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USE OF RECORDER CALLS FOR DETECTING LONG-EARED OWLS *ASIO OTUS*

USO DE RECLAMOS GRABADOS PARA DETECTAR BÚHOS CICOS *ASIO OTUS*

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The songs of many bird species are sexual signals. They convey information on individual qualities that play a relevant role in advertising territory ownership and mate attraction (Galeotti & Pavan, 1993; Catchpole & Slater, 1995; Appleby & Redpath, 1997; Galeotti *et al*., 1997; Galeotti 1998). At the hearing of an intruder, birds usually react by delivering territorial vocalisations. Accordingly, several studies rely on the use of elicited calls to systematically obtain data on the relative abundance of owls (e.g. Zuberogoitia & Campos, 1997; Martínez & Zuberogoitia 2000, 2002). Whether this technique is an efficient one for detecting Long-eared Owls *Asio otus* is still a controversial issue. Viada (1994) succeeded in detecting individuals over a large area by broadcasting a pool of male, female and fledgling calls, but Sará & Zanca (1989) and Zuberogoitia & Campos (1998) found that owls were not responsive to playback.

The aims of this study are (1) to determine if Long-eared Owls respond to broadcasts of conspecific calls, (2) to determine if the broadcast improved our ability to detect owls and (3) to discuss the behavioural response of owls.

The study was conducted at 23 sites (16 point-count stations in Madrid, Central Spain; two in Valladolid, Central Spain; and five in Barcelona, Eastern Spain). All areas were similar in landscape structure and composition (dry cereal croplands with scattered woodlots of *Pinus* spp. or *Quercus* spp. of small to medium sizes). Experiments were carried out from 2/25/00 to 3/9/00, during the courtship period of the owls. The start of each experimental visit (see below) varied between point-count stations (19 h 25 min to 22 h 35 min). The experiment was performed one time at each site only during rainless and windless nights. Broadcast stations were located within 100 m from the edge of the woodlots.

Each experimental visit to a territory included the following phases: (1) Spontaneous calls (SC): starting at dusk and after an initial 2-minute period, we recorded the following data during a 10-min period: date, hour, number of detected owls (observed or heard), sex of the owl according to its vocalisations (Saurola, 1997), calling rate (number of vocalisations), and agonistic response, if any could be noticed. We could distinguish sexes by voice because males have a low cooing territorial call whereas females produce a nasal buzzing call (Cramp & Simmons, 1980; Mikkola, 1983; Saurola, 1997, Scott, 1997). (2) Playback (PB): immediately after SC, a territorial intrusion was simulated by broadcasting male territorial calls using cassette players for 10 minutes. The recorded call imitated the rate and number of bouts characteristic for the species (Cramp & Simmons, 1980; Mikkola, 1983; Scott, 1997). Broadcast volume was adjusted to ensure clear vocal rendition. The same data as in SC were recorded, plus latency (i.e. time elapsed from the onset of the period to the first vocalisation heard).

Some owls were not detected by their vocal behaviour but because they wing-clapped or flew over the point-count station. Altogether 21 owls were detected during the initial SC period (11 of them being vocally active), while 32

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owls were detected during the playback period (20 of them being vocally active; Table 1). However, the difference between the number of individuals detected during each survey period was only marginally significant (χ^2 = 2.6, df = 1, *P* = 0.049). Only in two territories were owls not found at all in spite of territories being occupied, as shown by a further survey. It is possible that in these territories owls were not vocal but they flew silently over the station and went unnoticed by the observers. It is also possible that owls were far from the area at the time of the experimental visit or that the point-count station was too far away from the territorial core area.

Table 2 shows the mean calling rate per 10 min of males and females detected in each period. To test for differences in the calling rates between contiguous experimental periods we compared the number of calls produced by vocal owls. Between SC and PB periods, males significantly increased their calling rate (*t* = 1.69, *P* = 0.022, *n* = 20), as also females did (*t* = 1.24, *P* = 0.012, *n* = 20). Females were more vocally active than males in both periods, as shown by the differences in call rates (See Table 2 for means. SC: t = –2.78, d.f. = 21, P = 0.011; PB: t = –3,48, d.f. = 18 , P = 0.003).

As the PB period was performed after the SC period, it could be argued that differences in

TABLE 1

Number of Long-eared Owls detected during the two experimental periods at each point-count station.
[Número de Búhos Chicos detectados durante los dos periodos experimentales en cada estación de escucha.]

	Spontaneous calls *[Cantos espontáneos]*			Playback *[Grabación]*			
Point count station *[Estación de escucha]*	Observed + heard *[Observados + oídos]*	Vocal males *[Machos vocales]*	Vocal females *[Hembras vocales]*	Observed + heard *[Observados + oídos]*	Vocal males *[Machos vocales]*	Vocal females *[Hembras vocales]*	Vocal, sex unknown *[Individuos vocales, sexo desconocido]*
1	2	0	0	4	1	1	—
2	0	0	0	0	0	0	—
3	1	0	0	1	0	1	—
4	1	0	0	2	0	1	—
5	0	0	0	0	0	0	—
6	2	0	0	2	1	1	—
7	2	0	1	2	1	1	—
8	0	0	0	1	0	0	—
9	0	0	0	1	—	—	1
10	0	0	0	0	0	0	—
11	2	1	1	2	0	1	—
12	2	0	1	2	0	1	—
13	2	0	1	2	1	1	—
14	0	0	0	1	1	0	—
15	0	0	0	1	0	0	—
16	0	0	0	1	0	0	—
17	2	0	1	2	1	1	—
18	1	0	1	1	0	0	—
19	1	1	0	1	0	0	—
20	1	0	1	1	0	1	—
21	2	1	1	1	0	0	—
22	0	0	0	1	—	—	1
23	0	0	0	2	—	—	2
Total	**21**	**3**	**8**	**32**	**6**	**10**	**4**

the number of territories found between the SC and PB periods could be due to increased spontaneous activity of the owls, i.e., our results would just mirror peaks in hooting. Thus we tested if time of the day at which experiments were conducted had any effect on the probability of assessing territory occupancy. First we tested if calling rates (number of vocalisations per 10 min) varied with time after dusk, but we found no significant correlation between the time after dusk at which the SC and the PB periods started and calling rates (males: SC: r = 0.33, P = 0.114; PB: r = 0.09, P = 0.693, n = 23; females: SP: r = 0.36, P = 0.087; PB: r = 0.34, P = 0.123, n = 23; Spearman rank correlations). Then we performed a Logistic Regression Analysis (Hosmer & Lemeshow, 1989) using the time after dusk as independent variable and the detection (code 1) or not (code 0) of an occupied territory as dependent variable. The probability of detecting a singing Long-eared Owl (i.e., an occupied territory) did not vary with the time after dusk at which the PB periods started (SC: Likelihood Ratio test, G^2_1 = 25.34, P = 0.189).

Our results suggest that the use of male playbacks may increase the chances of detecting Long-eared Owls during the courtship period. 48% of the territories would have been wrongly classified as unoccupied if the study had been conducted only by listening to spontaneous vocalisations. Similar results have been found for many other owl species (Galeotti 1990; Ward *et al.*; 1991, Haugh & Didiuk, 1993; Kavanagh & Peake, 1993; Redpath, 1994; Debus, 1995; Zuberogoitia & Campos, 1998). Figure 1 shows that no new individuals were detected six minutes after we started the playback period, although we cannot rule out that a longer period for successful detection would emerge if a larger sample size was available. Nevertheless, 12 Long-eared Owls were not vocally active in response to playback of conspecifics, and could only be detected by direct observation while flying over the point-count station or by listening to their wing-clapping.

Males, unlike females, were very silent during the SC period. Since the study was performed within less than two weeks before the mean date of laying at every locality (*unp. data*), it is likely that the pair bond was already established and, therefore, the investment of males in spontaneous territorial advertising relative to the onset of courtship could have been small (Martínez & Zuberogoitia, 2000). In that case, females would spontaneously call to encourage males to provide food (Mikkola, 1983).

Both males and females increased call rates after the male playback was broadcasted. However, the contribution to territorial defence was quantitatively and qualitatively different between the sexes, males more frequently flying over the experimental station and wing-clapping than females, which in turn were more vocal than males. Of the calling males, 80% also wing-clapped and overflew the experimental station, and 42% kept on doing so after the playback was finished. Other than during courtship, Long-eared Owls wing-clap in order to flush birds and hunt them down (*pers. obs.*). In order to explain the sex-specific response of Long-eared Owls, we suggest that some females might have been incubating and that they guarded the nest while the males took a more active role in territorial defence (Zuberogoitia & Martínez, 2000). One function of duetting might be to signal an intruder that both members of the pair will attack together (Appleby *et al.*, 1999). However, we could not find a tendency for members of the pair to respond together. This does not necessarily imply that territorial defence is not cooperative in Long-eared Owls, such as it is in Scops Owls *Otus scops* (Galeotti *et al.*, 1997) and Tawny Owls *Stix aluco* (Appleby *et al.*, 1999).

Long-eared Owls are monogamous, and extra-pair fertilizations are rare (Scott 1997; Marks *et al.*, 1999). It has been shown that helping behaviour at nests among related Long-eared Owls may occur in stable roosts (Galeotti *et al.*, 1997). Therefore, it is likely that males would benefit from aggressively defending their investment in reproduction against a non-related intruder. This could account for the fact that males responded aggressively to playback.

In conclusion, conducting broadcast surveys within three hours of dusk during the late stages of courtship or the early days after laying should guarantee a sufficient success in assessing territory occupancy. Playback was more efficient than listening to spontaneous vocalisations in assessing territory occupancy. However, a high percentage of individuals (mainly males) may have gone unnoticed because they did not vocalise in response to playback but

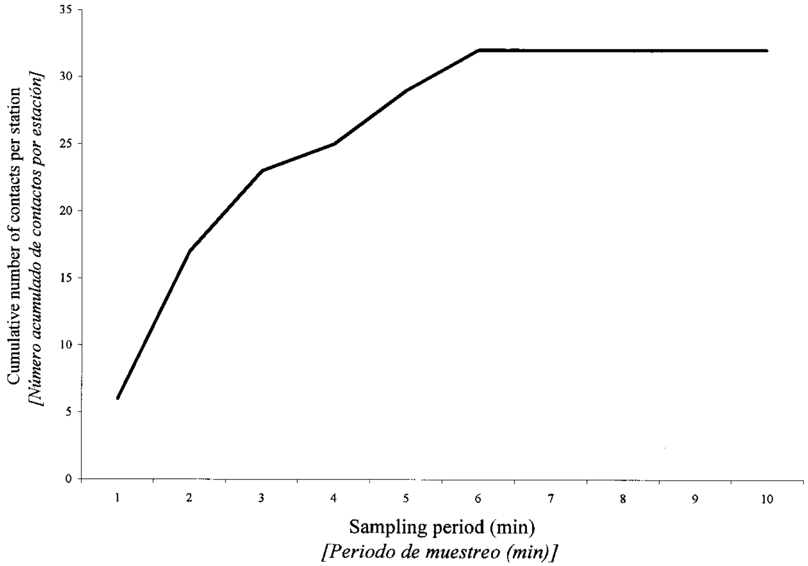

FIG. 1.—Cumulative response rate of Long-eared Owls during the playback period (number of contacts per station, observed and heard individuals pooled together) in relation to length of the sampling period.
[Frecuencia acumulada de contactos de Búhos Chicos vistos u oídos durante el periodo de respuesta a reclamos grabados con relación a la duración del periodo de muestreo.]

approached the intruder silently or wing-clapping. Those individuals may be detected by using a torch (see Martínez & López, 1999). It has been shown that food availability influences the timing of vocal activity of male Long-eared Owls (Tome, 1997). Factors such as habitat structure and composition, owl density, breeding success and the response to playback during migration should also be accounted for in order to provide managers with a year-round labour-efficient survey method. A thorough test designed to determine the most efficient survey method should also account for the response of the focal species to a range of stimuli, because we cannot be sure that the response to different stimuli be the same (Kroodsma, 1989).

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