

INTRA-YEAR REUSE OF GREAT HORNED OWL NEST SITES BY BARN OWLS IN EAST-CENTRAL COLORADO

DAVID E. ANDERSEN¹

Department of Wildlife Ecology, University of Wisconsin, Madison, WI 53706 U.S.A. and Colorado Fish and Wildlife Assistance Office, U.S. Fish and Wildlife Service, 730 Simms St., No. 292, Golden, CO 80401 U.S.A.

ABSTRACT.—Barn owls (*Tyto alba*) sequentially reused nest sites of great horned owls (*Bubo virginianus*) within the same breeding season on two occasions in east-central Colorado during 1982 and 1983. Two of 22 cliff nest sites used by great horned owls during the 2-year period were subsequently reused by barn owls, while no red-tailed hawk (*Buteo jamaicensis*, $N = 8$) or common raven (*Corvus corax*, $N = 20$) cliff nests were sequentially used by barn owls. In temperate latitudes, only rarely are sympatric raptor species expected to exhibit breeding behavior that could accommodate intra-year sequential nesting at the same site.

KEY WORDS: *breeding; Bubo virginianus; Colorado; barn owl; great horned owl; nest site; Tyto alba.*

Re-uso intra-anual de nidos de *Bubo virginianus* por *Tyto alba* en el centro-este de Colorado

RESUMEN.—*Tyto alba* re-usó secuencialmente nidos de *Bubo virginianus* en la misma estación reproductiva y en dos ocasiones (1982 y 1983), en el centro-este de Colorado. Dos de los 22 nidos usados por *B. virginianus*, durante el período de dos años, fueron subsecuentemente re-usados por *T. alba*. En latitudes templadas, estas especies simpátricas, raramente se espera que exhiban una conducta reproductiva que incluya nidificación secuencial intra-anual en el mismo sitio.

[Traducción de Ivan Lazo]

Barn owls (*Tyto alba*) are sympatric with great horned owls (*Bubo virginianus*) throughout much of their breeding range in North America (Johnsgard 1988), and these two species' nest-site characteristics are often similar (Knight and Smith 1982). Great horned owls are also potential predators of barn owls (e.g., Wayne 1924, Rudolph 1978, Knight and Jackman 1984, Millsap and Millsap 1987) and have reportedly killed barn owls at their nest sites (Millsap and Millsap 1987). Presumably, barn owls select nest sites that provide protection from predation by great horned owls if other factors that influence nest site selection (e.g., thermal protection, Millsap and Millsap 1987) are met.

Several authors (e.g., Smith and Marti 1976, Marti et al. 1979, Bunn et al. 1982) have suggested that barn owl populations may be limited by the availability of suitable nest sites. In predominantly

open habitats, breeding density of many raptors is thought to be limited by the availability of suitable nest sites (Olendorff and Stoddart 1974, Newton 1979, Andersen 1991). In these habitats, different raptor species often nest in closer proximity to one another than would be expected if nest sites were placed randomly or regularly (Schmutz et al. 1980, Restani 1991), and this pattern appears to correspond to the distribution and density of suitable nest sites. Where nest sites are not limiting, interspecific nest dispersion may become more regular (Rothfels and Lein 1983). Perhaps due to low availability of suitable nest sites, many raptors appropriate nests from other species from one year to the next (e.g., Newton 1979, Smith and Murphy 1982), suggesting the occurrence of interspecific competition for nest sites. However, intra-year use of the same nest site by two raptor species is probably rare.

During a 2-yr study of raptors in east-central Colorado I observed two instances of within-year use of great horned owl nest sites by barn owls. These observations are consistent with the suggestion that nest site availability may influence distribution

¹ Present address: Minnesota Cooperative Fish and Wildlife Research Unit, National Biological Service, Department of Fisheries and Wildlife, University of Minnesota, St. Paul, MN 55108 U.S.A.

Table 1. Cliff nests of large birds located on the Fort Carson Military Reservation, Colorado from 1982 through 1983 and the occurrence of intra-year reuse of those nests by barn owls.

SPECIES	YEAR	NO. OF NESTS	NO. OF NESTING ATTEMPTS THAT FAILED	
			NO. OF NESTS REUSED	NO. OF NESTS REUSED
Red-tailed Hawk	1982	4	1	0
	1983	4	0	0
Great Horned Owl	1982	9	0	0
	1983	13	3	2
Common Raven	1982	10	3	0
	1983	10	—	—

of raptors nesting in predominantly open habitats, and provide an example of the conditions under which interspecific, intra-year breeding in the same nest site might occur. To my knowledge, similar observations have not previously been reported in the literature.

METHODS

During 1982 and 1983, I monitored nesting raptors on the Fort Carson Military Reservation (FCMR) in east-central Colorado (see Andersen et al. [1985] for a description of the FCMR). Nests were located each spring from the ground (on foot or from a vehicle) by searching potential nesting habitat. In March and/or April of each year, potential nesting areas (primarily cliff lines, prominent trees and canyons) were also surveyed from a helicopter, and all nest sites occupied in 1982 were rechecked in 1983. Each nesting attempt was monitored approximately weekly until young fledged or the nesting attempt failed. Follow-up visits were made to nests where no young fledged in order to determine cause of failure, and nest sites were visited during August in the year they were monitored to quantify their physical characteristics.

RESULTS AND DISCUSSION

During follow-up visits to nests in 1983, I located two barn owl nests at sites where great horned owls had nested earlier in the year (Table 1). One nesting attempt, located on 6 August, contained three barn owl young, and was situated where a great horned owl nesting attempt had failed on approximately 13 April 1983. The other nest contained five barn owl young and was found on 7 August at a site where great horned owls had fledged on approximately 16 May 1983. Neither barn owl nest was subsequently visited to determine nesting success, although I estimated that young were at least

halfway through the nestling period at both nests (based on photographs in Bunn et al. [1982]) and thus had a high probability of fledging.

Barn owl nesting only infrequently occurred at vacated nest sites of great horned owls (two of 22 cliff nest sites of great horned owls over a 2-yr period) and was not observed in old nests of other large cliff-nesting birds (red-tailed hawks [*Buteo jamaicensis*] or common ravens [*Corvus corax*]) on the FCMR (Table 1). Both nest sites used by barn owls were on cliffs; one in an old stick nest that appeared to have been constructed by common ravens and the other in a large natural cavity in a sandstone cliff. The only other barn owl nesting attempt located on the FCMR during the 2-yr study was in a natural cavity in a cliff (Andersen 1988).

On the FCMR, great horned owls laid eggs in early March and young fledged in early to mid-May. In north-central Colorado, barn owls fledged young from July to early September (Millsap and Millsap 1987); egg laying occurred from April through early July (Pickwell 1948, Smith et al. 1974, Colvin 1985, Marshall et al. 1986). The period of nest initiation on the FCMR is not known, but if similar to north-central Colorado, then barn owls may be able to use both successful and unsuccessful great horned owl nest sites as potential nests.

Within-year use of the same nest site by two raptor species is likely to be rare. In temperate areas, most raptors of medium to large body size begin nesting in late winter or early spring, and generally attempt nesting only once during a single breeding season (Newton 1979, Johnsgard 1988). Sequential use of a nest by different species within a single breeding season requires one species to relinquish the site early in the season, and the other to adopt the site relatively late in the season. Reuse of nest sites may also be more likely when suitable nest sites are limited and when neither species constructs its own nest, further limiting potential nest sites. These conditions are probably only met in a few species pairs, with barn owls being one of the few species likely to initiate nesting late in the season (Stewart 1952, Henny 1969).

ACKNOWLEDGMENTS

Support for this study was provided by the U.S. Army, Directorate of Environmental Compliance and Management, Fort Carson, Colorado, through the U.S. Fish and Wildlife Service (Colorado Fish and Wildlife Assistance Office and the Wisconsin Cooperative Wildlife Research Unit). Support was also provided by the College of Ag-

ricultural and Life Sciences, the Graduate School and the Department of Wildlife Ecology at the University of Wisconsin-Madison. I thank W.R. Mytton, T.S. Prior, S.R. Emmons and B.D. Rosenlund, who helped coordinate the project on military property and O.J. Rongstad for invaluable guidance and assistance. Field assistance was provided by T. Aydelott and G.M. Hughes. Previous drafts of this manuscript were reviewed by C. Bandy, T.L. Warren, R. Bunn, B.D. Rosenlund, K.M. Canestorp, M.G. Henry, L.L. Kinkel, B.A. Millsap, J. Marks, C.S. Houston, D.G. Smith and an anonymous reviewer.

LITERATURE CITED

- ANDERSEN, D.E. 1988. Common barn owl killed by a prairie falcon. *Southwest. Nat.* 33:377-378.
- . 1991. Management of North American grasslands for raptors. Pages 203-210 in B. Giron Pendleton, D.L. Krahe, M.N. LeFranc, Jr., K. Titus, J.C. Bednarz, D.E. Andersen and B.A. Millsap [Eds.], Proc. Midwest Raptor Management Symposium and Workshop. Nat. Wildl. Fed. Sci. Tech. Ser. No. 15.
- , O.J. RONGSTAD AND W.R. MYTTON. 1985. Line transect analysis of raptor abundance along roads. *Wildl. Soc. Bull.* 13:533-539.
- BUNN, D.S., A.B. WARBURTON AND R.D.S. WILSON. 1982. The barn owl. Buteo Books, Vermillion, SD U.S.A.
- COLVIN, B.A. 1985. Common barn owl population decline in Ohio and the relationship to agricultural trends. *J. Field Ornithol.* 56:224-235.
- HENNY, C.J. 1969. Geographical variation in mortality rates and production requirements of the barn owl (*Tyto alba* spp.). *Bird-Banding* 40:277-290.
- JOHNSGARD, P.A. 1988. North American owls: biology and natural history. Smithsonian Institution Press, Washington, DC U.S.A.
- KNIGHT, R.L. AND R.E. JACKMAN. 1984. Food-niche relationships between great horned owls and common barn owls in eastern Washington. *Auk* 101:175-179.
- AND D.G. SMITH. 1982. Summer raptor populations of a Washington coulee. *Northwest Sci.* 56:303-309.
- MARSHALL, J.D., C.H. HAGER AND G. MCKEE. 1986. The barn owl egg: weight loss characters, fresh weight prediction, and incubation period. *Raptor Res.* 20:108-112.
- MARTI, C.D., P.W. WAGNER AND K.W. DENNE. 1979. Nest boxes for the management of barn owls. *Wildl. Soc. Bull.* 7:145-148.
- MILLSAP, B.A. AND P.A. MILLSAP. 1987. Burrow nesting by common barn-owls in north central Colorado. *Condor* 89:668-670.
- NEWTON, I. 1979. Population ecology of raptors. Buteo Books, Vermillion, SD U.S.A.
- OLENDORFF, R.R. AND J.W. STODDART, JR. 1974. The potential for management of raptor populations in western grasslands. Pages 47-87 in F.N. Hamerstrom, Jr., B.E. Harrell and R.R. Olenдорff [Eds.], Management of raptors. Raptor Research Found., Raptor Res. Rep. No. 2.
- PICKWELL, G. 1948. Barn owl growth and behaviorisms. *Auk* 65:359-373.
- RESTANI, M. 1991. Resource partitioning among three *Buteo* species in the Centennial Valley, Montana. *Condor* 93:1007-1010.
- ROTHFELS, M. AND M.R. LEIN. 1983. Territoriality in sympatric populations of red-tailed and Swainson's hawks. *Can. J. Zool.* 61:60-64.
- RUDOLPH, S.G. 1978. Predation ecology of coexisting great horned and barn owls. *Wilson Bull.* 90:134-137.
- SCHMUTZ, J.K., S.M. SCHMUTZ AND D.A. BOAG. 1980. Coexistence of three species of hawks (*Buteo* spp.) in the prairie-parkland ecotone. *Can. J. Zool.* 58:1075-1089.
- SMITH, D.G. AND C.D. MARTI. 1976. Distributional status and ecology of barn owls in Utah. *Raptor Res.* 10:33-44.
- AND J.R. MURPHY. 1982. Nest site selection in raptor communities on the eastern Great Basin Desert. *Great Basin Nat.* 42:395-404.
- , C.R. WILSON AND H.H. FROST. 1974. History and ecology of a colony of barn owls in Utah. *Condor* 76:131-136.
- STEWART, P.A. 1952. Dispersal, breeding behavior, and longevity of banded barn owls in North America. *Auk* 69:227-245.
- WAYNE, A.T. 1924. A death trap to the American barn owl (*Tyto pratincola*). *Auk* 41:342.

Received 26 September 1995; accepted 15 February 1996