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Nest-Site Characteristics of Sympatric Ferruginous and Swainson's Hawks

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a rookery of *E. jubatus* on Sugarloaf Rock, 1 km W of Cape Mendocino Lighthouse, Humboldt County, California.

Sugarloaf Rock is 300 m offshore, and is connected to the mainland by a rocky bar during tides of  $-0.15$  m and lower. Sugarloaf Rock is 99.4 m high, is circular and has precipitous sides. Several deep clefts and caves are cut into the rock on the southwest and northwest sides. The rookery occupied a large shelf 30 by 60 m, just above high tidewater on the northwest side of the rock. Fifty meters southwest of Sugarloaf Rock was a small rock ("SW Rock") 22 by 10 by 15 m high upon which sea lions hauled out.

Observations were conducted between May 1969 and November 1970. Sea lions were counted directly in 1970 during my visits to the rock which lasted from 2 to 24 hrs. Northern sea lions were also counted from aerial photographs taken on 16 July and 13 August 1969 and from photographs taken from the top of Sugarloaf Rock on 31 July 1969 that only covered a quarter of the rookery shelf. I did not sex and age sea lions until my visit of 22 May 1970. The sexes and ages of sea lions observed in 1969 were estimated from photographs. Counts represent minimum numbers of animals because not all the area occupied by sea lions was visible from my observation post. Sullivan (1980) found a mid-afternoon peak in numbers, while 10 out of 13 of my counts were conducted between 0500 and 1000 hrs.

Numbers of wintering sea lions were low until the arrival of breeding animals in May (Table 1). Females were first observed pupping on 22 May and pupping reached a peak in mid-June. Pupping was only observed on Sugarloaf Rock. Copulation was observed once on 20 June 1970. When Sugarloaf Rock was visited on 13 November, no territorial males were seen.

Sugarloaf Rock was also occupied by subadult male California sea lions (*Zalophus californianus*) throughout the year, although numbers were lower during the breeding season of *E. jubatus* (Table 1). California sea lions were rarely found on the *Eumetopias* rookery shelf.

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## NEST-SITE CHARACTERISTICS OF SYMPATRIC FERRUGINOUS AND SWAINSON'S HAWKS

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Nest sites are often limiting for buteos that inhabit grasslands in North America. Few studies, however, have quantified nest-site characteristics of sympatric buteos in any habitat (e.g., Titus and Mosher 1981, Auk 98:270–281). We studied nest-site characteristics of sympatric Ferruginous Hawks (*Buteo regalis*) and Swainson's Hawks (*B. swainsoni*) that nested in a juniper-grassland in northcentral Oregon to evaluate how the two species partitioned the resource. The only available tree nest-sites in our study area were western juniper (*Juniperus occidentalis*) of nearly uniform age. Therefore, we could examine differences in nest placement between the two species where a limited range of potential nest-sites existed.

The study area ( $4.8 \times 1.6$  km) was located in Juniper Canyon, northern Morrow County, Oregon, at an elevation of 170 m. In addition to western juniper, the area was characterized by big sagebrush (*Artemisia tridentata*) and rabbitbrush (*Chrysothamnus nauseosus* and *C. viscidifloris*) interspersed with cheatgrass (*Bromus tectorum*) and Sandberg's bluegrass (*Poa sandbergii*). Western juniper ranged from 3.0–7.0 m in height, determined by climbing to the top of each. Total density of juniper was determined from a complete count to be 0.21 trees/ha. Junipers were clumped in two areas—a 47 ha stand that contained about 60% of all junipers on the study area (2.0 trees/ha), and a 100 ha stand comprising 22% of the trees (0.4 trees/ha). The remaining trees were scattered throughout the study area.

We checked each juniper and found 17 Ferruginous Hawk and 14 Swainson's Hawk nests. Nests

TABLE 1. Estimates for variables used to describe nest-site characteristics of Ferruginous and Swainson's Hawks.

Characteristic	Ferruginous Hawk (N = 17)			Swainson's Hawk (N = 14)			p
	Mean	SD	Range	Mean	SD	Range	
Distance of nest from tree bole (m)	0.6	0.52	(0.0-1.5)	1.1	0.85	(0.1-3.5)	*
Distance of nest from bole as percent of crown radius (%)	18.4	16.18	(0.0-43.3)	34.0	22.42	(2.3-92.1)	*
Tree height (m)	4.8	1.78	(3.0-9.0)	6.2	1.71	(4.2-9.0)	*
Nest height (m)	2.9	1.42	(1.2-7.5)	4.7	1.18	(3.0-6.8)	**
Nest height as percent of tree height (%)	60.6	15.02	(37.8-87.1)	76.7	11.37	(42.2-88.9)	**
Radius of main nest support branch (cm)	7.3	3.11	(2.5-14.3)	2.5	1.12	(1.1-5.1)	***
Number of nest support branches	5.1	1.73	(3.0-9.0)	5.4	2.03	(3.0-10.0)	ns
Radius of nest tree bole (cm)	21.7	8.23	(10.2-38.2)	24.4	8.77	(12.7-39.8)	ns
Crown radius of nest tree (m)	3.1	0.96	(1.5-4.7)	3.4	0.78	(2.0-4.4)	ns
Vegetation openness around nest (%) <sup>a</sup>	41.1	30.11	(10.0-99.0)	47.1	21.28	(15.0-80.0)	ns
Vegetation openness above nest (%) <sup>a</sup>	57.5	33.55	(5.0-99.0)	66.0	31.43	(10.0-99.0)	ns

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ , ns = nonsignificant; *t*-test.  
<sup>a</sup> See McCrimmon (1978).

were measured during March 1980 and February 1981, and their builders were identified to species by observing the birds during the 1979 and 1980 nesting seasons and from examination of material used in nest construction. Ferruginous Hawks build their nest of bulky sagebrush stems 3–4 cm in diameter while Swainson's Hawk nests are more delicate, constructed of juniper twigs, grass, and tumbled mustard (*Sisymbrium* sp.) (Call 1978, USDI Bur. Land Manage. Tech Note TN-316). Methods used to measure nest characteristics follow McCrimmon (1978, *Auk* 95:267–280). Nests modified by other species (e.g., Black-billed Magpie, *Pica pica*) were excluded from analysis.

Nest-site characteristics of the two species differed on six variables (Table 1). Swainson's Hawks constructed nests higher and in taller trees than Ferruginous Hawks; examination of "nest height as percent of tree height" revealed the higher relative position of Swainson's Hawk nests. "Radius of main nest support branch" showed the largest and most consistent difference between species (as indicated by the relatively low overlap in range of values). Support branches were smaller for Swainson's Hawk than for Ferruginous Hawk nests. By nesting relatively high in trees, Swainson's Hawks encountered potential nest support branches of smaller size than did Ferruginous Hawks. Swainson's Hawks also constructed nests farther from the tree bole than did Ferruginous Hawks, which is a reflection of the relatively high location of nests supported by smaller branches for the former species.

Swainson's Hawks arrived in Juniper Canyon several weeks later than Ferruginous Hawks (pers. obs.). Ferruginous Hawks might occupy all premium nest-sites, relegating Swainson's Hawks to alternate sites. However, because there appeared to be ample unoccupied large trees providing adequate nest-sites in the area, we doubt Swainson's Hawks were excluded from nesting in relatively low positions.

Swainson's Hawks constructed nests on smaller limbs than Ferruginous Hawks. Because female Swainson's Hawks weigh about 42% less than female Ferruginous Hawks (calculated from Imler 1937, Bird-Banding 8:166–169), their body weight and nest weight can be supported by smaller structures than Ferruginous Hawks. Material used in nest construction may also reflect nest placement and body weight; nests of Swainson's Hawks are relatively flimsy structures compared to the bulky nests of Ferruginous Hawks (Schmutz et al. 1980, *Can. J. Zool.* 58:1075–1089).

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## MATERNAL DEFENSIVE BEHAVIOR IN THE PORCUPINE (*ERETHIZON DORSATUM*)

ROBERT G. LYNCH

On 22 August 1981 I observed a previously unreported defense behavior of a female porcupine with a single juvenile offspring. The two porcupines had been grazing on leguminous seed pods and herbaceous plants around my camp near 100-acre Meadow in Granite County, Montana, at an elevation of about 2700 m. The adult female was about 65 cm long and the juvenile about 45 cm long, possessing quills on its tail and hind-quarters, but the quills on the rest of its body were not yet fully developed. When the female was about 6 m away from me and the young about 15 m away, I stood up, startling the female. She ran toward the young porcupine, emitting low grunting calls, to which the young responded by running toward the female. When the two met, the adult female rose up on her hind legs, and the young placed its head against her abdomen. The female