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THE INFLUENCE OF AUDIO-LURES ON CAPTURE PATTERNS OF MIGRANT NORTHERN SAW-WHET OWLS

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Abstract.—The effect of audio-lures on capture patterns of migrant Northern Saw-whet Owls (*Aegolius acadicus*) was assessed. The majority of new owls were captured within 12 m of the lure and capture frequencies decreased with increasing distance away from the lure. Recaptures tended to occur farther away from the audio-lure than new captures. Capture locations of foreign retrapped owls, however, were not significantly different than new owls. Although capture locations did not differ between adult and immature owls, there was a detectable size bias in the distribution of capture locations. Smaller owls tended to be caught farther away from the lure than larger owls. Our results demonstrate that when an audio-lure is used, a small number of mist nets is sufficient to capture substantial numbers of Northern Saw-whet Owls. However, studies targeting recaptures may benefit from the use of more nets spaced over a larger area.

LA INFLUENCIA DE CARNADAS AUDITIVAS EN LOS PATRONES DE CAPTURA DE INDIVIDUOS MIGRATORIOS DE *AEGOLIUS ACADICUS*

Sinopsis.—Se evaluó la influencia de carnadas auditivas en los patrones de captura de individuos migratorios de *Aegolius acadicus.* La mayoría de los buhos fueron capturados a unos 12 m de la carnada auditiva y la frecuencia de captura se redujo con el incremento de la distancia a que se colocó el aparato de sonidos. Las recapturas tuvieron la tendencia de ocurrir a mayor distancia de la carnada auditiva que la captura de individuos noveles. Sin embargo, la localidad de captura de aves reatrapadas no resultó significativamente diferente que las de buhos nuevos. Aunque no hubo diferencia en la localidad de captura entre buhos adultos e inmaduros, se pudo detectar un sesgo en la distribución de localidades de captura. Las aves más pequeñas tendieron a ser capturadas a mayor distancia de la "carnada" que las aves de mayor tamaño. Nuestros resultados demuestran que cuando se utiliza una carnada auditiva, un número reducido de redes de niebla es suficiente para capturar un número sustancial de individuos de *Aegolius acadicus.* Sin embargo, estudios dirigidos a la recaptura de individuos pudieran beneficiarse de la utilizacion de un número mayor de redes cubriendo una mayor cantidad de área.

Since the 1960s, Northern Saw-whet Owls (*Aegolius acadicus*) have been banded during fall and spring migration at various sites in North America (Mueller and Berger 1967, Holroyd and Woods 1975, Weir et al. 1980, Duffy and Kerlinger 1992). All of these efforts to capture Saw-whet Owls were conducted passively, that is simply with the use of mist nets without any type of lure to attract owls. Capture rates were usually low. Beginning in the late 1980s, some owl banding sites began experimenting with the use of playback recordings to enhance capture rates (D. Brinker, pers. comm.). Audio-lures consisting of a Saw-whet Owl advertising call (Cannings 1993) were played continuously throughout owl banding efforts. Audio-lures increased capture rates 5–10 fold over passive trapping (T. Erdman, pers. comm.). As a result, most owl banding stations in North America now use audio-lures to maximize capture rates.

Despite the widespread use of playback recordings (and lures in general) to capture birds, little information exists on how birds respond to such lures. Lures may bias samples toward certain individuals based on age, sex, condition, or residency status (Weatherhead and Greenwood 1981, Senar 1988, Figuerola and Gustamante 1995). The objectives of this study are (1) to demonstrate how capture frequencies change with increasing distance away from an audio-lure, (2) to identify age or size biases in a sample of lure-trapped Northern Saw-whet Owls, and (3) to determine the effect of an audio-lure on capture patterns of new, recaptured, and foreign retrapped owls.

STUDY AREA AND METHODS

Migrating Northern Saw-whet Owls were trapped and banded during each fall, 1994–1996 (Whalen et al. 1997). Owls were trapped at three stations located south of Cape Charles, Virginia on the lower Delmarva Peninsula (37°09'N, 75°58'W). Stations were approximately 3–5 km apart. Each station was wooded with a mixture of loblolly pine (*Pinus taeda*), eastern redcedar (*Juniperus virginiana*), and/or hardwoods (*Quercus* spp.) and contained moderate densities of shrub and understory vegetation.

A continuous line of six mist nets was erected along an east/west axis at each station. Nets were numbered from 1–6 starting at the west end of each net lane. An electronic audio-lure was positioned at the center of each net lane (between nets 3 and 4) to attract migrating owls. Each audio-lure consisted of a cassette tape-player, amplifier, and loud-speaker and was powered with a 12 V marine battery. A continuous broadcast of a Saw-whet Owl call was played at an estimated sound output of around 100 dB.

Each year banding operations began during the third week of October and continued through the second week of December. Each night, nets were opened and audio-lures were started at sunset. Nets were usually checked for owls at 2100 h, 2400 h, 0300 h, and dawn. Captured owls were banded with U.S. Fish and Wildlife Service aluminum bands. Unflattened wing chord measurements were taken to the nearest 1.0 mm and mass was measured to the nearest 1.0 g. We determined age according to criteria established by the Canadian Wildlife Service and the U.S. Fish and Wildlife Service (Anonymous 1977). Saw-whet Owls were aged as hatching year (HY) if all primary and secondary remiges and coverts appeared uniform in color or as after hatching year (AHY) if primary and secondary remiges were not uniform in color, indicating the presence of more than one generation of feathers.

Net locations were recorded for captured owls to allow for analysis of the spatial distribution of captures relative to the audio-lure. Individual mist nets were used to define distance classes away from the audio-lure. Nets were situated 0–12, 12–24, and 24–36 m away from each audio-lure.

RESULTS

Net locations were recorded for 858 new Northern Saw-whet Owl captures (Table 1). Capture frequencies decreased with increasing distance

TABLE 1. Distribution of Northern Saw-whet Owl capture locations relative to an audio-lure. Data are pooled for owls caught at three different trap stations operated each fall, 1994–1996.

		Distance from audio-lure (m)		
	n	0–12	12–24	24–36
New captures	858	541 (63.1)[a]	187 (21.8)	130 (15.2)
AHY	212	137 (64.6)	50 (23.6)	25 (11.8)
HY	580	362 (62.4)	127 (21.9)	91 (15.7)
Mass > 95 g	231	160 (69.3)	40 (17.3)	31 (13.4)
Mass < 85 g	240	137 (57.1)	63 (26.3)	40 (16.7)
Wing > 141 mm	259	171 (66.0)	53 (20.5)	35 (13.5)
Wing < 137 mm	235	139 (59.1)	55 (23.4)	41 (17.4)
Recaptures	182	79 (43.4)	40 (22.0)	63 (34.6)
Foreign retraps	33	16 (48.5)	12 (36.4)	5 (15.2)

[a] Values indicate raw frequency of owl captures with percentage of row totals in parentheses.

from the audio-lure. The frequency of new owl captures was significantly greater at 0–12 m than at 12–24 m (χ^2 = 172.1, df = 1, $P < 0.001$). Likewise, more owls were caught at 12–24 m than at 24–36 m (χ^2 = 10.2, df = 1, $P < 0.005$).

The overall distribution of capture locations did not differ between stations or between years (Table 2). Out of nine possible station-year combinations, only the distribution at station 1 in 1995 differed from the pooled distribution of all new owl capture locations (χ^2 = 10.6, df = 2, $P < 0.005$). At station 1 in 1995, fewer owls were trapped 0–12 m from the audio-lure than expected (53% compared to 63% in pooled station-year combinations), and more owls were trapped at 24–36 m than expected (23% compared to 15%). However, the general pattern of decreasing capture frequency with increasing distance from the audio-lure was still seen at that station.

TABLE 2. Distribution of new Northern Saw-whet Owl capture locations relative to an audio-lure at each trap station during each year.

			Distance from audio-lure (m)		
Year	Station	*n*	0–12	12–24	24–36
1994	1	17	11 (64.7)[a]	1 (5.9)	5 (29.4)
	2	21	15 (71.4)	1 (4.8)	5 (23.8)
	3	14	7 (50.0)	6 (42.9)	1 (7.1)
1995	1	183	97 (53.0)	44 (24.0)	42 (23.0)
	2	225	153 (68.0)	44 (19.6)	28 (12.4)
	3	293	188 (64.2)	67 (22.9)	38 (13.0)
1996	1	29	19 (65.5)	8 (27.6)	2 (6.9)
	2	39	29 (74.4)	8 (20.5)	2 (5.1)
	3	37	22 (59.5)	8 (21.6)	7 (18.9)
	Total	858	541 (63.1)	187 (21.8)	130 (15.2)

[a] Values indicate raw frequency of owl captures with percentage of row totals in parentheses.

The spatial distribution of AHY Saw-whet Owl captures did not differ from HY owls (Table 1; χ^2 = 2.5, df = 2, P = 0.286). However, owls trapped closer to the audio-lure tended to be slightly larger than those caught farther away. To demonstrate this effect, capture locations were compared for the highest and lowest quartiles for both mass and wing chord (Table 1). The distribution of capture locations for Saw-whet Owls heavier than 95 g was skewed closer to the audio-lure than those weighing less than 85 g (χ^2 = 14.4, df = 2, $P < 0.001$). Likewise, the distribution of Saw-whets with wing chords measuring more than 141 mm was skewed closer to the audio-lure than those with wing chords less than 137 mm (χ^2 = 6.2, df = 2, $P < 0.05$).

Net locations were recorded for 182 individual Saw-whet Owls captured a second time within a given trap-year (Table 1). The distribution of recapture locations was significantly different than the distribution of all new captures (χ^2 = 56.7, df = 2, $P < 0.001$). Recaptures tended to occur farther away from the audio-lure than initial captures. At 0–12 m, the relative frequency of recaptures was 31% lower than the frequency of initial captures. At 24–36 m, however, the relative frequency of recaptures was 128% higher than the frequency of initial captures.

Capture locations were recorded for 33 Saw-whet Owls trapped on the lower Delmarva Peninsula that were originally banded at other owl banding sites in eastern North America (Table 1). All of these owls were originally banded at sites which also use audio-lures. Although the proportion of foreign retraps that were caught 0–12 m from the audio-lure was 31% less than the proportion of new captures caught at this distance, the distribution of foreign retraps was not significantly different than the distribution of new owl captures (χ^2 = 4.3, df = 2, P = 0.115).

DISCUSSION

The effectiveness of the audio-lure was demonstrated by the fact that 63% of all new Saw-whet Owl captures occurred in the two nets immediately adjacent to the lure. Clearly the location of owl captures depends on the position of the audio-lure. Furthermore, the distribution of new owl capture locations was consistent among stations and between years in our study. During only one year at one station did the distribution of capture locations differ significantly from the pooled distribution of all new owl captures.

Weatherhead and Greenwood (1981) found biases based on age, sex, and condition for various species of blackbirds caught in decoy traps. For certain species, captures were biased toward males, HY birds, or birds in poorer condition. In our study, the distribution of Saw-whet Owl captures with respect to distance from the audio-lure did not differ between age groups. Smaller Saw-whet Owls, however, tended to be caught at greater distances from the audio-lure than larger Saw-whets. Mass alone might suggest a condition bias in the capture locations of owls relative to the lure. However, our results for both mass and wing chord suggest that truly smaller-bodied individuals exhibit more lure shyness than larger Saw-whets. This finding may represent a sex bias. Although Saw-whet Owls exhibit some reversed sexual dimorphism with males tending to be smaller than females (Earhart and Johnson 1970), this species lacks adequate sexing criteria (Mueller 1990). Without definitive sexing criteria, it remains unclear as to whether this bias is based on sex, body size, or both.

It is well known that when capture-recapture techniques are employed, animals that have previously been caught may exhibit trap shyness (MacArthur and MacArthur 1974). Our results demonstrate that Saw-whet Owls trapped using playback recordings show such an effect. Recaptured owls were caught farther away from the audio-lure than new owls. Recaptured owls were not smaller than new owls based on either weight or wing chord, therefore, size bias does not account for the difference between the capture locations of new and recaptured owls. Instead, this difference suggests that some owls approach an audio-lure with greater caution when they have been previously captured with this technique. As a result, some locally banded individuals may become wary enough to avoid recapture.

Although the overall distribution of foreign retrap Saw-whet Owls was not significantly different than the distribution of new owl captures, current data remain insufficient to draw definitive conclusions. Many previously banded owls may exhibit some degree of lure shyness. Whereas the majority of new owl captures (63%) occurred within 12 m of the audio-lure, the majority of foreign retraps (52%) were caught greater than 12 m away. The implications of these results are important because lure shyness may have a negative influence on the potential to recover banded birds.

When designing experiments that involve the capture of birds with mist nets, economic factors inevitably come into play. Our results show that, when using an audio-lure, most new individuals may be captured in close proximity to the lure. As a result, capture rates may often be maximized by using more lures, each with a small number of nets. However, studies focusing on the recapture of individuals may benefit from a different design. In our study, recaptures occurred farther away from the lure due to trap shyness. As a result, recapture rates may be maximized by using more widely-spaced net arrays with each lure.

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