

METEOROLOGICAL BIASES IN CENSUSES OF ROOSTING BROWN PELICANS IN FLORIDA

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As part of a continuing long-term study of Brown Pelicans (*Pelecanus occidentalis*) on the southwest coast of Florida, T. Below has censused pelicans in the Naples region frequently during the past four years. Much of this information will be presented elsewhere but in this paper we examine the possible biases caused by meteorological factors to the counts of pelicans roosting/loafing on pilings on Naples Beach.

Naples Beach is affected by moderate weather patterns with few dramatic changes. Therefore, it is difficult to determine the effects of most of these changes on bird populations. Only wind, and the attendant water-wave conditions, had discernable effects and in this paper we detail those effects.

METHODS AND STUDY AREA

Naples is located at 26° 9' N, 81° 47' W in Collier County, Florida. The study area considered here consists of the Gulf of Mexico beach from Doctors Pass (on the north) to Gordon Pass, a 10.5 km distance that includes the following features: 4 groins, located at 3rd, 24th, 27th, and 31st Avenues South, a span of 3.5 km, each composed of approximately 350 wooden pilings, extending 122 m from the beach into the Gulf and standing 1.5 m above the highest marine growth, constructed in the early 1950's by one contractor using the same design; and numerous rock and small wooden groins projecting from a few meters to 50 m into the Gulf. The latter groins are occasionally awash at high tide or during strong west winds.

We have 113 censuses for which Below counted the pelicans present at 1700 on one day and at 0700 the next morning. During each census he estimated the state of the tide, surf condition, cloud cover, temperature, and wind direction and velocity. These estimates were later compared to local weather reports. Only wind direction and velocity could be related to differences in the number of birds present between afternoon and morning censuses and these factors are analyzed more fully.

Below determined the total number of pelicans involved in each census pair (afternoon plus morning) and computed a percent difference as either plus or minus to indicate that either more or fewer pelicans were present during the morning census. For example: afternoon census = 100 birds; morning census = 50 birds; total = $100 + 50 = 150$. The afternoon census composed 67% of the total and the morning census composed 33% of the total, or $0.67 - 0.33 = 0.34$: a difference of $-.34$ in the morning.

In Table 1 we present the percent differences for all 113 census pairs, by appropriate wind direction, wind velocity, and as either a plus or minus change.

RESULTS AND DISCUSSION

Naples Beach is oriented in a NNW to SSE direction, 6° West of North with the land on the East. The predominating wind patterns are off the Gulf of Mexico as indicated by the fact that of the 113 census pairs, 76 (67%) occur in the NW to S sectors; these are the sectors in which the wind comes from across the water. In the SW sector 27 (24%) of the census pairs occur, this is the highest number of pairs in any one wind sector.

We interpret the difference as an index to the activity of the birds by showing the amount of change between afternoon and morning census: a minus difference indicates that birds have left the study area and a plus difference indicates that birds have moved into the area. Fifty-five percent of the differences occur in the three westerly wind sectors, indicating that more bird activity occurs when winds blow from across the water.

Distinct differences exist between the plus and minus pairs at lower wind velocities (0-5, 6-10, 11-15 mph). The total percent difference for the plus pairs are 30% higher than the minus pairs at 0-5 mph. At 6-10 mph, the percentage is reversed with the minus pairs 72% higher. This trend of higher total percent differences for the minus pairs continues at 11-15 mph with the minus pairs 92% higher than the plus pairs. At 16-20 mph, few data exist and interpretation becomes difficult (see below).

At wind speeds of 0-5 mph, 74 (65%) differences occur. Of the 8 compass sectors, none show a decrease and 7 show an increase in the number of pelicans present in the morning. We interpret this to mean that winds under 5 mph are favorable for Brown Pelicans to roost in this area and that birds move into the area and roost during the night on the groins during calm winds.

At wind speeds of 6-10 mph, 14 (70%) of the pairs are minus. Ten (71%) of the 14 pairs occur in the westerly wind sectors. Thus, as winds increase and shift to a westerly direction, conditions become less favorable for pelicans roosting on the groins.

At wind speeds of 11-15 mph, 11 (85%) of the pairs are minus. Nine of the 11 pairs occur in the westerly sectors, 4 (35%) in the SW and 4 (36%) in the NW sector. As wind speeds continue to increase, conditions for roosting deteriorate. The equal distribution of pairs in the two westerly sectors (NW and SW) indicate that at Naples Beach as wind velocity increases and blows from either the NW or SW the roosting pelicans are affected equally. As wind strongly increases the percent differences do not increase, thus it appears that at any wind velocity above a certain rather low threshold conditions are less favorable for roosting than during calm nights.

When winds reach 15 mph and higher, few Brown Pelicans remain on the groins, their movements become erratic and analysis is difficult, probably because of the small sample size as the birds leave the area.

CONCLUSIONS

This study clearly indicates that wind velocity and direction affect the number of Brown Pelicans roosting for the night on the groins in the Gulf of Mexico in Naples, Florida. Our data from elsewhere in Florida indicate that winds may also affect the number of birds present at one specific location. On calm nights, the number of birds spending the night increases in an exposed situation. However, as the wind velocity increases and becomes more directly from across the water (and thereby increasing wave size and amount of flying spray), the number of pelicans decreases. If the wind velocity continues to increase or continues to blow for some period of time, the pelicans leave the exposed roosts to spend the night elsewhere. We will present our data on population utilization of the whole Naples region elsewhere. However, these data clearly indicate the need for careful consideration of the effects of weather on ecological monitoring (i.e., Christmas Bird Count data), the need for censusing large geographic areas, and the need for long-term, frequent censusing for accurate population studies.

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Request for assistance. — Nestling Turkey and Black vultures are being used as surrogates to perfect techniques that may be used as part of the recovery program for the endangered California Condor. If you know of active vulture nests from which nestlings can be obtained, please contact *Michael Wallace, Archbold Biological Station, Rt. 2, Box 180, Lake Placid, Florida 33852.* Call collect 813/465-2571.