Committee on the Status of Endangered Wildlife in Canada

Comité sur le statut des espèces menacées de disparition au Canada

Ottawa, Ont. K1A 0H3
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STATUS REPORT ON THE TUNDRA PEREGRINE FALCON *FALCO PEREGRINUS TUNDRIUS* IN CANADA

BY

MARIANNE BROMLEY

STATUS ASSIGNED IN 1992
VULNERABLE

REASON: POPULATIONS NOW STABLE OR INCREASING. MUST CONTINUE TO BE MONITORED BECAUSE OF CONTINUED PESTICIDE LOAD.

OCCURRENCE: NORTHWEST TERRITORIES, YUKON TERRITORY, NEWFOUNDLAND, QUEBEC

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0H3 (819)
Ottawa, Ont. K1A ~~0E7 (613)~~ 997-4991

JUNE 1990

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STATUS REPORT ON THE TUNDRA PEREGRINE FALCON
FALCO PEREGRINUS TUNDRIUS

IN CANADA

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MARIANNE BROMLEY

STATUS ASSIGNED IN 1992

VULNERABLE

UPDATE REPORT ON THE STATUS OF TUNDRA PEREGRINE FALCONS (*Falco peregrinus tundrius*) IN CANADA

for the

COMMITTEE ON THE STATUS OF ENDANGERED WILDLIFE IN CANADA

June 1992

Marianne Bromley

Author's status recommendation: Vulnerable
Status assigned by COSEWIC: Vulnerable - 1992

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ABSTRACT

The previous status report on Peregrine Falcons was written in 1978. Since that time, extensive surveys and intensive studies have been done on tundra Peregrine Falcons. Many previously unreported nest sites have been found throughout most of the tundra peregrine's range. In the Northwest Territories and Labrador, areas of suitable peregrine habitat remain unsurveyed, and there are likely nest sites still undiscovered. In the Yukon, the small population on the North Slope became extirpated in 1981. However, in 1989 a pair was observed in the area, and in 1990 a single bird was seen.

In the Northwest Territories, Ungava Bay, and Labrador, population densities, numbers of occupied territories, reoccupancy rates, and productivity rates indicate that populations are stable or increasing, and seem to be reproducing normally. The results of the 1980 and 1985 North American Peregrine Surveys and analyses of migration data support the evidence for healthy tundra peregrine populations.

Year-to-year variations in numbers of breeding pairs and reproductive success occur locally and are likely a result of variable weather, and availability of prey especially during early spring.

Levels of pesticide residues in tundra peregrines seem to be decreasing. However, the falcons are still at risk as organochlorine pesticides continue to be used on their wintering grounds. Substantial accumulations have been found in peregrines at Rankin Inlet, N.W.T. Data indicate a degree of eggshell thinning just short of critical level, and some nesting pairs fail each year as a direct result of eggshell breakage.

Given the evidence for 1) stable or increasing populations, and 2) the continuing danger of organochlorine contamination, the proposed status of tundra Peregrine Falcons, including the Labrador and Ungava Bay populations, is vulnerable.

INTRODUCTION

The previous status report on Peregrine Falcons was written by Martin in 1978. The 1978 report discussed distribution, population sizes and trends, habitat, general biology, and limiting factors for the 3 subspecies of peregrines in Canada. Martin found little detailed data on population numbers and productivity of Canadian Peregrine Falcon populations. She concluded that for northern peregrines "...there are areas in which declines are serious, other areas where peregrines appear to be maintaining themselves, and areas which could hold as yet undiscovered populations. The actual trend of the northern population at the present time is inconclusive".

Since 1978, extensive surveys and intensive research in several study areas have provided new information on the breeding distribution and biology of the tundra peregrine. These recent data suggest that the population dynamics of tundra peregrines differ from those of peregrines breeding further south. Consequently, an updated report on the tundra peregrine, incorporating new data, seemed necessary. An effort has been made to avoid repeating what Martin has already written. Therefore, detailed information on habitat, general biology, and the history of pesticide-induced population declines is not included. The reader should consult the 1978 report as well as this update for complete information.

DISTRIBUTION

With a few exceptions, the overall breeding range of the tundra peregrine described by Martin (1978) has not changed. However, many new occupied sites have been found within that range, often in previously unexplored areas. Figure 1 shows the approximate range of tundra peregrines in Canada.

Northwest Territories

In the Northwest Territories, significant breeding populations of tundra peregrines exist in the areas of Rankin Inlet; the Central Arctic Coast; the Horton, Anderson, and Hornaday Rivers; Southern Baffin Island; Wager Bay; and the Melville Peninsula. Approximately 650 tundra peregrine sites are known in the Northwest Territories. Large areas of suitable peregrine habitat have never been surveyed, and a large number of sites certainly remain undiscovered (C. Shank, S. Matthews, pers. comm.; Calef and Heard 1979). Surveys in previously unexplored areas suitable for breeding peregrines have located undocumented nest sites (Alliston and Patterson 1978, Calef and Heard 1979).

Yukon

In the Yukon, the small population of tundra peregrines on the North Slope vanished as a breeding population in 1981 (Mossop

1988). The area of suitable habitat for tundra peregrines in the Yukon is relatively small (approx. 29,000 km^2). Surveys during the last 15 years covered about 80% of the available habitat, so it is unlikely that many undocumented sites exist (D. Mossop pers. comm.).

Ungava Bay and Labrador

Researchers first documented peregrine falcons at Ungava Bay in 1967 (Cade and Fyfe 1970) although there are numerous historical records. Since 1967, several surveys have been undertaken. Cade and Weaver (1988) consider that most sites around the Bay have now been located and that it is unlikely that inland cliffs harbour many additional pairs at present.

Prior to the 1960's, peregrines are known to have bred along the coast of Labrador but populations apparently declined leading Martin (1978) to indicate Labrador as a former breeding area, with no sites known in 1978. In recent years, extensive surveys have located substantial numbers of occupied peregrine sites along the coast of Labrador (Lemon and Brazil 1990). To date, the entire coast has been surveyed as well as a few inland valleys. Surveys along the river valleys have located several peregrine sites, and it is likely that additional occupied sites will be discovered as more inland areas are surveyed (J. Brazil pers. comm.).

Subspecies Distribution

The taxonomy of Ungava Bay and Labrador peregrines is uncertain. It has not been definitively established whether they are anatum or tundra peregrines (Brazil 1990, Murphy 1990, Anatum Peregrine Falcon Recovery Team 1990), although they have been included in discussions by the Anatum Peregrine Falcon recovery Team. There are differences of opinion regarding the differentiation of anatum and tundra peregrines across northern Canada. Some populations do not seem to fit clearly into one or the other subspecies.

Morphometric and plumage characteristics, including the presence of some dark plumages, in the Rankin Inlet peregrine population suggest those birds are intermediate between tundra and anatum. Rankin Inlet is near the southern latitudinal limit of the range generally defined for tundra peregrines (Court et al. 1988a). In the varied terrain of Labrador, peregrines have been found in what could be considered typical tundra habitat, hunting typical tundra prey. Some of the birds look like tundra subspecies; others look more like anatum (J. Brazil pers. comm.).

Peregrines found in the past on the Yukon North Slope appear more similar morphologically to anatum than to central arctic tundra peregrines. The demographics of the North Slope population are also different from those of the central and eastern arctic tundra peregrine populations but they are different from the Yukon anatum populations as well. The Yukon North Slope has not been reinvaded by peregrines from the healthy anatum population around Old Crow, separated by 60 km and a mountain range. On the other hand, a peregrine from the Porcupine Basin, assumed to be anatum, bred among tundra peregrines on the North Slope of Alaska (D. Mossop pers. comm.).

There is also some disagreement on whether the peregrines nesting in the Campbell Hills are of the tundra subspecies, and an extension of the Yukon North Slope population, or anatum and an extension of the Mackenzie Valley population (D. Mossop pers. comm.). To date they have been considered the latter for survey and management purposes as the habitat of the Campbell Hills is more similar to that of the Mackenzie Valley (C. Shank, S. Matthews pers. comm.).

Court et al. (1988a) suggested the existence of a latitudinal line of intergradation between the tundra and anatum subspecies. This would agree with White and Boyce's (1988) statement that in continental peregrine races, the character gradients separating subspecies are gradual because ranges abut and intergradation occurs. The intergradation between adjacent subspecies has not been well defined and, for the most part, peregrine range boundaries are poorly delimited.

Statistical analyses of 8 morphometric and plumage characteristics in museum specimens suggest that, overall, the 3 North American races can be separated at the 79% level (75% is the accepted level for subspecies definition). Based on measurements alone, anatum and tundra peregrines were confused in 20 - 35% of the cases (White and Boyce 1988).

Researchers are currently searching for genetic markers specific to breeding populations. To date, no marker is known which will identify an individual's population. However, this may become possible as techniques are refined through ongoing research (Longmire 1988, Morizot 1988).

Tundra peregrines generally migrate through eastern and central North America, and over-winter in South America (Martin 1978). Details of their migration and wintering habits are not well known. Figure 2 shows the distribution of 32 band returns (up to 1988) for tundra peregrines banded in Canada. Researchers banding migrating peregrines at Cedar Grove, Wisconsin stated that most peregrines trapped were clearly tundra birds, and it was likely that all but a few of the individuals that passed Cedar Grove in the fall were of arctic or subarctic origin. They also found that winter recoveries of peregrines banded at Cedar Grove were all from South America (Mueller et al. 1988).

PROTECTION

The tundra Peregrine Falcon is under provincial/territorial jurisdiction. All provinces/territories have legislation protecting falcons from capture and harassment. In the N.W.T. and Yukon, possession of peregrines or their eggs without a permit is prohibited, and there are no provisions for issuing permits for capture from the wild.

In Labrador, there are provisions for 2-km development buffers around all falcon nests on Crown Land (J. Brazil, pers. comm.). In most jurisdictions, no legislation specifically protects peregrine habitat. However, land use permits are generally required for development. Conditions and/or guidelines for development can be attached to the permits when it is necessary to minimize disturbance of specific peregrine habitats. Although voluntary in most cases, and usually complied with by developers, the guidelines can often be "given teeth" through the Environmental Impact Assessment process and public pressure (J. Brazil, S. Matthews pers. comm.).

The tundra peregrine is listed under Appendix I of the Convention on International Trade in Endangered Species of Fauna and Flora (CITES) because of the look-alike problem with he endangered <u>anatum</u> peregrine.

POPULATION SIZE AND TRENDS

Yukon

The Yukon is the only area in which tundra peregrines are not breeding in all suitable habitats. The 15-17 known pairs of tundra peregrines ceased to breed in the Yukon in 1981. For the first time in 10 years, a pair was found occupying a territory on the North Slope in 1989, but they failed to breed successfully. A single adult was found in 1990, and in 1991 a new pair was located but failed to produce young (D. Mossop pers. comm.).

There is some hope that the Yukon population will become reestablished. It is possible that it will reflect the trend of the tundra peregrines on the North Slope of Alaska (D. Mossop pers. comm.). That population declined in the 1960s, reaching its lowest point in the early 1970s. It began to recover in the late 1970s and has increased steadily since then (Ambrose et al. 1988). The Alaska tundra peregrine population is increasing rapidly, and individuals from it could reinvade the Yukon North Slope. It is also possible that some of the 32 tundra peregrines bred in captivity and fostered on the Yukon North Slope may return to nest (D. Mossop pers. comm.).

Labrador and Ungava Bay

There are historical records of peregrines nesting along many sections of the Labrador coast. However, there was no evidence of productive nests in Labrador between 1971 and 1985 despite several surveys. Peregrines apparently began to increase along the coast in the early 1980s (Murphy 1990). From 1985 to

1989, 26 occupied territories were identified. At least 80% of these nests were occupied in 1990 (Brazil 1990, Lemon and Brazil 1990). More nests may be found as inland river valleys are surveyed.

The number of peregrine sites known on Ungava Bay has increased from 28 in 1980 to 61 in 1990 although it is unclear what proportion of this increase is a result of increased survey effort. The rate of occupancy in the last decade varied from 48% to 82%. In 1990, 34 of 61 sites had territorial pairs (D. Bird pers. comm.; Bird and Weaver 1988).

Northwest Territories

In the N.W.T., populations appear numerically healthy in all areas surveyed. The Keewatin District is thought to have some of the densest and most productive peregrine populations to be found anywhere in the world (Court et al. 1988a). In Rankin Inlet, the number of territorial pairs was relatively constant from 1981 - 1984 (17 - 20 pairs), and increased to 26 pairs in 1985 and 1986. In 1990, there were again 26 territorial pairs.

In 2 study areas on the central arctic coast, the number of occupied peregrine territories increased significantly between 1982 and 1990 (Fig. 3) (Shank et al. in prep.). On average, the number of occupied territories increased each year by 2 in one study area and 5 in the other. In 1990, 95 sites were occupied by peregrines in the 2 areas.

During intensive surveys by canoe between 1987 and 1990, Obst (1988 a,b; 1990) found 18 peregrine territories on the Horton River, 23 on the Anderson River, and 27 on the Hornaday River. In 1988 on the Hornaday River, 92% of 26 known occupied territories were productive (Obst 1990). In 1990, 79% were reoccupied and productive. On the Horton River in 1990, 91% of 18 sites were reoccupied but only 64% were productive. The rate of occupancy of available sites is generally accepted to be 80% - 90% in a stable population (Kiff 1988). Obst (1990) suggested that a severe cold spell coinciding with peak egg laying initiation could have caused the decline in productivity in 1990.

On a regional basis, Bromley (1988) calculated the percent reoccupancy of sites occupied one year and checked in the following year. For 66 sites checked between 1982 and 1985 in the Kitikmeot region, the overall reoccupancy rate was 60%. In the Baffin region, the overall reoccupancy rate was 65% for 34 nests. Comparable data after 1985 are not available.

Productivity

Productivity rates across northern Canada also indicate that populations of tundra peregrines are healthy. In Ungava Bay, there has been a dramatic increase in the number of young per successful pair, from a low of 1.77 in 1970 to 3.13 in 1990 (D. Bird 1990; Bird and Weaver 1988). Obst (1988 a,b) found an average of 2.54 young per productive territory in the Anderson River in 1987. He found 3.8 eggs per productive territory on the Horton River in 1987, and 3.1 on the Hornaday in 1988. Bromley (1988) found an overall average of 2.8 young per successful pair between 1983 and 1985 in both the Kitikmeot and Baffin regions.

In addition to breeding birds, there is evidence of a substantial population of non-breeding birds in several areas (J. Brazil pers. comm.; Bromley 1983, Court 1986). As this segment of the population is impossible to survey, one can only speculate about its size. In a given area, it is possible that there are as many non-breeders as breeders (Newton 1988).

Trends

Although population estimates of tundra peregrines are not available, some trends can be noted. Increasing numbers of breeding peregrines have been reported in Labrador and along the central arctic coast, as well as in Alaska and western and southern Greenland (J Brazil pers. comm.; Bird and Weaver 1988, Shank et al. in prep.). It is unclear what proportion of this increase in sightings is a result of more intensive search effort and how much reflects actual population increase. Both probably contribute. The Ungava Bay population is considered stable and highly productive. Year to year variability occurs usually as a result of poor weather (D. Bird pers. comm.).

The number of pairs breeding successfully at Rankin Inlet varies with spring weather conditions and the availability of prey. The number of territorial pairs has increased by 30% and productivity has nearly doubled in years of peak microtine abundance. In years of poor spring weather, productivity is less than half of the yearly average (Court et al. 1988 b, 1990). Consequently, no trends have been determined; however Court et al. (1990) concluded that this population "remains productive, cannot be considered in decline, and is unlikely to show a decline in the next few years". They extend that conclusion as well to "most other productive tundra- nesting peregrine populations in Canada".

These trends are supported by the results of the 1980 and 1985 North American peregrine surveys, which indicated that tundra peregrine populations were generally stable or increasing, although fluctuations occurred locally (Kiff 1988).

Analyses of migration statistics also show clear and consistent increasing trends for northern populations of peregrines since the mid-1970s (Cade et al. 1988, Titus and Fuller 1990, Ward et al. 1988). Cade et al. (1988), using the Lincoln Index on migration data, concluded that "however one judges the accuracy of the Lincoln Index, it certainly indicates that several thousand peregrines are being produced each year in arctic and boreal America by several thousand pairs of adults".

HABITAT

The breeding habitat of tundra Peregrine Falcons in the N.W.T. supports a wide range of nesting densities, including some of the highest recorded for peregrines in North America. Bromley (1988) calculated average regional densities of 1 pair/186 km^2 in the Kitikmeot region of the N.W.T., and 1 pair/285 km^2 in the Baffin region. Higher densities have been recorded in local situations.

On 2 study areas of 2000 km^2 and 4000 km^2 along the central arctic coast, densities averaged 1 pair/60 km^2 (Shank et al. in prep.). Calef and Heard (1979) calculated a density of 1 pair/50 km^2 in an area of 2100 km^2 near Wager Bay. The density of breeding peregrines at Rankin Inlet has been as high as 1 pair/17 km^2 in an area of 450 km^2. This density approaches the highest recorded for peregrine populations in Great Britain nesting in association with seabird colonies (Court et al. 1988b, Court et al 1990).

The mean distance between nests in Rankin Inlet was 3.3 km. Along the Anderson and Hornaday Rivers, the mean distance between nests was 2.8 km and 1.6 km respectively (Obst 1988b). This compares with the high densities of peregrines nesting on the Queen Charlotte Islands, where the average distance between pairs was 1.6 km and the peregrines were linked to a large seabird population (Beebe 1960 in Martin 1978).

It seems unlikely that such high densities can be supported over a large area. Bromley (1988) concluded that, although very high densities can occur locally, Fyfe's (1969) estimate of 1 pair/52 km^2 was an overestimate for most areas. Court et al. (1988b) cautioned against extrapolating Rankin Inlet densities to other areas.

It is likely that the high densities in local situations are a result of unlimited nest sites in a region otherwise poor in nest sites (Bradley 1988, Obst 1988b). Obst (1988b) found that suitable nest sites were concentrated along a relatively short section of cliffs on the Hornaday River, but were more widespread on the Anderson River, where the distance between nests was somewhat greater. Court et al. (1988a) agree with Ratcliff (1980) that "local concentrations of cliffs in a region where they are otherwise sparse can produce unusually close clusterings of pairs", and suggest that is the case at Rankin Inlet.

Nesting densities and distances between nests have not been reported for Labrador and Quebec.

Court et al. (1988a) documented the use of alternative nest sites by peregrines through colour banding adults. The distance between cliffs used by the same pair in different years ranged from 550 m to 2025 m (n = 8). Calef and Heard (1979) found 3 alternative nest sites averaged 2.4 km from previously used sites. This was closer than the minimum distance observed between simultaneously occupied sites. Obst (1988a) found 2 nest sites, both with nestlings, 400 m apart and facing each other across the river. In Ungava Bay, 6 of 12 territories had alternative sites on adjacent cliffs or across the river (Bird and Weaver 1988).

Bird (1990) reported that suspected alternative nest sites have been used simultaneously during years of high peregrine densities. This situation has also been documented in Scotland in an expanding peregrine population (Newton and Mearns 1988), and in Rankin Inlet (Court et al. 1988b).

Recent studies in the N.W.T. have indicated that size, location, and density of territories may vary annually in response to factors such as the availability of prey (Bromley 1988).

GENERAL BIOLOGY

Food Habits

Obst (1988a, 1989) identified over 500 prey items of peregrines along the Horton, Anderson, and Hornaday Rivers, N.W.T. Peregrines on the Hornaday River relied very heavily on small passerines (47% of total prey individuals, 9% of biomass) and shorebirds (32% of individuals, 26% of biomass). Prey remains for peregrines on the Anderson River contained more waterfowl (8% of individuals, 35% of biomass), larger passerines such as robins and thrushes (31% of individuals, 8% of biomass), and shorebirds (49% of individuals, 22% of biomass). These prey reflect subarctic woodlands and are less typical of tundra peregrines (Obst 1989). In both areas, ptarmigan, gulls and terns were found more occasionally. Mammals occurred in prey remains to a much lesser extent. Obst (1988a, 1989) found that peregrines in these areas took surprising numbers of nestlings of many species, including shorebirds.

Peregrines in Rankin Inlet prey on at least 19 species of birds, although the bulk of their diet in most years consisted of 4 local passerines and ptarmigan (Court et al. 1988a). They also preyed on 3 species of mammals, especially lemmings during peak years. Bradley (1988) concluded that the microtines are an important prey item for the Rankin Inlet peregrines as they constituted as much as one third of the total biomass of prey even in years of low microtine abundance. Rodents appear to be a significant source of food for the Rankin Inlet peregrines during the period after the falcons arrive on the breeding grounds and before the arrival of most migratory bird prey (Bradley 1988).

Ornithologists in Central and South American countries state that migratory shorebirds constitute the principal prey of the peregrine on its wintering grounds (Fyfe et al. 1990).

LIMITING FACTORS

Pesticide Contamination

Martin (1978) thoroughly reviews the factors limiting peregrine populations, including the history of, and evidence for, pesticide-related population declines.

The bans on the use of DDT throughout North America allowed the recovery of many peregrine populations over the last decade (Peakall and Kiff 1988). Peakall et al. (1990) found a distinct decrease in residue levels of DDE in all North American subspecies of peregrines since the 1970s. Other research throughout North America supports these findings (Ambrose et al. 1988, Court et al. 1990, Henny et al. 1982, Noble and Elliott 1990). Peakall et al. (1990) concluded that the apparent stability of tundra peregrine populations in the 1980s could be correlated with the decreased levels of contamination. Court et al. (1990) also suggested that the food habits of some tundra peregrine populations (asynchronous arrival of falcons and migratory prey on breeding grounds; a relatively low proportion of contaminated prey in the diet before laying) helped prevent the accumulation of critical levels of organochlorines, and therefore allowed them to maintain a high level of reproductive success, even though the falcons winter in polluted areas.

Although positive trends are indicated, the danger of organochlorine contamination cannot be considered a thing of the past. Organochlorine contaminants are still found in the body tissues and eggs of peregrines in Canada years after most of the parent compounds were banned (Court et al. 1990, Noble and Elliott 1990, Peakall et al. 1990). Pesticide-related failures in reproduction continue to occur in tundra peregrine populations at a rate of about 10% (Court et al. 1990).

Many countries in Central and South America continue to use organochlorine pesticides now banned in Canada and the United States. Information on the extent of their use is difficult to obtain (Fyfe et al. 1990). Blood samples taken from peregrines during fall and spring migrations in Virginia and Texas showed that most of the falcons' pesticide burden was accumulated on wintering grounds in Latin America (Henny et al. 1982). Young birds accumulated levels of DDE as high as those in adult birds after one winter in the south (Court et al. 1990, Henny et al. 1982).

Samples of peregrine prey species from Peru and Ecuador contained pesticide residue levels suggesting continued adverse effects on the reproductive success of peregrines wintering in those countries. Contamination levels were not significant in Suriname and Costa Rica (Fyfe et al. 1990). Band returns indicate that tundra peregrines winter in South America more than Central America; consequently they may be exposed to higher levels of contamination.

Pesticide levels were determined for 11 migratory prey species sampled in Rankin Inlet (Court et al. 1990). All except snow buntings contained measurable levels of organochlorines, and most contained PCBs. Shorebirds and waterfowl carried elevated levels of organochlorines. Rock Ptarmigan and 3 of the 4 species of passerines had insignificant levels. Water Pipits had the highest levels, high enough to potentially affect the breeding success of peregrines that prey on them.

Court et al. (1990) found substantial levels of DDE, PCB's and other contaminants in the plasma of adult peregrines in Rankin Inlet. The birds did not accumulate residues continuously, but varied in the level of contamination from year to year. The mean level of DDE in the blood of adult females was significantly lower in summer than in spring, indicating that the birds may shed their burden of DDE during breeding season.

Court et al. (1990) also demonstrated that some pairs (10%) of nesting peregrines failed each year as a direct result of egg breakages associated with DDE contamination. The average shell thickness for eggs from 62 clutches of 26 pairs was only 1% above the critical level for successful reproduction.

It is not known how critical these factors are to the long-term survival of populations, or whether the trend toward declining levels of contamination is likely to continue, or be reversed as peregrines continue to be exposed to foreign sources of organochlorines as well as other pollutants in North America.

Natural Limiting Factors

Nest sites and food are the main resources that naturally limit breeding populations (Newton 1988, Newton and Mearns 1988). Nest sites are generally abundant in areas where tundra peregrines breed. Bradley (1988) reported that at Rankin Inlet nest sites were not limiting, as there were many unused ledges and stick nests apparently suitable for nesting. However, there often seemed to be a shortage of nesting territories, with some individuals excluded from breeding. Sizes of territories, determined by territorial behaviour of falcons in early spring, apparently limit the number of pairs that breed in a given year. The degree of territoriality was ultimately influenced by the food supply, particularly during pre-laying (Bradley 1988, Court 1986, Poole and Bromley 1988).

During years of abundant food, for instance high numbers of microtines, peregrines may require smaller territories, be less aggressive, and allow extra pairs to nest between regular territories (Ratcliffe 1980 in Shank et al. in prep.; Bradley 1988, Court 1986). This may explain the occasional simultaneous use of alternative sites, discussed earlier, observed by several researchers.

Newton (1988) suggests that territorial behaviour is the proximate mechanism through which breeding densities are adjusted to local food supply, with pairs spacing themselves more widely in districts where prey are scarce. This also seems to apply to years in which prey are scarce. The availability of prey in early spring, before the arrival of migratory prey, seems to be a limiting factor influencing numbers of breeders as well as reproductive success (Bradley 1988, Poole and Bromley 1988, Shank et al. in prep.).

Severe weather during pre-laying, incubation, or early nestling stages can result in delayed onset of breeding, decreased clutch size, and mortality of eggs and chicks. Evidence suggests that year to year variations in reproductive performance of peregrines at Rankin Inlet and Ungava Bay are associated with severe weather during critical periods of breeding (D. Bird pers. comm., Bradley 1988, Court 1986). In Scotland, poor breeding years for peregrines were usually associated with cold or wet springs (Newton and Mearns 1988). Severe weather can decrease the availability of prey at critical times and also have direct effects on the survival of eggs and young nestlings. Tundra nesting peregrines in particular are vulnerable to weather, which varies greatly from year to year and can be severe even into the summer months. There is nothing known about habitat conditions and trend on the wintering grounds and whether this affects tundra peregrine populations.

Human Activity

Illegal taking of tundra peregrine eggs and nestlings and shooting or capture of breeding birds are not considered to be significant problems (D. Bird, J. Brazil, D. Mossop, C. Shank pers. comm.). Most breeding habitat of tundra peregrines is remote enough to be secure from disturbance by humans. However, increasing human activity may have impacts on nesting peregrines in local situations. D. Bird (pers. comm.) reported that increasing human activity on the Koksoak River, Ungava Bay, may be having an impact on the nesting behaviour of 3 peregrine pairs on the river. The peregrines appear to be using sites as far from the town of Kuujjuak as possible, and nesting more closely together. Low level military flights are a concern in Labrador. Throughout the tundra peregrines range, adventure tourism is burgeoning creating potential for very serious levels of nest site disturbance.

During migration and on the wintering grounds, peregrines come into closer contact with humans than during the breeding period. Little is known about disturbance or loss to shooting during the months of September to May.

Martin (1978) discusses the varied effects of human disturbance on peregrines.

EVALUATION

Substantial amounts of new data have been gathered on tundra Peregrine Falcons since Martin's 1978 report. The number of occupied sites known has increased significantly throughout the breeding range of the tundra Peregrine Falcon. Previously undocumented nest sites continue to be found as previously unexplored areas are surveyed.

Intensive research in several areas of the N.W.T., annual surveys by management agencies, 5-year North American Peregrine surveys, and migration statistics all indicate that tundra Peregrine Falcon numbers are healthy and stable, except in the Yukon. Reproductive success varies from year to year in several populations, but overall productivity appears normal. The variation in density and reproductive success apparent in several tundra-nesting peregrine populations may be an adaptation to the variable weather and prey densities characteristic of northern habitats.

However, tundra peregrines and their prey are still accumulating substantial levels of organochlorine pesticides and PCB's, primarily on their wintering grounds. Data at Rankin Inlet also indicate a degree of eggshell thinning just short of the critical level, with some nesting pairs failing each year due to egg breakages.

Much remains unknown about the effects of pesticides and other pollutants on peregrines--e.g., the effects of combinations of pollutants, and the chronic, multi-generational impacts on peregrine populations--and the timing and pattern of population declines in relation to pesticide accumulation in individual birds.

Neither do we know if, when, or how much the use of organochlorine pesticides is likely to decrease on the peregrine's wintering grounds. It is perhaps these "unknowns" that constitute the greatest threat to tundra Peregrine Falcons.

The differentiation of tundra and anatum Peregrine Falcons is an issue because of the still precarious position of North American Peregrine Falcons, and the need to continually monitor and protect them, as well as manage populations that have not yet recovered. The population dynamics of anatum peregrines, especially in southern Canada, differ from those of tundra peregrines. If tundra populations are considered stable enough to be downlisted, while anatum peregrines remain endangered, biologists will need to decide how to manage those populations that are not clearly assignable to a subspecies.

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PROPOSED STATUS

Based on a large amount of new information, the proposed status for the tundra Peregrine Falcon is Vulnerable. This is a downlisting from the current status of Threatened. This proposal should include peregrines nesting in Labrador and Ungava Bay. Although their subspecies status remains uncertain, their habitat and population dynamics reflect those of other tundra-nesting peregrines more than those of anatum Peregrines nesting further south.

There is no evidence to suggest that the tundra Peregrine Falcon is likely to become endangered in Canada. However, concern remains for the Yukon population which has been extirpated but is now showing signs of reestablishment and recovery. This population has never represented a large proportion of the subspecies' numbers (<20 pairs out of thousands) but may represent a unique expression of the type.

Tundra peregrines throughout the range are still at risk because of the continued use of organochlorine pesticides on their wintering grounds. If use of those compounds is stopped, if it can be demonstrated that tundra peregrines and their prey no longer accumulate measurable levels of pesticide residues, if intensively studied populations remain stable, and if their wintering habitat can be shown to be secure, consideration could be given to delisting the tundra peregrine.

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Figure 1. The approximate breeding range of tundra peregrine falcons in Canada.

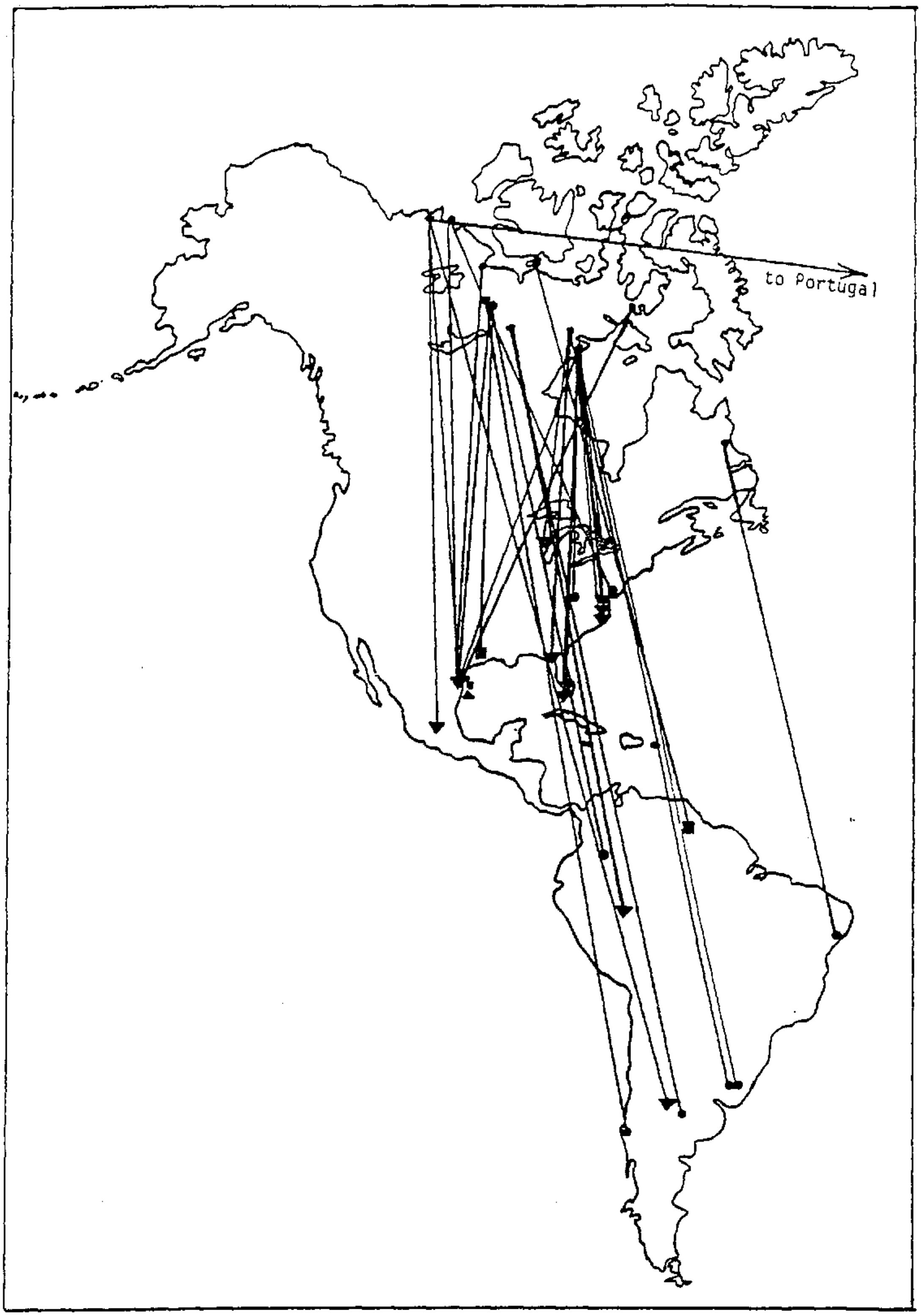

Figure 2. Approximate location of banding and recovery of tundra perergrine falcons. Data current to 1988. Symbols for recovery indicate season of recovery. ● = winter, ▲= spring, ■= summer, ▼ = fall. All data from Canadian Wildlife Service Bird Banding Office.

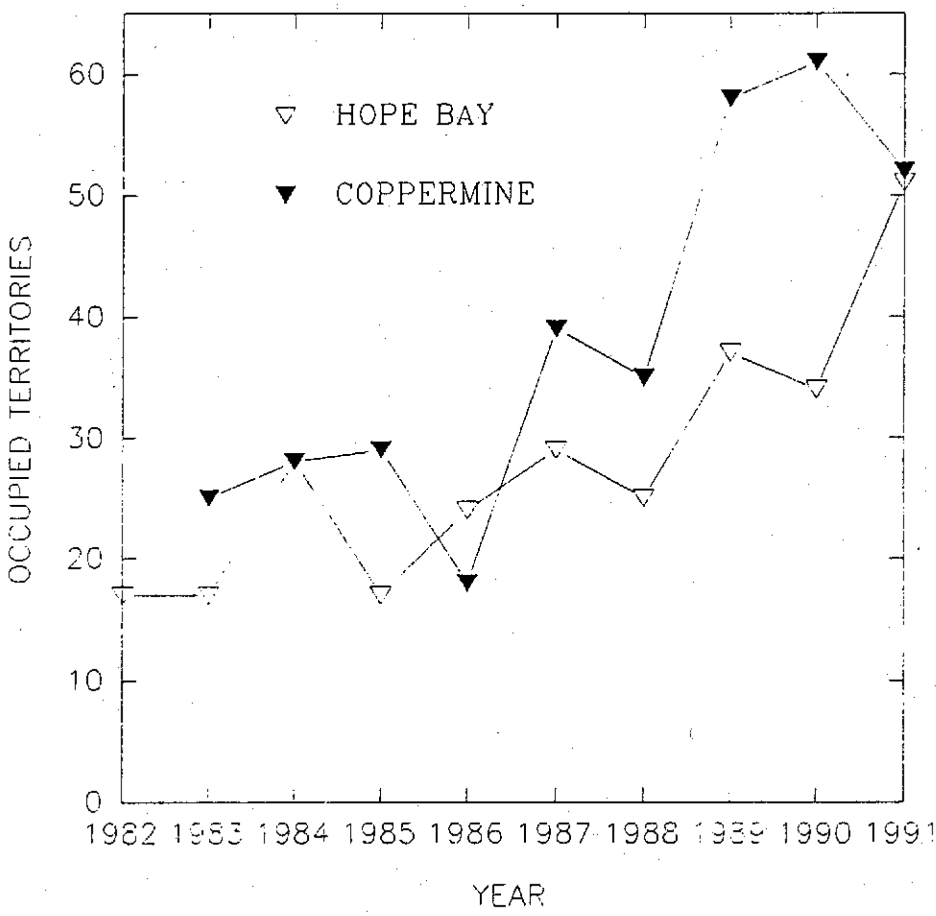

Figure 3. Number of occupied peregrine falcon nests at two central Arctic study sites; Hope Bay and Coppermine.