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A COMPARATIVE STUDY OF TWO BARN OWL (*Tyto alba*) NESTING SITES IN SOUTHERN KANSAS

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The purpose of the study was to determine adult barn owl activity, clutch size, fledgling success, and weights of owlets at two nesting sites in southern Kansas. Weights of owlets were taken at approximately two week intervals over a 42 day period. Further, infrared sensors were placed near both nests to record and compare owl activity near the two nests for 26 days. One nest was in an enclosed deer hunting blind and the other nest was in a barn loft.

Nesting sites for barn owls (*Tyto alba*) have been documented in the literature to include: cavities in trees, burrows in banks, and nooks in buildings (Goss, 1891). Wallace (1948) states reference to a barn owl nesting in a California mine shaft some 65 feet below the ground. Abandoned steel mill buildings have been reported as nesting sites in Utah (Smith et al, 1974). Barns and abandoned buildings are common nesting sites (Bunn et al, 1982). In Texas, an abandoned water tower was observed as a nesting site (Hamilton and Neill, 1981). Nesting boxes have served as successful sites both in Texas (Otteni et al, 1972) and in Scotland (Taylor, 1991). More recent studies in Nebraska show successful nesting sites within artificial nesting boxes in barns, grain bins, and a 55-gallon barrel placed in a canal bank (Gubanyi et al, 1992). A graphic design for barn owl nesting boxes is included in Bunn et al, 1982.

METHODS

In this study, I observed the successful nesting of two pairs of barn owls within an enclosed hunting blind on a steel supported tower and in an old barn loft. The two barn owls nesting sites were approximately five miles northeast of Geuda Springs, Cowley Co., KS.

The hunting tower blind was located at 37° 09' 02" N 97° 07' 09" W. The nest was within a steel tower blind, 30 feet above the ground. The blind was six feet by eight feet wide, and about six feet high. The wooden frame of the blind was covered with tin and the wooden floor with an old nylon rug. Observational windows were located on each side of the enclosure. A broken section in a window on the south wide of the structure permitted an entrance and exit to the nesting site. The site was exemplary for the infrared counting system.

The barn loft nest was located at 37° 09' 12" N 97° 07' 31" W in the northeast corner of a wooden barn. The nest was placed in a gap between two rows of stacked prairie hay. Bales of hay were positioned to force the adult owls to pass through the infrared sensory beam with each entry and exit.

The tower and barn were located on the lower Arkansas River flood plain. The area has sand hills with deciduous hardwood trees and native prairie. Native prairie is a critical habitat for barn owls (Laycock, 1985).

The tower nest was more exposed to disturbances by potential predators and humans than was the barn nest. Since the old barn nesting site was restricted to storage, the only human activity was by researchers.

Although Taylor (1991) found no difference in the mean number of barn owlets fledged per nest between an intensive study and nonintensive study, attempts were

made in this study to reduce possible infringements in the nesting areas. Gubanyui et al (1992) reported that human disturbances may induce nest abandonment, especially in the early days of incubation.

Interval visitation events by the adult owls at the nesting site were collected by the use of Trail Master infrared sensor and field laptop computer. Each time an owl broke the beam of light, an event was registered by the minute, hour, and date. The sequential weights and general observations of the owlets in both nests also were noted.

During the morning of 9 May, the infrared sensor was placed near a broken window within the hunting tower blind. On that day, there were six barn owl eggs in a cluster on a nylon rug. A seventh egg was located on the outer perimeter from the clutch. The nest, in the barn, was not monitored with a sensor until 19 June. The 26 days of comparative activity between the two nests began at 20:00 hours on 19 June and ended at 12:00 hours on 16 July.

The dark interiors, within the barn and the blind, assured more accuracy with the infrared sensors. In an attempt to avoid merely bobbing motions of the owl, an arbitrary

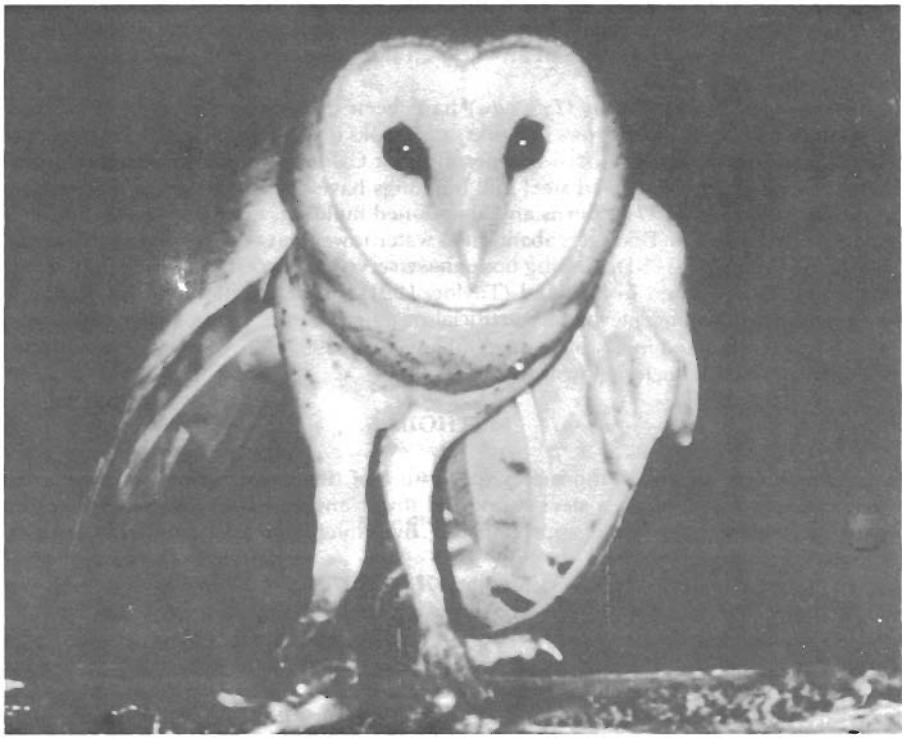

FIGURE 1. Photograph of Barn Owl taken by infrared sensor placed at nest site.

decision was made to count only those events that were at least one minute or more apart. The system accurately recorded exits by adult owls with arrival of researchers. Approximately every two weeks, the data was down loaded from the sensor into a portable laptop computer and analyzed using the Trail Master Statpack. Timed events were recorded as activity events and not merely as feeding events.

In one sequential photography session using the Trail Master system, both the male and female adult owl were recorded at the tower nesting site. It was assumed both adults were feeding the young. Photographs in the barn were not possible without undue disturbance to the adult owls. However, two adult birds commonly exited from the barn when disturbed.

On the morning of 23 May, there were two newly hatched owlets and four eggs in the tower nest. The oldest owlet was estimated to be six days old. Estimates of the owlets' ages were based upon reports of 2.3 day intervals in hatching of the eggs (Smith et al, 1974) and egg tooth references (Bunn et al, 1982).

On 6 June (14 days after observing the two owlets in the tower), I located six owlets in the barn loft nest. The oldest owlet in the barn was a few days younger than the oldest owlet in the tower. The owlets' weight were recorded with the use of a triple-beam balance. General health of the owlets also was noted. The weight data is listed in Tables 1 and 2.

TOWER OWLETS

In a comparison of the mean weights of the owlets, the tower nest had the higher mean (619.5 g). By the end of the study, there were but three probable fledglings from the tower nest compared with five from the barn nest. Two of the owlets in the tower nest became entangled in nylon thread from the rug. One of the injured owlets deteriorated and died due to its injuries; the other had a deformed wing. A third owlet appeared to have an infection in one of its eyes. By late morning in July, the owlets in the tower displayed more heat stress than did those in the barn.

Owlet weights were taken in the tower on 5 June, 21 June, 3 July and 18 July (Table 1 and Table 2). On 5 June, the oldest owlet was estimated to be 19 days old. The mean weight of the six owlets was 177.3 g (range 55-258 g). The five remaining owlets were weighed on 21 June. The mean weight was 455.8 g (range 309-596 g). The oldest owlet was estimated to be 34 days old. By 3 July, the oldest owlet was estimated to be 47 days old. The mean weight of the four remaining owlets was 605 g (range 474-697 g). The owlet weighing 474 g had become entangled in rug thread found in association with the nesting site. The injury resulted in obvious abnormal wing growth. The smallest remaining owlet was severely injured by nylon thread around its leg; it was not weighed. Though attempts were made to remove loose threads around the nesting area, the rug was nailed to the floor of the blind; thus, the injuries could not realistically have been prevented. During this study, the owlets ranged in weight from 55 g to 697 g.

On 18 July, the largest owlet in the tower was observed as it fledged from the tower. The owlet was estimated to be 62 days old. It was not possible to capture and weigh the owlet prior to its fledging. The mean time to fledging had been reported to be 64.3 days (range 62-67) (Smith et al, 1974). The remaining two owlets had a mean weight of 620 g. The owlet with the injured leg was dead near the nest and the owlet with the injured wing was placed in a rehabilitation center. It was assumed that the two healthy owlets fledged within a few days.

Of interest was the number of birds delivered as prey to the tower nest. Smith et al, (1974) reported blackbird prey at 1.2%. However, Colvin and McLean (1986) indicate a high of 37% of blackbirds in the diet during the September migration of blackbirds. Otteni et al (1972) noted an increase of Icterinae from 1% to 14% in the pellets during years with decline of mice. A dead, newly fledged meadowlark (*Sturnella sp.*) was found in the tower nest. I found no reference in the literature specifying meadowlarks as prey of barn owls. On another occasion, the remains of an adult male and an immature Red-winged Blackbird (*Agelaius phoeniceus*) were noted in the tower nest. Cattail growths, along the shores of a nearby pond, provided nesting sites for Red-winged Blackbirds. Since this study was not involved with the analysis of owl pellets, no percentage estimates of Icterinae or rodents as prey were considered. Other researchers have noted that the number of prey items in barn owl diet may reflect prey availability (Gubanyi et al, 1992).

BARN LOFT OWLETS

Owlet weights were taken in the barn on 6 June, 21 June, 4 July and 19 July (Table 1 and Table 2). The mean weight of the six owlets on 6 June was 134.9 g (range 40-240 g). On 21 June, the five remaining owlets were weighed. The mean weight was 455.2 g

Tower		Barn		Tower		Barn	
5 June		6 June		21 June		21 June	
Owl	Weight (grams)	Owl	Weight (grams)	Owl	Weight (grams)	Owl	Weight (grams)
1	258	1	240	1	596	1	578
2	243	2	197	2	574	2	546
3	231	3	149	3	432	3	418
4	184	4	113	4	367	4	417
5	92	5	70	5	309	5	317
6	55	6	40				
N = 6 Mean = 177.3		N = 6 Mean = 134.9		N = 5 Mean = 455.6		N = 5 Mean = 455.2	

TABLE 1 — Summary of June owlets' weights.

Tower		Barn		Tower		Barn	
3 July		4 July		18 July		19 July	
Owl	Weight (grams)	Owl	Weight (grams)	Owl	Weight (grams)	Owl	Weight (grams)
1	697	1	631	1	fledged	1	630
2	675	2	614	2	653	2	575
3	573	3	573	3	587	3	551
4	474	4	536			4	515
		5	529			5	445
N = 4 Mean = 605		N = 5 Mean = 576.6		N = 2 Mean = 620		N = 5 Mean = 543	

TABLE 2 — Summary of July owlets' weights.

(range 317-578 g). By 4 July, the mean weight of the five owlets was 576.6 g (range 529-631 g). On 19 July, the mean weight of the five owlets was 543 g (range 455-630 g). The owlets were in excellent condition. Through the course of the study, the owlets in the barn ranged in weight from 40 g to 630 G. The 40 g owlet was expected due to a later hatching clutch in the barn than in the tower. All five surviving owlets in the barn were healthy and were more aggressive than in the tower nest.

In a comparison of mean weights (4 July and 19 July), there was about a 6% loss of weight. The 16% loss in weight in the youngest owlet was not expected.

RECORDED INFRARED EVENTS FOR BOTH NESTS

Table 3 and Figure 2 are a summary listing of all the infrared recorded events during the study. A total of 934 events with at least a minute between intervals was recorded in the tower and a total 624 events were registered within the barn. The activity periods for the owls were divided into four time units: 24:00 to 06:00, 06:00 to 12:00, 12:00 to 6:00, 6:00 to 24:00. Between 24:00 and 06:00, 276 or approximately 30% of all events occurred within the barn and 352 or about 56% were recorded in the tower. During the daylight hours, in the interval between 07:00 and 19:00, there were 229 events or about 25% of the total events within the barn and 12 or merely about 2% of

Barn			Tower		
Time Interval	Total Events — 6 Hours	% Total Events — 6 Hours	Time Interval	Total Events — 6 Hours	% Total Events — 6 Hours
24:00-06:00	276	29.6	24:00-0600	352	56.4
0600-12:00	124	13.3	0600-12:00	40	6.4
12:00-18:00	113	12.1	12:00-18:00	0	0
18:00-24:00	421	45.1	18:00-24:00	232	36.6
Total	934			624	

TABLE 3 — A summary of the six hour activity periods for both nests.

the total events within the tower. From 18:00 and 24:00, there were 449 events or about 48% of the total events within the barn as compared with 232 events or about 37% of the total events within the tower. The most active times in the entire study occurred in the barn between 18:00 and 24:00 with 421 events or about 45% as compared with 352 events or about 56% between 24:00-06:00 in the tower. The least active time unit at both sites occurred between 12:00 to 18:00. There were 113 or about 12% of the total events within the barn and no events in the tower.

The number of visitations between the tower and barn nesting sites were compared to determine if there was significanct differences in the adult owls' activities indicated between the two sites. Admittedly, in this study, the sample size was limited; thus, a random sample of neither the adult owls nor the nesting sites could be documented. This work has not proven whether the adult activity at the two nesting sites was deter-

COMPARISON OF RECORDED ACTIVITY AT TWO BARN OWL NESTS (19 JUNE-16 JULY, 1992)

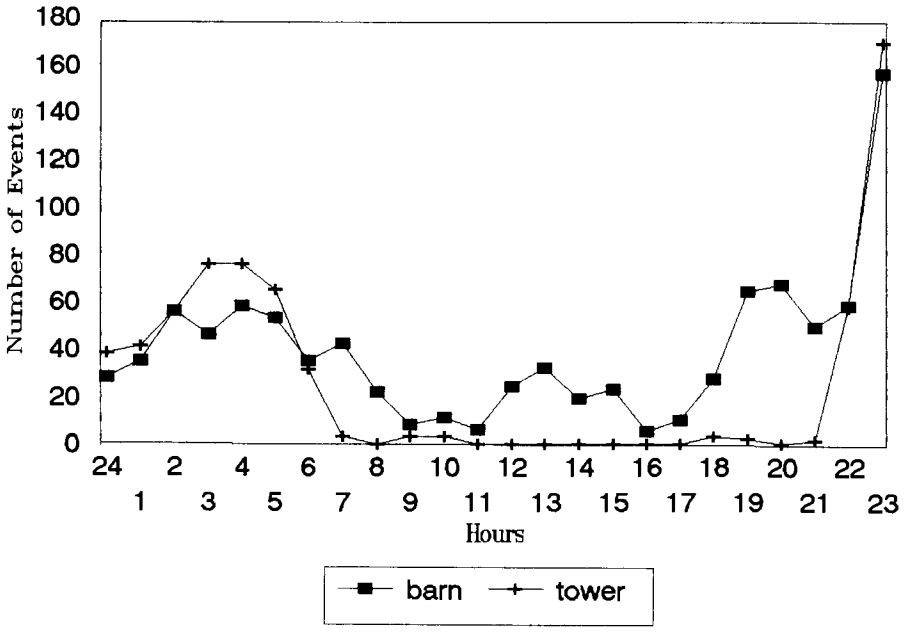

FIGURE 2. Results indicating hour intervals and events.

mined by individual owl's behavior, the particular setting of the nest, human or possible predatory activity near the tower, or a combination of several factors. Given such limitations, a paired *t*-test was completed in an attempt to determine if there was a significant difference between the events' activity between the tower and barn loft nests. The visitation events at the tower were significantly lower in number than the barn visitations ($t = 2.599$, df23, $p = .016$). The overall recorded events between the two nesting sites indicated about 33% more activity at the barn nest as compared with the tower nest.

DISCUSSION

Because of the small sample size, additional studies are required to determine if clutch size and owlet general health differ significantly in the varying conditions of the nesting sites. Frayed nylon rugs or other entanglements should not be near nesting barn owls. A nesting box mounted either on the support beams or within the blind may serve as a solution to the entanglement problems.

The growth rate does vary from barn owl brood to brood and depends almost entirely upon the amount of food that is delivered to the young. Further, it is not uncommon for barn owlets to lose weight after thirty days of age (Baudvin, 1975). As the weights data were compared with owlets in another study (Pickwell, 1948), the barn loft and tower owlets were within an expected range of weights. Pickwell (1948) reported a weight of a near fledging at 650.3 g.

The weighing of the owlets was a challenging procedure especially as the owlets reached four weeks of age and older. The owlets can be aggressive or as accurately recorded by Bunn, et al, (1982), "vicious." The owlets were carefully separated into individual sacks during the weighing procedure to avoid injury to each other.

A study involving a larger sample size of nests fitted with infrared monitors throughout the feeding period for the owlets is recommended. Exact numbers of events would have been beneficial to complete the accuracy of the study. Another shortcoming in the study was the inability to differentiate owlet behavior from activity by the adults by infrared monitoring in the later stages of the nesting period. However, with the small number of daylight events recorded within the tower and the intentional cessation of the study at the time the barn loft owlets were preparing to fledge, the events were thought to be largely restricted to adult owl movements.

This study demonstrates the application of the Trail Master as a reliable monitor in owl nesting studies. The use of the system might best be restricted to dark nesting sites due to potential interference from normal daylight infrared waves. Further, the Trail Master was not as intrusive as human observers would have been.

Photographic documentation was possible with the use of the Trail Master. In addition, photographs provided information concerning prey identification at the blind.

Because just three of the total six owlets fledged, it would initially appear that the tower nesting was merely 50% successful in the production of fledged young. However, the complication of the entanglement and injuries to the two owlets in rug thread must be considered.

Further studies could determine if the absence of adult owls during daylight hours is an expected behavior in more exposed nesting sites. In addition, future studies could attempt to determine if there are correlations in the events of the barn owls relating to moonlight, cloud cover, rainfall, or temperatures. Further photographic documentation of adult owl visits to the nests also would be helpful.

This study suggests that enclosed elevated hunting or observational blinds might well serve as barn owl nesting sites if adequate native prairie is available and if the blind is visited infrequently by humans during nesting. Obvious conflicts arise with human sportsmen as one observes the odors and wastes produced by nesting barn owl. Future studies are recommended to determine if deer hunting blinds fitted with nesting boxes might serve as nesting sites for barn owls. A nesting box would provide the necessary protection for the owlets and later the box could be removed before the hunting season. Another advantage to the nesting box within a tower blind, would be the darkness

necessary to activate a Trail Master system during the daylight hours.

During early July, the owlets in both nests were banded. Both adult owls in the barn also were banded after the young had fledged.

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