FINAL REPORT
14 March 2002

Preliminary Assessment of Tundra-Nesting Birds in the Point Thomson Area, Alaska, 2001

Prepared for

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This report was prepared under contract to BP Exploration (Alaska) Inc.
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Cite report as:

Rodrigues, R. 2002. Preliminary assessment of tundra-nesting birds in the Point Thomson area, Alaska, 2001. Prepared for BP Exploration (Alaska) Inc. by LGL Alaska Research Associates, Inc. 26 p + appendices.

Cover photo by Robert Rodrigues

ABSTRACT

Twenty-eight 10-hectare plots were established to study tundra-nesting birds in early June 2001 in the Point Thomson area at Point Thomson Unit 3 near the gravel pad. Fourteen plots were located near proposed infrastructure and were designated as treatment plots. The other 14 plots were located on tundra away from proposed infrastructure and were designated as reference plots. The vegetation/land cover types on reference plots were matched as closely as possible with those on treatment plots. The establishment of the two plot types will allow for comparisons of bird use of tundra near and away from infrastructure should development occur in the area. Each plot was surveyed twice to determine nest density, species composition, nesting success, and habitat use for nesting tundra birds between 12 June and 5 July.

Nest densities were within the ranges reported for other North Slope areas. Diversity of common species was lower than that reported for the Prudhoe Bay area but higher than that reported for most locations in the Arctic National Wildlife Refuge. The three most common species were Lapland longspur (*Calcarius lapponicus*), semipalmated sandpiper (*Calidris pusilla*), and pectoral sandpiper (*Calidris melanotos*). Nest success was approximately 50% for all species combined, excluding Lapland longspur. Study design did not allow sufficient plot visitation to determine longspur nesting success. Predation was responsible for most nest failure, and was probably caused by arctic foxes and jaegers. Three vegetation/land cover categories dominated the landscape, and bird nest sites did not occur on any particular habitat type more than expected based on the amount of habitat available. However, for semipalmated sandpiper, and for all species combined, nests sites occurred less frequently than would be expected on wet sedge/moist sedge, dwarf shrub tundra complex.

The difference in use by nesting birds was not great between reference and treatment study plots, suggesting that the two types of plots may form a suitable baseline for use in studies of future development in the Point Thomson Unit.

Key words: *Calcarius lapponicus*, *Calidris melanotos*, *Calidris pusilla*, Lapland longspur, oilfield development, pectoral sandpiper, semipalmated sandpiper, shorebirds, tundra habitats, vegetation/land cover

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Preliminary Assessment of Tundra-Nesting Birds in the Point Thomson Area, Alaska, 2001

INTRODUCTION

The Point Thomson Unit owners (BP Exploration (Alaska) Inc. (BPXA), ExxonMobil Corporation, Phillips Alaska Inc., and Chevron-Texaco) are considering development of an oilfield in the Point Thomson Unit, about 80 km east of the Prudhoe Bay oilfield. The proposed development would include the construction of gravel roads to production sites east and west of the existing Point Thomson Unit 3 gravel pad (Figure 1). The length of the roads to the proposed east and west well pads would be approximately 7 and 10 km, respectively. In addition, a gravel airstrip oriented northeast to southwest would be constructed approximately 3 km south of the Point Thomson Unit 3 pad. A gravel road would connect the airstrip to that pad and to the east and west well pad roads. An elevated pipeline to transport produced oil would be constructed parallel to the road system from the east well pad to the west well pad and would continue west to connect with the Badami Pipeline. Gravel for construction of the infrastructure would be mined from a proposed site near the northeast end of the airstrip, and a gravel storage area would be established north of the mine site (Figure 1).

Oilfield developers and wildlife managers are concerned about the effect of North Slope development on wildlife populations. Numerous studies in the Prudhoe Bay area have described the responses of wildlife to oilfield operations and development (Troy 1988; Pollard et al. 1989; Troy and Carpenter 1990; Truett et al. 1994, 1997). Frequently, these studies have been conducted during the production phase of oilfield development after construction of oilfield infrastructure has occurred, and comparisons of pre- and post-development wildlife activity are not possible. Pre-development data may be helpful in determining placement of facilities and assessing the responses of wildlife to oilfield development.

Several studies have already been conducted in the Point Thomson Unit. In 1983, an environmental report described the vegetation/land forms, birds, mammals, and fish of the Point Thomson Unit (Hampton et al. 1983). Wright and Fancy (1980) reported on the responses of birds and caribou to exploratory drilling operations at the Point Thomson Unit 4 pad. Fechhelm et al. (2000) collected data on fish resources in the coastal waters near Point Thomson in 1999, and that study was continued during summer 2001. Noel and Funk (1999) produced a vegetation/land cover map for portions of the Point Thomson Unit. Annual systematic aerial surveys of molting waterfowl have included the marine waters of the Point Thomson Unit (Noel et al. 2000), and systematic aerial surveys of large mammals have been conducted over terrestrial habitats in the Point Thomson area (Pollard and Noel 1995; Noel and King 2000; Noel and Olson 2001). LGL et al. (1999) produced an environmental report for the Point Thomson area.

Other studies conducted on the Arctic Coastal Plain near the Point Thomson Unit have included fish and bird studies in the Badami Unit west of Point Thomson (Fechhelm et al. 1995, TERA 1995) and an environmental assessment of the Badami Unit (BPXA 1995). South of the Point Thomson Unit, TERA (1993a) characterized the breeding season bird community for the Yukon Gold project. East of Point Thomson, the U.S. Fish and Wildlife Service (USFWS) has conducted numerous studies in the Arctic National Wildlife Refuge (ANWR) (e.g., Oates et al. 1987).

In 2001, LGL Alaska Research Associates, Inc. (LGL) was contracted by BPXA on behalf of the Point Thomson Unit Owners to collect pre-development baseline data on tundra-nesting birds in the area proposed for development in the Point Thomson Unit. A base camp was established at Point Thomson Unit 3 gravel pad and study plots were located within walking distance of the camp (Figures 1 and 2). Study plots were located both near (treatment plots) and away from (reference plots) proposed infrastructure. Study plots were censused during the nesting season to determine nest density and success, species composition, and habitat use by tundra birds. This report presents the findings of that study.

BUSINESS RATIONALE

Since oilfield development began on the Arctic Coastal Plain of Alaska in the late 1960s, oilfield developers and wildlife managers have been concerned about the effects of oilfield development on wildlife. Specifically, there has been concern regarding disturbance and displacement of tundra-nesting birds by oilfield activities, and the effects of predators that may be attracted by oilfield infrastructure (Troy 1988; Troy and Carpenter 1990; Johnson et al. 1992). The results of pre-development baseline studies at Point Thomson will provide a basis for comparisons with data collected after development that may provide insight into the effects of oilfield operations on tundra-nesting birds. Pre-development baseline data on habitat preferences for tundra-nesting birds may aid oilfield developers and wildlife managers in determining future locations of oilfield infrastructure.

OBJECTIVES

The objectives of this study are to:

- Collect baseline data to characterize the tundra-nesting birds of the Point Thomson area by determining nest density, species composition, and nesting success.
- Determine the habitat types used by tundra-nesting birds at Point Thomson.
- Establish study plots on tundra near and away from sites of proposed infrastructure that can be surveyed before and after development to make pre- and post-development comparisons of tundra-nesting bird activity.

STUDY AREA

The Point Thomson Unit extends along the coast from the Staines River in the east to approximately 5 km east of Bullen Point in the west. It includes marine areas that extend from approximately 3 to 10 km offshore, as well as some of the barrier islands in that area. South of the shoreline, the Point Thomson Unit extends inland 8 to 11 km in the eastern portion of the unit and 3 to 5 km in the west. The study area is located near the coast in the central portion of the unit and includes the tundra area within approximately 4 km from the Point Thomson Unit 3 gravel pad (Figures 1 and 3).

The area is generally a flat coastal plain extending south to the Brooks Range and is composed primarily of wet and moist tundra. Microrelief is characterized by the presence of strangmoor ridges, high- and low-centered polygons, and hummocks. Wetlands are a dominant component of the Point Thomson Unit as evidenced by the presence of numerous lakes, ponds, streams, and aquatic tundra vegetation types (Noel and Funk 1999).

The Point Thomson Unit contains at least nine abandoned gravel pads that were used as drilling platforms during exploratory operations. Most early exploration was conducted during the late 1970s and early 1980s. Three gravel pads (Point Thomson Unit Numbers 1 and 3, and Alaska State C-1) are located near the study area. The exploratory wells on these pads were plugged and abandoned by 1981, although the Point Thomson Unit 3 gravel pad has been used over the years as a staging area for other exploratory efforts and as a campsite for various projects.

METHODS

Site Selection and Plot Setup

Twenty-eight 10-ha study plots were overlaid onto an existing vegetation/land cover map (Noel and Funk 1999) that included delineation of the proposed development for the Point Thomson Unit (Figure 2). For analysis in future years, the study plots were divided into "reference" and "treatment" plots on the basis of their proximity to proposed infrastructure. Fourteen study plots were placed on tundra within 500 m of proposed infrastructure in areas that could be accessed on foot from a campsite at the Point Thomson Unit 3 gravel pad. These plots were designated as treatment plots and were located adjacent to proposed roads, the proposed airstrip, and the proposed mine site and gravel storage area. Another 14 study plots were located on tundra approximately 1 km or more from proposed infrastructure in habitats that matched as closely as possible those of corresponding treatment plots. These 14 plots were designated as reference plots. Each 10-ha study plot encompassed an area with dimensions of either 100 m x 1000 m or 200 m x 500 m.

Study plots located within walking distance from the Point Thomson Unit 3 gravel pad were established in the field during 2–7 June 2001. For study plots measuring 100 m x 1000 m, a wooden stake was placed every 50 m along the centerline of the plot. For study plots measuring 200 m x 500 m, wooden stakes were also placed 50 m apart and two centerlines were established, each 50 m from the edge of the plot. Each stake was marked with numbers and arrows to establish a grid of 20 cells in each study plot, each measuring

50 m x 50 m, on either side of the centerline. Starting and ending points for transect centerlines were determined using a Trimble Geo-Explorer Global Positioning System (GPS) unit (Appendix A).

Data Collection

From 12 June through 5 July, each study plot was censused twice for nesting birds. The first and second census periods were from 12–21 June, and from 24 June through 5 July, respectively (Table 1). Nesting birds were censused using a rope drag method to flush incubating birds from their nests (described in Troy et al. 1983). The rope drags involved two biologists walking abreast along the grid lines dragging a nylon rope between them. A third biologist walked behind the rope, midway between the two biologists dragging the rope. Birds that had not been flushed during this procedure, but that exhibited behavior indicating that they might be nesting in the area, were also observed to determine if they had a nest.

All located nests were marked with a plain wooden tongue depressor on which was written the species name and an identification number. The tongue depressor was inserted into the tundra approximately 1 m from the nest in the direction of the study plot centerline. A fluorescent orange tongue depressor with a direction arrow and the number of paces to the nest was inserted into the tundra on the centerline. Information including species, nest number and location, date, habitat description, and number of eggs or young was recorded in a field notebook. Data from field notebooks were transcribed onto permanent data sheets each evening, and were later transferred to computer spreadsheets.

Bird use of each plot was also determined during the rope drag censuses. The biologist walking behind the rope recorded species, numbers of individuals and their behavior, grid cell within which the bird was recorded, and general habitat characteristics for all birds observed during the census period. Jaegers and owls that were flying over the plots were considered to be hunting and were counted in the census. Birds flying over the plots that did not appear to be actively using the plots were not recorded.

During the second rope drag census, the final status (successful or failed) of some nests was determined; however, many nests were still active, and the final status of these nests could not be determined. Nests that were still active after the second census were revisited after the breeding season, from 11–13 August, to determine status.

Nest success or failure was determined using the criteria of Troy and Wickliffe (1990). A nest was considered to have failed if the initiation date was known and the nest was found empty before the normal incubation time was completed, or if signs of predation, such as broken eggs, fox scat or scent at an empty nest, or a destroyed nest were present. For shorebirds, a nest was considered successful if it contained tiny egg shell fragments ("egg bits" originating from egg shell pipping). For waterfowl, a nest was considered successful if egg shells with dry membranes attached to the shell were found in or near the nest cup. For Lapland longspurs (*Calcarius lapponicus*), a nest was considered successful if fledged young were observed near the nest. The presence of feather sheathes (powdery material shed from developing feathers) and alarmed adults near an empty nest were also used as indicators of nest success. However, the presence of feather sheaths in the nest cup only indicated that the chicks were close to fledging and did not preclude the possibility of nest predation late during the developing period of young birds.

Data Analysis

Nest density data (total number of nests per 10-ha plot) were compared for each pair of reference and treatment plots. Nest density (nests per km^2) for each species on all reference plots combined was compared with nest density on all treatment plots combined. Species richness (the number of species nesting in each plot) was compared between pairs of reference and treatment plots, and the total number of species nesting in all reference plots combined was compared to the total number of species nesting in all treatment plots combined.

The criteria for determining nest status was straightforward for shorebirds and waterfowl because young leave the nest shortly after hatching; nest success or failure was determined by the characteristics of egg shells remaining at the nest. Nests of shorebirds and waterfowl were classified as successful or unsuccessful, and the numbers of successful and unsuccessful nests were compared between pairs of reference and treatment plots.

The status of Lapland longspur nests was more difficult to determine because young longspurs remain in the nest for 8 to 12 days after hatching. The nest contents are only indicators of nest status and are not diagnostic in determining nest success or failure. Because success or failure of longspur nests could not be determined with the same degree of certainty as for shorebirds and waterfowl, the final status of longspur nests was considered separately from that of other species.

The number of bird sightings (total number of sightings per 10-ha plot) was calculated for each study plot. The total number of bird sightings was compared for each pair of reference and treatment plots during each survey period. The number of sightings in each plot type was also compared between the first and second survey periods. Behavior classifications recorded during each survey were totaled for each species and differences in behaviors were compared for each species between the first and second survey period.

The percentage of each vegetation/land cover category in each study plot was determined. Percentages were totaled for reference plots, treatment plots, and for all study plots combined. The average percent cover of each vegetation/land cover category was calculated for reference plots, treatment plots, and for all study plots combined.

The vegetation/land cover category at each nest site was determined by mapping the nest location on the existing vegetation/land cover map (Noel and Funk 1999). The number of nests of each species in each vegetation/land cover category was calculated. Photographs were taken at most nest sites during 11–13 August and later examined to verify that vegetation/land cover categories had been correctly assigned to each nest. A chi-square test was used to compare the number of nests observed with the number expected based on the amount of habitat available in the various vegetation/land cover categories.

RESULTS

Some bird species that were observed in the area of the campsite at Point Thomson Unit 3, or while observers walked between the study plots and camp, were not recorded during the nesting surveys. Table B1 lists all species seen in the Point Thomson area during the study period.

Nest Density

The total number of nests of all species combined was slightly higher on reference plots than on treatment plots (Tables 2 and 3, Appendix C). As a group, shorebirds dominated the nesting avifauna in terms of number of species and number of nests; however, the most abundant individual species nesting on both plot types was Lapland longspur (Table 3). Semipalmated sandpiper (*Calidris pusilla*) and pectoral sandpiper (*Calidris melanotos*; Figure 3) were also fairly common nesting species. Waterfowl nested in much lower densities than other groups.

Of the three most common nesting species, more Lapland longspur nests were found in treatment plots than in reference plots (Table 3). In contrast, more semipalmated sandpiper and pectoral sandpiper nests were found in reference plots than in treatment plots, although for pectoral sandpiper, the difference in the number of nests between the two plot types was only one nest. The numbers of nests of other species were all much lower and comparisons of these numbers are probably not useful (Table 3).

Species Composition

More species nested in reference plots than in treatment plots (13 vs. 8; Table 3). One unidentified eider nest was found on a treatment plot. This nest was probably a king eider nest and was not included in calculations of species richness because there were other king eider nests on treatment plots. The difference in the numbers of species in the two plot types was due primarily to small numbers of nests of shorebirds and waterfowl that were found in reference plots (Table 3). Only one species, stilt sandpiper (*Calidris himantopus*; Figure 3) that nested in treatment plots was not found nesting in reference plots.

Nest Success

Nest success for non-passerines (all species excluding Lapland longspur) was higher on reference plots (55%) than on treatment plots (43%; Table 4). On all plots combined the overall nest success for all non-passerines was 49%. For Lapland longspurs, two nests (one in each plot type) were classified as successful, 24 nests (12 in each plot type) were classified as likely successful based on the presence and amount of feather sheath material in the nest cup, and 37 nests (16 in reference plots and 21 in treatment plots) failed.

Bird Use

During the first census period (first rope drag), slightly more bird sightings were recorded on reference plots than on treatment plots (Tables 5 and D1). During the second census period, more birds were observed on treatment plots than on reference plots.

The number of bird observations declined in both plot types from the first to the second census period. The decline in the number of observations recorded during the second census period did not include all species on all plots (Table 6). More Lapland longspurs were observed on treatment plots during the second census than the first, and parasitic jaeger (*Stercorarius parasiticus*) observations increased on both plot types from the first to the second census period. The most common nesting species (Lapland longspur, semi-palmated sandpiper, and pectoral sandpiper) were also the most commonly observed species on both reference and treatment plots (Table 6).

Pomarine jaegers (*Stercorarius pomarinus*) were common in the Point Thomson area and were frequently observed early in the season during plot set-up and during the first census period. By late June, pomarine jaegers had declined in abundance and no pomarine jaegers were observed during the second census period (Table 6).

The most common behaviors observed for all species combined on all study plots combined were feeding, incubating, and displaying (Table 7). Most of the behaviors recorded for pectoral sandpipers during the first survey period were feeding and displaying. During the second survey period, incubation became the dominant behavior. Semipalmated sandpipers followed a similar pattern, although few birds were recorded as displaying during either survey period. For Lapland longspurs, feeding and displaying remained the dominant behaviors recorded during both survey periods. This general pattern of behavior (feeding, displaying, and incubation) was exhibited by most other species, although the numbers of observations were low. However, most observations of jaegers and other predators, i.e., short-eared owl (*Asio flammeus*) and northern harrier (*Circus cyaneus*), were of birds hunting over the study plots.

Habitat Selection

In all study plots combined, three vegetation/land cover categories as described by Noel and Funk (1999) dominated the landscape (Table 8). Vegetation/land cover category IIId (wet sedge/moist sedge, dwarf shrub tundra complex) covered a slightly larger area than categories IVa (moist sedge, dwarf shrub/wet graminoid tundra complex) and Va (moist sedge, dwarf shrub tundra). These three vegetation/land cover categories accounted for 85% of the total area of all study plots combined. All vegetation/land cover categories for the Point Thomson area are briefly described in Table 9.

The combined total areas for various vegetation/land cover categories for reference and treatment plots each followed a similar pattern (Table 8). The greatest difference in the distribution of vegetation/land cover categories between the two plot types was in the amount of category Ve (moist graminoid, dwarf shrub tundra/barren complex), which was less well represented on treatment plots. Category Ve is similar to category Va and is distinguished from it by the presence of numerous frost scars or frost boils.

For all tundra-nesting bird species combined, and for all plots combined, nests occurred in seven different vegetation/land cover categories (Table 10). Approximately 89% of all nests occurred on one of the three most abundant vegetation/land cover categories. Nests occurred most frequently in categories IVa and Va, and to a lesser extent in IIId.

Considering only the nests of the three most common nesting species (Lapland longspur, semipalmated sandpiper, and pectoral sandpiper), 73% occurred in categories IVa and Va, 16% occurred in category IIId, and 11% occurred in other categories (Table 10). Considering all species combined on all study plots combined, tundra-nesting birds did not preferentially choose any particular habitat for nesting sites more than would be expected based on the amount of habitat available. The same is true for individual species with regard to nest site selection by longspurs and pectoral and semipalmated sandpipers. However, when considering all species combined and semipalmated sandpiper alone, the occurrence of nest sites on vegetation/land cover category IIId was less than would be expected based on the amount of habitat available ($P < 0.05$). The numbers of nests of other species were too low to make similar comparisons.

The number of nests of Lapland longspurs and semipalmated sandpipers were divided almost equally between vegetation/land cover categories IVa and Va (Table 10). Slightly more pectoral sandpipers nested in category IVa than in category Va. Although a significant selection for nest sites in a particular vegetation/land cover category could not be demonstrated for all species combined or for individual species, 86% of all semipalmated sandpiper nests were located in one of these two vegetation/land cover categories.

DISCUSSION

Nest Density

Overall nest density on the Point Thomson study plots in 2001 (52.2 nests per km^2) falls within the range of nest densities reported for the Prudhoe Bay area since the 1980s, although nest densities have generally been higher at Prudhoe Bay (e.g., Troy and Carpenter 1990; TERA 1991, 1993b, 1996; Rodrigues 1992). The studies at Prudhoe Bay have generally incorporated a more intensive field effort than was implemented in the current study. At Point Thomson we visited each study plot twice during the nesting season, whereas the study plots at Prudhoe Bay were often visited five or more times during the nesting season. Increased visitation to study plots in the Point Thomson study area would likely have resulted in slightly higher nest densities than were recorded in 2001. However, some of the higher nest densities reported in the Prudhoe Bay area (140.8 nests per km^2) occurred in the Colville River Delta, where each study plot was censused only once during the nesting season (Johnson et al. 2000).

East of Prudhoe Bay, tundra-nesting bird studies have been conducted midway between Prudhoe Bay and the Point Thomson Unit 3 study area in the Kadleroshilik River and Badami areas (TERA 1995), at the Yukon Gold area approximately 15 km south of Point Thomson Unit 3 (TERA 1993a), and east of Point Thomson in the ANWR (Martin and Moitoret 1981; Oates et al. 1987). In the Point Thomson Unit, Wright and Fancy (1980) conducted tundra-nesting bird studies near Point Gordon and Point Sweeney, west of Point Thomson Unit 3.

Nest densities at Point Thomson Unit 3 in 2001 (52.2 nests per km^2) were lower than those reported at the Kadleroshilik River (69.7 nests per km^2) and Badami areas (74.3 nests per km^2) for studies conducted in 1994, but higher than those reported at Yukon Gold (28.3 nests per km^2). Nest densities at Point Thomson Unit 3 were generally slightly higher than those reported at coastal and inland sites in ANWR (Oates et al. 1987), although nest densities averaged 83.5 nests per km^2 on study plots in the Canning River delta (Martin and Moitoret 1981). Wright and Fancy (1980) reported approximately 80 nests per km^2 in the western portion of the Point Thomson Unit. All of the above studies employed a more intensive field effort than the current study.

On tundra study plots on the Arctic Coastal Plain, waterfowl generally nest in lower densities than other bird groups (TERA 1995). This was the case at Point Thomson in 2001 (Table 3). The nesting density of waterfowl at Point Thomson (2.5 nests per km^2) was similar to, but slightly higher than, that reported for the Badami area (1.3 nests per km^2; TERA 1995). However, waterfowl nest densities at Point Thomson were lower than those reported by TERA (1995) for the Kadleroshilik area (5.0 nests per km^2), the Prudhoe Bay area (6.0 nests per km^2), and the Milne Point area (6.3 nests per km^2). No threatened or endangered waterfowl were found nesting on Point Thomson study plots in 2001 and no threatened or endangered species were observed in the area during the course of the study.

Species Composition

TERA (1993a, 1995) has noted that species composition of tundra-nesting birds differs among areas across the Arctic Coastal Plain of Alaska from Prudhoe Bay to ANWR. Lapland longspur is generally the most abundant nesting species in all areas, and pectoral sandpiper is also common to abundant in all locations. In the Prudhoe Bay area, these species are joined by semipalmated sandpiper and one of the phalaropes, either red (*Phalaropus fulicaria*) or red-necked (*Phalaropus lobatus*), forming a group of four species that are all common nesters at most locations. In most areas of ANWR and at the Yukon Gold area south of Point Thomson, semipalmated sandpiper and the phalaropes are uncommon nesting species, and only two species, longspurs and pectoral sandpipers, are common. However, the composition of tundra-nesting birds of one area of ANWR, the Canning River delta, resembles that of Prudhoe Bay in that the four common nesting species at Prudhoe Bay are also common nesting species there (Martin and Moitoret 1981).

The Point Thomson area appears to be intermediate between the Prudhoe Bay area and ANWR in terms of diversity of common nesting species. Point Thomson is similar to ANWR in that phalaropes appear to be uncommon nesting species; however, semipalmated sandpiper, which is not a common species at most ANWR locations, is a fairly common nesting species at Point Thomson. The presence of semipalmated sandpiper as a common nesting species at Point Thomson is similar to what might be expected for the Prudhoe Bay area, although the low number of phalaropes nesting at Point Thomson distinguishes that area from Prudhoe Bay. The species composition of nesting birds in the Point Thomson area appears to be similar to that of the Badami area, approximately 30 km to the west (see TERA 1995).

Nest Success

Nest success at Point Thomson for all species combined, excluding Lapland longspur (49%) falls within the range reported for other studies in the Prudhoe Bay area (e.g., Troy and Carpenter 1990; TERA 1991, 1993b). Nest success in the Yukon Gold area during one year of study in 1993 (86%) was much higher than at Point Thomson, although nest density at Yukon Gold (28.3 nests/km^2) was approximately half that of the Point Thomson area (52.2 nests/km^2). Nest success at the Badami area, west of Point Thomson, was not reported (TERA 1995).

Jaegers and arctic foxes (*Alopex lagopus*) are known to prey on tundra-nesting birds and their eggs (Maher 1970, 1974; Martin and Barry 1978; Burgess 2000), and these predators are probably responsible for most of the nesting failure at Point Thomson in 2001. Pomarine jaegers were common at Point Thomson early in the nesting season. Pomarine jaegers feed primarily on lemmings and breed only during years of high lemming concentrations (Pitelka et al. 1955; Maher 1974). Non-breeding pomarine jaegers are known to be opportunistic feeders during low lemming years and will prey on birds and bird eggs (Maher 1974). Lemming numbers were probably not high enough to initiate breeding by pomarine jaegers at Point Thomson in 2001, as no pomarine jaegers were observed in the area after 21 June, although lemmings were observed in the area through the entire survey period. Pomarine jaegers were often observed hunting over the study plots and may have been responsible for some nest predation.

Parasitic jaegers are less reliant on lemmings and prey more on birds and eggs than do pomarine jaegers (Maher 1974; Martin and Barry 1978). Parasitic jaegers were observed hunting over tundra study plots during the entire study period. It is likely that more predation on tundra-nesting birds at Point Thomson may have resulted from parasitic jaegers than from pomarine jaegers. Long-tailed jaegers (*Stercorarius longicaudus*) were occasionally observed in the study area, but because of their low occurrence, they probably did not significantly affect the numbers of tundra-nesting birds.

Arctic foxes were not observed on any of the study plots during census periods, although they were frequently observed hunting in the general area of the study plots. Arctic foxes are known as predators of nesting birds in the Prudhoe Bay area (Troy and Carpenter 1990; Johnson et al. 1993a, 1993b; Burgess 2000; Noel and Johnson 2000) and were observed taking eggs from nests of Canada geese (*Branta canadensis*) near the campsite at Point Thomson on several occasions. Fox scent was detected at one depredated longspur nest, and fox scat was present at two depredated semipalmated sandpiper nests. Arctic foxes may have been one of the primary predators of tundra bird nests at Point Thomson in 2001.

Bird Use

The densities of birds using the Point Thomson study plots (Table 6) were similar to those reported for other North Slope areas (Spindler 1978; Martin and Moitoret 1981; Troy 1985, 1988; Rodrigues 1992). The reduced number of sightings from the first to the second census period is most likely the result of reduced levels of display and feeding, and increased levels of incubation as the season progressed, particularly for pectoral and semipalmated sandpipers (Table 7). Pectoral sandpiper sightings during the second census period were less than half of the numbers recorded for the first census period (Table 6), and almost no males were observed displaying during the second survey period (Table 7). Male pectoral sandpipers do not participate in incubation and care of the young, and typically leave the breeding grounds during the incubation period before the eggs hatch (Pitelka et al. 1974). Semipalmated sandpiper sightings followed this general trend, although the differences between survey periods were not as dramatic. Semipalmated sandpipers follow a different breeding strategy than pectoral sandpipers and are monogamous; both adults share in incubation and care of the young (Pitelka et al. 1974). Semipalmated sandpipers are not likely to leave the breeding ground before the young are hatched.

The levels of feeding and display for Lapland longspurs remained relatively high during both census periods, but the number of birds incubating dropped. Predation of longspur nests was probably fairly high. Of 63 longspur nests, 37 (59%) were known to have failed. Some of the 24 nests classified as possibly successful, based on presence and amount of feather sheath material, probably also failed, adding to the 59% of nests known to have failed. Nest predation would decrease the number of birds incubating. Male longspurs continued to display throughout the study period, and feeding observations likely included adults from unsuccessful nests and fledglings from successful nests.

Habitat Selection

TERA (1995) reported nest densities of tundra birds in different vegetation types in the Badami area, and Martin and Moitoret (1981) compared bird nest densities on different tundra types in the Canning River delta. Most nesting bird species in both of these studies were similar to those nesting at Point Thomson in 2001, although red phalaropes, which occurred in low numbers at Badami and Point Thomson, were common in some areas in the Canning River delta.

Habitats were divided into three types at Badami (wet tundra, moist/wet tundra complex, and moist/dry tundra; TERA 1995) and at the Canning River delta (lowland, mesic, and upland; Martin and Moitoret 1981). For the purposes of discussion, these habitat types can be classified as wet, wet/moist, and moist/dry, respectively, according to the relative amount of wetness. Wet tundra habitats are poorly drained and may have standing water in some areas; moist/wet habitats are intermediate in wetness; and moist/dry habitats are well drained and dryer. If vegetation/land cover types at Point Thomson are combined in such a way that IIIa, IIId, and IIIe form one category, and Va and Ve form a second category (categories III and V), then vegetation/land cover categories III, IV, and V at Point Thomson would be comparable to the habitat classifications at Badami and the Canning River delta. Vegetation/land cover categories III, IV and V correspond to wet, wet/moist, and moist/dry, respectively.

Habitats used for nesting display similar trends at Point Thomson and Badami (Table 11). Higher nest densities occur in wet/moist habitats and lower nest densities occur in wet habitats at both locations. At these locations, Lapland longspur, semipalmated sandpiper, and pectoral sandpiper are the dominant species. At the Canning River delta, the higher nest densities occur on wet/moist habitats as at the other locations; however, wet habitats have higher densities than moist/dry habitats (Table 11). At the Canning River delta, Lapland longspur, semipalmated sandpiper, and pectoral sandpiper are also dominant species, along with a fourth species, red phalarope. Red phalarope was the most numerous breeding species in the lowland, or wet, study plot. Rodrigues (1994) reported that red-necked phalaropes in the Prudhoe Bay area also selected nest sites in wet areas. In this sense, the avifauna of the Canning River delta more closely resembles that of Prudhoe Bay than it does that of Point Thomson or the Badami area.

At the Canning River delta (Martin and Moitoret 1981) and in the current study, more semipalmated sandpiper nests were found on wet/moist and moist/dry habitats than on wet habitats. Rodrigues (1994) also reported semipalmated sandpipers nesting more commonly on drier habitats than on wet ones in the Prudhoe Bay area. However, TERA (1995) reported the highest nest densities for semipalmated sandpipers at Badami on moist/wet habitats and the lowest on moist/dry habitats. Wet habitats at Badami were intermediate in nest density for semipalmated sandpiper.

Although tundra-nesting birds in the current study did not nest in any particular habitat type more than would be expected based on the amount of habitat available, for all species combined and for semipalmated sandpiper alone, fewer nests than expected were observed in wet habitats. Phalaropes commonly nest in wet habitats, and three of the four phalarope nests found at Point Thomson were in wet habitats. However, phalaropes were uncommon nesting birds at Point Thomson in 2001, which probably helped to account for the lower number of nests found in wet habitats. Preliminary results at Point Thomson indicate that wet/moist and moist/dry habitats (vegetation/land cover categories IV and V, respectively) may be more important for nesting birds in the Point Thomson area than wet habitats (vegetation/land cover category III).

SUMMARY

The nest density of birds in the Point Thomson area in 2001 was similar to nest densities reported for other areas of the Arctic Coastal Plain. Species diversity at Point Thomson was intermediate between what might be expected at Prudhoe Bay to the west and the Arctic National Wildlife Refuge to the east. Lapland longspur was the most common nesting species, and the number of longspur nests was almost equal to the number of nests of all shorebird species combined. Pectoral and semipalmated sandpipers were also fairly common nesting species. All other shorebird species nested in lower densities. The density of waterfowl nests was also relatively low, and no threatened or endangered waterfowl were found nesting or were observed in the study area.

Nest success was approximately 50% for all species combined, excluding longspurs. Data were insufficient to determine nesting success for longspurs. The most frequently observed predators on the study plots were jaegers. Arctic foxes were also observed in the area, although no foxes were observed on study plots during surveys. It is likely that jaegers and arctic foxes were responsible for most of the nest predation at Point Thomson in 2001.

The most common nesting species (Lapland longspur, semipalmated sandpiper, and pectoral sandpiper) were also the most commonly observed species during surveys. Bird use of the study plots declined from the first to the second survey periods.

Although nests were found on seven different vegetation/land cover categories, 89% of all nests occurred on three vegetation/land cover categories.

Tundra-nesting birds did not choose any particular habitat type more preferentially than would be expected based on the amount of habitat available. However, when considering all species combined and semipalmated sandpiper alone, the occurrence of nests on vegetation/land cover category IIId (wet sedge/moist sedge, dwarf shrub tundra complex) was less than would be expected based on the amount of habitat available.

The difference in use by nesting birds was not great between reference and treatment study plots, suggesting that the two types of plots form a suitable baseline for use in studies of future development in the Point Thomson Unit.

ACKNOWLEDGMENTS

This project was funded by BP Exploration (Alaska) Inc. Dr. Bill Streever, Dave Trudgen, Allison Erickson, and Wilson Cullor of the BPXA Environmental Studies Group helped with logistical support during the planning stages of the project. Bill Streever had useful comments on the draft of this report. Bill Wilson of LGL assisted during the planning stages of the project. Craig Perham and Lynn Noel helped with mapping of study plot locations. Shawn Haskell, Alicia Haskell, and Chris Harper assisted with establishment of study plots in the field. Jessy Coltrane, Craig Reiser, and Aaron Helmericks assisted with field work. Scott Wolfe, Paul Jensen, and Jessy Coltrane helped with statistical analyses. Steve Johnson, Matt Cronin, Robin Senner, and Bill Wilson had many helpful suggestions during the preparation of the report. Shelly Schwenn and Alicia Haskell expedited food and other supplies to the field camp. Peggy Kircher helped with report preparation. Field supplies and personnel were transported safely to and from the field camp by Air Logistics Inc.

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