Alaska and its importance to Western Hemisphere shorebirds

Robert E. Gill, Jr. & Stanley E. Senner

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Thirty-seven species of shorebirds breed in Alaska, and six overwinter in its subarctic regions. The coastal habitats of Alaska provide critical staging areas during spring and fall migrations; 51 sites qualify within the three categories of shorebird reserves listed by the Western Hemisphere Shorebird Reserve Network (Hemispheric, International and Regional). Studies on Alaskan shorebirds span 50 years, although the largest number of field studies have been undertaken over the past 20-year period.

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En Alaska se reproducen treinta y siete especies de aves costeras, seis de las cuales pasan el invierno en esas regiones subárticas. Los hábitats costeros de Alaska son zonas cruciales para las escalas durante las migraciones de primavera y otoño; 51 sitios están comprendidos en las tres categorías de reservas de aves costeras incluidas en la lista de la Red de Reservas de Aves Costeras del Hemisferio Occidental (hemisféricas, internacionales y regionales). Los estudios de las aves costeras en Alaska se remontan a 50 años, aunque la mayoría de los estudios sobre el terreno se han llevado a cabo en los últimos 20 años.

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Trente-sept espèces d'oiseaux de rivage se reproduisent en Alaska et six hivernent dans ses régions subarctiques. Les habitats côtiers de l'Alaska constituent des aires de repos vitales durant les migrations printanières et automnales; 51 sites appartiennent à l'une des trois catégories (hémisphérique, internationale et régionale) du Réseau de réserves pour les oiseaux de rivage dans l'hémisphère occidental. Les études sur les oiseaux de rivage de l'Alaska couvrent 50 ans, quoique la plupart des études de terrain portent sur les deux dernières décennies.

Robert E. Gill, Jr., Alaska Fish and Wildlife Research Center, National Biological Survey, 1011 E. Tudor Rd, Anchorage, Alaska 99503, USA.
Stanley E. Senner, International Council for the Protection of Birds — United States Section, PO Box 101193, Anchorage, Alaska 99501, USA. (Present address: National Audubon Society, 4150 Darley, Suite 5, Boulder, Colorado 80303, USA.)

Introduction

In 1977, when the last major symposium on Western Hemisphere shorebirds was held, Frank Pitelka solicited from researchers a broad synthesis of information about coastal habitats in Alaska and their importance to shorebirds (Pitelka 1979). Unfortunately, none was forthcoming; at that time, there were too few data, and the information available was of limited geographic coverage. In the ensuing 15 years, a considerable body of information has been gathered on shorebirds and their ecology. Here we present an overview of the work that has been done in Alaska. Although our focus on shorebirds within a single state may seem somewhat provincial, Alaska is a distinct feature of the hemisphere in terms of prominent land-forms and land-cover. Alaska not only serves as the terminus of several major migratory bird flyways but also supports a unique shorebird fauna that has evolved within the region. One of our primary goals in this paper is to acquaint our colleagues in Central and South America with the importance of Alaska to shorebirds during the austral winter. We also hope to promote international co-operative research leading to more effective conservation and management of shorebirds and their habitats throughout the Western Hemisphere.

The region and physical setting

By most standards, Alaska is a huge region. Its borders span 20 degrees of latitude and 57 degrees of longitude, distances comparable to those between the Canadian and Mexican borders and the Pacific and Atlantic coasts of the United States. Alaska's area is equal to that of Peru and Ecuador combined (Figure 1). The coast of Alaska is unusually convoluted and encompasses about 55,000 km of shoreline, a distance equal to about 40% of the coast of the entire conterminous United States and exceeding that of the coastline of South America (Hall 1988). In this region, more so than at most temperate and tropical latitudes, tides greatly influence the extent and quality of habitats available to shorebirds. Tidal amplitudes range

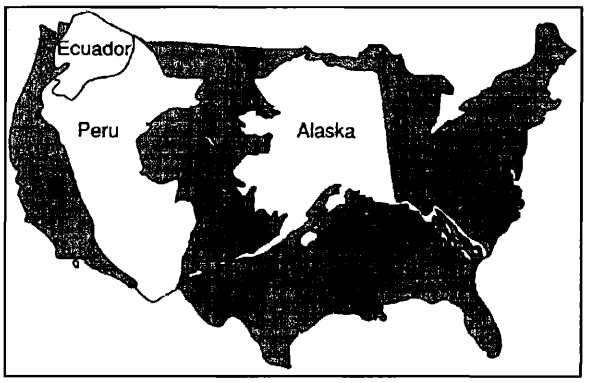

Figure 1. Alaska's area compared with those of the conterminous United States and Ecuador and Peru.

from less than 0.3 m along the Beaufort Sea coast to almost 9.0 m in portions of south-central Alaska. The mean tidal range among 55 sites within Alaska that have been identified as being important to shorebirds (see below) is 3.0 ± 2.2 m (SD). Consequently, Alaska has more vegetated and unvegetated littoral habitat than the rest of the United States and Mexico combined (Hall 1988).

The shorebirds in Alaska

About 80 species of shorebirds (Charadrii) regularly breed in the Western Hemisphere, of which about two-thirds are migratory (Pitelka 1979; Hayman, Marchant & Prater 1986; Sibley & Monroe 1990). Among the migratory species, 47 (89%) occur in Alaska, and 37 of these, plus three additional races, regularly breed there (Page & Gill 1994). Information available on population size and distribution for 17 of these taxa allowed us to estimate the relative proportions of the global and Western Hemisphere breeding populations that occur in Alaska (Table 1). Alaska hosts almost the entire breeding population of three species (*Numenius tahitiensis, Arenaria melanocephala* and *Calidris mauri*) and four subspecies (*C. alpina pacifica, C. ptilocnemis ptilocnemis, C. p. couesi* and *Limnodromus griseus caurinus*). Probably 75% of the world population of *Aphriza virgata* and *C. ptilocnemis tschuktschorum* and 100% of the Western Hemisphere populations of *Pluvialis fulva, Limosa lapponica baueri* and *C. canutus roselaari* also breed in Alaska (Table 1). Alaska is important to yet a third group, albeit one for which we have little or no information. For these taxa (*Haematopus bachmani, Heteroscelus incanus, N. phaeopus hudsonicus* and *L. haemastica*), Alaska may support as much as half of their respective Western Hemisphere populations (Table 1).

Where do Alaska's breeding shorebirds disperse during the boreal winter? Pitelka (1979), Boland (1991) and, more recently, Page & Gill (1994) have summarized the wintering distributions of shorebirds in various regions of the Western Hemisphere. A summary of the non-breeding distributions of shorebirds that breed in Alaska is shown in Table 2. Only seven species regularly spend the boreal winter in Alaska, all within ice-free subarctic regions. These include *H. bachmani, A. melanocephala, A. virgata, C. alba, C. ptilocnemis, C. alpina* and *Gallinago gallinago.* Six species winter primarily in temperate North America, 13 have ranges that include portions of both North and South America, 10 winter in South America, 3 winter in Oceania and Asia and 5 have populations that winter in Oceania, in Asia and throughout the Americas (Table 2).

Important sites for shorebirds in Alaska

Alaska is important to shorebirds of the Western Hemisphere not only for its extensive breeding grounds but also for its provision of critical staging areas during spring and fall migrations. One measure of the importance of Alaskan coastal habitats is the number of sites within the region that qualify for inclusion in the Western Hemisphere Shorebird Reserve Network (WHSRN) (Figure 2). To date, only one site in Alaska, the Copper River Delta, has been formally dedicated within the WHSRN system. A second site, the central Yukon–Kuskokwim River Delta, has formally been nominated as a WHSRN site. Both sites qualify as Hemispheric reserves (Senner, West & Norton 1981; Senner & Howe 1984; Gill & Handel 1990).

Based on preliminary data (R. Gill & L. Tibbitts, unpubl. data), we have identified an additional 4 sites in Alaska as Hemispheric reserves, 4 sites as either Hemispheric or International reserves, 8 sites as International reserves and 33 sites as Regional reserves (Figure 2). Proposed Hemispheric reserves include the southern Yukon–Kuskokwim River Delta and Montague Island in Prince William Sound. Most Bering Sea islands qualify as either Hemispheric or International reserves based on the percentage of populations of *C. ptilocnemis* breeding there (Figure 2). The preponderance of sites in western and south-western Alaska is strongly correlated with the greater tidal ranges and larger expanses of littoral habitat, specifically the invertebrate-rich mud- and sand-flats in these areas that are used by migrant shorebirds. Major breeding areas along the coast, and perhaps in the poorly studied interior of Alaska, may also qualify for inclusion within the WHSRN. For example, the well-defined Arctic Coastal Plain provides critical nesting habitat for several Arctic-nesting species, and discrete breeding areas on the Seward Peninsula and Norton Sound (Figure 2) have been identified for *N. tahitiensis* (Gill, Lanctot & Handel 1991) and *L. fedoa* (Gibson & Kessel 1989).

Table 1. Alaska's contribution to global and Western Hemisphere populations of selected shorebird species. Note that the information required to make the following estimates was available for only 14 of 37 nesting species.

Species	% of breeding population[a]		Source
	Global	Western Hemisphere	
Haematopus bachmani	60	60	1,2,3
Pluvialis fulva	?	100	1,2,4
Heteroscelus incanus	50	50	1,6
Numenius tahitiensis	100	100	2,7
N. phaeopus hudsonicus	50	50	1,5,6
Limosa haemastica	30–50	30–50	1,5,6
L. lapponica baueri	20–40	100	3,8,9
Arenaria melanocephala	100	100	1,10
Aphriza virgata	75	75	1,2,11,12
Calidris mauri	95	100	1,13
C. ptilocnemis ptilocnemis	100	100	1,9,14
C. p. couesi	100	100	1,9,14
C. p. tschuktschorum	75	100	1,9,14
Calidris alpina pacifica	100	100	1,13,14
Tryngites subruficollis	20–50	20–50	1,6,15
Limnodromus griseus caurinus	100	100	1,14

[a] These represent best estimates based on known distributions and applicable studies: 1 = American Ornithologists' Union (1957); 2 = Campbell *et al.* (1990); 3 = Page & Gill (1994); 4 = Connors (1983), Connors, McCaffery & Maron (1993); 5 = Morrison & Ross (1989); 6 = Hayman, Marchant & Prater (1986); 7 = Gill, Lanctot & Handel (1991); 8 = Lane (1987); 9 = R. Gill (unpubl. data); 10 = Handel & Gill (1992a); 11 = Norton *et al.* (1990); 12 = P. Martin (unpubl. data); 13 = Senner, West & Norton (1981); 14 = Gabrielson & Lincoln (1959); 15 = Lanctot & Slater (1992, unpubl. data).

We stress that the data supporting designations of WHSRN sites in Alaska are quite varied in quality and quantity. We anticipate that designations of some sites may shift up or down with better information. Some sites have not been looked at since the 1970s, others only from the air and yet others during periods of less than optimal use by shorebirds. For example, upper Kachemak Bay, in south-central Alaska, certainly qualifies as an international site based on the large numbers of *C. mauri* that occasionally stop there in spring (Senner, West & Norton 1981). Upon further study, this site may prove to be of hemispheric importance.

Studies past and present

Although published information on Alaskan shorebirds dates to the late 1700s, most of the earlier reports focused on occurrence and distribution, primarily as part of comprehensive faunal studies of various regions of the state (see Gabrielson & Lincoln 1959 for review). Given the size of the state, the length of its coastline and its comparative paucity of roads, such studies will likely continue to reap great benefits well into the next century. Studies directed specifically at shorebirds in Alaska, however, did not really begin until the middle of this century and have occurred in three distinct phases (Figure 3). Some of the earliest studies, such as those by William Conover in the early 1940s, involved examination of museum specimens to resolve questions on the taxonomy of Alaskan shorebirds (*i.e. P. dominica, Tringa solitaria, A. interpres, C. canutus, C. alpina, C. ptilocnemis* and *Limnodromus* spp.). Field research did not begin until the 1950s, when Frank Pitelka and his students began what proved to be a 30-year investigation of the reproductive and social biology of species nesting on the North Slope and Yukon–Kuskokwim River Delta. Other major field studies of shorebirds in this early phase occurred at only six sites in the state (Figure 3). These addressed various aspects of distribution, habitat use, migration ecology and behaviour (see Handel *et al.* 1981 for a review of studies in Alaska prior to 1980).

Spurred by the advent of modern mineral exploration in Alaska in the 1960s and an increasing level of environmental awareness, studies of shorebirds entered their most productive era (Figure 3). From 1976 to the mid-1980s, a host of shorebird studies was initiated in Alaska. The great majority occurred along coastal areas in response to impending widespread exploration for oil and natural gas on the continental shelf. Most of these studies were designed to assess the seasonal dependence of shorebirds and other marine avifauna on coastal habitats. A few studies examined in more detail the breeding and migration ecology of particular species.

The past decade has seen yet a third phase of shorebird studies in Alaska (Figure 3). This period is characterized by studies at fewer locations but generally of longer duration, such as those of Troy (1992, this volume) and Moitoret & Walker (1993). Recent studies have focused on monitoring communities of shorebirds in regions of ongoing or

Table 2. Principal 'wintering' regions of shorebird species breeding in Alaska.

Species	Wintering region[a]				
	North America	Bicontinental	South America	Asia–Oceania	Asia–Oceania/ Bicontinental
Haematopus bachmani	x[b]				
Pluvialis squatarola		x			
P. dominica			x		
P. fulva					x
Charadrius semipalmatus		x			
C. vociferus		x			
Tringa melanoleuca		x			
T. flavipes		x			
T. solitaria			x		
Heteroscelus incanus					x
Actitus macularia		x			
Bartramia longicauda			x		
Numenius tahitiensis				x	
N. phaeopus hudsonicus					x
Limosa lapponica				x	
L. fedoa	x				
Arenaria interpres					x
A. melanocephala	x[b]				
Aphriza virgata		x[b]			
Calidris canutus		x			
C. alba					x[b]
C. pusilla		x			
C. mauri		x			
C. minutilla		x			
C. fuscicollis			x		
C. bairdii			x		
C. melanotos			x		
C. ptilocnemis	x[b]				
C. alpina pacifica	x[b]				
C. a. sakhalina				x	
C. himantopus			x		
Tryngites subruficollis			x		
Limnodromus scolopaceus	x				
L. griseus caurinus		x			
Gallinago gallinago		x[b]			
Phalaropus lobatus			x		
P. fulicaria			x		

[a] Modified from Pitelka (1979), Boland (1991) and Page & Gill (in press).
[b] Species with populations that regularly spend the boreal winter in Alaska.

planned development, such as the North Slope, or on species of particular concern, such as *N. tahitiensis*. Throughout all earlier phases of shorebird research in Alaska, studies in the interior region or in upland habitats of the state have been virtually absent. This trend finally appears to be changing. Within the past five years, long-term projects were initiated on *P. fulva* and *P. dominica* (Connors, McCaffery & Maron 1993; Johnson *et al.* 1993; S. Gunther, unpubl. data), *N. tahitiensis* and *N. phaeopus* (Gill, Lanctot & Handel 1991; McCaffery, this volume) and *Tryngites subruficollis* (Lanctot & Slater 1992, unpubl. data). With greater emphasis on species that migrate to the Neotropics, our knowledge of shorebirds breeding in non-coastal areas of Alaska should increase substantially.

Information known and research needs

Since the 1977 symposium in Monterey, California, a wealth of new information has been gathered about shorebirds in Alaska. As expected, much of this information pertains to the seasonal use of habitats by species while in Alaska, especially during the non-breeding period, when birds are particularly dependent on coastal areas (*e.g.* Shields & Peyton 1979; Gill & Handel 1981; Lehnhausen & Quinlan 1981; Senner, West & Norton 1981; Woodby & Divoky 1983; Gill, Handel & Connors 1985; Andres 1989; Gill & Handel 1990; Norton *et al.* 1990; Johnson, Wiggins & Wainwright 1992; M. Bishop & C. Iverson, unpubl. data). Other studies

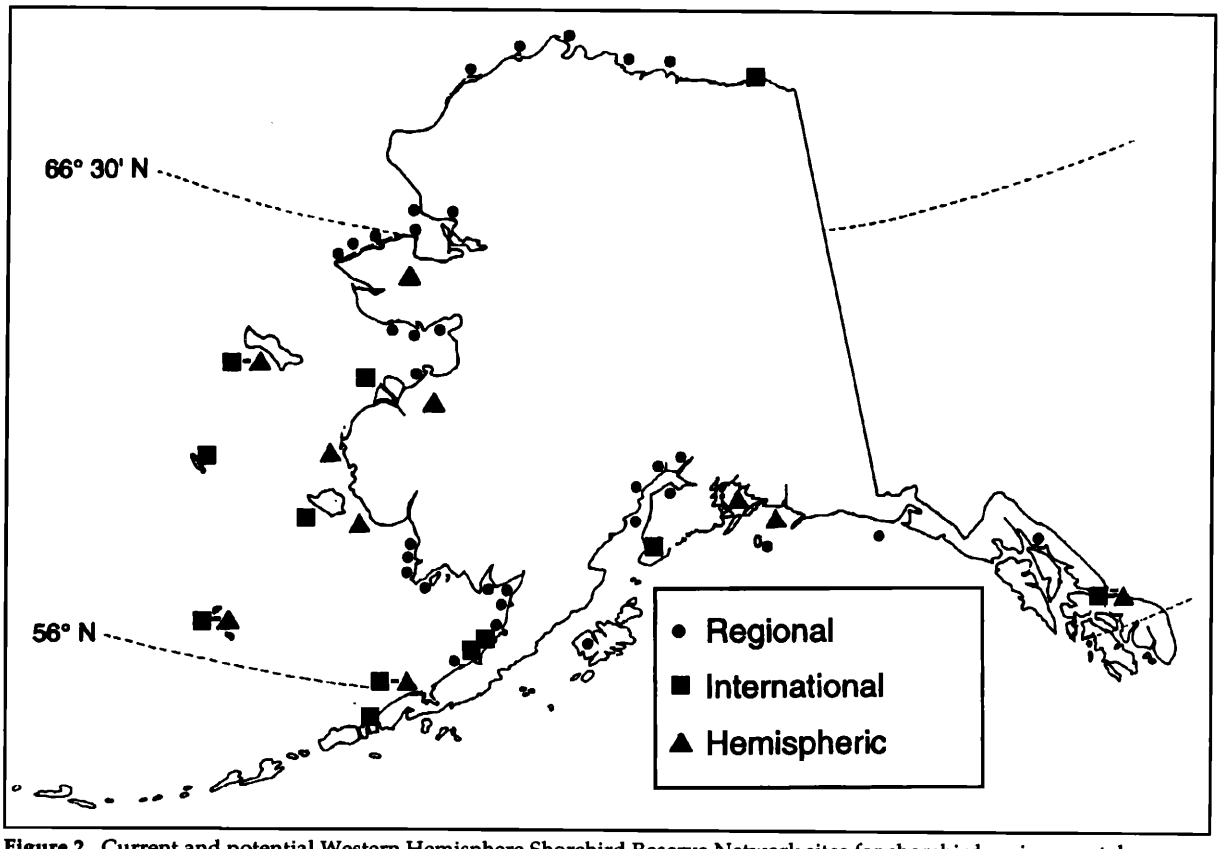

Figure 2. Current and potential Western Hemisphere Shorebird Reserve Network sites for shorebirds using coastal habitats in Alaska (R. Gill & L. Tibbitts, unpubl. data).

have focused on the status and size of populations (Handel & Gill 1992a; Gill & Redmond 1992; Troy 1992, this volume), and some have clarified or raised questions about taxonomic problems (Connors 1983; Tomkovich 1986; Gibson & Kessel 1989; Browning 1991; Piersma & Davidson 1992; Connors, McCaffery & Maron 1993). Yet other studies have addressed specific aspects of breeding ecology (Ashkenazie & Safriel 1979; Smith 1980; Handel 1982; Schamel & Tracy 1987; Gill, Lanctot & Handel 1991; McCaffery & Gill 1992; Johnson *et al.* 1993), foraging ecology (Senner, Norton & West 1989) and migration ecology (Senner, West & Norton 1981; Senner & Martinez 1982; Handel & Dau 1988; Johnson & Herter 1990; Handel & Gill 1992b).

While the foregoing represents an impressive body of knowledge, much information is still required for conservation and management initiatives, especially those in the international arena. Data on population sizes, geographical ranges during various phases of the annual cycle and locations of staging and stop-over sites are indispensable in these efforts. However, greater emphasis needs to be placed on linking discrete breeding, staging and wintering areas at the population and subpopulation levels.

For instance, we have good information on discrete non-breeding areas for only 6 of 37 species of shorebirds that nest in Alaska (Table 3). For four other species, we suspect certain linkages exist between particular breeding and non-breeding areas. For the remaining 27 species, however, we know little more about distributional patterns than what appears in field guides. We cannot hope to understand the factors influencing population levels of different shorebird species or begin to monitor their numbers and trends without basic information on the existence of subpopulations and related migrational patterns. We especially need this type of information for species that nest across the Nearctic and spend the boreal winter in the Southern Hemisphere.

Specific issues for co-operative study

Based on the current state of knowledge of shorebirds and their ecology in Alaska, we here suggest several projects that may benefit from co-operative studies among researchers in Alaska, Canada and the Southern Hemisphere. Various methods may be used, but analysis of genetic material in comparison with results of large-scale colour-marking programmes appears best suited to resolving most issues.

(1) Determine if *L. haemastica* using the Chiloe region belongs to the population breeding in Alaska, as suggested by Morrison & Ross (1989).

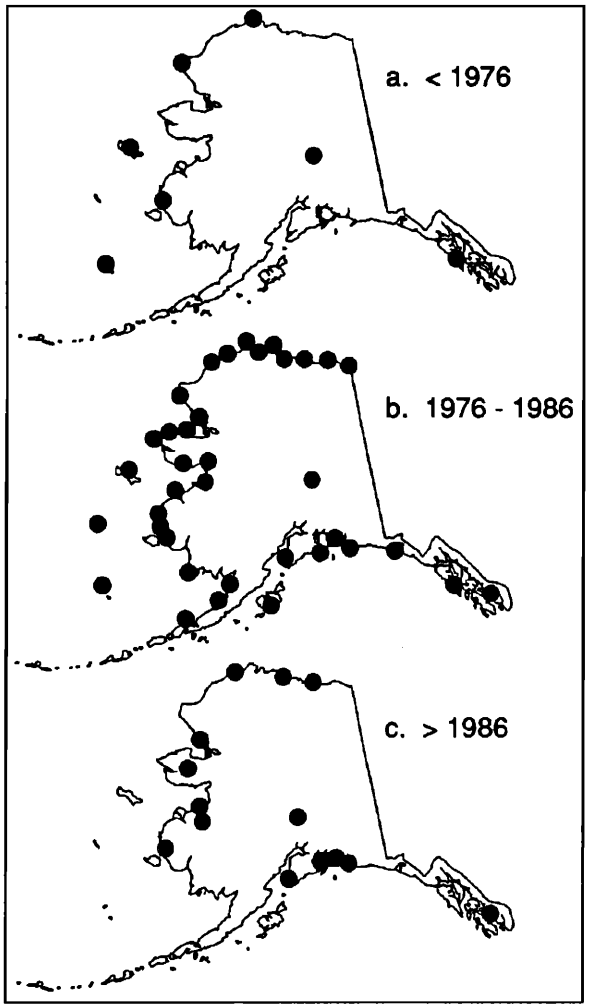

Figure 3. Sites in Alaska at which shorebirds were the principal or a major focus of study.

Recent studies in Alaska have shown that numbers of this species can be captured and marked on post-breeding staging areas.

(2) In conjunction with ongoing studies of *T. subruficollis* in Alaska, in which populations are being monitored and birds are being marked, initiate similar studies in the Canadian Arctic and develop monitoring programmes on the non-breeding grounds in South America.

(3) Assess the existence of discrete populations of *A. virgata*. Recent studies in Alaska have identified areas where the majority of the population stages during early May.

(4) Determine the subspecific status and non-breeding season distribution of *C. canutus* breeding and staging in Alaska. Recent studies have linked Alaska and Wrangel Island breeding populations (Tomkovich, *in* Piersma & Davidson 1992), but their wintering distribution remains unclear.

Table 3. Status of knowledge of discrete non-breeding areas of Alaska-produced shorebirds.

Generally known	Suspected	Unknown
Calidris alpina	*Limosa lapponica*	27 species
Calidris ptilocnemis	*Numenius tahitiensis*	
Calidris mauri	*Arenaria interpres*	
Limosa fedoa	*Calidris pusilla*	
Arenaria melanocephala		
Pluvialis fulva		

Biologists studying non-game species (and shorebirds in particular) have had a history of coping with limited funds and personnel. Because many of the problems we face are now global in scope, no one person or group can do justice to them. We hope that from the Quito conference we will establish some long-lasting, international partnerships so that we can identify and solve our resource problems together.

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