of Mr. Reading and detected his rock collection sites, sample tags, and other traces (e. g., two tags were on a rocky ridge 1100 m from the UEC nest site). We were confident that we located the UEC nest site within a radius of 150 m.

From 24 May - 03 June, we camped in a camouflaged tent 500 - 800 m from the UEC nest site area. In case an Eskimo Curlew would settle into this area, we were prepared to move our camp immediately in order to avoid any disturbance or attraction of predators. We intended to identify and observe any Eskimo Curlew from a safe distance with a spotting scope (Baush & Lomb, 15 - 60, 65 mm) and binoculars (Zeiss 8 x 24; Bushnell 10 x 26). We had an open view of 1 - 2 km around the camp site and were well within hearing distance of the nest site area. On 03 June, with the approach of the breeding season, we moved our camp 2,5 km south of the UEC nest site area and camped there until the end of this project.

From 24 May - 29 June, we searched the entire study area on foot. We concentrated, however, on an area of 85 km^2 (60 % of the study area) which was centered around the UEC nest site and offered suitable Eskimo Curlew and Whimbrel staging, feeding and/or nesting habitats.

From 24 May - 03 June, we concentrated our daily hiking routes on an area within 2 - 3 km around the UEC nest site location. In suitable habitat we visited any gap larger than 100 m x 100 m. From 04 - 20 June, we increased this radius to 4 - 6 km and occasionally to 7 - 8 km. In suitable habitat we visited any gap larger than 200 m x 200 m. During these hikes we crossed the nest site area and its vicinity frequently. We each hiked on average 12 - 14 km (10 - 18 km) daily not including explorations off the route. We took frequent stops to observe and listen to birds. From 20 - 28 June, J. Obst hiked routes that extended towards the extremities of the study area.

During our searches we identified all birds and other wildlife. We were familiar with bird species and their songs from previous extensive bird surveys in the tundra of the Western Canadian Arctic from 1987 - 1993 (Obst 1993 and 1994a). We concentrated especially on bird songs or vocalizations which were unfamiliar to us to ensure that we would not miss an Eskimo Curlew. Although Whimbrels were easily identified at large distances by their distinctive calls and appearance we observed each individual carefully with binoculars and spotting scope to detect individual differences in the plumage, crown and eye stripes, color, size, bill, etc.

During our searches we had Eskimo Curlew and bird identification field guides with us (e. g., Harrison 1978, Robbins et al. 1983, Godfrey 1986, Gollop et al. 1986, Hayman et al. 1986, Peterson 1980 and1990, etc.), Mr. Reading's correspondence, his maps, and his nest and egg photographs (Fig. 1 - 3).

Data Collection

For measurements of rhododendron blossoms and eggs on photographs we used an electronic caliper which indicated the nearest 1/100 mm. For egg measurements in the field we used a ruler.

To determine the degree of the distortion of egg color and shape caused by the camera optic, the angle the photographs were taken from, the film, exposure time, light conditions, and the processing of prints from slide films, we took 72 photographs of Whimbrel eggs (Fig. 4 - 10) in the field with different lenses and cameras (Nikon and Pentax bodies, 60 - 300 mm and 70 - 210 mm Tamaron zoom lenses, 28 - 70 mm wide angle and 50 mm lenses, 64 Kodachrome slide film), under different light conditions and exposure times, and from different angles and distances (range 40 cm - 4 m). We noted detailed descriptions and/or sketches of the nest site character and the color, shape, markings, and size of Whimbrel eggs in the field.

Definitions of Whimbrel Nesting Territories and Distances between Nest Sites

The extreme agitated behavior of Whimbrels enabled us to locate nest sites or encircle their approximate location. We defined an occupied nesting territory as such when a pair indicated by their agitated behavior that they were nesting. We located the approximate nest site within an area of 100 m x 100 m. We used the center of this area for the assumed nest site location which we indicated on 1 : 50 000 scale topographical maps. We obtained the

distances between Whimbrel nest sites by measuring the distances between the assumed nest site locations on 1 : 50 000 scale topographical maps. We used the same procedure to measure the distances between Whimbrel nest sites and the UEC nest site. We located the UEC nest site within a radius of 150 m and used the center of this area for the assumed UEC nest site location.

Follow-up

If the search was to be successful further field work was to be conducted as outlined in Obst (1994b).

RESULTS

Observations on the Whimbrel

Spring Arrival, Occupation of Territories, and Nesting Density

On 24 and 25 May, we did not observe any Whimbrels in the vicinity of the UEC nest site area. On 26 May, ten pairs of Whimbrels arrived within a few hours and settled in the vicinity of the UEC nest site area. Other Whimbrels staged in the UEC nest site area and continued thereafter with migration. Most Whimbrels observed at this time were in pairs.

On 27 May, the first Whimbrel territories were occupied. During the course of this study we identified 44 occupied Whimbrel nesting territories in the study area. Twenty-two occupied Whimbrel nesting territories were within 3 km of the UEC nest site. The closest Whimbrel nest sites were 300 m (territory # 1), 500 m (territory # 2), 650 m (territory # 3), and 1100 m (territory # 4) from the UEC nest site. The Whimbrel territories # 1 and # 2 overlapped with the UEC nest site area and with each other. We sometimes observed territorial conflicts and chases between these Whimbrels. The Whimbrels from territory # 3 visited the UEC nest site area occasionally and were chased away by the Whimbrels from Territory # 1. The minimum distances between Whimbrel nest sites were 300 m, but more typically 400 - 500 m.

Along the 12 km route hiked by Mr. Reading in 1992 we found seven occupied Whimbrel nesting territories and another three within 300 - 400 m of the route.

Behavior

The presence of Whimbrels was obvious throughout the study area because of their intense calling and flying activities. Whenever we came within 300 m of a Whimbrel nest, one or both adults flew towards us uttering constant distress calls. When we came within 50 m of the nest both adults intensified distress calls and flew agitatedly around us. Because of this behavior, it was easy to find Whimbrel nests (Fig. 4 - 10) or their approximate location.

During short visits at two different nest sites the adult Whimbrels occasionally came as close as 30 m but usually stayed at least 50 m from us. While we were at the nests the agitated flying activities of the Whimbrels ceased somewhat and usually the Whimbrels sat on the ground still uttering distress calls.

Initiation of Egg Laying, Egg and Nest Site Description

Judging from the agitated behavior of Whimbrels around their nest sites we assumed that most Whimbrel pairs initiated egg laying between 02 - 07 June. Assuming an egg laying interval of 48 hours, an average clutch size of four eggs, an incubation period of 27 - 28 days (Harrison 1978) starting with the first egg, and a shorter incubation period for the last eggs of a clutch (time compensation so all eggs will hatch at about the same time), we estimated most Whimbrel eggs should have hatched from 29 June - 05 July.

In order to limit the possible destruction of Whimbrel nests caused by predators attracted by our presence (see 'Predation and Nest Defense of Whimbrels' in Appendix 2) we examined only two Whimbrel nests:

Nest # 1. Date found: 13 June; clutch size: four eggs; measurements of two eggs: 63 x 42 mm and 65 x 43 mm; color of eggs: dark olive-green; blotches on the eggs: large and blurry, dark brownish-black blotches were concentrated and larger around the round pole (the elliptical end of the egg); smaller blotches and spots on the rest of the eggs; egg shapes: distinct conical, almost triangular (long pyriform) below the round pole; nest: on top of a hummock in a wet sedge meadow with a 20 cm tall dwarf birch 1.5 m from the nest; nest lining: trampled stems of sedges which grew on top of the hummock which was used as nest site; nesting habitat: in the middle of a wet sedge meadow surrounded by dryer dwarf birch - willow - moss hummocks; photographs: Fig. 4 - 7.

Nest # 2. Date found: 15 June; clutch size: four eggs; measurement of one egg: 62 x 39 mm (the eggs were noticeably smaller than the eggs from nest # 1); color of eggs: dark greenish olive-brown, much darker than the eggs from nest # 1; blotches on the eggs: large and blurry, dark brown and concentrated near the round pole on two eggs, and almost evenly distributed over the other two eggs; egg shapes: pronounced conical, same as the eggs from nest # 1; nest: on dry earthy ground right beside a 25 cm tall dwarf birch and a rhododendron blossom; nest lining: none; nesting habitat: the top of a rocky ridge with dry earthy ground, large scattered boulders, scattered dwarf willows and birches, crowberries and other berries, rhododendron, labrador tea, and few lichens; photographs: Fig. 8 - 10; the habitat of this site was similiar to the habitat at the UEC nest site (Fig. 1 - 3).

Description of Whimbrel Habitats

Whimbrels used a variety of nesting habitats in the study area, both in low-lying (slopes and valleys) and high ground (plateaus). Common nesting habitats were hummock - bog, wet sedge meadows (Fig. 4 - 7), poorly and/or well drained upland tundra with scattered to fairly dense dwarf willows, and valleys, slopes, and ridges with dry or wet ground with scattered dwarf willows and birches (Fig. 8 - 10). These habitat types intermingled largely and were also used as staging and feeding habitats. Bear-, bil-, cran-, and crowberries were abundant and we commonly observed Whimbrels feeding on leftover berries from the previous year (we were unable, however, to determine which kind of berries they ate).

The description of the habitat in the UEC nest site area (see below) suited one type of nesting habitats used by the Whimbrel (Fig. 1 - 3, and 8 - 10).

Additional information on predation and nest defense of Whimbrels and the description of the Whimbrel is in Appendix 2.

Description of the Habitat in the Unconfirmed Eskimo Curlew Nest Site Area

The UEC nest site area was on dry sandy and earthy soil (mixed with some scattered rocks) on a well drained gentle slope between a rocky ridge and a 1-km-long lake. The distance between the ridge and the lake was about 500 m and the elevation decline was 10 - 20 m. The slope faced to the east. The UEC nest site area was 300 m x 300 m (0.09 km^2) and was bordered on its west, south, and east flanks by open-canopied pockets of forest with 1 - 4 m tall black spruce and a few 5 - 7 m tall larch. The northern border was a large wet sedge meadow. The UEC nest site area (0.09 km^2) consisted of 45 % open lichen - moss tundra with some grasses and sedges, 3 % dwarf birch, 2 % dwarf willow, 1 % dwarf black spruce, 15 % crowberry, 10 % bilberry, 10 % cranberry, 5 % arctic bear berry, 10 % labrador tea, scattered 10 - 20 cm tall rhododendron bushes, and small places with exposed ground (Fig. 1 - 3).

Birds and other wildlife which occured in the UEC nest site area are described and listed in Appendix 2.

Size of Rhododendron Blossoms

The first rhododendron (Rhododendron lapponica) flowers opened on 10 June and the peak flowering season was from 22 - 28 June. New and closed flower buds indicated that the flowering season for this species would continue on a moderate level for an unknown period.

The following measurements were taken from the flower diameter in two sample plots selected at random in the UEC nest site area.

Sample plot # 1; 25 June; blossom size: range 25.39 - 33. 08 mm ($\bar{x}$ = 29.13 mm; SD = 2.92, N = 7).

Sample plot # 2; 28 June; blossom size: range 24.03 - 32.79 mm ($\bar{x}$ = 28.61 mm; SD = 2.4, N = 14).

Analysis of Egg Photographs

Size of the Unconfirmed Eskimo Curlew Eggs

The diameter of the rhododendron flower shown in the photograph (Fig. 1) was 4.61 mm and the diameters of three eggs in the same photograph were 6.18 mm, 6.39 mm, and 6.23 mm or on average 6.26 mm. Assuming the actual diameter of the rhododendron flower (Fig. 1) in the field was 29.13 +/- 2.92 mm (data from above 'Rhododendron Blossom Sizes'; plot # 1) or 28.61 +/- 2.4 mm (plot # 2) the actual diameters of the eggs (Fig. 1 - 3) would be 39.55 +/- 3.96 mm or 38.85 +/- 3.26 mm. Although it is not possible to determine the exact size of the eggs their range may be between 35.59 - 43.51 mm in diameter. The average diameter for Eskimo Curlew eggs is 36 mm and for Whimbrel eggs 42 mm (Harrison 1978, Gollop et al. 1986).

Distortion of Egg Images Photographed in the Field

We took photographs of two Whimbrel nests and eggs (Fig. 4 - 10). The pronounced conical shape of Whimbrel eggs was poorly or not at all reflected in slide and print images of the eggs (Fig. 4 and 6). Photographs taken vertically from a distance of 40 - 100 cm above the eggs with zoom and wide angle lenses did show the conical shape to some degree only when the position of the eggs was horizontal to the ground (Fig. 7, and 9 - 10). When eggs were positioned at a slight angle (naturally the pointed pole of

most eggs points in a slight down ward fashion to the center of the clutch or nest) they appeared to be oval on photographs (Fig. 4 and 6, and 9 - 10).

In photographs taken from an angle of 20^0 - 80^0 at 0.8 - 2 m distance and greater the conical shape of the eggs was largely distorted and appeared oval on photographs (Fig. 6 and 8).

The dark olive-green color of the Whimbrel eggs from the nest # 1 which we noted in the field appeared to be light olive-green or buff olive-beige on slide images and even lighter on prints which were processed from these slides (Fig. 4 - 7). Similarly, the even darker (compared with the eggs of nest # 1) dark greenish olive-brown color of the Whimbrel eggs from nest # 2 appeared to be light olive-green on slide images and much lighter on prints (Fig. 8 - 10).

The blurry dark-brownish appearance of blotches, their relatively large size, their specific distribution over the eggs, and their character were well represented on photographs (Fig. 4 - 7, and 9).

DISCUSSION

1. Size of the Unconfirmed Eskimo Curlew Eggs

Based on the analysis of the eggs the size of the unconfirmed Eskimo Curlew eggs suited both the size of Eskimo Curlew and Whimbrel eggs.

2. Shape of the Unconfirmed Eskimo Curlew Eggs

Eskimo Curlew eggs are oval shaped as opposed to the pronounced conical shape of Whimbrel eggs (illustrations and descriptions in Harrison 1978; Gollop et al 1986; Fig. 11 - 12). In some cases, however, Whimbrel eggs could be less pronounced conically and slightly oval shaped (Harrison 1978). The unconfirmed Eskimo Curlew eggs (Fig. 1 - 3) appeared to be oval shaped on the photographs and resembled more the shape of Eskimo Curlew eggs than Whimbrel eggs. Both the photographs of the known Whimbrel eggs (especially Fig. 4 - 6, but also Fig. 8 - 10) and the photographs of the unconfirmed Eskimo Curlew eggs (Fig. 1 - 3), were taken from the same angle, and the positions of the eggs in the nests were similar (Fig. 1 - 6, and 8 - 10). Therefore, the degree of distortion which was detected on the egg photographs is the same for both the sets of photographs (Fig. 1 - 6, and 8 - 10). We concluded that the original shapes of the unconfirmed Eskimo Curlew eggs were conical as were the Whimbrel eggs.

3. Color of the Unconfirmed Eskimo Curlew Eggs

The color of the unconfirmed Eskimo Curlew eggs in the photographs (light buff olive-beige; Fig. 1 - 3) was similar to the color of Eskimo Curlew eggs described and illustrated (Fig. 11) in Harrison (1978). We observed substantial color distortions in the photographs of known Whimbrel eggs (Fig. 4 - 10) photographed in the field. The original dark olive-green or dark greenish olive-brown color of Whimbrel eggs was distorted on the photographs to a light olive-green, buff olive-beige, or greenish olive-beige (Fig. 4 - 7) similar to the color of the unconfirmed Eskimo Curlew eggs (especially Fig. 2 - 3). Therefore, we concluded that the original color of the unconfirmed Eskimo Curlew eggs (Fig. 1 - 3) was darker and olive-green in the field and more similar in color to Whimbrel eggs rather than Eskimo Curlew eggs.

According to Harrison (1978) the colors of Whimbrel eggs range from pale green or olive to deeper olive-buff or buff and for Eskimo Curlew eggs

from pale olive to pale buff. Usually the egg colors faint slightly with the advance of the incubation period. The incubation period of the unconfirmed Eskimo Curlew eggs was almost over, because the eggs were actually hatching when found.

4. Blotches of the Unconfirmed Eskimo Curlew Eggs

The patterns of spots and blotches on the unconfirmed Eskimo Curlew eggs (Fig. 1 - 3) were clearly the same as on Whimbrel eggs. The markings on Whimbrel eggs are typically blurry dark blackish-brown or dark brown spots and blotches with varying size, and are evenly distributed or concentrated near the round pole (Fig. 4 - 5, and 7). Spots and blotches on Eskimo Curlew eggs are sharply outlined, evenly distributed over the egg, and also may show some tiny purple spots (Fig. 11 - 12; descriptions in Harrison 1978, Gollop et al. 1986). Because the markings of both known Whimbrel eggs (especially Fig. 4 - 5) and the unconfirmed eggs (especially Fig. 2 - 3) were very similar, and because the markings of the unconfirmed eggs were dissimilar to known Eskimo Curlew eggs (Fig. 11 - 12), we concluded that the unconfirmed eggs were Whimbrel eggs.

5. Description of the Unconfirmed Eskimo Curlew

The circumstances of the casual and very brief observation of the unconfirmed Eskimo Curlew, the unawareness of the observer about the existence of the Eskimo Curlew at the time of the observation, and the insufficient description of the bird and its behavior leave room for confusion with the Whimbrel.

In describing the unconfirmed Eskimo Curlew in 1992, the observer noted that the observed bird was 'paler and less strongly marked than a Whimbrel'. This description, however, suits the Whimbrel and not the Eskimo Curlew which is heavily barred on the breast and flanks and darker than the paler and less heavily streaked Whimbrel (Hayman et al. 1986). Also, we found the markings of the Whimbrel to be quite visible.

The description of the size and the characteristics of the bill of the unconfirmed Eskimo Curlew can vary according to the distance of the observer and his experience with related species.

The missing description of distress calls from the unconfirmed Eskimo Curlew may be attributed to the unfortunate hearing difficulties of the observer. Both the Whimbrel and the Eskimo Curlew utter constant distress calls when flushed from the nest (MacFarlane 1891, Gollop et al. 1986, this study).

6. Nest Site Fidelity of the Eskimo Curlew and the Whimbrel

Because nest site fidelity has been widely reported for the Whimbrel (Skeel 1983, Grant 1989 cited in Grant 1992) and other shorebirds (e. g., Heldt 1966, Soikkeli 1967 and 1970, Gratto et al. 1985) we would expect the Eskimo Curlew to also be faithful to their nesting territories. The area was, however, occupied by a dense nesting population of the Whimbrel in 1994. Because of philopatry we expect that the Whimbrels were there in 1992.

Mr. Reading did not see any Whimbrels along his hiking route on 07 July 1992. It is possible that most Whimbrel eggs hatched before 07 July 1992 and only few (mostly second clutches if the first clutches were lost) after that date. Whimbrels' behavior is much quieter when they have hatchlings, their presence is not as obvious during the hatchling and nestling periods, and they leave their immediate nesting territory right after hatching (M. A. Skeel, pers. comm.). The estimated hatching period for most Whimbrels in 1994 was 29 June - 05 July, however, we believed that spring was early in 1994 compared to 1992. Although it is not possible to determine the dates of the hatching period in 1992 it could be that most Whimbrels hatched before 07 July 1992. This would explain the apparent absence of Whimbrels along Mr. Reading's hiking route.

The possibility that predation, weather conditions, or food shortage in 1992 caused the dispersal of the total Whimbrel population in the area which then reappeared again in 1994 (or 1993) with a total of 44 nesting Whimbrel pairs is highly unlikely (M. A. Skeel, pers. comm.).

In 1994, the UEC nest site area was a disputed area overlapping two adjacent Whimbrel nesting territories with territorial conflicts which sometimes involved Whimbrels from a nearby third territory. This would place the UEC nest site area within the center of a dense nesting population of 44 Whimbrel pairs, at least in 1994. It is unlikely that nesting Whimbrels would permit one or several pairs of Eskimo Curlews within their territories (M. A. Skeel, pers. comm.). Gollop et al. (1986) pointed out that the larger and more aggressive Whimbrel may depress the Eskimo Curlew's nesting success during territorial conflicts between the two.

If the Eskimo Curlew was nesting in the discussed area we would expect more than one pair. Otherwise, it is unlikely that this species would have been able to find mates, reproduce, and survive on an extremely low population level for a period of almost 100 years.

7. Region and Location of the Unconfirmed Eskimo Curlew Nest Site Area

The region and location of the UEC nest site area may well be within the former breeding range of the Eskimo Curlew. While observations of Eskimo Curlews during the summer were occasionally reported (Gollop et al. 1986) breeding records were never established in this region.

8. Comparison with Formerly Known Eskimo Curlew Habitats

We considered about 60 % of the study area offered suitable staging, feeding, and/or nesting habitats for both the Eskimo Curlew and the Whimbrel. The habitats in the upland tundra of the study area, the relief, and elevation resembled closely the only known former Eskimo Curlew nesting habitats in the Anderson - Horton rivers and Point Lake areas (Gollop et al. 1986, Obst 1993 and 1994a). These former nesting habitats were in well drained grassy upland tundra within the forest-tundra transition zone and surrounded by numerous small lakes. The vegetation around nest sites consisted mainly of scattered dwarf birch and willow, scattered white spruce (Picea glauca), sedges, grasses, Dryas, arctic white heather (Cassiope tetragona), lupine (Lupinus arcticus), bilberry, cranberry, bear berry, and crowberry (MacFarlane 1891, Gollop et al. 1986, Obst 1993 and 1994a).

The Whimbrel uses a variety of habitats and nests commonly in low-lying hummock - bog, sedge - meadow, and heath habitats, but also in Dryas and open dwarf willow habitats, and well-drained upland tundra as described for the study area (Skeel 1983, Gollop et al. 1986, Grant 1992, Obst 1993 and 1994a).

9. Co-existing Shorebirds in Eskimo Curlew Nesting Habitat

The Lesser Golden-Plover (Pluvialis dominica) and Lesser Yellowlegs (Tringa flavipes) were reported not only to be associated with the Eskimo Curlew at the nesting grounds but were and still are abundant on these nesting grounds (MacFarlane 1891, Gollop et al. 1986, Obst 1993). Nesting territories of the Lesser Golden-Plover were scarce in the study area. The Lesser Yellowlegs was occasionally observed and was reported to nest just outside the study area near the tree line (K. Reading, pers. comm.).

CONCLUSION

On the basis of our five weeks intensive field investigation, the abundance of nesting Whimbrels at and surrounding the nesting area, our analysis of distortions in photographs of eggs, and the insufficient description of the bird observed, we concluded that the unconfirmed Eskimo Curlew nest was almost certainly that of a look-alike species, the Whimbrel.

EPILOGUE

The investigation was conducted with great efforts and hope. The results of this investigation were somewhat disappointing for the involved parties. The experience and useful information gained from this project, however, may be helpful for future investigations and searches. We will continue to encourage people to report their observations of possible Eskimo Curlew sightings. The success of the Eskimo Curlew Recovery Plan Project depends on the people working in and reporting from the field.

FUTURE SEARCHES

The Eskimo Curlew Recovery Plan Project will continue with annual searches for the Eskimo Curlew in its formerly known breeding grounds in the Northwest Territories in the areas outlined in Obst (1993). If these searches are successful an action plan for the recovery of this species using this information will be developed by the ECRT and applied in cooperation with the CWS, NWT DRR, and INAC.

The continuation of these searches, however, depends largely on the availability of funding, sponsors, and volunteers. Inquiries can be addressed to the authors of this report. Besides conducting searches for the Eskimo Curlew our mandate is to inform people about the status of this species and cooperate with hunters and trappers, scientists, and other people working in the field.

ACKNOWLEDGEMENTS

We would like to express special thanks to the following people and agencies in Yellowknife for their help and financial support:
K. J. McCormick, Director, Canadian Wildlife Service (CWS), Environment Canada; D. Livingstone, Director, Environment and Conservation, Department of Indian and Northern Affairs Canada (INAC); D. Melton, Director, Wildlife Management Division, Department of Renewable Resources (DRR), GNWT; and the Directors of Ecology North.

For supervising this project, help in the analysis of the data, and reviewing the draft of this report we are indebted to R. G. Bromley, Waterfowl Biologist (DRR) and Northwest Territory Representative on the Eskimo Curlew Recovery Team, Yellowknife. We also want to thank B. Croft (DRR), S. Matthews (DRR), R. Mulders (DRR), J. Sirois (CWS), M. A. Skeel, R. Walker (INAC), M. Williams (DRR), and the Directors of Ecology North, Yellowknife, for their support and information.

We appreciate the help of the Hunters and Trappers Association (HTA) in Arviat for supporting a Wildlife Research Permit.

We acknowledge the information provided by K. A. L. Reading and would like to express special thanks for his cooperation in the investigation and for his ongoing enthusiasm and contributions to the natural history of the northern region.

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APPENDICES

Appendix 1. Photographic Plates of Eskimo Curlew and Whimbrel Eggs

The color distortions on the following photographic plates (Fig. 1 - 11) are significant and may be mis-leading for identification purposes. The blotches on all eggs (Fig. 1 - 11) are, however, useful for identification. Interested readers who would like to see the original slides, prints, or high quality xerox prints may obtain them for a small fee from the authors.

The photographic plates (Fig. 1 - 11) are colored xerox reproductions taken from prints which were processed from the original slide images (Kodachrome 64). Usually the slides turned out to be lighter in color than the original eggs and the prints are lighter in color than the slide images. The color of the xerox copies varied largely. Some xerox copies emphazised a beige, or yellow, and others a green colored overtone varying from dark to light.

The xerox copies shown here have a yellowish-green tone, darkened the appearance of the unconfirmed Eskimo Curlew eggs, and emphazised a greenish tone on the known Whimbrel eggs which appeared more beige on the original slides and prints (although the original egg colors were dark olive-green or dark greenish olive-brown). The colors of the eggs in Fig. 11 appear to be yellowish-beige, however, in the original illustration (Harrison 1978) the colors of the eggs were dark olive-brown (Whimbrel egg) and light buff or olive-beige (Eskimo Curlew egg).

The proportions of the egg sizes on the xerox copies are fairly well represented compared with the original prints. Fig. 12 is a regular black and white xerox copy.

Fig. 1 - 3: The unconfirmed Eskimo Curlew nest and eggs photographed by K. A. L. Reading in 1992. The Rhododendron lapponica flower (Fig. 1, to the far right center) was the only size reference for the eggs.

Fig. 4 - 7: Whimbrel nests (# 1) and eggs in a wet sedge meadow photographed by the authors 2.5 km south of the unconfirmed Eskimo Curlew nest site, 13 June 1994.

Notice the slight differences in color distortion between Fig. 4 - 5 and Fig. 6 - 7. The shapes of the eggs appear oval on Fig. 4 - 6. The eggs in Fig. 7 were placed horizontal and photographed from vertical above the eggs.

The typical conical shape of Whimbrel eggs is somewhat represented in Fig. 7, however, the original shape was much more pronounced conical than shown on the photograph. The blurry dark brown blotches are characteristic for Whimbrel eggs.

The Kodachrome film roll (Fig. 7) is 42.69 mm long from the red edge to red edge, or 47.29 mm long in total length.

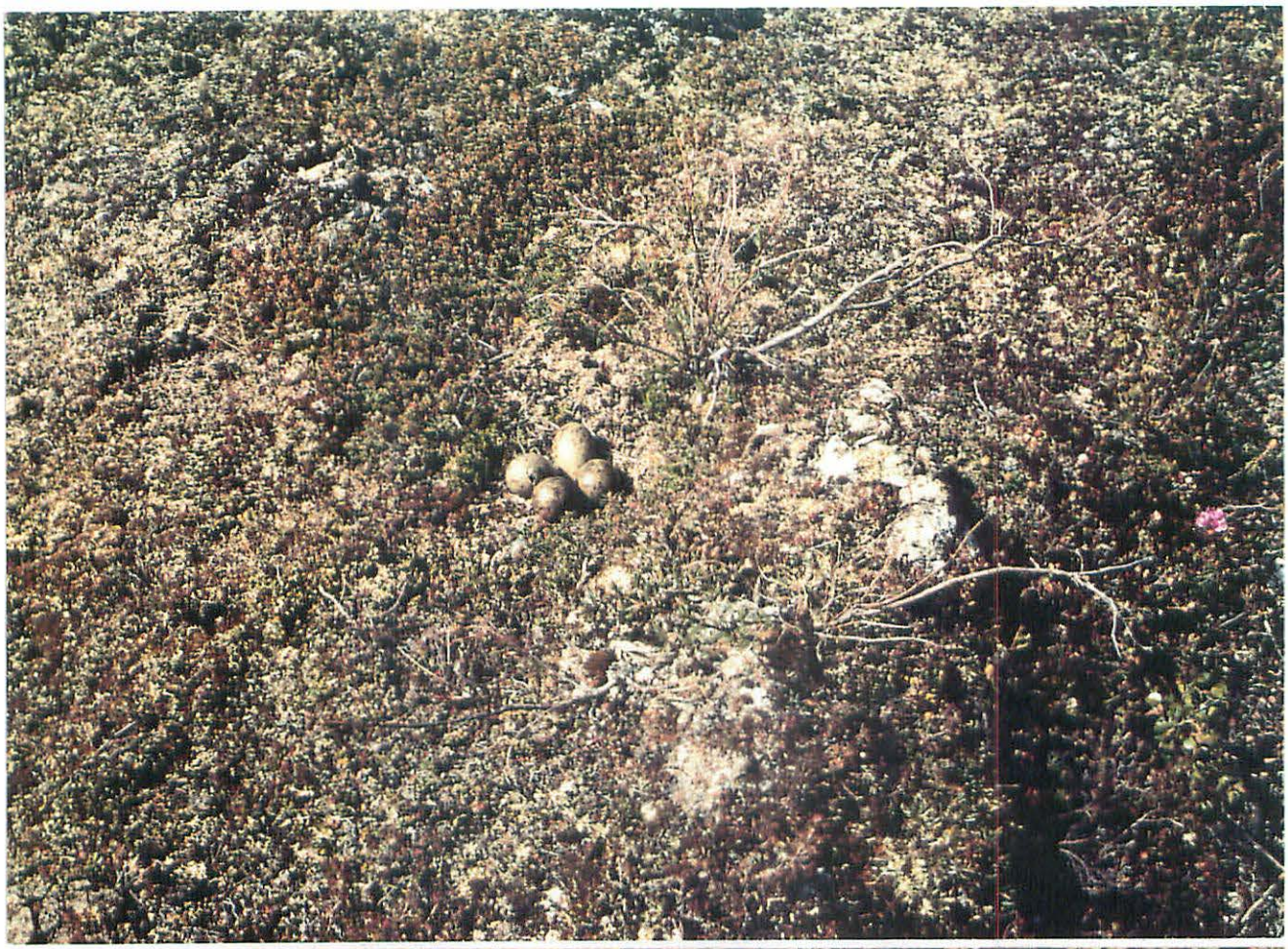
Fig. 8 - 10: Whimbrel nest (# 2) and eggs photographed by the authors 3 km south of the unconfirmed Eskimo Curlew nest site, 15 June 1994.

The habitat of this nest site is the same as the habitat of the unconfirmed Eskimo Curlew nest site (Fig. 1 - 3). The photographs were taken late at night when the midnight sun was close to the horizon. The color distortion of the vegetation and eggs is significant. The horizontal positioned egg (beside the purple lighter) shows somewhat the conical shape, however, the original shape was even more conical. The total length of the lighter was 80.88 mm; the length of the purple case was 68.70 mm.

Fig. 11 - 12: Fig. 11 is from an illustration in Harrison (1978). The Whimbrel egg is # 1 and the Eskimo Curlew egg is # 2. Both egg colors are largely distorted towards a yellowish-beige. Fig. 12 is from an illustration in Gollop et al. (1986). The Eskimo Curlew egg is shown on the left and the Whimbrel egg is in the middle.

In both figures (Fig. 11 and 12) the typical pronounced conical shape of Whimbrel eggs appear to be not well represented.

1



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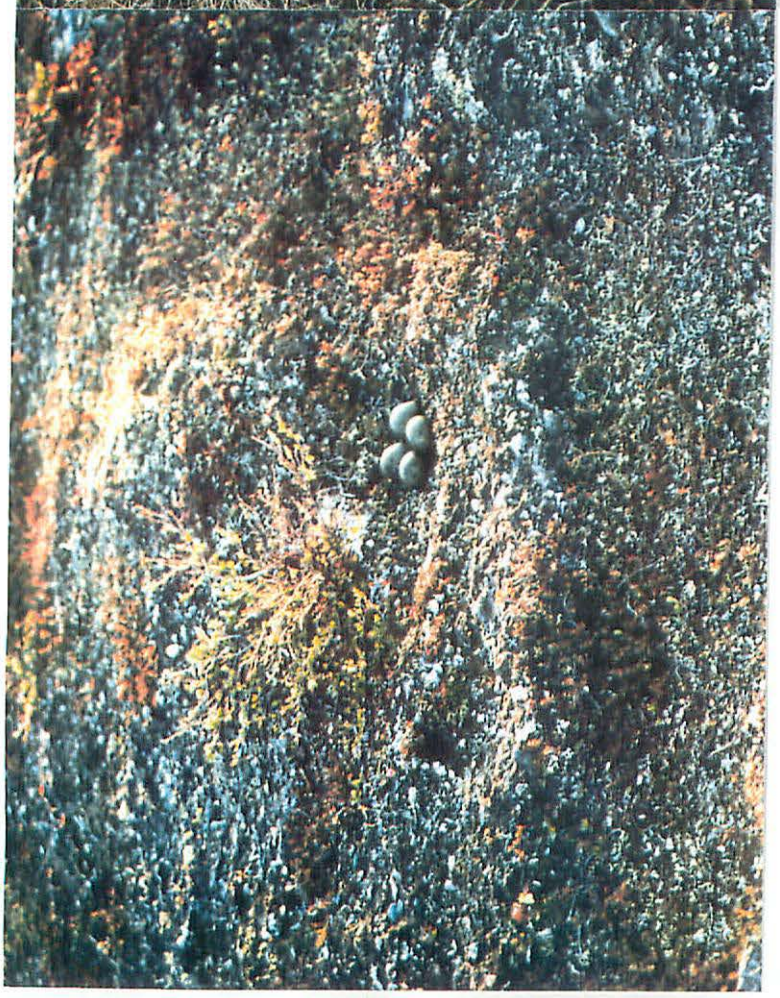

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Appendix 2. Birds and Other Wildlife in the Study Area

Spring Migration of Waterfowl and Shorebirds

On 24 May 1994, upon our arrival in the study area, the spring migration of geese, swans, and cranes was already advanced. This migration seemed to peak between the 25 -26 May, slowed down abruptly on 27 May, and continued at a low level until it was over on 02 June. The study area appeared to be a significant migration route for thousands of geese (Table 1).

The Common Snipe (Gallinago gallinago) was already in the area on or before 24 May. The first Pectoral Sandpiper (Calidris melanotos) and Stilt Sandpiper (Calidris himantopus) were observed on 25 May. The Least Sandpiper (Calidris minutilla), Lesser Golden-Plover (Pluvialis dominica), Lesser Yellowlegs (Tringa flavipes), and Whimbrel (Numenius phaeopus) arrived on 26 May. Most duck species arrived 26 - 31 May (Table 1).

Observations on the Whimbrel

Predation and Nest Defense of Whimbrels

The most abundant predators in the pursuit of Whimbrel and other bird nests and eggs were the Long-tailed Jaeger (Stercorarius longicaudus) and the Arctic Fox (Alopex lagopus). Pairs of the Long-tailed Jaeger commonly followed us on our hiking tours waiting for birds being accidentally flushed from nests by us. Whenever we came close to a Whimbrel nesting territory the agitated behavior of the Whimbrels immediately attracted the Long-tailed Jaegers. The jaegers started searching persistently for the Whimbrel nest and eggs. Occasionally Whimbrels chased the jaegers in the air. Usually the distressed Whimbrels gave up with their defense after a while and the jaegers rested on hummocks or rocks around the assumed Whimbrel nest site, waiting. Although we did not witness jaegers plundering Whimbrel nests we avoided entering immediate nest site areas of Whimbrels. Several times we found ptarmigan and Passeriformes nests which were plundered by jaegers, ravens, or gulls.

The Arctic Fox was common in the study area and would often at night follow our trails from the previous day. In one case an Arctic Fox plundered a Whimbrel nest (Nest # 1) a few hours after our visit at this nest. Therefore we stopped searching for Whimbrel nests after inspecting Whimbrel nest # 2.

Other predators which were common during the breeding season in the study area were the Herring Gull (Larus argentatus), Common Raven (Corvus corax), Northern Harrier (Circus cyaneus), and the Sandhill Crane (Grus canadensis). Uncommon predators were the Parasitic Jaeger (Stercorarius parasiticus), Golden Eagle (Aquila chrysaetos), Peregrine Falcon (Falco peregrinus tundrius), Gyrfalcon (Falco rusticolus), Wolf (Canis lupus), and Ermine (Mustela erminea).

We observed Whimbrels chasing gulls, jaegers, ravens, harriers, cranes, eagles, and other Whimbrels from their nesting territory. During these chases in the air Whimbrels often used their long bills trying to hit the intruders. In the case of jaegers and sitting cranes Whimbrels appeared to be unsuccessful with their chase.

Description of the Whimbrel

We observed over 100 individual Whimbrels in the study area. Most Whimbrels had a distinct white crown stripe across the head. Some individuals, however, had only a faint, beige-colored crown stripe which sometimes was difficult to detect with the spotting scope or binoculars. In four cases, this faint beige colored stripe did not seem to stretch across the head but was only barely seen on the back of the head and in another case on the front of the head. In one case, we could not identify any crown stripe at all (both of us observed this sitting Whimbrel for about 15 min. with the spotting scope under good light conditions and at about 40 m distance). Hayman et al. (1986) pointed out that the crown stripe is not always visible.

There appeared to be a slight difference in body size and length of bill between some individuals. Depending on the light conditions, individual differences, and probably the age and/or sex of individuals the appearance of the bill in proportion to the bird varied from slender to most commonly bulky. The bills were blackish-brown and had usually but not always a noticeably distinct drop near the tip.

When sitting on the ground the legs and parts of the belly were often hidden by obstructive vegetation. In this position Whimbrels appeared much smaller from a distance (50 m and over) than they were.

The color on the back and upperwings ranged from grey-brown to dark brown with whitish or buff spots and notches. The color of the belly was light-beige to greyish-white with grey or brown streaks on the flanks and the neck. When flying the barred greyish primaries and greyish or buff underwing cover with barrs was visible only at close distance and under good light conditions.

The thin eye stripe was dark brownish or blackish and in most cases very noticeable. The color of the legs was dark bluish-grey. The tail was barred grey-brown.

The most important features in the identification of Whimbrels at large and small distances were their distinct and constant calls. We noticed 7 - 8 different calls.

Birds and Other Wildlife in the Unconfirmed Eskimo Curlew Nest Site Area

Between 24 May and 02 June, flocks of the Greater White-fronted Goose (Anser albifrons frontalis), Snow Goose (Anser caerulescens), Canada Goose (Branta canadensis), Sandhill Crane (Grus canadensis), and several duck species used the wet sedge meadow beside the UEC nest site area as staging and feeding habitat. Common Snipe, Pectoral, Stilt, and Least sandpipers, and the Whimbrel staged commonly in this wet sedge meadow during the spring migration and later nested there or in the surrounding area.

Other birds occupying and nesting in the immediate UEC nest site area were the Willow Ptarmigan (Lagopus lagopus), American Robin (Turdus migratorius), American Tree Sparrow (Spizella arborea), Savannah Sparrow (Passerculus sandwichensis), White-crowned Sparrow (Zonotrichia leucophrys), and the Harris's Sparrow (Zonotrichia querula). Birds which staged occasionally in the area were redpolls, pipits, longspurs, and the Snow Bunting (Plectrophenax nivalis). Birds which nested or were observed out side the UEC nest site area are listed below and in table 1.

The only mammals observed in the UEC nest site area were migrating Caribou (Rangifer rangifer), Arctic Fox, Arctic Hare (Lepus arcticus), signs of wolves (scats and prey remains), Brown lemming (Lemmus sibiricus), and Microtus spp.

Observations of Other Birds

The Black Scoter (Melanitta nigra)

The observation of the Black Scoter during the breeding season in the southern District of Keewatin deserves attention. Black Scoters arrived on 31 May and settled permanently on numerous small and several large lakes. From 31 May - 10 June, mixed groups (males and females) of 2 - 14 (usually 5 - 6) gathered on individual lakes (sex ratio was about 50 : 50). From 11 - 18 June only pairs (always a male and a female) were observed. Several

pairs were counted on some lakes (between 2 - 10 pairs). From 19 - 29 June, only single males or groups of males (2 - 5) were observed. Hence, we assumed that the females were on eggs at that time because we made similar observations of other duck species. Daily observations of Black Scoters ranged between 2 - 30. We assumed that about 30 pairs nested in an area of 20 km^2 covered with numerous lakes.

The Greater White-fronted Goose (Anser albifrons frontalis)

From 24 May - 02 June, few thousands of the Greater White-fronted Goose migrated north. We also observed Greater White-fronted Geese during the breeding season and assumed that they nested in widely scattered single pairs throughout the study area. Our assumption was based on regular observations of single pairs and two instances where we flushed geese from the suspected nests but could not find the well hidden nests after a brief search.

The Mountain Bluebird (Sialia currucoides)

The observation of one nesting pair of the Mountain Bluebird in the southern District of Keewatin is of interest. The pair was found nesting in the hollow dead trunk (2 m tall and 30 cm in diameter) of a black spruce. This spruce trunk was the largest in the study area. The trunk and the nest site area were on a small hill with rocky outcrops right beside an esker and a small pond. A small black spruce - larch forest grew scattered along the hill slope and on the esker. This hill and esker had a somewhat mountainous character in the otherwise surrounding flat tundra terrain. From 16 - 29 June, we observed this pair almost daily at the nest.

The Willow Ptarmigan (Lagopus lagopus)

The Willow Ptarmigan was abundant in 1994. In suitable habitat there were 4 - 5 occupied Willow Ptarmigan territories per 1 km^2. An estimated 50 - 60 occupied territories were in the study area. Ptarmigan kills from raptors were very common.

Abundance and Status (Table 1)

The abundance and status of a species (Table 1) was determined subjectively. The following definitions were adopted from J. Sirois in Zoltai et al. (1992): Birds that were recorded five times or less during the observation period (24 May - 29 June 1994) were considered rare (R), those recorded between 5 - 25 times uncommon (U), and those recorded more than 25 times common (C). When nests, eggs, or young were observed, a species was a confirmed breeder (B). When no evidence of nesting was found but breeding was suspected, it was designated a probable breeder (b). Species observed only during migration were designated migrants (M), whereas non-breeding species observed during the summer were designated transients (T).

A question mark (?) indicates that the abundance or status were unknown, a hyphen (-) indicates that the information is not available, and '< 24 May' indicates that the species could have been there before the 24 May which was the first date of observations.

Table 1. Birds Observed in the Study Area, Southern Keewatin, 24 May - 29 June, 1994.

Species	First Date Observed	Status	Abundance	Remarks
Common Loon *Gavia immer*	27 June	?	R	Surprisingly, only one single sighting.
Tundra Swan *Cygnus columbianus*	< 24 May	M	C	Few dozens migrating.
Greater White-fronted Goose *Anser albifrons frontalis*	< 24 May	M and b	C (M), U (b)	Few thousands migrating. Several pairs assumed nesting.
Snow Goose *Anser caerulescens*	< 24 May	M	C	Tens of thousands migrating.
Canada Goose *Branta canadensis*	< 24 May	M and T	C	Many thousands migrating; flocks of 20 - 90 molt-migrants continued flying north almost daily untill 23 June.
Green-winged Teal *Anas crecca*	29 May	M and b	U	
Northern Pintail *Anas acuta*	26 May	M and b	C	
Lesser Scaup *Aythya affinis*	04 June	M and B	C	
Oldsquaw *Clangula hyemalis*	26 May	M and B	C	Most common duck.
Black Scoter *Melanitta nigra*	31 May	M and b	C	> 30 pairs assumed nesting in an area of 20 km² with numerous lakes.
Common Merganser *Mergus merganser*	10 June	T	U	Groups of males only.
Red-breasted Merganser *Mergus serrator*	26 May	M and b	C	
Bald Eagle *Haliaeetus leucocephalus*	-	?	?	Not seen but prey remains (large fish) found on perches.
Northern Harrier *Circus cyaneus*	26 May	B	U	3 - 5 nesting pairs.

Table 1. Continued.

Species	First Date Observed	Status	Abundance	Remarks
Sharp-shinned Hawk *Accipiter striatus*	31 May	?	R	One single observation.
Northern Goshawk *Accipiter gentilis*	-	?	?	Not seen but molted feathers found on perch. K. A. L. Reading (pers. comm.) observed one in 1992.
Rough-legged Hawk *Buteo lagopus*	26 May	M and T	U	Breeds outside the study area (K. A. L. Reading, pers. comm.).
Golden Eagle *Aquila chrysaetos*	14 June	T	U	Nesting assumed outside the study area.
Peregrine Falcon *Falco peregrinus tundrius*	16 June	T	U	Breeds outside the study area (K. A. L. Reading, pers. comm.).
Gyrfalcon *Falco rusticolus*	31 May	T	U	Breeds outside the study area (K. A. L. Reading, pers. comm.).
Willow Ptarmigan *Lagopus lagopus*	< 24 May	B	C	4 - 5 territories per 1 km² in suitable habitat; 50 - 60 nesting territories.
Sandhill Crane *Grus canadensis*	< 24 May	M and B	C	
Lesser Golden-Plover *Pluvialis dominica*	26 May	M and B	C	10 - 11 nesting territories.
Semipalmated Plover *Charadrius semipalmatus*	01 June	B	C	
Lesser Yellowlegs *Tringa flavipes*	26 May	T	U	Breeds SE of the study area at the tree line (K. A. L. Reading, pers. comm.).
Whimbrel *Numenius phaeopus*	26 May	M and B	C	44 nesting territories.
Semipalmated Sandpiper *Calidris pusilla*	05 June	T or b	U	Summer transient or breeding ?

Table 1. Continued.

Species	First Date Observed	Status	Abundance	Remarks
Least Sandpiper *Calidris minutilla*	26 May	B	C	
Pectoral Sandpiper *Calidris melanotos*	25 May	B	C	
Dunlin *Calidris alpina*	27 June	B	R	One nesting pair.
Stilt Sandpiper *Calidris himantopus*	25 May	B	C	
Short-billed Dowitcher *Limnodromus griseus*	06 June	?	R	One sighting.
Common Snipe *Gallinago gallinago*	< 24 May	B	C	
Red-necked Phalarope *Phalaropus lobatus*	02 June	b	C	
Pomarine Jaeger *Stercorarius pomarinus*	07 June	M	U	
Parasitic Jaeger *Stercorarius parasiticus*	31 May	b	U	
Long-tailed Jaeger *Stercorarius longicaudus*	31 May	B	C	
Herring Gull *Larus argentatus*	< 24 May	b	C	
Glaucous Gull *Larus hyperboreus*	26 May	M	R	
Arctic Tern *Sterna paradisaea*	08 June	b	C	
Short-eared Owl *Asio flammeus*	25 May	B	C	
Belted Kingfisher *Ceryle alcyon*	08 June	?	R	One single observation.
Eastern Phoebe *Sayornis phoebe*	29 May	b	C	

Table 1. Continued.

Species	First Date Observed	Status	Abundance	Remarks
Horned Lark *Eremophila alpestris*	27 May	B	C	
Hirundinidae spp.	28 May	M	R	One seen, too far to identify.
Common Raven *Corvus corax*	< 24 May	B	C	
Mountain Bluebird *Sialia currucoides*	16 June	B	R	One nesting pair.
American Robin *Turdus migratorius*	25 May	B	C	
American Pipit *Anthus spinoletta*	25 May	b	C	
Yellow Warbler *Dendroica petechia*	26 May	?	R	One sighting.
Blackpoll Warbler *Dendroica striata*	03 June	?	R	One sighting.
American Tree Sparrow *Spizella arborea*	25 May	B	C	
Savannah Sparrow *Passerculus sandwichensis*	01 June	b	C	
White-crowned Sparrow *Zonotrichia leucophrys*	26 May	B	C	
Harris's Sparrow *Zonotrichia querula*	26 May	B	C	
Lapland Longspur *Calcarius lapponicus*	25 May	B	C	
Snow Bunting *Plectrophenax nivalis*	25 May	M	C	
Rusty Blackbird *Euphagus carolinus*	02 June	b	U	
Common Redpoll *Carduelis flammea*	25 May	B	C	

Table 1. Continued.

Species	First Date Observed	Status	Abundance	Remarks
Hoary Redpoll *Carduelis hornemanni*	25 May	B	C	

Mammals

The abundance and status of a species (Table 2) was determined subjectively, as defined for Table 1.

Table 2. Mammals Observed in the Study Area, Southern Keewatin, 24 May - 29 June, 1994.

Species	Status	Abundance	Remarks
Arctic Hare *Lepus arcticus*	B	C	
Arctic ground squirrel *Spermophilus parryii*	B	C	
Brown lemming *Lemmus sibiricus*	B	C	Many signs, observations, and remains in pellets and scats.
Microtus spp.	B	C	Unidentifyed remains in scats.
Wolf *Canis lupus*	?	R	Three sightings; many caribou kills.
Arctic Fox *Alopex lagopus*	B	C	
Grizzly Bear *Ursus arctos*	?	?	No fresh signs; two old diggings.
Ermine *Mustela erminea*	B	R	Two dens.
Caribou *Rangifer tarandus*	M	C	Several thousands (mainly bulls and yearlings) migrating NE from 24 May - 14 June.

Appendix 3. Budget

Cost Accounting - 1994

Cooperating Agencies and Volunteer Contributions

The cooperating agencies and volunteers contributions were from the Canadian Wildlife Service (CWS), Environment Canada, Yellowknife (YK); Environment and Conservation, Department of Indian and Northern Affairs Canada (INAC), YK; Wildlife Management Division, Department of Renewable Resources (DRR), GNWT, YK; Ecology North, YK; and the volunteers J. Obst and A. Spaulding.

Income

- CWS	$	3852.00
- DRR	$	3761.66
- Ecology North	$	260.05
- INAC	$	5000.00
- Volunteers	$	3410.66
Total income	$	16284.37
Total costs	$	16284.37

Equipment Loans

- CWS	$	2300
- DRR	$	6600
- Volunteers	$	3500
Total equipment loans	$	12400

Donations

- Volunteers	$	8750
Total donations	$	8750

Detailed Budget - 1994

The cooperating agencies and volunteers contributions, equipment loans, and donations were from the CWS, INAC, DRR, Ecology North, and the volunteers J. Obst and A. Spaulding.

Income	Disbursements	Source	Items
$ 3852.00	$ 3852.00	CWS	Aircharter YK - Keewatin.
$ 3761.66	$ 2685.00	DRR	Aircharter Keewatin - YK.
	$ 914.66	DRR	Field equipment.
	$ 162.00	DRR	Office equipment.
$ 5000.00	$ 5000.00	INAC	Aircharter YK - Keewatin - YK.
$ 3410.66	$ 2492.77	Volunteers	Field equipment.
	$ 917.89	Volunteers	Field provisions and materials, preparations, office material.
$ 260.05	$ 260.05	Ecology North	Aircharter.
$16284.37	$16284.37		

Total aircharter was $ 11797.05, and total field equipment & preparations & office material was $ 4487.32.

Breakdown on Equipment Loans and Value of Donations

Equipment Loans	Donations	Source	Items
$ 2300		CWS	Personal Locator Beacon; spotting scope.
$ 6600		DRR	SBX radio; tripods; solar panel; video, camera, and recording equipment; computer and office.
	$ 8750	Volunteers	Contributed wages (3 1/2 person months - $ 2500/month = $ 8750).
$ 3500		Volunteers	Field equipment.
$ 12400	$ 8750		

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Obst, J.
Annual report ...Eskimo
Curlew recovery plan project
NWT, 1994: Results...invest-
igation into an.unconfirmed