

Winter distributions of North American plovers in the Laguna Madre regions of Tamaulipas, Mexico and Texas, USA

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To determine the distribution and abundance of wintering plovers in the Laguna Madre of Texas and Tamaulipas, surveys were conducted in December 1997 and February 1998, along a 160 km stretch of barrier islands in Mexico and ~ 40 km of shoreline on South Padre Island, Texas. Altogether, 5,673 individuals, representing six plover species, were recorded during the surveys. Black-bellied Plovers *Pluvialis squatarola* were the most numerous (3,013 individuals), representing 53% of the total number of plovers observed. Numbers of Piping *Charadrius melodus*, Snowy *C. alexandrinus*, Semipalmated *C. semipalmatus*, and Wilson's Plovers *C. wilsonia* were 739, 1,345, 561, and 13 birds, respectively. Most individuals (97%) of all species except Wilson's Plovers were observed on bayside flats of the barrier islands. Similar numbers of Piping Plovers were recorded at South Padre Island, Texas, and in the Laguna Madre de Tamaulipas. Over 85% of the individuals of each of the other species were found in the more extensively surveyed Mexico portion of Laguna Madre. In Tamaulipas, most plover species were observed more often on algal flats than any other substrate. These results provide evidence of the value of these systems as wintering areas for plover species and indicate the need for more extensive survey efforts to determine temporal and spatial variation in the distribution of these species within the Laguna ecosystem.

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INTRODUCTION

In recent years, regional or rangewide declines have been reported for populations of North American plovers (Family: Charadriidae; Page *et al.* 1995, Brown *et al.* 2000, Sanzenbacher & Haig 2000). Habitat conservation efforts for shorebirds have focused principally on migratory (stopover) areas and, to a lesser extent, breeding areas (Brown *et al.* 2000), largely neglecting the importance of wintering areas. Yet, wintering populations of many species, particularly in coastal regions, are threatened by habitat loss and degradation as well as exposure to environmental toxins (U.S. Fish and Wildlife Service 1988, 1996; Page *et al.* 1995)

Adjacent to the Gulf of Mexico, the Laguna Madre regions of Texas and Tamaulipas include vast expanses of sand, mud, and algal flats used by a variety of wintering waterbirds. However, the relative inaccessibility and expanse of this ecosystem has deterred extensive studies of avian populations within these areas. Morrison *et al.* (1993) conducted aerial surveys of shorebird populations along the Mexican Gulf and Caribbean coastlines in

January 1993, and found the highest regional concentrations of shorebirds in the northern portion of the Laguna Madre de Tamaulipas. Observers, however, were only able to categorize birds by size classes; thus the distribution and abundance of individual species in the region remained virtually unknown.

Large-scale surveys along the Gulf of Mexico have identified the lower Laguna Madre of Texas as a major wintering area for threatened/endangered Piping Plovers *Charadrius melodus* and suggested the Gulf coast of northern Mexico likely supported a large wintering population as well (Haig & Oring 1985, Haig & Plissner 1993, Eubanks 1994, Plissner & Haig 2000). In January, 1991 and 1996, under the direction of U.S. and Canadian Piping Plover recovery teams, extensive international censuses of Piping Plovers were conducted throughout the wintering range of the species. The results of these extensive surveys indicated that the wintering areas of a third of known breeders remained undetermined (Haig & Plissner 1993, Plissner & Haig 2000). While large numbers of Piping Plovers were recorded in south Texas,

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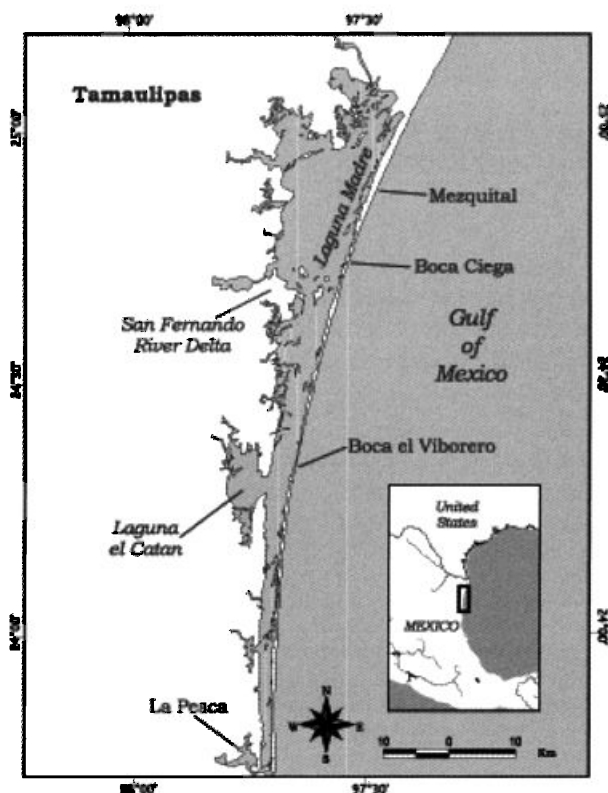


Figure 1. The Laguna Madre regions of Texas, USA, and Tamaulipas, Mexico. Survey areas included laguna shorelines of South Padre Island, Texas, and barrier islands from Mezquital to La Pesca, Tamaulipas.

survey efforts in Mexico were limited in scope, suggesting that many of the “missing” birds were likely to be present in the Laguna Madre region of Mexico.

Five additional plover species, Semipalmated Plovers *C. semipalmatus*, Snowy Plovers *C. alexandrinus*, Wilson’s Plovers *C. wilsonia*, Killdeer *C. vociferus*, and Black-bellied Plovers *Pluvialis squatarola*, also regularly winter in similar habitats in the region. Therefore, as a follow-up to the international Piping Plover censuses, our objectives were to determine the distribution, abundance, and habitat use of wintering plovers throughout the Laguna Madre, as an important first step toward ascertaining the importance of this region for wintering populations of these species.

METHODS

The Laguna Madre regions of southeastern Texas and northeastern Mexico are comprised of an expansive system of shallow, hypersaline lagoons and algal, mud, and sand flats, separated from the Gulf of Mexico to the east by a ~435 km stretch of narrow barrier islands. Channels (bocas) intermittently transect the islands, connecting the lagunas with the Gulf. These passes form naturally during major storm events or may be created and maintained by dredging operations for

navigational purposes, and may subsequently remain open for variable time periods. The Texas Laguna Madre consists of an upper and lower portion (~275 km total), bisected by a 30 km stretch of mostly dry land. The Rio Grande delta separates the Texas and Tamaulipas lagunas. Approximately 160 km of barrier islands form the eastern shore of the Mexican Laguna Madre, stretching between the villages of Mezquital (25°14’N, 97°27’W) and La Pesca (23°47’N, 97°46’W), Tamaulipas (Figure 1). Shorebird habitat of the Gulf shoreline and in the lagoon systems consists of algal, mud, and sand flats, washover flats, and beaches.

The study was conducted during two time periods in the winter of 1997–1998. From 9–12 December 1997, seven observers, using all-terrain vehicles (ATVs), recorded all plovers observed along ~83 km of the barrier islands of the Laguna Madre de Tamaulipas, Mexico, from Mezquital south to Boca el Viborero. From 16–21 February 1998, three observers used ATVs to survey ~77 km of barrier island habitat, from La Pesca north to Boca el Viborero. On 24 February 1998, four biologists used ATVs and a 4X4 truck to survey ~40 km of South Padre Island, Texas, south of the Port Mansfield shipping channel. Observers counted all Piping Plovers, Snowy Plovers, Semipalmated Plovers, Black-bellied Plovers, Wilson’s Plovers, and Killdeer observed during coverage of the Gulf coast beaches and laguna habitats of the barrier islands. In addition to counting individuals of all plover species, observers in Tamaulipas recorded habitat substrates and Global Positioning System (GPS) coordinates for Piping Plovers and Snowy Plovers.

RESULTS

Altogether, 5,673 individuals of six plover species were observed along 200 km of the barrier islands of the Laguna Madre regions of Tamaulipas and southern Texas (Table 1). Black-bellied Plovers represented 53% of the plovers observed throughout the region and were followed in relative abundance by Snowy Plovers (24%), Piping Plovers (13%), Semipalmated Plovers (10%), and Wilson’s Plovers and Killdeer (each <1%). In Tamaulipas, the majority of birds were observed during the first survey period, in the region between Mezquital and Boca el Viborero (Table 1).

Surveyors encountered most plovers as individuals or in small, loose flocks. Concentrations of birds were highest around bocas between barrier islands. Among individuals for which habitat type could be determined, 35% were observed on algal flats, 27% on sandflats, 26% mudflats, 5% on sandy beaches, and 6% on other habitats. Black-bellied Plovers were distributed across most types of substrates, ranging from inundated flats to high sand flats (Figure 2). Piping Plovers were found predominantly on algal flats, while Snowy Plovers were predomi-



Table 1. Number of plovers observed in the Laguna Madre regions of Tamaulipas, Mexico and Texas, USA, during December 1997 and February 1998. Densities (birds/km) are indicated in parentheses.

Species	North ¹	Tamaulipas South ²	Total	Texas South Padre Island ³	Grand Total
Piping Plover	348 (4.2)	17 (0.2)	365 (2.3)	374 (9.4)	739 (3.7)
Snowy Plover	774 (9.3)	417 (5.4)	1191 (7.4)	154 (3.9)	1345 (6.7)
Wilson's Plover	1 (<0.1)	10 (0.1)	11 (0.1)	2 (0.1)	13 (0.1)
Semipalmated Plover	433 (5.2)	109 (1.4)	542 (3.4)	19 (0.5)	561 (2.8)
Black-bellied Plover	1515 (18.3)	1074 (13.9)	2589 (16.2)	424 (10.6)	3013 (15.1)
Killdeer	0 (0)	2 (<0.1)	2 (<0.1)	0 (0)	2 (<0.1)
Total Plovers	3071 (37.0)	1629 (21.1)	4700 (29.4)	973 (24.3)	5673 (28.4)

¹ Survey between Mezquital south to Boca el Viborero, Tamaulipas (~83 km).

² Survey between La Pesca north to Boca el Viborero, Tamaulipas (~77 km).

³ Survey between Port Mansfield, Texas, south for ~ 40 km.

nantly associated with algal and mudflats. Only Wilson's Plovers utilized Gulf beaches nearly as frequently as habitat on the laguna side of the barrier islands.

DISCUSSION

Our results provide an initial indication of the relative importance of the Laguna Madre ecoregion for wintering plovers. Although large numbers of most species were observed, the significance of the region for populations of Semipalmated and Black-bellied Plovers is unclear because both species are abundant and winter throughout extensive geographic ranges. The total numbers of

Snowy Plovers recorded, however, represent approximately half the estimated Great Plains and western Gulf breeding populations (Page *et al.* 1995; L. Gorman and S. Haig, unpubl. data). Furthermore, the numbers of Piping Plovers observed in the Laguna Madre de Tamaulipas and on South Padre Island, Texas, together represent 12% (6% each) of the overall 1996 breeding population of the species (Plissner & Haig 2000). Extensive surveys of the lower Laguna Madre of Texas in 1991 and 1996 resulted in similar proportions of the breeding population wintering in the region (6.1% and 7.3%, respectively).

Although relative abundance of habitat types was not

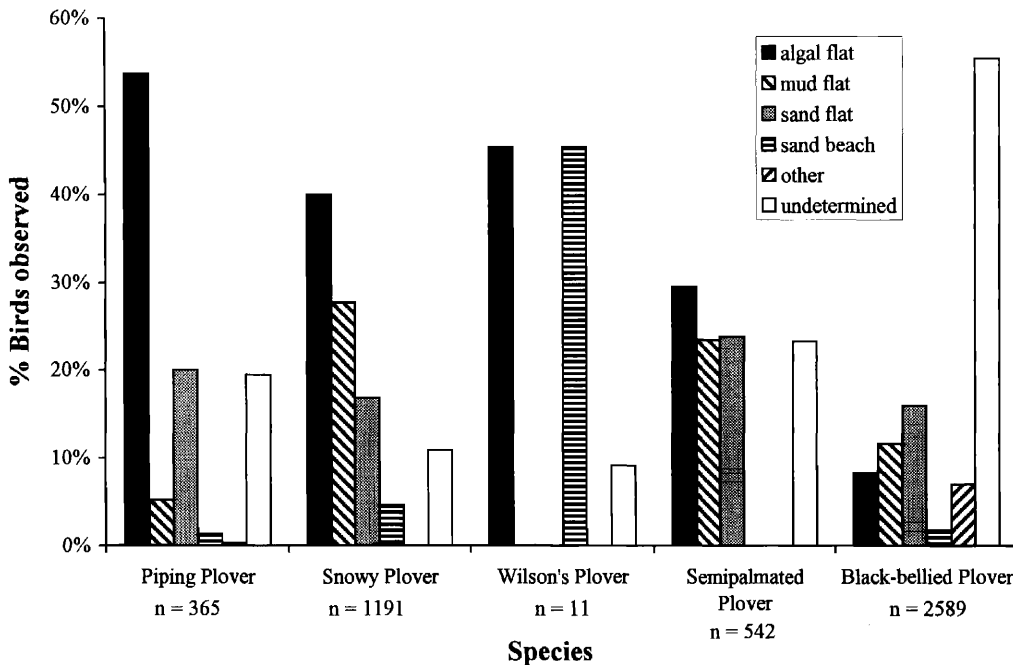


Figure 2. Distribution of plovers among habitat types of the eastern shoreline and barrier beaches of the Laguna Madre region of Tamaulipas, Mexico. Other habitats include water, shell, and aggregate substrates.

calculated during the study, most species, and particularly Piping Plovers, were largely associated with algal flats on the bayside of barrier islands. Drake (1999) reported similar patterns of habitat use for radio-tracked Piping Plovers in Texas. The difference in Piping Plover densities in the U.S. and Mexican portions of the Laguna Madre, therefore, may reflect the greater abundance of preferred habitat (algal flats) adjacent to South Padre Island, Texas (K. L. Drake and K. R. Drake, pers. comm., but see Eubanks 1994).

Within the laguna systems, flux in water distribution due to wind direction and speed (i.e. "wind tides") determines the amount of tidal flat habitat available for foraging shorebirds (Brush 1995, Zonick 2000) and may have accounted for the spatial patterns of species distributions that we observed. Zonick *et al.* (1998) and Drake (1999) noted that Piping Plovers in the Laguna Madre of Texas remained fairly sedentary throughout the winter period (1 December – 15 February), although individuals regularly travelled several kilometres (up to 20 km) to cross the Texas Laguna Madre and used mainland tidal flats when high tides inundated preferred barrier island flats (Zonick *et al.* 1998, Zonick 2000). In Tamaulipas, dramatic changes in habitat availability resulting from wind tides are most evident in the southernmost and shallowest portion of the laguna (E. Carrera, pers. comm.). A severe cold front with strong northerly winds passed through the region during the second half of the first survey period. This front may have induced some plovers to seek tidal flats on the Mexican mainland, resulting in a conservative population estimate.

During aerial surveys of the Gulf and Caribbean coasts of Mexico in January 1991, Morrison *et al.* (1993) observed highest concentrations of small shorebirds along the mainland shoreline of the northern Laguna Madre de Tamaulipas, an area not surveyed during our study, and along the southern portion of the laguna habitat covered during the second survey period. The 1991 surveys were hampered by windy conditions throughout the observation period, which likely resulted in conservative population estimates and may also explain the greater abundance of birds recorded in the southern and western portions of the laguna. More thorough surveys of the Laguna Madre, covering mainland and barrier island habitats, and other coastal systems to the south (e.g., lagunas in Veracruz, Mexico) are required to determine the distribution, abundance, habitat preferences and spatial and temporal distributions of plovers in this region.

Despite its acknowledged and presumed value for migratory and locally breeding waterbirds (Baldassarre *et*

al. 1989, Wilson & Ryan 1997), the Laguna Madre de Tamaulipas has been the focus of few conservation initiatives and has received little attention for designation of protected status. Morrison *et al.* (1993) suggested that the numbers of shorebirds observed during aerial surveys qualify the region as an International Site for the Western Hemisphere Shorebird Reserve Network, although the area has not received such designation. Results of this study further suggest that protection of habitat in these regions is clearly warranted for Piping Plover recovery efforts and for conservation of the Great Plains and western Gulf Coast populations of Snowy Plovers.

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