

Singing Observations in 1982 was 1 month later than in 1981, and the dramatic decline in Total Observations began 2 weeks later. The breeding phenology of the Sage Sparrow likewise was delayed by about 3 weeks in 1982; first nests were completed on 27 April in 1981 and by 18 May in 1982. Such a shift in breeding phenology probably is less important in this species, however, because Sage Sparrows did not show the strong seasonal changes in detectability noted for Brewer's Sparrows. For Brewer's Sparrows or similar species, year-to-year fluctuations in breeding phenology may have important implications for censusing, particularly if the research is designed such that census counts are conducted at the same time each year.

Consistency between years in seasonal profiles of detectability is an important consideration in determining the general application of such profiles. Seasonal variation in Total Observations was more consistent between years for Brewer's Sparrows than for Sage Sparrows (Fig. 1, see statistics above). Singing Observations varied significantly throughout the season for Brewer's Sparrows in 1981, but not in 1982 (1981: $F[4, 15] = 9.63, P < 0.01$; 1982: $F[3, 12] = 1.60, P < 0.25$). Seasonal variations in Singing Observations were not significant for the Sage Sparrow in either year (1981: $F = 1.58, P < 0.25$; 1982: $F = 1.63, P < 0.25$). We have no explanation for the annual variation in Singing Observations for the Brewer's Sparrow, but it could become important with this and other species whenever a high degree of reliance is placed on aural observations to locate birds.

Consistent seasonal profiles of detectability, when known, may be used *a priori* in scheduling bird counts, after making appropriate adjustments for year-to-year differences in weather and other factors. (For a discussion of such adjustments, see Best 1981.) Where seasonal patterns of detection are inconsistent from one year to the next, the pattern for the particular year under study must be determined and then used when interpreting the census results. Emlen (1984) suggested one procedure for doing this.

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REESTABLISHMENT OF AN INSULAR WINTER WREN POPULATION FOLLOWING A SEVERE FREEZE

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Winter Wrens (*Troglodytes troglodytes*) are abundant and permanent residents of the forests of western Washington state (Jewett et al. 1953). They may be equally common, and possibly even more so, on some of the small islands off the Olympic Peninsula where, however, they may be

locally eliminated by severe winter freezes. The following observations record in detail the chronology of one such episode of extinction and recolonization.

Tatoosh Island (48°24'N, 124°40'W) is approximately 0.7 km northwest of the northwestern tip of the Olympic Peninsula, a distance which is also the minimum colonization distance. The predominant vegetation, dense tangles of salmonberry (*Rubus spectabilis*) and salal (*Gaultheria shallon*), appears to provide excellent habitat for Winter Wrens and is 5-6 ha in extent. F. Richardson visited the island in July, 1956 and 1959, as did D. R. Paulson in June, 1970 and 1971, and D. Wood in July, 1974 and 1975, and they all recorded these wrens as common (maximum density: 1 singing male/0.4 ha of appropriate habitat). I noted wrens on most of my 67 trips, which usually lasted 2-8 days, between June, 1968 and October, 1978. During a visit from 26-29 December 1978, however, the island "froze." Ice formed in standing water to a depth of 10-15 cm; no heated human residences were

available to wrens for shelter or warmth. I did not record air temperatures, but three consecutive nights were clear with strong (10–25 knot) winds from the east. Air temperatures at the nearest National Weather Service station (Quillayute; approximately 55 km to the southeast and at an elevation comparable to Tatoosh) were recorded as (date; max./min. degrees F): 28 December, 32/16; 29 December, 29/19; 30 December, 26/20; 31 December, 28/9; 1 January, 32/10 (U.S. Dep. of Commerce 1978, 1979). On my trips to the island on 16–21 March and 26–29 April 1979, I found neither wrens nor the other two conspicuous, resident passerines, Song (*Melospiza melodia*) and Fox (*Passerella iliaca*) sparrows.

My observations on subsequent trips suggested the following recolonization pattern. No wrens were seen or heard in 1979 ($n = 12$ visits), 1980 ($n = 9$), 1982 ($n = 10$), or 1983 ($n = 12$). In 1981, wrens were heard in February and March, but were neither seen nor heard on the subsequent seven visits. In 1984, wrens were heard in mid-March, and on nine of 10 visits between then and mid-November. The density of singing males (five) was roughly about 50% of the previous maximum. Wrens have been conspicuous on all (six) 1985 trips to date. The other passerines of interest were active at a feeder that was established in October, 1979, and had returned to pre-freeze abundance by late June, 1980 (G. B. van Vliet, pers. comm.).

These observations are compatible with what is known of Winter Wren biology. Bent (1948, and references therein) recorded a number of invasions or extinctions on habitable islands in Alaska. In Europe, the same species occupies similar vegetation-dense habitats (Armstrong 1955). Although few data exist on fluctuations in insular populations, on the mainland, wrens seem especially susceptible to cold weather, and show precipitous population declines during severe winters (Batten 1980, Williamson 1981). On Tatoosh, the 6-year interval noted between extinction, presumably due to some combination of cold and starvation, and recolonization probably indicates the difficulties experienced by a relatively sedentary species in invading nearby habitable terrain that is isolated by a water gap. For instance, the coldest weather in western

Washington's history occurred in January, 1950. On Tatoosh, the maximum recorded temperature between 13–18 January was 28°F, and the minimum was 14°F (U.S. Dep. of Commerce 1950). Wrens were abundant in 1956 (F. Richardson, pers. comm.). From 16–18 December 1964, air temperatures on Tatoosh were generally below freezing, ranging from 33–14°F (U.S. Dep. of Commerce 1964). I heard wrens in June, 1968. I know of no records of disappearance of Winter Wrens from mainland sites during any of these intervals.

Extreme climatic events, such as freezes, are recognized as important determinants of island avifaunas. Winter Wrens can be abundant, permanent, and conspicuous residents on islands like Tatoosh. In the last decade, however, they have been absent as breeders 50% of the time (1979–1984) and, since 1950, I estimate that breeding wrens have been absent a maximum of about 40% of the years.

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BEHAVIOR AT A PINYON JAY NEST IN RESPONSE TO PREDATION

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Predation is a major cause of nest failure in a population of Pinyon Jays (*Gymnorhinus cyanocephalus*) that inhabit Flagstaff, Arizona (Marzluff 1983). Jays in this population reduce predation by nesting colonially, concealing their nests (Marzluff 1983), and grouping fledged young in a creche that is guarded by sentinels (Balda and Balda 1978). Typically, they mob predators and desert their nests (Clark and Galdon 1979) after acts of predation. I report here the response of one pair of jays to the partial removal of their brood by an American Crow (*Corvus brachyrhynchos*). The predation event spanned a two-day period, which enabled me to contrast the parents' behavior during the event with their behavior before the event. I also compare their behavior to the behavior of other jays that were not detected by predators.

Individuals in the study population have been color-banded since 1972. The nesting attempt described herein was begun on 13 May 1983 by a four-year-old male and a three-year-old female in their second breeding season together. The nest was placed 8.5 m high in a 10-m ponderosa pine tree (*Pinus ponderosa*). Five eggs were laid, all of which hatched on 30 May.

My results reported here were based on 20.6 h of nest observations over six days (10.6 h before predation and 10.0 h after predation). I observed the nest from a distance of 15 m in a canvas blind. Before predation, I watched the nest for 4.6 h on the morning of 13 June, for 4.0 h after noon on 14 June, and for 2.0 h before noon on 15 June. Following predation, I watched the nest for 2.0 h before noon on 15 June, for 3.0 h after noon on 15 June, and for 5 h before noon on 16 June.

On 15 June, both parents arrived in the nest tree together at 08:24, and proceeded to feed and clean the 16-day-old young. They departed 2 min later, and an adult American Crow appeared at the nest at 08:58. All nestlings begged from the crow, as they would from their parents (see McArthur 1982 for a description of begging). The crow jabbed one young bird repeatedly in the head and neck region until it was dead. During this time, all nestlings called harshly. The crow then grasped the dead young with its bill and carried it from the nest. The crow's visit lasted about three minutes.