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SHORT COMMUNICATIONS

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BEHAVIORAL CONDITIONING AND TECHNIQUES FOR TRAPPING BARRED OWLS (*STRIX VARIA*)

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Providing mice to (''mousing'') Spotted Owls (*Strix occidentalis*) to determine if a bird has a mate, find nests, and locate young in the vicinity of the nest is a standard technique in the study of this species (Forsman 1983, Blakesley et al. 2001, Hobbs et al. 2005). In the course of our ongoing ecological studies of Barred Owls (*Strix varia*) in the central Piedmont of North Carolina (Harrold 2003, Mason 2004) and Florida, we expanded on ''mousing'' by training owls to associate a specific sound with food provisioning.

Spotted Owl researchers have not, to the best of our knowledge, trained owls to respond to specific sounds. In addition to facilitating trapping, this refinement of the mousing technique made it easy and efficient to provide mice to our study birds and collect data on nests and reproduction, as do Spotted Owl researchers.

We here describe our training process and trapping techniques. Our trapping efforts usually began with noose cages, or bal-chatris (Berger and Mueller 1959), but we often had to rely on other trapping methods when birds became trap-shy. We discuss the different capture techniques and the benefits of training the subject birds prior to trapping. We present this information as an aid to researchers studying Barred Owls and believe the technique should be applicable to other owl species and perhaps even certain Falconiformes.

METHODS

Study Areas. Our studies were conducted in Florida and the southern Piedmont of North Carolina. In south-central Florida, we worked at the 4120-ha MacArthur Agro-ecology Research Center in Highlands County. The habitats there include wet and dry prairie, improved bahai grass (*Paspalum notatum*) pasture, numerous seasonal wetlands, ditches and canals, and old citrus groves. Interspersed among these habitats are forested islands of cabbage palm (*Sabal palmetto*) and live oak (*Quercus virginiana*) where Barred Owls nest. In North Carolina, we worked in the suburbs of Charlotte and in surrounding, less heavily developed areas, predominantly in Mecklenburg County. The suburban areas were mostly densely inhabited, older (50–90 yr) neighborhoods with many large trees (mostly willow oaks [*Quercus phellos*]). Forested rural areas included county nature preserves and extensive tracts of primarily deciduous forests with scattered stands of pines (see Harrold 2003).

Training. The training technique varied with the situation, but entailed initially attracting owls with a broadcast recording of the eight-note territorial call (''acoustical luring''; Mazur and James 2000) or visiting the vicinity of a known nest and waiting for the adults to appear. Once a bird was encountered, we placed a live domesticated house mouse (*Mus musculus*) in an open area, on a low branch, tree trunk, or on a small (10 × 10 cm) platform above the ground vegetation and made high-pitched, squeaking noises to mimic a mouse distress call. When the owl took the mouse one of us whistled loudly. The same whistle was repeated while the owl was eating the mouse. After the first mouse was consumed, we provided a second. When proffering the second mouse, we ensured that the owl saw that the mouse was coming from the researcher. Again, when the owl took the mouse, we whistled. We often provided a third mouse on the first encounter.

We usually trained a new pair around dusk, when we could see the birds. Generally two of us worked together, as one observer occasionally missed an owl that approached from behind. We trained new pairs on consecutive nights if possible until they were responding to our whistle. After the first night, we tried the training sound first, and if no birds appeared we tried additional luring with a broadcast. After at most three or four feeding sessions, nearly all suburban owls learned to recognize our training sound. With rural birds, many of which responded

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to acoustical luring but did not allow us to remain close to them, we broadcast the territorial call, whistled, and then left mice on the platform.

It was not necessary that the training sound be a whistle. In North Carolina, we also used a taped broadcast call during the training process. In Florida, rather than whistle, we imitated a Barred Owl call to attract the owls.

We used black, gray, and white lab mice, but preferred white mice because they are more visible. Early in the breeding season, the adult owls waited until dusk before attacking a mouse, so most of the training and trapping with adult owls took place at dusk or later. For this reason, the increased visibility of white mice was useful.

Trapping. We predominantly used two different techniques: collapsible mist nets, or dho-gazas (Bloom 1987), with mice as the lure animal and bal-chatris with gerbils (*Meriones unguiculatus*) or mice as the lure animal. (One capture was made with a tethered Barred Owl in front of a dho-gaza.) We also used fixed mist nets, a spring-loaded bownet (Shor 1990), and a dead mouse in a noose carpet. We did not test different trapping techniques in any systematic fashion, but rather experimented with different techniques and chose the best for the circumstances at each site.

We used dho-gazas of three sizes: 1 m × 0.6 m, 3 × 2 m, and 7 × 2 m (length × height in each case). We suspended the larger nets between 1.7-m extendible painting poles painted flat black. We premeasured the distance between the poles with the net set and had a string of this length tied between the poles. This permitted one person to set the net very quickly. We placed one pole in the ground, pulled the measuring string taut and placed the second pole. The net could then be attached to one pole and walked over and attached to the second pole without having to reposition the pole. The training and trapping process was approved by the UNC-Charlotte IACUC, Protocol 02-013.

RESULTS

Training. We (MAM) first used training in rural situations in Florida beginning in 1990 to capture 10 adult owls during nine breeding seasons. In North Carolina, we (ROB and ESH) utilized training to capture 31 adults, two dispersing hatch-year birds, and one fledgling Barred Owl.

In suburban habitats in North Carolina, the 34 birds we trapped after training were relatively easy to train. After we placed a mouse in front of an owl, however, some owls watched the first mouse for 40 min before finally taking it. At least two birds took the first mouse presented in less than 30 sec. A 15-min wait was not unusual. Although a few owls learned that the whistle meant food and approached us after a single feeding session, most suburban birds responded after three or four sessions. Three suburban birds (all males) were too shy to train.

Birds in rural situations were more cautious, and training took longer. Seven rural birds in North Carolina would not let us get close to them. For these birds, we left the area after placing mice near where we knew or thought the birds were. After 3–5 nights of regular feeding at a fixed time, a bal-chatri trap was placed in the area where mice had been left. This technique was successful at six of seven locations.

Table 1. Numbers of Barred Owl captures (including recaptures) with different traps and training regimes.

TRAP	ADULTS	HY[1]	FLEDGLINGS	TOTALS
No training:				
Bal-chatri	7	2	7	16
Dho-gaza (with live owl)	1	0	0	1
With training				
Dho-gaza	36	0	0	36
Mist net	1	0	0	1
Bal-chatri	20	0	0	20
Bownet	2	0	1	3
Noose carpet (dead mouse)	1	0	0	1
Totals	68	2	8	78

[1] HY = Post-dispersal young.

It was never necessary to retrain an owl that had been conditioned the year before. For four birds, the period between feeding sessions in subsequent seasons ranged from 1 to 4 yr, and eight others responded quickly to our call after not having been fed for >7 mo.

We found that once one member of a pair was taking mice, the mate often learned to take mice quickly and without our having been aware that it was learning. However, at the peak of courtship, shortly before egg-laying (January–February in Charlotte), some females would not take a mouse, but rather waited for the male to catch it and deliver it to her. Copulation usually occurred after this courtship feeding.

Five birds took dead mice after they were trained to live mice.

Trapping. We trapped 61 Barred Owls a total of 78 times, using a variety of techniques (Table 1). These 61 birds comprised 51 territorial adults, eight fledglings still in their natal territories, and two post-dispersal juveniles.

We captured 17 owls (nine adults, one juvenile dispersing, and seven fledglings; Table 1) with no training. Using the training technique, we trapped 44 owls (42 adults, one dispersing juvenile, and one fledgling). Of the adults, 15 females and four males were caught in rural situations (no males were caught in rural North Carolina habitats), while 17 adult females and 15 adult males were trapped in suburban habitats. Three birds were trapped originally with no training and subsequently recaptured for radio replacement after they had been trained.

We attempted five captures with fixed mist nets and were successful only once, so we abandoned the technique. In Florida, two attempts with bal-chatris were unsuccessful, so we switched to dho-gazas and continued using that technique for the duration of our Florida study.

In North Carolina, success rates with bal-chatri and dho-gazas were identical. In 36 out of 48 capture attempts with

a bal-chatri (75%), we captured target owls that stared intently at or made a pass at a baited bal-chatri; in 24 of 32 capture attempts with dho-gazas (75%), we caught owls that approached the lure mouse. After unsuccessful capture attempts, we returned on subsequent nights and were eventually able to catch all but five of our target birds.

If an owl hit the bal-chatri several times but was not noosed, it either became wary of the trap or disinterested. We had some success with such owls on the first trapping effort after taking away the bal-chatri, letting the owl take a free mouse, and then putting the bal-chatri in a different position. If we were unsuccessful with the bal-chatri, we then tried a dho-gaza, usually on a subsequent evening.

We found that birds initially caught in a bal-chatri subsequently avoided them, so it was necessary to use a dho-gaza or bownet to retrap birds when transmitters needed to be removed or replaced.

We captured three Barred Owls with a spring-loaded bownet and were unsuccessful with a fourth attempt. Two of our successful captures with the bownet were of birds that pounced on the mouse and stayed on the ground for a moment, rather than snatching the mouse while in flight. In these situations, the birds were easily and safely trapped. Of the two birds that did not land on the mouse, we safely caught one and missed the other when the bownet was released too soon.

For trapping with a dho-gaza, in all but one case we used mice as the lure animals. In the relatively high ambient light of suburban nights, we found it most effective to put the mouse between the owl and the dho-gaza, rather than the more traditional arrangement wherein the target bird flies through the net as it attempts to catch or strike the lure animal. With the net between the owl and the mouse, the owls often saw the net and avoided it. With the net behind the mouse, no owl tried to avoid the net. In North Carolina, the adult owls almost always snatched the mouse off the ground while flying, so once they committed to attacking the mouse they flew into the net.

The smaller dho-gazas (1- and 3-m long) were useful in more confined settings, but have the shortcoming that the flight path of the owl has to be very predictable. We abandoned the 1-m net early in the study, as the support poles made it too conspicuous. The 7-m net had the advantage of providing flexibility relative to the path the owl took after it took the mouse. The large net was also much less conspicuous because each pole was about 3 m from the mouse. For birds that hesitated before taking mice, we tethered the mouse or placed the mouse on a feeding platform in front of the net to keep it in the middle of the net.

One bird was captured with a dho-gaza set up over a captive Barred Owl. This was a pair for which we wanted to retrap the male to replace a transmitter. The bird was originally caught on a bal-chatri with minimal training. Subsequent attempts to train the bird were unsuccessful, so we tried the dho-gaza over a live owl. In this case, we caught the female and not the male.

DISCUSSION

Several trapping techniques other than those described in this paper have been used to capture Spotted and Barred owls as well as other raptors (Fuller and Christenson 1976, Bull 1987). Elody (1983) and M. Fuller (pers. comm.) used a captive Barred Owl in front of standard, tethered mist nets to capture Barred Owls, but the success rate was low. Mazur et al. (1997) set two two-shelved, 12-m mist nets in a ''V'' with free lab mice, mice in a bal-chatri trap, or a moveable mounted Barred Owl in the center of the ''V'' as described by Elody and Sloan (1985). They captured 14 adult Barred Owls, but did not indicate how many owls were missed. Olsen (1999) used three mist nets set in a triangle around a tethered Barred Owl to catch 20 Barred Owls in Alberta. Noose poles have been used to capture both adult and juvenile Barred and Spotted owls (Forsman 1983), and Nicholls and Fuller (1987) used Swedish goshawk traps as in their study in Minnesota.

Although we usually trained birds before any trapping attempt, we suggest that trapping with a bal-chatri when the owls are first encountered may be more efficient. If the birds are not caught on the first attempt, they can then be trained, which facilitates capture attempts with dho-gazas. If a bird is caught on this first attempt, subsequent training facilitates further research with the bird. A possible drawback with this approach is that after hitting and escaping from a bal-chatri, the bird may become too wary of the researcher to be trained and trapped. This apparently happened once during our study.

The likelihood of trapping a given sex changes with the stage of the breeding season. For a few weeks before egg-laying, when the males were engaged in courtship feeding, some females showed little interest in mice, whereas males were readily trained and captured. Similarly, while the females were incubating, the males were much more likely to be captured. The lack of males in the North Carolina rural sample may be related to the timing of our trapping efforts, which were concentrated in December and January, a full month or more before egg-laying. We suspect that females stay closer to the nest than the males during this period and that courtship feeding may not have reached a peak when we were trapping. Additionally, in suburban pairs in the North Carolina study, female territories were significantly smaller than those of males (ca. 100 ha vs. 200 ha; Harrold 2003), so males are more likely to be far from the nests. Because we trapped close to the nests, we were more likely to encounter females. Females in both habitats were captured either early in the breeding period or after they had started hunting to feed the young.

We did not consider proximity to the nest when choosing a trapping location. Some of our birds were captured <20 m from their nests. No bird captured in the study abandoned its nest.

Training Barred Owls to accept lures requires a significant investment of time. In our experience, the first session could take up to an hour, and when birds did not learn the training sound during the first feeding, we occasionally were not

able to attract the birds with acoustical luring during one or two subsequent visits. However, once an owl had taken mice, subsequent training visits lasted only 10–15 min. If the feeding sessions were at the same time, birds would often be waiting for us when we arrived. With the faster reaction to mice after the first visit, several birds in close proximity could be trained simultaneously.

Despite the time involved, training owls to come to a researcher is useful for a number of reasons. Given the duration of the owls' memory, having trained birds in a pair provides an indication of nest fidelity or replacement. Obviously, this technique is not completely reliable, but a change in response suggests there may have been a change in a pair. Another benefit of the process, unrelated to trapping, is that it can be used to have adults lead a researcher to a nest or dependent young (Forsman 1983). Furthermore, the technique enables researchers to position trap and owl for effective capture. For example, in suburban situations, it may be helpful to lure the target bird away from brightly lit areas or away from areas with heavy pedestrian or automobile traffic. Mousing also allows researchers to approach tagged birds for observation and facilitates retrapping for transmitter removal or replacement. Perhaps most importantly, the technique enables researchers to return and try alternative trapping techniques after an unsuccessful effort has left a bird trap-shy.

CONDICIONAMIENTO COMPORTAMENTAL Y TÉCNICAS PARA ATRAPAR A *STRIX VARIA*

RESUMEN.—Entrenamos individuos de *Strix varia* para asociar un silbido o llamado con la provisión de alimento. Esto facilitó enormemente atrapar a las aves, localizar sus nidos y pichones, y reconocer el reemplazo en las parejas reproductivas. Atrapamos 61 lechuzas en un total de 78 veces. Cuarenta y cuatro de las lechuzas habían sido entrenadas antes de su captura. Las trampas bal-chatris (36 capturas) y las redes de niebla colapsables dho-gazas (37 capturas) fueron nuestros métodos preferidos para capturar a las lechuzas. Describimos nuestras técnicas de entrenamiento y de captura como una ayuda para otros estudios sobre *S. varia* y otras especies de lechuzas, para las cuales sospechamos que éstas técnicas pueden ser aplicables.

[Traducción del equipo editorial]

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