The status of Alaska's large shorebirds: a review and an example

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Western Alaska supports five breeding species of large sandpipers (*Numenius* and *Limosa*). Three of these, Hudsonian Godwits *L. haemastica*, Marbled Godwits *L. fedoa* and Whimbrels *N. phaeopus*, winter in the Western Hemisphere. Breeding distributions and breeding biology of these forms are poorly known, and details on their staging grounds, migration routes and wintering grounds are fragmentary. A population of Whimbrels in western Alaska exhibited low breeding density, site fidelity and fledging success in 1988–1990. Reproduction was particularly poor in 1990. Hypotheses to explain the reproductive failure cannot be evaluated, nor can the geographical scale of the decline be ascertained from existing data. The decline at this one site may not be symptomatic of a more general trend. These uncertainties highlight the low priority given to the study of large sandpipers.

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La region oeste de Alaska aloja 5 especies reproductoras de aves playeras grandes (*Numenius* y *Limosa*). Tres de estas: la limosa ornamentada *L. haemastica*, la limosa canela *L. fedoa* y el zarapito cabezirrayado *N. phaeopus* pasan el invierno en al hemisferio occidental. Se conoce poco respecto a las distribuciones y la biologia de la reproduccion de estas formas y se tienen conocimientos parciales respecto a los torrenos de estancia, rutas de migracion y terranos de invernacion. Una poblacion de zarapitos cabezirrayados en Alaska occidental exhibio una densidad reproductora baja, fidelidad al sitio y exito en la crianza en al periodo 1988–1990. La reproduccion fue particularmente baja en 1990. A partir de los datos existentes no se pueden evaluar las hipotesis para explicar al fracaso reproductivo, ni tampoco se puede calcular la escala geografica del descenso. El descenso demografico en este sitio puede no ser sintomatico de una tendencia mas general. Estas incertidumbres indican el bajo nivel de prioridad otorgado al estudio de las aves playeras grandes.

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On trouve dans la partie occidentale de l'Alaska cinq espèces de barges et de courlis nicheurs (des genres *Numenius* et *Limosa*), dont trois, la Barge hudsonienne *Limosa haemastica*, la Barge marbrée *L. fedoa* et le Courlis corlieu *Numenius phaeopus*, hivernent dans l'hémisphère occidental. Les aires de nidification et la biologie de la reproduction de ces formes sont mal connues et les données sur les aires de repos et d'hivernage et les voies migratoires sont fragmentaires. Une population de Courlis corlieu de la partie occidentale de l'Alaska examinée entre 1988 et 1990 présentait une faible densité de reproduction, une fidélité au site et un succès d'envol. La reproduction a été particulièrement faible en 1990. On ne peut évaluer les hypothèses visant à expliquer l'échec de la reproduction ni l'ampleur spatiale du déclin à partir des données existantes. Le déclin observé à cet endroit n'est pas nécessairement le signe d'une tendance plus générale. Ces incertitudes révèlent la faible priorité accordée à l'étude des courlis et des barges.

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Introduction

Five species of large shorebirds nest in western Alaska: Whimbrel *Numenius phaeopus*, Bristle-thighed Curlew *N. tahitiensis*, Hudsonian Godwit *Limosa haemastica*, Bar-tailed Godwit *L. lapponica* and Marbled Godwit *L. fedoa* (Gabrielson & Lincoln 1959; Kessel & Gibson 1978; Gibson & Kessel 1989; Kessel 1989). Our knowledge of the habitats, migration routes and geographical areas used by these species in Alaska during their annual cycle is extremely fragmentary compared with that for smaller shorebird species in Alaska (Holmes 1966, 1971; Senner 1979).

Hudsonian Godwits, Marbled Godwits and Whimbrels breed in Alaska and winter in the Western Hemisphere (American Ornithologists' Union 1983), but we lack basic information on their life histories, distributions and population dynamics. With few exceptions (*e.g.* Hagar 1966; Skeel 1983), the same can be said of most populations breeding in Canada. In this paper, I review knowledge of the Alaskan populations of these species through the year and describe a recent reproductive failure in a local Alaskan Whimbrel population. Large shorebirds in the Western Hemisphere should receive much more attention than they currently do from shorebird biologists and wildlife managers.

The status of Alaska's large shorebirds

Hudsonian Godwits

Hudsonian Godwits breed around Cook Inlet in south-central Alaska (Williamson & Smith 1964) and probably in western Alaska (Kessel & Gibson 1978; Kessel 1989; B. McCaffery, unpubl. data). The maximum spring count at Alaskan staging areas is 204 birds. Recent (1992) sightings of up to a thousand post-breeding birds at a single site on Cook Inlet (G. Balogh, pers. commun.) suggest an Alaskan population in the low thousands.

Breeding birds arrive in Alaska nearly a month earlier than breeding birds at Churchill, suggesting a different migration route (Kessel & Gibson 1978) and perhaps a discrete wintering area. The large population on Chiloe Island off Chile's west coast (Morrison & Ross 1989) may include Alaskan breeders, but this is speculation.

Marbled Godwit

The race *L. fedoa beringiae* apparently nests only on the Alaska Peninsula (Gibson & Kessel 1989), along 30–40 km of coastal tundra between Ugashik Bay and Cinder River and perhaps 60 km west to Port Heiden. Its breeding biology has not been studied, and the breeding population size, evidently very small, is unknown.

In winter, a few Marbled Godwits are found on the coast of Washington and Oregon, but most members of this race occur on the coast of California north of San Francisco Bay (Gibson & Kessel 1989). Between 5,000 and 10,000 Marbled Godwits overwinter within the range known for this form (LeBaron 1991), but many may be of other races.

Whimbrel

In Alaska, the broad outlines of the Whimbrel's breeding range and the major fall staging areas are fairly well known (Gabrielson & Lincoln 1959; Handel & Dau 1988). The fall population may exceed 10,000, but there are no data linking specific breeding populations with particular staging areas.

Wintering Whimbrels on the Pacific coast of Latin America may include Alaskan birds, but this has not been confirmed. The small numbers of this race wintering in New Zealand (Pratt, Bruner & Berrett 1987) might also originate in Alaska.

Case study: a Whimbrel population decline

Study site and methods

During a study of Bristle-thighed Curlews, data on breeding Whimbrels were collected in 1987–1991 on the Yukon Delta National Wildlife Refuge, Alaska. The habitat mosaic included dwarf shrub meadows on flat or gently sloping mesic terrain, dwarf shrub mat along ridgelines and steep xeric slopes and shrub thickets on steep moist slopes and drainages (Kessel 1979). Whimbrels occupied both dwarf shrub habitats, which were characterized by an abundance of berry-producing shrubs. Over-wintered berry densities reached 200,000/ha in late spring, and crowberries *Empetrum nigrum* alone accounted for 80% of this total (B. McCaffery, unpubl. data).

Data on nesting phenology, nest density, clutch size and reproductive success were collected near the Archuelinguk River (62°16'N, 162°30'W) on 26 May – 13 July 1987. In 1988–1990, similar data were collected at Curlew Lake (62°22'N, 163°30'W) from early May to mid-July for Whimbrels, as well as for Pacific Golden-Plovers *Pluvialis fulva*, Bristle-thighed Curlews and Long-tailed Jaegers *Stercorarius longicaudus*. In 1991, breeding densities for these four species were determined during 5–30 May.

In 1988, four adult Whimbrels and eight adult Bristle-thighed Curlews were captured and colour-banded to assess breeding site fidelity in subsequent seasons. In 1989 and 1990, faeces deposited by foraging *Numenius* were collected when defecation was observed; *Numenius* faeces not assignable to species were ignored. Each sample was analysed for the presence of invertebrate fragments, fruit parts and *E. nigrum* seeds and was classified as consisting primarily (>50%) of either invertebrate fragments or fruit remains (excluding seeds). Although some studies have determined the percentage of several categories in faecal remains to the nearest 10% (*e.g.* Herrera & Jordano 1981), I was not confident in my ability to achieve this level of resolution. Chi-squared contingency tables using SPSSPC+ (SPSS 1988) were used to assess interspecific and interannual differences in faecal contents. The alpha level for tests of significance was 0.05.

Results

Nesting density, site fidelity and reproductive success

In 1988–1991, the mean number of Whimbrel breeding pairs in a 5-km^2 area was 5 (Table 1). Bristle-thighed Curlews occurred at slightly higher mean densities (Table 2). Six of eight Bristle-thighed Curlews banded in 1988 returned as

Table 1. Whimbrel productivity in 5-km^2 Curlew Lake study area, 1988–1991.

	1988	1989	1990	1990[a]	1991
Nests	8	6	2	5	4
Nests hatched[b]	6	4	2	3	–[c]
Eggs	26	22	6	18	–[c]
Eggs hatched	19	14	6	7	–[c]

[a] Totals from expanded 9-km^2 area.
[b] Hatched nest = ≥1 egg hatched.
[c] Data not collected.

Table 2. Number of breeding pairs of Pacific Golden-Plovers, Bristle-thighed Curlews and Long-tailed Jaegers in Curlew Lake study area, 1988–1991[a].

Species	1988	1989	1990	1991	Mean
Pacific Golden-Plover	7	8	4	5	6.0
Bristle-thighed Curlew	6	5	6	6	5.8
Long-tailed Jaeger	4	5	3	6	4.5

[a] The area searched for Bristle-thighed Curlews was 7.5 km^2. Approximately 9.0 km^2 were searched for Pacific Golden-Plovers and Long-tailed Jaegers.

breeders in 1990, whereas none of four Whimbrels did.

Approximately two-thirds of Whimbrel nests reached the hatching stage (68% observed, 66% calculated; Mayfield 1975), and 61% of the eggs hatched. However, no more than 3 of 24 nests fledged young, and I confirmed fledging (1 young) in only one instance.

The 1990 reproductive failure

Pairs were seen within 2 days of the first aerial displays by territorial males in all years, and the first nests were initiated 9, 12 and 14 days following the birds' arrival in 1988, 1989 and 1990, respectively. Mean initiation dates were 12, 15 and 20 days after arrival, respectively. Thus, nest initiation was later in 1990, although snow-melt and plant leaf-out in 1990 were comparable to those in 1988 and earlier than those in 1989.

Only two nests were initiated in the study area in 1990 (Table 1). Both had only three eggs, whereas all other complete clutches (n = 17) had four eggs. A search of an additional 4 km^2 adjacent to the main study area in 1990 located three more nests.

The percentage of eggs hatching averaged 69% in 1988 and 1989 but fell to 39% in 1990 (Table 1). All eggs hatched in both three-egg clutches in 1990, but two of the four-egg clutches in the supplementary area were depredated. At the third nest with four eggs, only one egg hatched. Of the other three eggs, one was soft and unpigmented, and the adults attempted to remove it from the nest. Another egg disappeared, and the third was found, cracked and empty, outside of the nest.

Faecal analysis

Seven and 21 Whimbrel faeces were collected in 1989 and 1990, respectively. Four of the 1990 samples were collected earlier than any in 1989; these were excluded from the analysis. Sixty-five and 37 Bristle-thighed Curlew faeces were analysed in the two years, respectively. Overall, 100% of Whimbrel faeces included fruit parts, and 82% included invertebrate remains. For Bristle-thighed Curlews, 97% contained fruit parts, and 60% had invertebrate remains.

The relative contribution of these dietary components varied between the two years for both species. The proportions of Whimbrel and Bristle-thighed Curlew faeces composed primarily of invertebrate remains declined significantly in 1990 ($\chi^2 = 8.80$ and 6.095, p = 0.003 and 0.0136, respectively). Similarly, the proportions of faeces containing crowberry seeds increased significantly in 1990 for both Whimbrel ($\chi^2 = 11.31$, p = 0.0008) and Bristle-thighed Curlews ($\chi^2 = 3.94$, p = 0.0470). The data suggested that Whimbrels selected invertebrates more often and berries less often than did Bristle-thighed Curlews.

Significantly fewer Whimbrel faeces were dominated by berries in 1989 ($\chi^2 = 22.38$, $p < 0.0001$), and more included invertebrates in 1990 ($\chi^2 = 4.62$, p = 0.0315).

Breeding status of co-occurring species

Like Whimbrels, the breeding densities of Pacific Golden-Plovers and Long-tailed Jaegers reached their four-year low in 1990 (Table 2), and mean clutch size for Long-tailed Jaegers fell from 1.8 in 1988 (n = 4) and 1.6 in 1989 (n = 5) to 1.0 in 1990 (n = 3). Among the four breeding charadriiforms at Curlew Lake, only Bristle-thighed Curlews did not exhibit lower numbers in 1990 (Table 2).

Discussion

The breeding density of Whimbrels at Curlew Lake was an order of magnitude lower than in 'good' habitat at Churchill, Manitoba (11 pairs/km^2) and only 20–25% of nesting densities in 'poor' habitat there (Skeel 1983). Breeding densities in Shetland were even higher, up to 21 pairs/km^2 (Grant 1991). At Curlew Lake, Whimbrel breeding site fidelity was markedly lower than that for Bristle-thighed Curlews, as well as lower than that for Whimbrels in both Manitoba (Skeel 1983) and Shetland (Grant 1991). Whimbrel nest success at Curlew Lake was intermediate between that for Whimbrels in good and poor habitat, respectively, at Churchill (Skeel 1983) and not significantly different from either.

Egg hatching success at Curlew Lake was similar to that determined in Shetland (Grant 1991), but fewer than 13% of breeding pairs fledged young. Even if all potentially successful pairs fledged the maximum number of young, fledging success of the Curlew Lake study population was no more than half that of Whimbrels in Shetland (Grant 1991).

Whimbrel reproduction in 1990 stood out as particularly poor. Nesting was delayed, nesting density was lower, clutches of fewer than four eggs were detected for the first time and the percentage of eggs hatching declined. Why did the reproductive failure occur in 1990? Factors operating on or away from the breeding grounds, or both, could have been responsible.

Factors on the breeding grounds

Evans & Pienkowski (1984) suggested weather and predation as the most important factors limiting shorebird productivity. However, at Curlew Lake, weather was decidedly mild in 1990. Relative to other years, predation pressure was also low. The 1990 breeding season was the only year in which Common Ravens *Corvus corax* did not nest near the study area, where adult ravens with dependent young had been the most serious predator of *Numenius* eggs and young (B. McCaffery, unpubl. data).

Whimbrels may have fared poorly in 1990 owing to a decline in the availability of invertebrate prey. Both Whimbrels and Bristle-thighed Curlews appeared to consume fewer arthropods in 1990. This was not a response to an increase in alternative foods (*i.e.* berries), as overwintered fruit abundance did not increase between 1989 and 1990 (B. McCaffery, unpubl. data).

Pacific Golden-Plovers and Long-tailed Jaegers are primarily insectivorous at Curlew Lake, and both also declined in 1990. Only Bristle-thighed Curlews did not decline in 1990, perhaps owing to their greater reliance on berries.

Neither the availability of invertebrate prey nor those foraging behaviours correlated with variation in food abundance (*e.g.* Hutto 1990) were quantified, and the sample sizes of faeces were very small. Thus, although the pieces of the puzzle are consistent with the food limitation hypothesis, the analytical rigour required for confident inference is clearly lacking.

Factors away from the breeding grounds

The soft, unpigmented egg and the cracked empty egg were the only evidence implicating chemical contamination, the source of which must be away from the breeding grounds, as Curlew Lake is both a designated and a *de facto* wilderness. If factors outside of Alaska are responsible, declines at wintering sites may be detected. However, we do not know where these Alaskan birds winter.

There are very few long-term trend data for any wintering Whimbrel populations. The International Shorebird Survey (ISS) detected a statistically significant decline in Whimbrels along the Atlantic coast between 1972 and 1983 (Howe, Geissler & Harrington 1989). However, that survey sampled migrants, presumably from different breeding areas and possibly destined for different wintering areas, which precludes the detection of population trends at any geographic scale below the flyway. In addition, the ISS Whimbrel sample size was small, leading the authors to question the biological significance of the decline (Howe, Geissler & Harrington 1989).

Christmas Bird Count data provide some information on the Whimbrels that winter in North America, but these are only a small fraction of the total, as most Whimbrels winter in Middle and South America (American Ornithologists' Union 1983; Morrison & Ross 1989).

Conclusions

Although the size and productivity of the breeding Whimbrel population at Curlew Lake declined between 1988 and 1990, the data gathered there preclude conclusions regarding causation. It is impossible to assess the relative significance of the local decline at Curlew Lake, which might be merely a local phenomenon rather than revealing a wider trend.

This example illustrates how little we know about our large shorebird populations. North American species of the genera *Numenius* and *Limosa* should receive more attention than at present from both shorebird biologists and wildlife managers. Increased banding and monitoring of large shorebirds at sites with concentrations in Alaska will be helpful for determining the migration routes and wintering distributions of birds that breed or stage in Alaska. Potential sites for monitoring include Humboldt Bay and the Eel River mouth in California for Marbled Godwits, the Bay of Panama for Whimbrels and Chiloe Island in Chile for both Whimbrels and Hudsonian Godwits.

We also need better information on the breeding distribution and breeding biology of all three species in Alaska. Additional surveys and the accumulation of natural history information are imperative but scarcely adequate for managing these (or any other) wildlife populations responsibly (Nichols 1991). We need to move beyond descriptive studies and begin testing hypotheses to explain the behaviour, ecology and population dynamics of large shorebirds. Such rigour will challenge biologists' ability to design studies and especially to obtain adequate sample sizes, because these species occur at relatively low densities. These studies will require a level of funding previously unavailable to most shorebird researchers.

Finally, an assessment of critical sites for possible inclusion in the Western Hemisphere Shorebird Reserve Network is required. Few designated reserves support, or were designated because of, large numbers of *Numenius* and *Limosa*.

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