Autumn Populations and Movements of Migrant Northern Saw-whet Owls (*Aegolius acadicus*) at Little Suamico, Wisconsin

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Abstract.—Northern Saw-whet Owls (*Aegolius acadicus*) were once considered a "rare" bird in Wisconsin. In the 1960's mist netting at bird-banding stations revealed Saw-whets to be a regular, uncommon migrant. Passive mist netting was initiated at the Little Suamico Ornithological Station in 1971. Our Saw-whet Owl experiences were similar to other banding stations until 1986, when we developed an "audiolure". This technique, utilizing an amplified Saw-whet "solicitation" courtship call increased our annual catch more than tenfold. Now in use at major banding stations in the western Great Lakes area, this technique has resulted in over 2,000 Saw-whets being netted each autumn. Currently at Little Suamico 5 percent of adult owls netted have been previously banded. Approximately 40 percent of owls netted are northbound. Direct interstation recoveries reveal that Saw-whets migrate slowly at our latitude and often not in the expected southbound direction. Adults move greater distances per night than immatures. More than 200 recoveries and recaptures in subsequent years have been generated at Little Suamico since 1986. Migration dates and nightly travel distances suggest that many of the Saw-whet Owls that we encounter spend the winter in Wisconsin.

Today more Northern Saw-whet Owls (*Aegolius acadicus*) are banded each year in North America than any other owl species. Bird-banding stations in the western Great Lakes region capture several thousand annually, mainly during autumn migration. Two major "breakthroughs" in capturing these owls have greatly facilitated these efforts. The first came from the Cedar Grove Ornithological Station located in southern Wisconsin along Lake Michigan. Mueller and Berger (1967) were the first to report that "numbers" of these owls could be captured in autumn migration with the use of mist nets left open at night. Passive mist netting has been in use at numerous bird-banding stations since the 1960's with varying degrees of success depending upon location. The second significant breakthrough was developed at the Little Suamico Ornithological Station (LSOS) in northeastern Wisconsin. In 1986 we developed an audiolure technique, utilizing an amplified Saw-whet "solicitation" courtship call. This technique allowed us to reduce the number of nets in use by over 50 percent while increasing captures tenfold. Since 1986, over 6,000 Saw-whet Owls have been captured at LSOS and two nearby substations. Subsequently, we obtained additional encounter data on close to 400 owls. In this paper we examine some direct interstation recoveries in terms of nightly movements and habitat.

STUDY AREA AND METHODS

The Little Suamico Ornithological Station is located along the west shore of Green Bay, approximately 17 kilometers north of the city of Green Bay at 44°40' N and 87°50' W. The bayshore topography is flat, gently sloping upward to the west. The difference in elevation is so slight between the station and the bay, that during periodic episodes of high water levels, wind driven seiches have flooded the station area.

Extensive marsh, shrub swamp, and deciduous swamp forest lie to the northeast, east, and

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south. The adjacent land to the west and north consists of dairy farms and old fields intermixed with woodlots. Farther north and northwest, continuous forest becomes predominant. Little Suamico Ornithological Station is near the southern edge of the continuous forest. South of Green Bay the habitat changes to primarily open agricultural land with scattered small woodlots. A more detailed description of LSOS can be found in Brinker and Erdman (1983) and the vegetation of the region in Robbins (1991).

Passive netting for owls was initiated in 1971 when LSOS was founded. Although the site was picked primarily for diurnal raptor migration, it was assumed that nocturnal migrants—owls—would also be captured. Beginning in 1972 attempts were made to locate local owl flight lanes. In general, a net placed anywhere in the area eventually yielded owls. The number of nets monitored increased annually until 1978, when our effort peaked with 38, 12-m, 61-mm mesh nets, stacked two high. Approximately 0.5 kilometer of nets scattered throughout the area took about 2 hours to check. A then station record of 141 owls were netted in 1978, of which 108 were Saw-whets. While the increased number of nets and work produced more owls, the drain on human and financial resources was great.

In an effort to ascertain our degree of success at capturing owls migrating through the area, we transported a total of 150 owls 1.6 km to the northeast during the next several autumns to see how many would be recaptured. Much to our dismay, only four (2.7 percent) of these birds were subsequently renetted in the same season. We speculated that either the owls were able to avoid being netted again, which seemed unlikely since they would only have knowledge of the location of the nets they'd previously been caught in, or if we were netting only a very small portion of owls moving through the area.

This question was resolved in 1986. Since the mid-1970's attempts to lure owls to the nets were made by placing captive bait animals, feral Pigeons (*Columba livia*), Starlings (*Sturnus vulgaris*), gerbils (*Meriones unguiculatus*), and mice (*Peromyscus leucopus*) in cages or balchatri's near the nets. We also attempted to entice them by using amplified taped distress calls of passerines and electronic "chirping" Christmas tree bird ornaments. These efforts had very limited success and generally only worked on the larger owls—mainly Long-eared (*Asio otus*) and Barred Owls (*Strix varia*).

The extremely high water levels in 1986 left LSOS in a sorry and soggy state. One-third of our normal 100-day operation found us totally under water; the high water made it impossible for us to run our outlying net lines, for these areas were often submerged under up to 1-m of water. Only 13 nets around the hawk trapping area and station could be safely run. We literally spent the entire trapping season in hip boots and waders. However, the high water did leave time for additional experimentation with owl audiolures. As of 22 October 1986 only 30 Saw-whets had been netted. On 23 October the "primary" or "solicitation" call of a Saw-whet was played for the first time, and resulted in 12 Saw-whets netted in the first hour of operation. It appeared *the* lure had been found. Not only were we netting greater numbers of Saw-whets, but many more could be heard calling from surrounding trees. Unfortunately it was late October and the main flight had already passed; but not before we caught 132 Saw-whets. We have continued to use the audiolure ever since.

Since 1987, we have standardized our amplified audiolure to produce a sound pressure level of 100-110 decibels. On a calm night we can hear this tape 1.5 km away. The primary solicitation call of a Northern Saw-whet Owl is recorded on a 3 minute continuous loop cassette tape. Complete details and a schematic can be found in Erdman and Brinker (1997) in this proceedings.

Captured owls were temporarily held in individual holding boxes until processed and banded. Owls were aged based on plumage characteristics, measured and weighed. Net capture location, direction, and net deck (height) were also recorded for each owl. Owls netted in early morning were held until the following evening for release.

A summary of our banding records was obtained from the Bird Banding Laboratory, U.S.G.S. Biological Resources Division. Only verified direct recoveries from and to other banding stations in the same autumn were used in our analyses (tables 1, 2, and 3). These include Wisconsin stations located to the south of LSOS; Cedar Grove Ornithological Station (D. Berger), Woodland Dunes Nature

Center (B. Brouchoud), and to the west southwest; Pulaski (M. Wierzbicki), and Linwood Springs Research Station (E. Jacobs). A single station record outside of Wisconsin came from the southeast at Halifax, NC (F. Enders). Stations to the northwest, north and northeast of LSOS are: Hawk Ridge, Duluth, MN (D. Evans), Cape Thunder, Ont. and Whitefish Point Bird Observatory, Paradise, MI. Owl movements between LSOS and/or substations at Pensaukee and Lena were not included in this analysis.

RESULTS

The effectiveness of the audiolure in attracting Saw-whet Owls for capture was dramatic (fig. 1). The annual mean number of owls captured in the years of passive net use was 57 (range 15-108). With the use of the audiolure the mean number exceeded 600 owls, over a tenfold increase.

Over 40 percent of the Saw-whets netted at Little Suamico were northbound. Most were captured low in the nets, with 60 percent recorded within 1.7 m and 95 percent within 3.4 m of the ground. Over 90 percent of those recaptured at Little Suamico in the same season were netted in a higher deck (level) than their initial capture.

Ten to 15 percent of the Saw-whet Owls captured with the use of the audiolure weighed more than 100 g. Owls exceeding 100 g comprised only 1 percent of the birds netted passively. Further, an increased mass of almost 3 g was recorded for owls captured using the audiolure. An increased mass was also recorded for almost all of the owls recaptured more than 24 hours after release.

Analysis of 99 direct recoveries of owls banded at LSOS and recaptured at other stations in the same season are presented in table 1. A total of 85 owls (86 percent) comprised of 48 adults and 37 juveniles, were recaptured to the south and southeast. Another 14 owls (14 percent) evenly split between adults and juveniles, were recaptured to the west and southwest.

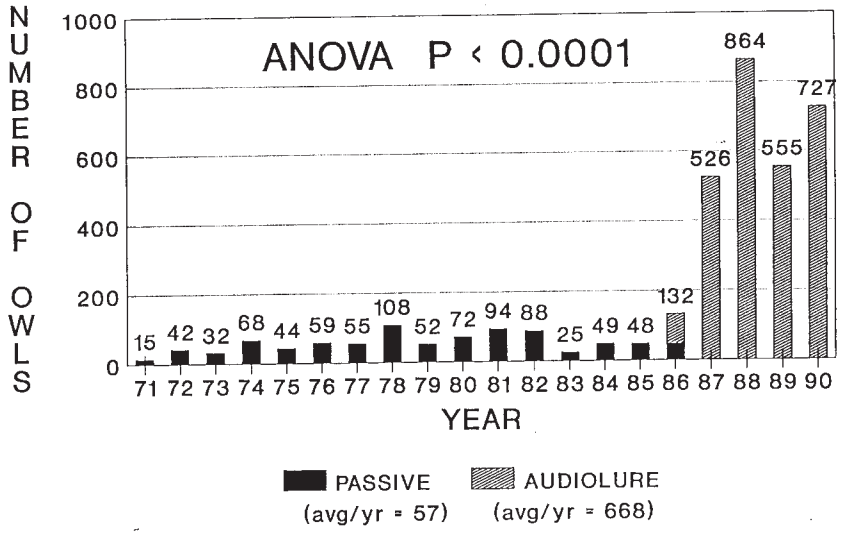

Figure 1.—*Number of Northern Saw-whet Owls captured, Little Suamico Ornithological Station, Wisconsin.*

Nightly movements of these owls averaged 7.7 km (range 1.0-44.8 km). Adults were more mobile, averaging 8.3 km, (range 2.6-44.8 km) nightly, 20 percent more than average juvenile nightly progress of 6.9 km (range 1.0-22.4 km). One long distance movement of 1,344 km by a juvenile owl in 1995 from LSOS to Halifax, NC, revealed an average nightly movement of 32 km.

At LSOS we captured 6 owls (4 adults and 2 juveniles) which had been banded north of Wisconsin earlier the same season (table 2). Average nightly movements of four adults from Hawk Ridge, Duluth, was 29.6 km (range 18.2-80 km). A juvenile from Whitefish Point B.O., MI averaged 28 km per night. Another juvenile originally banded at Cape Thunder Ont., averaged either 33.3 km or 21.8 km nightly, depending upon whether the owl crossed Lake Superior or traveled along the north shore and passed Duluth.

DISCUSSION

Prior to 1986, our experiences with Saw-whet Owls paralleled those of most other owl banding stations. For example: owls were most often netted on the leeward side of the woods on windy nights and owls were seldom netted on clear nights during a full moon. This has changed with the use of the audiolure technique. Owls are netted regardless of wind direction at LSOS. Wind velocity does affect the distance the audiolure can be heard. In October 1987, our best results came on a clear night with a full moon when 85 Saw-whets and one Long-eared Owl were captured. Saw-whet Owl migration peaks at our latitude usually in the second or third week of October. Typically, during this peak there will be one night when we net 10 percent of the years' total. This was true while passive netting and continues with the use of the audiolure.

The increase in mass of owls netted with the audiolure and the higher percentage of individuals exceeding 100 grams, suggests that we are now sampling more of the population or a different subpopulation (females?). We suspect that in the past, more of the owls we netted passively were hunting, while owls lured in by the call may have already fed and are migrating. They are also responding to a different stimulus.

That 40 percent of the owls netted at LSOS using the audiolure were northbound, moving opposite the expected migrational direction, is still puzzling. Initially we believed that these owls had passed higher overhead or were lured in from some distance to the east or west of the station. Since establishing two substations (Pensaukee and Lena) north of LSOS we have verified that some owls are indeed moving northward in autumn. We captured 11 owls (10 adults and a juvenile) in the same autumn that they were originally trapped and marked at the four banding stations located to the south and west of LSOS in Wisconsin. One adult from Cedar Grove traveled 136 km north in 12 nights, an average of 11.3 km per night. The origins of these northbound owls is still speculative. They could be dispersing individuals from the Wisconsin breeding population. Typically, juvenile raptors are more likely to disperse in random directions. That 10 of the 11 previously marked owls we captured moving north were adults suggests that this may not be the situation. These could also be owls from some distance north of Wisconsin which, having reached the southern limits of their autumn migration are now searching for suitable wintering habitat with adequate prey resources.

The banding stations at LSOS, Pulaski, and Linwood Springs are all located near the southern edge of the continuous northern forest in Wisconsin. Both the Woodland Dunes and Cedar Grove stations are located over 80 km south of this forest edge, and owls must cross open agricultural land with small scattered woodlots to reach them.

The comparison of long (> 320 km) and short (< 160 km) owl movements indicate either a change in owl migratory behavior and/or motivation (table 3). Owls moving south across the forested area of northern Wisconsin moved at an average nightly rate of 28 to 30 km. One adult moved from Hawk Ridge, Duluth to LSOS in only 5 nights, averaging 80 km per night. Owls moving south and west from LSOS averaged 7.7 km per night (range 1-50 km), which is roughly only 25 percent of the distance covered nightly by owls arriving at LSOS from the north. Perhaps the migratory behavior of owls varies dependent upon the habitat or prey resources encountered. Does it take an owl longer to traverse an open area of fragmented forests than an area of continuous forest?

Table 1.—*Autumn Northern Saw-Whet Owl movements in Wisconsin—direct recoveries from Little Suamico Ornithological Station, Wisconsin.*

Study area	Owls		Average number of nights	Range	Average km/night	Range
				Number nights		*(km/night)*
Cedar Grove O.S.	Total	61	15.7	3-37	9.17	3.68-44.8
170˚S	Juv.	26	16	6-37	8.58	3.68-22.4
85 miles/136 km	Adult	35	14.7	3-30	9.63	4.48-44.8
Woodland Dunes Nature Center	Total	23	15.6	5-30	5.29	2.72-16.64
155˚SSE	Juv.	10	15.2	5-30	5.47	2.72-16.64
52 miles/83.2 km	Adult	13	16	7-28	5.16	2.96-11.85
Pulaski	Total	6	12.2	2-22	1.6	.96-10-4
260˚WSW	Juv.	5	13.0	2-22	1.6	.96-10.4
13 miles/20.8 km	Adult	1	8.0	8	2.56	2.56
Linwood Springs Research Station	Total	8	20.2	12-27	7.68	5.6-12.64
260˚WSW	Juv.	2	26	12-27	5.84	5.6-6.08
95 miles/140 km	Adult	6	18.3	12-26	8.30	5.4-12.64

Table 2.—*Northern Saw-whet Owl—autumn distance movements to and from Little Suamico Ornithological Station, Wisconsin.*

Study area	Owls		Average number of nights	Range	Average km/night	Range
				Number nights		*(km/night)*
Hawk Ridge, Duluth to Little Suamico 250 miles/400 km	Adults	4	13.5	5-22	29.6	18.24-80
Cape Thunder, Ont. to Little Suamico 285 miles/456 km (crossing Lake Superior)	Juv.	1	21	21	21.76	21.76
438 miles/700 km (passing Duluth)	Juv.	1	21	21	33.28	33.28
Whitefish Point B.O. to Little Suamico 210 miles/336 km	Juv.	1	12	12	28	28
Little Suamico to Halifax, NC 840 miles/1,344 km	Juv.	1	41	41	32	32

Table 3.—*Comparison of long and short distance autumn movements of Northern Saw-whet Owls at Little Suamico Ornithological Station, Wisconsin..*

Distances traveled	Owls		Average distance	Range
	Number		*km/night*	*km/night*
Short Distance	Total	98	7.69	.96-44.8
< 100 miles/160 km	Juv.	43	6.92	.96-22.4
	Adults	55	8.30	2.56-44.8
Long Distance	Total	7	[1]30.30 or 28.7	18.24-80
> 200 miles/320 km	Juv.	3	[1]31.36 or 27.52	21.76-33.28
	Adults	4	29.6	17.6-80

[1] Cape Thunder owl calculated as crossing Lake Superior or passing through Duluth.

Although sample sizes are small, there appears to be no difference in average nightly movement rates between adult and juvenile owls documented in long distance(> 320 km) movements. All but one of these arrived at LSOS from the north passing over or through continuous forest. Short distance (< 160 km) movement rates of owls moving south of LSOS reveal that adults traveled an average of 20 percent farther each night than the juveniles (table 3). These owls are passing through much more diverse habitats.

The long distance movement of a juvenile Saw-whet Owl to Halifax, NC in 1995 which averaged 32 km per night indicates that some owls move at rates similar to those reaching LSOS from the north (table 3). Perhaps the more northern populations of Saw-whets are more migratory.

We suspect, based on low nightly movement rates, that many Northern Saw-whet Owls encountered at LSOS winter in Wisconsin.

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