Western Snowy Plover Nest Site Selection and Oyster Shell Enhancement

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Western Snowy Plover nest with three eggs on crushed oyster shell at Hayward Regional Shoreline.

Abstract

The Western Snowy Plover (*Charadrius alexandrinus nivosus*) generally nests on bare ground or sparsely vegetated beaches and salt pans adjacent to tidal waters. The Pacific Coast population of Western Snowy Plovers is listed as a federally threatened species and as a California Species of Special Concern. Previous studies have suggested that Western Snowy Plovers may select nest sites based on the amount of oyster shell substrate, which provides camouflage for eggs and chicks and potentially protects them from blowing wind and sand. We measured the percentage of crushed oyster shells, shell dimensions, number of shells, and total shell surface area for 18 Western Snowy Plover nests that occurred at the Hayward California Least Tern Colony from 2008 to 2014. Using pairwise t-tests, we compared these measurements to those obtained from 18 randomly chosen non-nest sites. Results indicate that Western Snowy Plovers at this location select nest sites with a greater percentage of crushed oyster shell cover, more shells, and a greater total surface area of shells than random sites.

Recently hatched Western Snowy Plover chick on nest of sand and crushed oyster shell at the Hayward California Least Tern Colony.

Introduction

Since 2001, the East Bay Regional Park District has managed nesting habitat for the California Least Tern (*Sternula antillarum browni*) at the Hayward Regional Shoreline on the eastern shore of San Francisco Bay, California. As has happened elsewhere in coastal California, our efforts have resulted in the attraction of breeding Western Snowy Plovers to the site. The Pacific coast population of Western Snowy Plovers was federally listed as a threatened species in 1993 and is currently listed as a California Species of Special Concern. Western Snowy Plover numbers have decreased due to habitat loss, increased predation, and human disturbance. To investigate the effectiveness of crushed oyster shell addition as habitat enhancement for plovers, we used data from 18 Western Snowy Plover nest sites that occurred at the Hayward California Least Tern Colony from 2008-2014.

Study Area

The study site is Island Five (37.629739N Lat., 122.146039W Long.) within a brackish water marsh of the Hayward Regional Shoreline, located on the eastern shore of the San Francisco Bay, California. Island Five is 0.24 ha (0.6 ac) in size and is one of 15 islands created within a man-made marsh system.

Map of Island Five showing all 18 Western Snowy Plover nests from 2008 to 2014.

Methods

Western Snowy Plover nests were found by forming a search image and systematically walking through the colony during the breeding season (Type 1 in-colony survey). All 18 nests found from 2008 to 2014 were included in the data analysis. In a 1-meter square area surrounding each nest site, we recorded the following: substrate composition (percent crushed oyster shell vs. percent sand), number of oyster shells (with a surface area greater than 800 mm^2), and total surface area of oyster shells measured. We then took the same measurements from 18 randomly chosen non-nest sites that were within a 5-meter radius of the active nests. Pairwise t-tests were then performed comparing these two data sets to determine statistical significance.

Results

Comparing the Western Snowy Plover nest sites using pairwise t-tests to the randomly chosen sites, it was found that the plover nest locations were significant for the following factors: composition of the substrate (percent crushed oyster shell vs. percent sand), number of oyster shells, and total shell surface area. Nest sites exhibited a statistically significant difference in substrate composition compared to random sites (Pairwise t-tests, n=18 nests, $p < .05$), showing 72% crushed oyster shell and 28% sand on average (Figure 1). Nest sites showed a highly significant difference in number of shells surrounding the nest within 1-square meter than did random sites (Pairwise t-tests, n=18 nests, $p < .001$) (Figure 2). On average, there were approximately 10 more oyster shells at nest sites. Total shell surface area was highly significant when compared to the random sites (Pairwise t-tests, n=18 nests, $p < .01$), and was greater in the nest sites by approximately 372 mm^2.

While this study had a relatively small sample size within an active California Least Tern colony, we believe these results could have important nesting habitat management applications for the Western Snowy Plover. With continued research, these findings may be used to better manage Western Snowy Plover habitat by attracting breeding pairs, thereby supporting the Recovery Plan efforts for the Pacific Coast population of this threatened species.

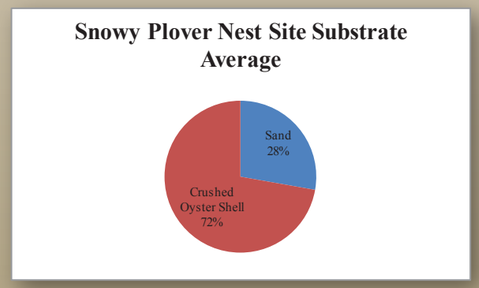

Figure 1: Average substrate of Western Snowy Plover nests. Nest sites exhibit a statistically significant difference in composition compared to random sites (Pairwise t-tests, n=18 nests over 7 years, $p < .05$). On average, nests showed more crushed oyster shell and less sand. Random sites had an average composition of 43% shells and 57% sand.

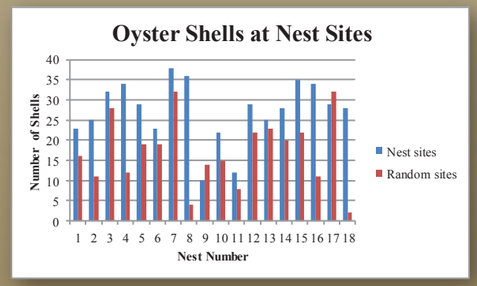

Figure 2: Number of oyster shells at each nest site and comparison site. Nest sites showed a highly significant difference in number of oyster shells as compared to random sites (Pairwise t-tests, n=18 nests over 7 years, $p < .001$). On average, nests had 10 more oyster shells than did random sites.

Sarah Gidre and Nicole Beadle conducting in-colony nest surveys on the island during the summer of 2014.

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