INTERNATIONAL
OWL CENTER

Passive acoustic monitoring of Barn Owls in southeastern Minnesota

Year 2

2021 Minnesota Ornithologists' Union Savaloja Grant Report

Submitted by Karla Bloem
International Owl Center
126 E Cedar St
PO Box 536
Houston, MN 55943

24 December 2021

INTRODUCTION

Barn Owls *(Tyto alba)* are a highly nocturnal species, making visual observations of healthy, living birds difficult (Marti et al. 2005). Although I have recorded their vocalizations on the security cameras that monitor the International Owl Center's captive owls many times since 2014, I have never seen a Barn Owl nor found evidence of their presence (feathers or pellets) in neighboring barns or the general area, nor have nearby residents seen or otherwise noticed them. Reports of Barn Owls are increasing in Minnesota (Bloem et al. 2018). Passive acoustic monitoring with portable automated recording units was successful at detecting wild Barn Owls in two new locations in 2021, but owls vocalized very infrequently and primarily in spring and fall.

OBJECTIVES

1. Test if placing recorders in fixed locations for a year increases detections of wild Barn Owls at new locations.

2. Test if trail cameras aimed at nest boxes detect Barn Owls visiting the boxes.

METHODS

I deployed my two existing Song Meter Minis on 21 and 22 March with alkaline batteries at locations where they recorded wild Barn Owls in 2020. I purchased two additional Song Meter Minis with lithium lids, lithium-ion batteries and renewed my subscription to Kaleidoscope Pro software (both from Wildlife Acoustics, Maynard, MA) with the Savaloja grant. Because of the longer life of lithium-ion batteries, these units were deployed on 7 and 17 May at more distant locations where Barn Owls had not previously been recorded.

The Minnesota Department of Natural Resources nongame program contributed another Song Meter Mini with lithium-ion batteries and two GardePro A3 trail cameras. This Song Meter Mini was deployed 15 June at a location where a nest box was present but no Barn Owls had previously been recorded. I installed a trail camera on a metal T-post at the same site and located the other trail camera at a nest box where owls had been recorded before but no recorder was currently deployed.

One Song Meter had technical issues on 4 July and was sent in for repair. The company replaced it, and I redeployed it 20 July. The company also sent a free Song Meter Micro and requested that I test it and give feedback. I deployed the Song Meter Micro 24 August, making a total of 6 recorders deployed in 2021.

I used the same recording settings as in 2020:

- Continuous recording from 30 minutes after sunset to 1 hour before sunrise
- Sample rate: 12000 Hz (24000 Hz at the nest site)
- Maximum recording length: 30 min (10 min at the nest site)
- Gain: 24 dB

From late spring through the end of summer the Song Meter Minis with 4 AA alkaline batteries could run for roughly 4 weeks until I needed to replace batteries. Those with 6 lithium-ion batteries could operate for about 3 months, and the Song Meter Micro could run for about 3 weeks on its 3 AA alkaline batteries. Deployment times shortened as daylength decreased.

Recorders were placed in fixed locations in Houston, Fillmore and Winona Counties, except the Song Meter Micro was moved to a wild Barn Owl nest I located in La Crosse, WI from 1 October to 14 November.

Deployments for two recorders running on alkaline batteries were ended 14 November and 8 December. I switched one recorder not able to run Li-ion batteries to Energizer lithium batteries in late November. Lithium batteries function better in freezing temperatures than alkaline batteries, with lithium-ion batteries functioning the best. Currently the three recorders with lithium-ion batteries are still deployed in addition to the one with Energizer lithium batteries.

I analyzed recordings using Kaleidoscope Pro to extract all potential Barn Owl calls using the following parameters:

- Minimum and Maximum Frequency Range: 1500-3300 Hz (although an upper limit of 2200 Hz was necessary in the spring to reduce extreme overlap with spring peeper choruses)
- Minimum and Maximum Length of Detection: 0.3 – 1.2 seconds
- Maximum inter-syllable gap: 0.001 – 0.1 (shorter durations were needed to reduce overlap with gray treefrogs and Whip-poor-wills, but full separation from gray treefrogs was not possible)
- Max distance from cluster center to include outputs in cluster.csv: 1.5
- FFT Window 10.67ms
- Max states: 12
- Max distance to cluster center for building clusters: 0.5
- Max clusters: 500

Because Barn Owl vocalizations are so infrequent and thus do not cluster well in Kaleidoscope Pro, I manually reviewed every sound file extracted using the above parameters.

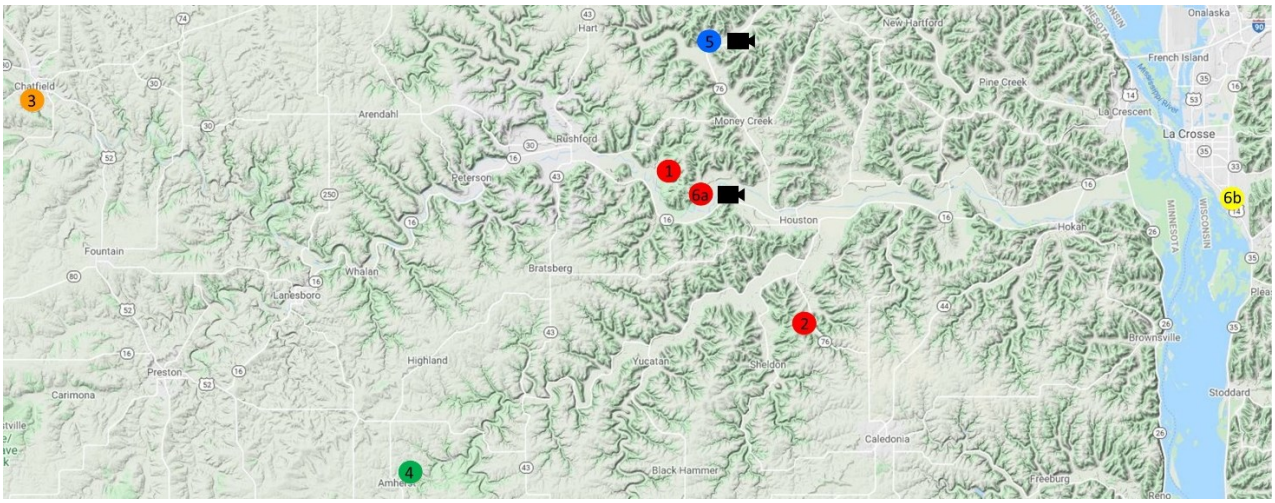
Trail cameras were mounted on a metal T-post in front of the nest boxes. Images included space around the boxes so owls could be seen coming or going. Cameras were programmed to take 4 megapixel photos and 10 second 1080p videos with a 0 second delay using the medium sensitivity setting, using side motion sensors. The cameras have a 0.1 second trigger speed.

RESULTS

Trail cameras did not detect any Barn Owls. One camera was paired with a recorder that did not detect any Barn Owls last year or this year (site #5, see map below). American Kestrels raised young in the nest box at that location and a Red-tailed Hawk and Great Horned Owl were caught on video perching on the nest box. The Great Horned Owls raised young in the area, as thousands of juvenile begging calls were recorded. Due to operator error, the camera was not turned on for most of July and August.

I deployed the other camera in May and it is still deployed. It is at a site that had the Song Meter Micro for only 57 days (site 6a, see map below). The Micro detected wild Barn Owls on two nights, but the camera did not capture any Barn Owls. American Kestrels nested in that nest box, and the box was also visited by Eastern Bluebirds, European Starlings and an Eastern Kingbird.

Song Meters detected wild Barn Owls at 5 of the 6 locations I monitored in 2021.



2021 recorder and trail camera deployment locations. *Red circles indicate where Barn Owls were detected in 2020 and 2021. The orange circle marks where recorders were placed both years but only detected Barn Owls in 2021. The blue circle indicates where a recorder was placed in part of 2020 and most of 2021 but no Barn Owls were detected either year. The green circle indicates where there was no recorder in 2020 but a Barn Owl was detected in 2021. The yellow circle marks the nest I found in La Crosse, Wisconsin. The camera icons indicate where I placed trail cameras.*

Site #	Start	End	Detection Dates (# of calls)
1	21-Mar		17 May (4); 9 Sept (2); 16 Sept (1); 23 Sept (3); 24 Sept (2)
2	22-Mar	14-Nov	1 Apr (1); 16 Apr (3); 8 May (3)
3	7-May		16 May (2 bouts of 3 calls each)
4	17-May		23 Oct (1); 25 Oct (1)
5	15-Jun		none
6a	24-Aug	1-Oct	9 Sept (7); 23 Sept (1)
6a	17-Nov	8-Dec	none
6b	1-Oct	14-Nov	1 Oct - 27 Oct (50,000+); 31 Oct (1); 6 Nov (1); 7 Nov (1)

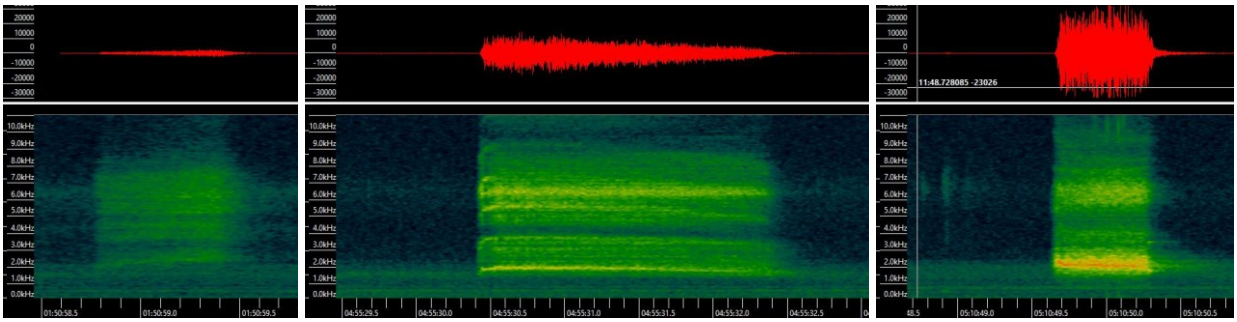
Sites 1-5 were monitored with Song Meter Minis. The Song Meter Micro was placed at sites 6a and 6b.

Sites where Barn Owls were detected included pasture (sites 2, 3, 4 and 6a) and shortgrass prairie (site 1). Site 4 is adjacent to tallgrass prairie and site 6a is adjacent to a hayfield and shortgrass prairie. Site 6b is in an urban yard, although the two adjacent lawns are heavily landscaped and have longer than average grass. The yards include many mature trees, and the nest was in a half-dead large silver maple tree with many natural cavities. One homeowner said they had a serious vole problem. Site 5, where no owls were detected, is a large area of pasture, prairie, and wet grasslands.

DISCUSSION

Continuous deployment of audio recording devices for most of a year was more successful at detecting wild owls than moving recorders to new locations every two weeks (wild Barn Owls were detected at 83% of surveyed sites in 2021 versus 8.3% of sites in 2020.) Continuous deployment of 6 recording devices also required less time and mileage than regularly moving 2 recorders (91.5 hours and 875 miles in 2021 versus about 150 hours and 1,008 miles in 2020.)

In 2021, during 991 recorder-nights I detected 41 Barn Owl screams (advertising calls) on 13 nights (not including the known nest site). In 2020 during 393 recorder-nights I detected at least 12 Barn Owl screams on 9 nights at 3 locations. The site within vocal range of our captive Barn Owl (6a) records the most calls. If that site is removed from the analysis, in 2021 I detected 26 screams on 12 nights at 4 locations and in 2020 I detected 3 screams on 3 nights from 2 locations.



Barn Owl calls recorded at the nest site. *Left: begging call; middle: mobbing call; right: advertising call*

The recordings I made at the nest site gave possible insights into Barn Owl vocalizations in this study. I recorded tens of thousands of Barn Owl begging calls at the nest, but the adults did not vocalize when making prey deliveries--begging call frequency simply increased for several seconds. Mobbing calls (drawn out screams given repeatedly until a potential mammalian predator leaves, which roughly translate into a string of nasty swear words) were recorded in many different bouts that may have been given by juveniles or adults.

Slankard et al. (2021) deployed satellite transmitters on two wild young Barn Owls in Kentucky. Within two weeks of dispersal one owl was hit by a car 139 km from the nest site. The second was tracked for 3.5 months and its signal stopped 23.5 km from the nest site, but in the meantime the owl made many distant excursions to other locations, the farthest being nearly 60 km from the nest site. Marti (1999) found the average dispersal distance based on band recoveries (n=144) to be 102.9 km (range 0-1267 km). Of 476 banded owls, Soucy (1980) noted three long distance band recoveries of 1760 km, 1760 km, and 1488 km. Stewart (1952) noted that Barn Owls in the north traveled farther distances from their banding locations than birds in the southern United States before being recovered.

The screams I have captured on recordings, which I presume are advertising calls based on the description in Marti et al. (2005), were only recorded at the nest site a few times. The call was given at the nest in the same way as the rest of my study: repeated 3 or fewer times. My best interpretation of this call at the nest is that it was an owl returning to the nest site to see if others were around

(translation: “Hey! Is anyone here?”) That context could fit what I am picking up on the recording devices: owls flying through an area just calling out a few times to check to see if other Barn Owls are in the area.

This could explain why I have recorded more wild Barn Owl calls within vocal range of our captive owl than elsewhere, as our owl usually vocally interacts with the wild owls. This could potentially indicate that the owls I am detecting are dispersing owls in search of a mate and a suitable territory. But I have recorded owls in the same location in multiple years, which could indicate that the locations are part of a dispersal corridor (all were in river valleys), or that there are enough dispersing owls that they regularly come across these patches of suitable habitat.

In addition to the owls I detected with recorders, I found an active Barn Owl nest in La Crosse, Wisconsin on 1 October, and another nest was found by the Minnesota Department of Transportation in Wabasha, MN on 5 October. A Barn Owl was photographed in Crawford County, WI along the Mississippi on 30 November, and I was able to confirm based on mutes, pellets and an old molted primary that the owl had been in the area at least a few months.

There seems to be an increasing trend in Barn Owls in Minnesota and although they remain difficult to detect, passive acoustic monitoring at fixed locations for a year is capable of detecting the presence of owls. Because analyzing recordings can be time intensive, monitoring during April, May, September and October is likely to capture the majority of advertising calls.

Next year I plan to deploy recorders at the known nest sites in La Crosse, WI and Wabasha County, and potentially at the site in Crawford County, WI. I plan to move the other recorders to new locations to see if I can detect Barn Owls at additional sites.

AKNOWLEDGEMENTS

I would like to thank the Minnesota Ornithologists’ Union for a grant from the Savaloja Fund to purchase equipment and software for this study, the Minnesota Department of Natural Resources for donating a Song Meter Mini and two trail cameras, Wildlife Acoustics for giving a Song Meter Micro for testing, and Kathi Finucane, Steve Wilson and Mary Shedd for individual donations. I would also like to thank all the landowners who allowed me to place recorders and nest boxes on their property (names not listed to protect exact locations of Barn Owls). I would also like to thank my husband, Hein Bloem, for his assistance and Piper the American Barn Owl for insights into vocalizations of the species.

LITERATURE CITED

Bloem, Karla A., Marjon Savelsberg, and Rose A. Yoakum. 2018. Recent Barn Owl Records in Minnesota. *The Loon* 90:39-41.

Marti, Carl D. 1999. Natal and breeding dispersal in Barn Owls. *Journal of Raptor Research*, *33*(3):181-189.

Marti, Carl D., Alan F. Poole and L. R. Bevier. 2005. Barn Owl (Tyto alba), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/001

Slankard, Kate G., Michael D. Patton, Loren F. Taylor, and James O. Barnard. 2021. Two Case Studies of Satellite Tracking Juvenile Barn Owl (*Tyto alba*) Dispersal. *Journal of Raptor Research* 55(1):115–118.

Soucy, Len J. 1980. Three long distance recoveries of banded New Jersey Barn Owls. *N. Am. Bird Bander* 5:97.

Stewart, Paul A. 1952. Dispersal, breeding behavior, and longevity of banded Barn Owls in North America. *Auk* 69:227-245.

BUDGET

Savaloja Grant Accounting

INCOME		**EXPENSE**	
Savaloja Grant	$2,070.00	2 Song Meter Minis + Li-ion accessories	$1,713.34
Individual donations	$240.00	Kaleidoscope software	$399.00
	$2,310.00	3 cable locks	$53.22
IN-KIND		Alkaline batteries	$118.58
Staff Time	$2,379.00	Trail cam brackets	$45.62
Mileage (1,008 miles)	$490.00	External hard drive	$114.35
Song Meter Micro	$249.00		
Song Meter Mini + Li-ion accessories	$795.83		**$2,444.11**
2 GardePro A3 trail cams + SD cards	$174.96		
	$4,088.79