

similar flocks foraging on other prey items. My results indicate that the spatial distribution of horseshoe crab egg clusters is one factor influencing the amount of aggression observed among shorebirds foraging on this resource. Altering the distribution from the naturally occurring irregularly spaced clusters to evenly spaced clusters dramatically decreased the frequency of aggressive encounters among turnstones.

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CASSIN'S FINCH NESTING IN BIG SAGEBRUSH¹

SIOBHAN L. SULLIVAN,² WILLIAM H. PYLE, AND STEVEN G. HERMAN
Malheur Bird Observatory, % The Evergreen State College, Olympia, WA 98505

Key words: Cassin's Finch; big sagebrush; nesting; Oregon; shrubsteppe.

Cassin's Finches (*Carpodacus cassinii*) nest primarily in conifers. Several authors (Bent 1968, Samson 1976, Harrison 1984) imply that nesting might occur in nonconiferous species. Ridgway (1877) and Jones and Baylor (1969) cite cases in which Cassin's Finches were found nesting in deciduous trees. In California, Ridgway located nests in quaking aspen (*Populus tremuloides*) and narrow-leaved cottonwood (*P. angustifolia*). In Idaho, Jones and Baylor found nests in black locust (*Robinia pseudo-acacia*), box elder (*Acer negundo*), and cottonwood (*Populus* sp.). We have been unable to locate specific references to Cassin's Finches nesting in shrubs.

While conducting breeding bird censuses in shrubsteppe habitats on Hart Mountain National Antelope Refuge in 1984, we found four Cassin's Finch nests in big sagebrush (*Artemisia tridentata*), one in western juniper (*Juniperus occidentalis*), and one in quaking aspen. All four nests in big sagebrush fledged young (Table 1), the nest in aspen failed, and the outcome of the juniper nest is unknown.

Hart Mountain lies in the Basin and Range province in southcentral Oregon (Hunt 1974). Vegetation is characteristic of the semi-arid high desert and is dominated by big sagebrush, low sagebrush (*A. arbuscula*), and bitterbrush (*Purshia tridentata*). Draws with springs support quaking aspen and willows (*Salix* spp.). Groves of western juniper and mountain mahogany (*Cercocarpus ledifolius*) occur in scattered locations. A 30-ha relict stand of ponderosa pine (*Pinus ponderosa*) is located on the southeast slope of the mountain.

All four nests in big sagebrush were within 350 m of Robinson Camp Spring (11 km south of refuge headquarters) and were 7 km from the relict stand of ponderosa pine. The next closest non-*Juniperus* conifer concentration greater than 30 ha occurs more than 30 km from Hart Mountain. The four sagebrush nests were located 155 m to 1.5 km from each other.

L. R. Mewaldt (pers. comm.) found that Cassin's Finches were common in the relict ponderosa pine stand. He estimated that from 63 to 91 pairs of Cassin's Finches nested in 5.4 ha of the pine stand in 1975 through 1979. From observations of cloacal protuberances and incubation patch development, he calculated that most nesting occurs in late May and early June, three weeks earlier than the dates we found nests in sagebrush in 1984.

The nesting in Big Sagebrush by Cassin's Finches is of particular interest because the potential nesting habitat of the species could be expanded significantly through the utilization of big sagebrush. Additional observations may reveal an even wider choice of nesting substrates for this seldom-studied species.

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² Present address: Huxley College of Environmental Studies, Western Washington University, Bellingham, WA 98225

TABLE 1. Nest development, nesting success, and nest placement for Cassin's Finch nesting in big sagebrush at Hart Mountain, Oregon, in 1984.

Date found	Number of eggs	Hatching date	Number of nestlings	Fledging date	Nest shrub height	Nest height
29 June	4	8 July	2	24 July	119 cm	86 cm
4 July	5	8 July	3	24 July	119 cm	67 cm
5 July	4	11 July	3	27 July	100 cm	60 cm
9 July	—	6 July	4	22 July	120 cm	90 cm

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EGG PRODUCTION IN HAND-RAISED WHITE-CROWNED SPARROWS¹

LUIS F. BAPTISTA AND LEWIS PETRINOVICH²

Ornithology/Mammalogy, California Academy of Sciences, San Francisco, CA 94118

Key words: *White-crowned Sparrow; Zonotrichia leucophrys; egg production; ovarian development.*

The principal stimulus to gonadal growth in birds in temperate latitudes is usually attributed to photoperiod (Farner and Follett 1979). Male White-crowned Sparrows (*Zonotrichia leucophrys*) may be stimulated to full testicular maturity in the laboratory by increasing photoperiod (Farner and Wilson 1957). However, some investigators have found that under similar conditions, ovarian development in females of this species appears arrested at the early stages of vitellogenesis, and these birds do not lay eggs (Farner et al. 1966, Lofts and Murton 1973). These conclusions are based on work with migratory *Z. l. gambelii*, but apply also to nonmigratory *Z. l. nuttalli* (M. L. Morton and L. F. Baptista, unpubl.). More recently, however, J. R. King (in litt.) found that a few *Z. l. gambelii* captured in the wild may lay eggs in captivity.

The pituitaries of captive wild-caught females had only 25% of the gonadotropic potency of wild females (King et al. 1966). Females held on long day and stimulated with taped male song exhibited higher rates of ovarian growth than controls held on long day alone (Morton et al. 1985). Neither treatment group laid eggs, however, and ovaries collapsed after attainment of peak weights. It has been suggested that the final stages of ovarian development may require additional proximate factors, such as stimulation of the nest cup or other characteristics of the habitat (Wing-

field and Farner 1978). In this paper we report that hand-raised female White-crowned Sparrows regularly laid eggs in the laboratory, and we suggest reasons why these data differ from those of previous investigators. In addition, two instances of White-crowned Sparrows breeding in captivity are described.

In 1983 we hand-raised 22 White-crowned Sparrows of the sedentary subspecies *Z. l. nuttalli* and two females of the montane subspecies *Z. l. oriantha*, all taken as nestlings. Two female *Z. l. nuttalli* collected as fledglings were also included in the laboratory colony. In 1984, 10 more females were hand-raised. Birds were housed singly in cages 62 × 59 × 39 cm or 80 × 38.5 × 70 cm. Birds were maintained in a room with windows, and thus experienced natural photoperiods. Females could hear and see singing males in neighboring cages.

These 36 females laid a total of 134 eggs between 29 February and 21 August. Each female laid from one to eleven eggs during that period. Nine females laid only one egg each. Whereas eggs in a clutch are usually laid on consecutive days in the wild, intervals between eggs tended to be irregular in our captive colony. For example, one individual laid single eggs on 18 April, 8 May, 6 June, and 21 June. The intervals between laying dates suggested that many females laid single egg "clutches." The one female that laid eleven eggs laid three single-egg clutches, two three-egg clutches, and one two-egg clutch.

Two instances of White-crowned Sparrows breeding in captivity were observed. In the 1979 breeding season, LFB placed a hand-raised female *Z. l. nuttalli* in an outdoor aviary (4.8 × 1.8 × 4 m) with a wild-caught male. The female built a nest in a small potted juniper, laid two eggs, and hatched one young. The nestling died after four days, possibly due to lack of insect food in the diet.

In 1982 a wild-caught male *Z. l. gambelii* was injected

¹ Received 6 September 1985. Final acceptance 4 February 1986.

² Present address: Department of Psychology, University of California, Riverside, CA 92521.