# INFLUENCE OF HUMAN ACTIVITY ON SHOREBIRD BEACH USE IN VENTURA COUNTY, CALIFORNIA

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## ABSTRACT

We studied the potential influence of human and dog activity on shorebird abundance at 13 sandy beaches in Ventura County, California. The 13 study beaches were randomly selected, and each beach was 1 km long. From June 1994 to May 1997, we counted all shorebirds, humans, and dogs at each beach once per month for a total of 36 counts. We found no significant relationship between instantaneous counts of either shorebirds and humans or dogs. However, there was a significant relationship among the 13 beaches between total shorebird and human use. The beaches with the greatest number of shorebirds (Ormond Beaches 1 through 3) were among those with the lowest number of humans. The results suggest that inaccessibility to humans may be an important aspect of shorebird habitat quality. Relatively undisturbed sandy beaches are quite rare in southern California, and the inaccessibility of the few remaining undisturbed beaches should be maintained.

**Keywords**: Human disturbance, California, shorebird, sandy beach.

## INTRODUCTION

From 1994 to 1997, we studied shorebird beach use along the coast of Ventura County in southern California (McCrary and Pierson, In prep.) Sandy beaches are an important aspect of Ventura County, making up 93% of the coastline (Smith et al. 1976). Sandy beaches in Ventura County are migratory and wintering areas for many shorebirds, such as willet (*Catoptrophorus semipalmatus*) and sanderling (*Calidris alba*), and some are used for nesting by the threatened western snowy plover (*Charadrius alexandrinus nivosus*). However, these beaches are also important to humans, and are subject to high levels of human use.

Shorebirds react to the presence of nearby humans in various ways. Depending on the proximity and type of human activity (walking, running, fishing, dog exercising), shorebirds may respond either by spending more time watching the potential human threat (Burger 1991, 1994; Burger and Gocheld 1991; Fitzpatrick and Bouchez 1998), by walking away from approaching humans (Fitzpatrick and Bouchez 1998), or by taking flight and moving to a nearby undisturbed section of beach (Smit and Visser 1993). Although these types of reactions have some effect on shorebirds, particularly a reduction in foraging time, a potentially more serious consequence of human and dog activity would be the abandonment of a valuable foraging area by some or all shorebirds. However, the potential for this type of reaction is less well studied than the others listed above. Although many other factors, such as prey availability, beach type, and time of year, can influence shorebird beach use, in this paper we examine the influence of human and dog activity on shorebird abundance.

## MATERIALS AND METHODS

We conducted counts of shorebirds, humans, and dogs at 13 beaches along the coast of Ventura County (Figure 1) from June 1994 to May 1997. Each of the 13 study beaches was 1 km in length and was selected at random from the 62-km Ventura County coastline. Most (93%) of the Ventura County coast, which runs northwest to southeast along the Santa Barbara Channel of southern California, consists of wave-swept, sandy intertidal beaches (Smith et al. 1976). Wetland habitats where shorebirds tend to concentrate are limited; the most extensive wetland in the county is on Point Mugu Naval Weapons Station, located along the central portion of the county coastline. Small amounts of shorebird foraging habitat are also located at the Santa Clara River mouth and the ponds associated with various sewage treatment plants.

Each month during this study, we counted all shorebirds, people, and dogs along the 13 beach segments. Counts at each beach were conducted by a single observer, who walked the 1-km length, recording shorebirds, humans, and dogs in a notebook or on a microcassette tape recorder; each count was completed within 15 to 30 min. Shorebirds were identified and counted using either 7 x 35 or 10 x 40 binoculars. Care was taken to avoid disturbing birds and double-counting. Although we did not record the specific activities of each person, we observed a range of activities typical of human beach use (walking, beach combing, jogging, dog

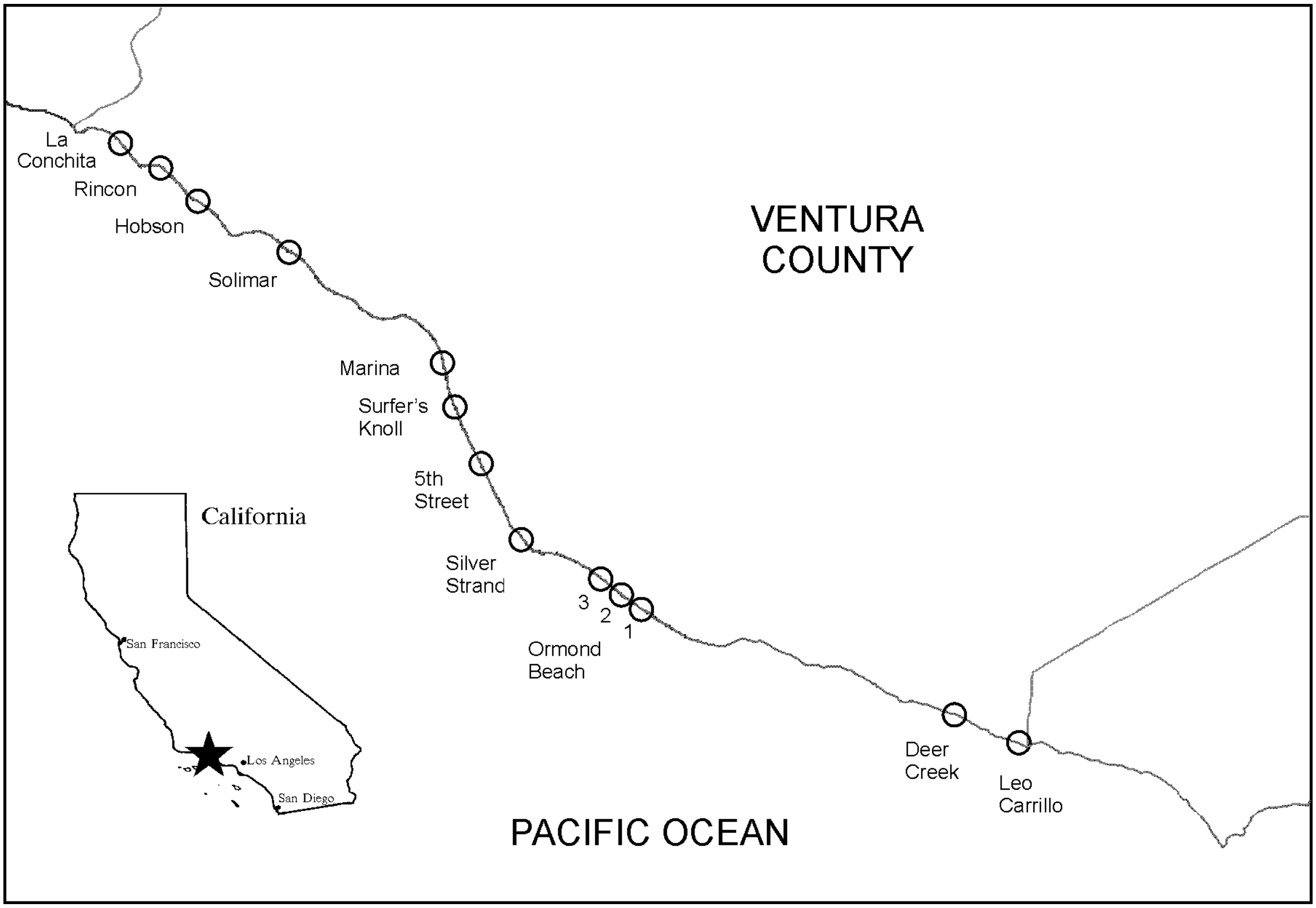


**Figure 1. Location of 13 sandy beaches in Ventura County, California where counts of shorebirds, humans, and dogs were conducted from 1994-1997.**

walking, fishing, surfing). These activities occurred at least occasionally on all the beaches in this study.

Although we surveyed each of the 13 beaches once per month, the actual number of days between surveys varied due to tides. Tides affect shorebird foraging habitat and behavior, especially in wetland habitats (Burger et al. 1977; Connors et al. 1981; Warnock and Takekawa 1995). To reduce or eliminate the influence of tides, we surveyed all sites during a rising tide from 0 to 0.75 m. On the outer coast, high tide may be best for censusing some shorebirds, such as sanderlings (Connors et al. 1981). However, some of the beach segments in this study may be submerged during high tide. Due to the nature of tides, the sites were surveyed at different times of day, but tide conditions are considered to be more important to shorebirds than time of day (S. Griffin, pers. comm.).

We performed all statistical analyses using SYSTAT 7.0 running on an IBM-compatible computer. We used Spearman's rank correlation test to examine relationships between shorebird abundance and human or dog abundance.

## RESULTS

During 36 months of study from June 1994 to May 1997, we recorded a total of 22,087 shorebirds from 23 species on 13 sandy beaches in Ventura County. The mean shorebird count (birds/km) during this period was 47.2 ±75.3 SD (n = 468, range = 0 to 603). Most notable among the 13 sandy beaches was the high level of variation in shorebird abundance from one beach to another; mean shorebird counts varied by an order of magnitude between beaches (Table 1, range of means = 11.2 to 126.9, n = 36).

The 13 beaches also experienced differing levels of human activity. During the same period of study, we recorded a total of 3,629 people and 528 dogs. The mean count was 7.8 ± 17.3 SD (n = 468, range = 0 to 220) for people (people/km) and 1.1 ± 1.9 SD (n = 468, range = 0 to 15) for dogs. Human and dog use also varied from beach to beach. As with shorebirds, mean human counts between beaches varied by an order of magnitude (Table 1, range of means = 1.1 to 25.3, n = 36). However, dogs varied much less from beach to beach (Table 1, range of means = 0.2 to 3.8, n = 36).

To examine the relationship between shorebird abundance and the presence of humans and dogs, we used three different approaches. In the first approach we made the assumption that, at any given time or place, the number of shorebirds on a beach is related to the number of humans and dogs on the same beach. That did not prove to be the case, however, and there was no significant relationship with either humans ($r_s = -0.07$, $P > 0.05$, $n = 468$) or dogs ($r_s = -0.08$, $n = 468$).

**Table 1. Mean counts of shorebirds, people and dogs at 13 sandy beaches in Ventura County, California.**

| | Shorebirds | | | People | | | Dogs | | |
|---|---|---|---|---|---|---|---|---|---|
| Site | Mean | SD | Range | Mean | SD | Range | Mean | SD | Range |
| La Conchita | 34.3 | 34.1 | 0-119 | 4.4 | 6.9 | 0-37 | 0.7 | 1.2 | 0-5 |
| Rincon | 19.1 | 28.4 | 0-137 | 11.4 | 24.1 | 0-120 | 0.8 | 1.3 | 0-5 |
| Hobson | 11.2 | 16.1 | 0-75 | 2.8 | 3.6 | 0-13 | 0.2 | 0.4 | 0-1 |
| Solimar | 12.0 | 11.2 | 0-39 | 9.6 | 15.7 | 0-80 | 1.2 | 1.4 | 0-5 |
| Marina | 22.3 | 30.4 | 0-174 | 25.3 | 37.8 | 0-220 | 3.8 | 2.9 | 0-13 |
| Surfer s Knoll | 37.3 | 54.9 | 0-283 | 8.4 | 7.4 | 0-32 | 1.4 | 1.7 | 0-5 |
| 5th Street | 29.3 | 31.4 | 0-134 | 8.8 | 7.8 | 0-40 | 1.3 | 1.3 | 0-5 |
| Silver Strand | 31.3 | 35.2 | 0-128 | 19.1 | 29.4 | 1-175 | 2.6 | 3.2 | 0-15 |
| Ormond 3 | 108.0 | 102.0 | 4-603 | 2.6 | 2.2 | 0-7 | 0.3 | 0.8 | 0-3 |
| Ormond 2 | 107.1 | 112.9 | 4-507 | 1.9 | 4.5 | 0-27 | 0.3 | 0.8 | 0-4 |
| Ormond 1 | 126.9 | 137.3 | 2-554 | 1.2 | 1.5 | 0-5 | 0.4 | 0.9 | 0-4 |
| Deer Creek | 36.7 | 62.0 | 0-324 | 1.1 | 1.8 | 0-6 | 0.4 | 0.9 | 0-3 |
| Leo Carrillo | 38.1 | 46.4 | 0-185 | 4.2 | 4.1 | 0-15 | 1.4 | 1.6 | 0-5 |

One problem with the above approach is the potential influence of differences between sites other than human or dog use, such as habitat (sand grain size, beach slope, wave height and period), prey availability (species richness, size, and abundance), and other disturbance factors (beach grooming). To remove the influence of these variables, we analyzed the data from each beach separately. The results of this analysis are shown in Table 2. In most cases the relationship between shorebirds and humans or dogs was not significant ($P > 0.05$); a significant ($P < 0.05$) correlation occurred in only five of the 26 comparisons. However, the interpretation of these five significant correlations is confounded by the fact that four of them are in an unexpected positive direction. At only one site, Leo Carrillo, was there a significant negative correlation, in this case, between shorebirds and dogs.

In the above two analytical approaches, we make the assumption that shorebird abundance at a specific instance in time is influenced by the presence of humans or dogs at the same time. However, the general level of human or dog use of a beach may be a more important factor to shorebird use than moment to moment variations. Using total counts for shorebirds, people, and dogs at each site as an index of the overall importance or use of each beach, a significant negative relationship (Figure 2) occurred between shorebirds and humans ($r_s = -0.626$, $P < 0.05$, $n = 13$). The relationship between shorebirds and dogs was not significant ($r_s = -0.212$, $P > 0.05$, $n = 13$).

**Table 2. Results of Spearman's rank correlation analysis of the relationship between shorebird, human, and dog abundance.**

| | People | | Dogs | |
|---|---|---|---|---|
| Site | r | P | r | P |
| La Conchita | 0.488 | ** | 0.421 | * |
| Rincon | 0.438 | ** | 0.025 | NS |
| Hobson Park | 0.083 | NS | 0.166 | NS |
| Solimar | 0.201 | NS | 0.189 | NS |
| Marina | 0.221 | NS | 0.464 | ** |
| Surfer's Knoll | -0.025 | NS | 0.214 | NS |
| 5th Street | -0.233 | NS | 0.127 | NS |
| Silver Strand | -0.145 | NS | -0.199 | NS |
| Ormond #3 | 0.231 | NS | 0.258 | NS |
| Ormond #2 | -0.075 | NS | -0.062 | NS |
| Ormond #1 | -0.133 | NS | -0.236 | NS |
| Deer Creek | 0.187 | NS | 0.074 | NS |
| Leo Carrillo | -0.026 | NS | -0.437 | ** |

NS = $P > 0.05$; * = $P < 0.05$; ** = $P < 0.01$.

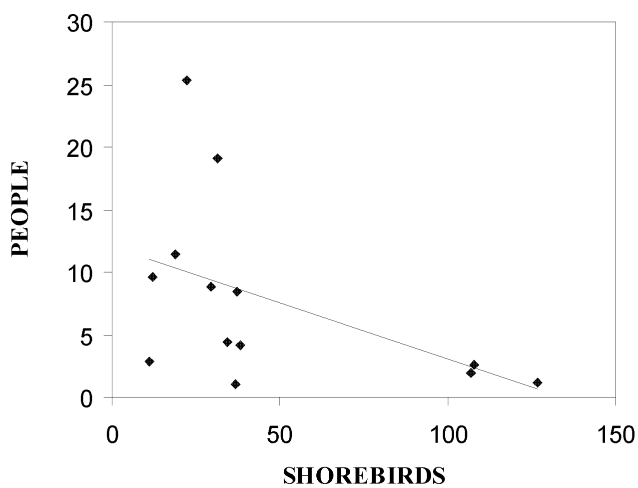


**Figure 2. Relationship between people and shorebird abundance at 13 sandy beaches in Ventura County, California based on total counts.**

## DISCUSSION

Based on our casual observations of shorebird reactions to humans and, especially, dogs on our 13 study beaches, we assumed that the number of shorebirds recorded on a beach during a specific count might be affected by the number of humans or dogs present at the same time. However, this did not prove to be the case, and we found no relationship between our individual counts of shorebirds and the number of humans or dogs present on the beach at the same time. Several problems exist with this approach, however. We conducted all counts only once per month, and almost all counts were conducted from Monday through Friday. Human and dog abundance may be much higher on weekends, however, and may be higher still on certain holidays (Memorial Day or Labor Day). The shorebird abundance we recorded on a beach on a Monday may have been more a reflection of human activity from the previous Saturday and Sunday. Alternately, the number of shorebirds occurring on the beach during one of our counts may have been influenced by the activity of humans or dogs just before we arrived. For example, on one occasion after we had completed a count, someone unleashed his dog, which then chased every shorebird off the beach. If we had arrived after the dog was gone, we may have seen far fewer birds.

In another approach, we used total abundance of shorebirds, humans, and dogs as indicators of the relative importance or use of each beach. Based on this approach, a significant negative relationship occurred between shorebirds and humans but not between shorebirds and dogs. We were surprised that there was not a stronger relationship between shorebirds and dogs because we saw dogs chasing shorebirds on many occasions. However, compared to the number of humans, relatively few dogs occurred on our 13 study beaches. The effect of dogs on shorebirds may be more apparent on beaches where dogs are more abundant.

In this study, three beaches, Ormond Beach 1 through 3 (Table 1), had consistently higher numbers of shorebirds (range of means = 107.1 to 126.9) than the other 10 beaches (range of means = 11.2 to 38.1). These three beaches were also among those with the lowest numbers of humans (range of means = 1.2 to 2.6 vs. 1.1 to 25.3). Based on the results of this study, one explanation for the high number of shorebirds at these three beaches is the consistently low level of human use. Shorebirds may accumulate at these three beaches as they are slowly pushed from surrounding beaches where there are higher levels of human activity. A similar trend was observed with shorebirds occupying rocky intertidal habitat at the Cabrillo National Monument in San Diego, California (Engle and Davis 1996). Based on the results of the Cabrillo National Monument study, the National Park Service eliminated human access to one of the areas studied to reduce disturbances to shorebirds (J. Engle pers. comm.). Limited access to humans may be an important aspect of habitat quality for shorebirds that use sandy beaches, and beaches with low levels of human use, such as the Ormond Beach area of Ventura County, may serve as important refuges. This is especially true if prey species are also abundant at these beaches. Relatively undisturbed sandy beaches are quite rare in southern California, and the inaccessibility of the few remaining undisturbed beaches should be maintained.

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