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Distribution, Abundance, and Nesting Characteristics of Snowy Plovers on the Oregon Coast[2]

Abstract

Distribution, abundance, and nesting characteristics of Snowy Plovers (*Charadrius alexandrinus*) were studied on the Oregon coast during 1978 and 1979. A maximum of 100 adults and fledged juveniles were observed on 12 discrete beach segments. Of 72 nests observed, at least 19 were lost to corvid predation, 11 were destroyed by storms and moving sand, and 9 were successful. Nest sites were characterized as flat areas with sand substrate and an average of 26 percent driftwood and less than 1 percent live vegetation for cover.

Introduction

As early as 1929 Bent (1929: 248) suspected that human developments on the Pacific coast encroached on habitat of Snowy Plovers (*Charadrius alexandrinus*). On the Oregon coast, information on distribution and abundance of Snowy Plovers before the 1970s was qualitative (Gabrielson and Jewett 1940: 246) and insufficient for an analysis of the influences of human developments on Snowy Plovers. Infrequent survey data from 1972 through 1977 led observers to suspect that numbers of Snowy Plovers were declining (W. Hoffman, unpubl. data; Oregon Dept. Fish and Wildl., unpubl. data), but variability in timing and thoroughness of surveys prohibited use of the data to investigate changes in distribution and abundance. Stabilization of sand with European beachgrass (*Ammophila arenaria*) (Cooper 1958, Wiedemann 1966), increased levels of recreational activity (USDA 1977), and community and industrial developments were suspected to be detrimental to Snowy Plovers (W. Hoffman, pers. comm.; Marshall 1969). Choice by Snowy Plovers of flat, unvegetated nesting habitat (Bent 1929: 248) and the month-long period required for chicks to fledge (Boyd 1972) were the basis for suspicions that nesting activities were most susceptible to human influences. The purpose of the present study was to establish baseline data for Snowy Plovers on the Oregon coast. Specific objectives were to (1) describe distribution and abundance patterns

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during the breeding season, (2) document nesting phenology, (3) study nest success, and (4) describe nesting habitat.

Methods

Distribution and abundance of Snowy Plovers were evaluated with two surveys (on foot) of sand beaches during 23 April to 23 June 1978 and 11 May to 20 June 1979. Beaches were selected based on historical records of use by Snowy Plovers and similarity to beaches with present use; about 240 km of beaches met these criteria (Fig. 1). In 1979 an additional 50 to 60 km of beach were surveyed to ensure adequate coverage, notably areas with dredge spoil on the interior of the North Spit Coos Bay. Timing of surveys followed a recommendation by G. Page (Point Reyes Bird Observatory, pers. comm.) that the best time to estimate numbers of breeding adults was in May and June. This was considered the period after migration from coastal wintering grounds of adults that bred elsewhere, yet before an influx of fledged juveniles from other areas.

We assessed seasonal changes in abundance, nesting activities, and nesting habitat at four study areas on the central Oregon coast (Sutton Creek, Siltcoos River, and Tahkenitch River outlets, and South Beach at Yaquina Bay; Fig. 1). Preliminary observations indicated high levels of recreational activity at South Beach, intermediate levels at Sutton and Siltcoos, and virtually no activity at Tahkenitch.

Nests were located by searching each study area at least weekly between 0600 and 1100 from 1 April to 10 August 1978 and 17 March to 31 July 1979. Additional searches occurred infrequently in March 1978 and August 1979. Simultaneous surveys were made to assess abundance of Snowy Plovers. Nests were visited at intervals varying from 1 to 6 days during 1978. In 1979, nests were visited at Sutton, Siltcoos, and Tahkenitch on a daily basis and at 1- to 4-day intervals at South Beach. Once a clutch was complete (three eggs or the onset of incubation), observer activity at nests was reduced by observing nests from a distance, unless a nest was vacant or eggs were not visible. Nineteen adults were captured with drop-traps (Boyd 1972) and noose snares (G. Page, pers. comm.) and banded before the 1979 nesting season.

After hatching or loss of eggs, we measured cover characteristics at each nest site (20 m radius of the nest) and at a paired site selected randomly within 75 m of each nest (referred to as random site) using line intercept sampling (Canfield 1941). We extended 6 20-m transects at 60 degree intervals from the nest and center of each random site and measured cm of driftwood, *A. arenaria*, total live vegetation (including *A. arenaria*), and total cover (all previous components plus dead vegetation and miscellaneous debris) intercepted by the transects. Measurements on the transects were recorded in segments of 0-0.5, 0-1.0, 0-1.5, 0-2.0, and 0-20 m from centers of the sites. An additional estimate of cover was made with square meter plots centered over nest and random sites. On line transects, cover estimates with 0.5 m of the sites showed greatest dissimilarity among nest sites and random sites and were most similar to cover estimates from square meter plots. Therefore, only measurements on transects within 0.5 m of the sites were further considered. Cover estimates for driftwood and live *A. arenaria* (the predominant nonliving and living cover components) were used to test for differences in characteristics of nest sites and random sites. Statistical analyses were completed before converting data to a measure of percentage cover.

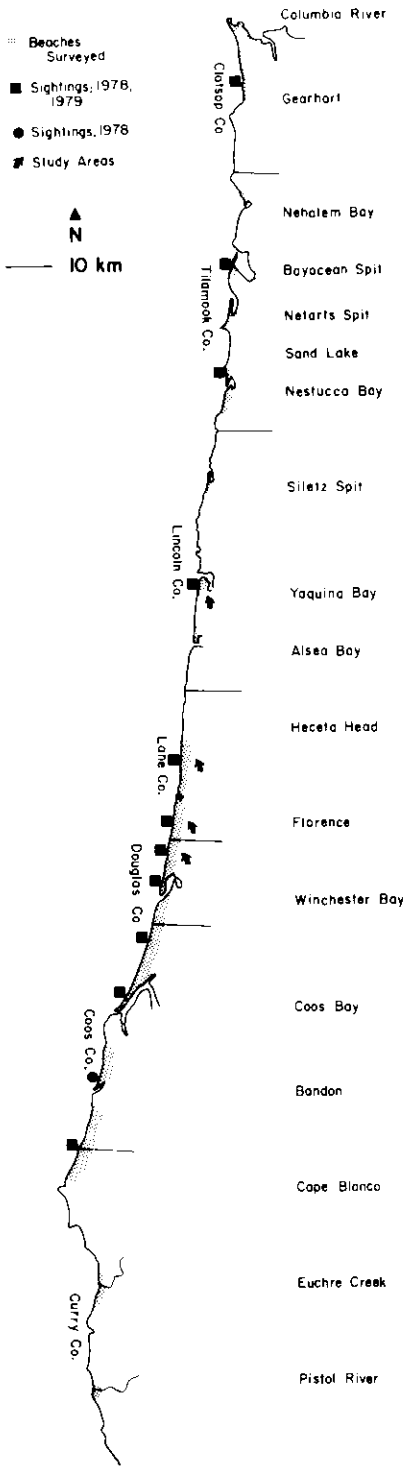

Figure 1. Beaches surveyed during 1978 and 1979 for Snowy Plovers and locations of study areas.

All statistical analyses followed Sokal and Rholf (1969). Tests are reported with results.

Results and Discussion

The Snowy Plover was neither abundant nor widely distributed along the Oregon coast during the breeding season. A maximum of 100 adults and fledged juveniles were observed during the two coastal surveys on 12 discrete beach segments (Table 1).

TABLE 1. Observations of Snowy Plovers along the Oregon coast during surveys in 1978 and 1979.

Beaches Surveyed	Dates of Surveys 1978	1979	Number 1978	1979
Peter Iredale St. Pk. to Gearhart	31 May	7 June	4	4
Bayocean Spit	2 June	9 June	21	7
Sand Lake	19 May	10 June	5	3
N. Spit Umpqua R.	23 April	8 June	10	4
Tenmile Creek	12 May	21 May	7	2
N. of Coquille R.	21 June	16 June	7	0
N. of Floras Lake	22-23 June	17-18 June	22	23
South Beach	[a]	[a]	2	3
Sutton Creek	[a]	[a]	6	6
Siltcoos River	[a]	[a]	5	2
Tahkenitch River	[a]	[a]	1	1
N. Spit Coos Bay[b]	5 May	20 June	3	45
Totals	—	—	93	100

[a]Numbers of birds were calculated from data from weekly surveys in June.
[b]Only beaches, not dredge deposits, associated with the spit were surveyed in 1978. Because Snowy Plovers were found on the dredge deposits in 1979, we believe the observation of 3 birds underestimates use of the spit in 1978.

Because the age of flying individuals could not be determined, adults and fledged juveniles were grouped; the majority of these individuals were probably adults because less than 6 percent of individuals positively identified were fledged juveniles.

We believed that the total number of birds recorded in 1978 was low because of incomplete coverage of portions of the North Spit Coos Bay. Totals for the other beaches were relatively consistent between the 2 years. Areas with previous records of use during the breeding season (March through August) where Snowy Plovers were not observed during either the 1978 or 1979 surveys were Clatsop, Nehalem, Netarts, Nestucca, Siletz, Alsea, and Pistol River spits, Neskowin Beach, and Euchre Creek (Gabrielson and Jewett 1940 : 246; Oregon Dept. Fish and Wildl., unpubl. summary of sighting records).

Because 1978 and 1979 were the first years that complete coastal surveys were conducted in the spring, assessing changes in abundance over years for the entire coast seemed impractical. Surveys in August and September at South Beach, the single area on the coast with relatively comparable survey records over time, indicated a steady decline in abundance from 1967 to 1979 (year and number of birds, respectively: 1967, 25; 1968, 35; 1969, 25; 1971, 15; 1972, 13; 1977, 10; 1978, 1; 1979, 0; W. Hoffman and Oregon Dept. Fish and Wildl., unpubl. data; Wilson 1980).

Developments that influenced South Beach during that time included opening of a state park adjacent to the beach and provision of vehicle access to the beach from the bordering jetty. The apparent absence of birds from nine of the 21 beach segments with historical records of use indicated to us that distribution was more restricted now

than previously. An adult Snowy Plover and nest were found, however, at Euchre Creek (J. Collins, Oregon Dept. Fish and Wildl., pers. comm.) in April 1979, before the coastal survey when no birds were observed. Therefore, 2 years of survey data did not absolutely demonstrate presence or absence of breeding birds from coastal areas.

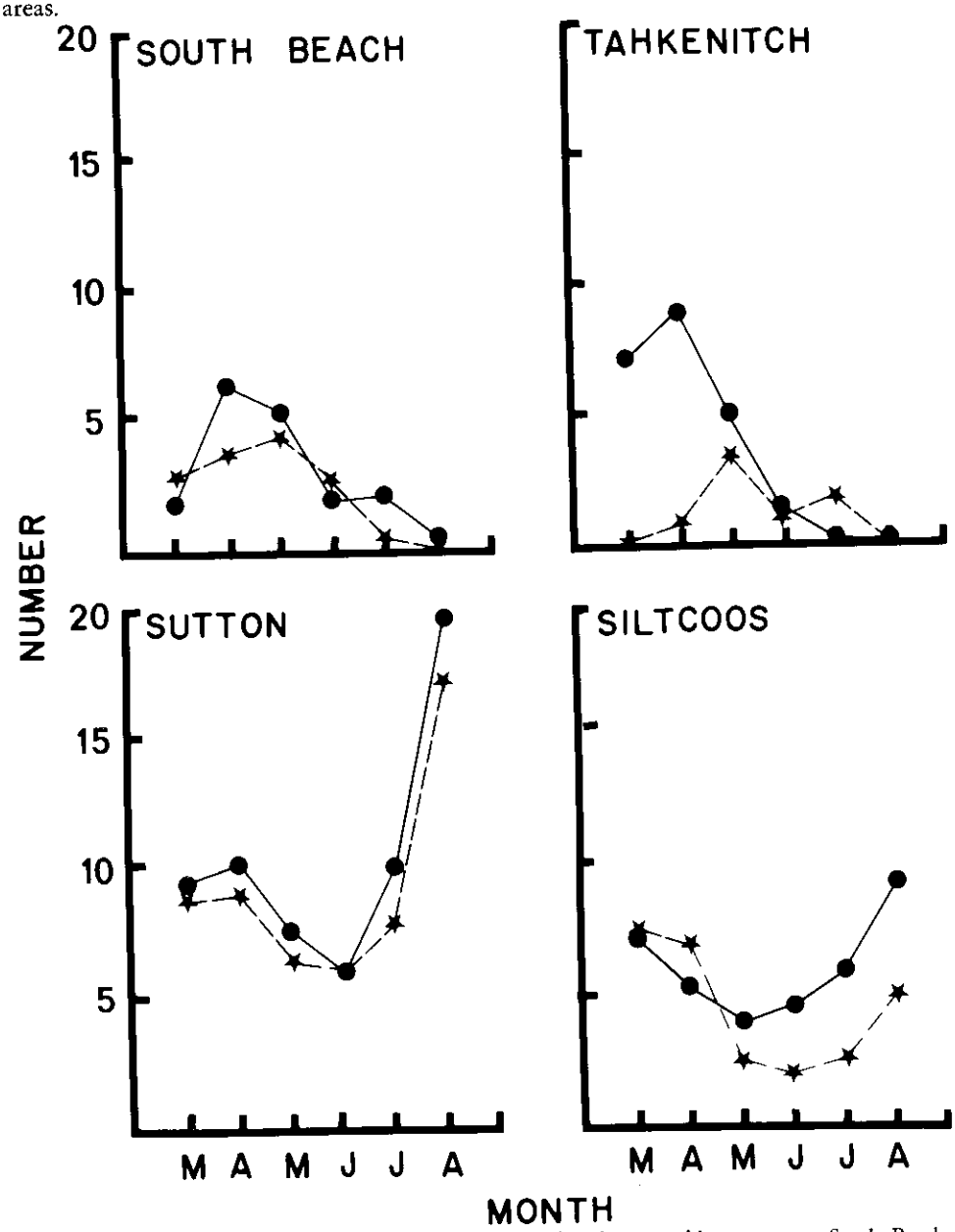

Figure 2. Mean monthly survey observations of adults based on weekly surveys at South Beach, Sutton, Siltcoos, and Tahkenitch study areas; 1978 (solid line), 1979 (dashed line); March to August. Differences in abundance were significant between areas ($p < 0.005$) but not between months ($p > 0.25$, ANOVA). Sutton supported the highest number ($p < 0.05$, Newman-Keuls).

Differences were not significant in abundance of Snowy Plovers among months of the breeding season based on weekly surveys of study areas ($p > 0.25$, ANOVA; Fig. 2). We observed consistent trends in abundance, however, between 1978 and 1979 at Siltcoos and Sutton that corresponded to trends observed on the California coast (Page *et al.* 1979). Numbers of adults declined from March and April to May and June, followed by an increase through the remainder of the sampling period. This trend corresponded to the explanation given earlier for movements of adults and juveniles. The trend of a decrease in numbers of adults at South Beach and Tahkenitch from April and May through the sampling period probably reflected a flocking tendency following the peak of breeding activities because we observed adults with bands move from one study area to another.

Nesting Phenology and Nest Success

The Snowy Plover was a persistent nester over a long nesting season but had low nest success. Seventy-two nests were found on the study areas (48 in 1978 and 24 in 1979, Table 2). We estimated the earliest onset of nesting activities as mid-March (1978); the latest nest observed was extrapolated to hatch in mid-August (also 1978, Fig. 3). Nest initiation was most frequent in April and May (31 and 32 percent, respectively, of all nests).

TABLE 2. Measures of Snowy Plover nest success at 4 study areas on the Oregon coast, 1978 and 1979.

	South Beach		Sutton		Siltcoos		Tahkenitch	
	1978	1979	1978	1979	1978	1979	1978	1979
No. Nests	8	2	14	11	15	7	11	4
No. Successful Nests	4	2	1	0	1	0	0	1
Fates of Unsuccessful Nests[a]	0-0-0	0-0-0	3-5-0	2-2-1	5-3-0	4-1-1	2-0-1	3-0-0

[a]Listed in order of number of nests known lost to corvids, destroyed by rain storms or moving sands, or abandoned.

Average nest success (the proportion of nests with at least one egg hatching) was 13 percent for both years. Highest success, but the fewest nests, were found at South Beach, the area with the highest level of recreational use (Wilson 1980). Predation by the American Crow (*Corvus brachyrhynchos*) and Northern Raven (*C. corax*) and movement of sand were important in nest loss (at least 30 percent of all losses resulted from corvid predation and 16 percent were attributed to movement of sand, Table 2). Nest loss associated with sand movement generally occurred when wind-driven sand buried eggs or moved eggs from nest scrapes. Cause of nest failure of 30 nests was not determined because rain or blowing sand removed evidence. These nest losses were not attributable to weather because we searched for, but did not find, buried eggs or eggs damaged by rain or hail. Because predators other than corvids were never implicated in nest loss, we believed corvids were primarily responsible for the loss of these nests.

Our observations indicated a high incidence of renesting, but the frequency could not be estimated because of movements of adults among study areas. As examples, in 1979 a pair at Sutton made at least three nesting attempts and a pair at Siltcoos made at least two attempts. A female nested unsuccessfully at least twice with a mate at Siltcoos, moved to Sutton for a third attempt following death of her first mate, and returned to Siltcoos for a fourth attempt with a third mate. Her final mate was involved in at least two earlier nesting attempts.

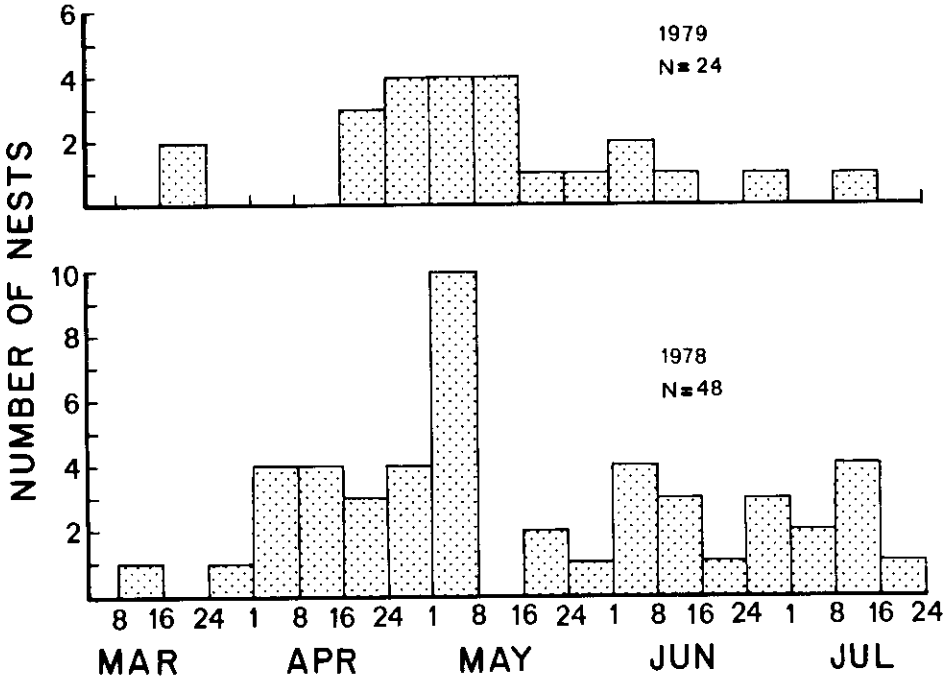

Figure 3. Estimated dates of Snowy Plover nest initiation for nests found at South Beach, Sutton, Siltcoos, and Tahkenitch study areas.

The level of nest success observed in our study was low compared with levels documented by others. In the Great Plains, Boyd (1972) and Grover (1979) reported levels from 37 to 73 percent. G. Page (pers. comm.) observed from 25 to 85 percent nest success at coastal and interior locations in California. Nest loss has been associated with avian and mammalian predation [predators include California Gulls (*Larus californicus*), Northern Ravens, American Crows, coyotes (*Canis latrens*), skunks (*Mephitis*), and racoons (*Procyon lotor*)], weather conditions (including storm tides, wind-driven sand, and hail or rain storms), cattle stepping on eggs, and human disturbance (Boyd 1972; Grover 1979; G. Page, pers. comm.; Rittinghaus 1975). Seemingly, the majority of factors causing nest loss are factors with which Snowy Plovers have evolved. And, healthy populations should be adapted to survive the losses unless predation pressures are more intense now than in the past, or the bird's ability to withstand high levels of nest loss has diminished because of other factors influencing the bird.

Conceivably Snowy Plovers that nest on the Oregon coast experience low nest

TABLE 3. Percent cover of driftwood, **Ammophila arenaria**, live vegetation, and total cover of Snowy Plover nest sites and paired random sites. N = 65.

	Nest Site		Random Site	
	Mean	S.E.	Mean	S.E.
Driftwood	26.0	3.0	5.0	1.0
A. arenaria	0.5	0.2	0.2	0.1
Live Vegetation	0.9	0.3	0.4	0.1
Total Cover	28.0	3.0	5.0	1.0

success because these birds are breeding on the periphery of their coastal range, and habitat conditions are not optimal. Yet, Widrig (1980) observed 60 to 80 percent nest success at Leadbetter Point, Washington, a location that approaches the northernmost extent of the Snowy Plover's breeding range.

Shorebirds as a group have wide distributions (Pitelka 1979); frequently use multiple-nesting strategies (Jenni 1974), which is an adaptation associated with unstable habitats (Emlen and Oring 1977, Orians 1969); and have relatively high rates of adult survival (45 to 85 percent per year; Boyd 1962, Lack 1954: 92). The Killdeer (*Charadruis vociferous*), a congener of the Snowy Plover, commonly inhabits areas influenced by human activity. These features of charadriiforms confound interpretation of the importance of two seasons of low nest success on the overall status of Snowy Plovers on the Oregon coast. We reserve judgment until additional information is available on reproductive success, survival of adults and juveniles, and movements of birds among breeding populations. But, we caution that conservative attitudes are appropriate relative to alteration of nesting habitat by man.

Nest Site Characteristics

Sixty-five nest sites and paired random sites were analyzed to determine cover characteristics of nest sites; seven sets of sites were excluded because of alteration before measurement. Mean cover of nest sites was 28 percent (Table 3). Driftwood constituted the vast majority of the cover (26 percent), and live vegetation accounted for less than 1 percent. *A. arenaria* accounted for more than half of the vegetation in the vicinity of nest sites. Estimates of cover of driftwood and *A. arenaria* were similar among the four study areas for nest sites and for random sites ($p > 0.05$, MANOVA), but cover at nest versus random sites was dissimilar ($p < 0.05$, MANOVA). Nest sites had more cover (28 percent for nests versus 5 percent for random sites); the apparent preference for more cover than was present on the average was usually satisfied by nesting near driftwood, and only rarely, by nesting close to vegetation.

Since the amount of dense vegetation on the Oregon coast has dramatically increased with introduction of *A. arenaria* (Wiedemann 1966), and since dense vegetation was not selected by Snowy Plovers for nesting habitat, speculation that the introduction of *A. arenaria* has restricted distribution of nesting Snowy Plovers seems valid. Changes in distribution of the Least Tern (*Sterna albifrons*) (Massey 1974), and Piping Plover (*Charadrius melodus*) (Wilcox 1959), species which also nest on sandy beaches, were associated with changes in vegetation cover. Likely consequences of restricted distribution of a population are reduced abundance or increased population influence by local factors or both. Possibly, therefore, the presence of *A. arenaria* has indirectly affected abundance of Snowy Plovers by influencing distribution.

Conclusions

The information presented in this paper can serve only as preliminary data for an assessment of the status of Snowy Plovers on the Oregon coast. Information on abundance, mixing of interior and coastal populations, and levels of reproductive success over several years is essential for an accurate assessment. Concern for the Snowy Plover is appropriate because of low abundance and restricted distribution. The appropriate expression of that concern should be additional monitoring of population performance

and, until additional information is available, reducing and possibly reversing unnatural changes on areas used by the birds.

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