J. Field Ornithol., 62(2):239-244

RESPONSE OF MOTTLED OWLS TO BROADCAST OF CONSPECIFIC CALL

RICHARD P. GERHARDT
Raptor Research Center
Boise State University
Boise, Idaho 83725 USA

Abstract.—Mottled Owls (*Ciccaba virgata*) were exposed to broadcasts of tape recordings of conspecific calls during a 6-wk period roughly spanning the nesting season of this species in Tikal National Park, Guatemala. Their responses were counted and the relationship between calling and certain parameters (such as weather, light and time of night) was evaluated. The owls were quite responsive to broadcast of conspecific vocalizations throughout the study period. Wind was the only factor, of those tested, that affected the potential to hear an owl call. The high rate of response (40%) under a variety of conditions suggests that broadcast of taped calls can be used as a census tool for this species. Additionally, results indicate that the Mottled Owl is common in Tikal and suggests that this little-known species is apparently territorial.

RESPUESTA POR PARTE DE INDIVIDUOS DE *CICCABA VIRGATA* A GRABACIONES DE LLAMADAS DE CONESPECÍFICOS

Sinopsis.—En el estudio que se llevó a cabo en el Parque Tikal de Guatemala, individuos de buhos moteados (*Ciccaba virgata*) fueron expuestos por 6 semanas (durante el periodo que en gran medida corresponde a la época de reprodución de la especie) a grabaciones de llamadas de miembros de su propia especie. Además de tomarse en cuenta sus respuestas, se evaluó de igual manera, la relación entre las llamadas y ciertos parámetros tales como condición climatológica, luz y hora de la noche. Los buhos mostraron gran respuesta a las grabaciones de conespecíficos a través del periodo de estudio. El viento fue el único factor, de los tomados en consideración, que afectó la potencialidad de escuchar la llamada de las aves. La alta frecuencia de respuestas (40%) bajo una gran variedad de condiciones, sugiere que el usar grabaciones puede ser muy útil como herramienta para hacer censos de estas aves. Los resultados del trabajo también indican que este buho es común en Tikal y que la especie aparentemente es territorialista.

Broadcasts of taped vocalizations have been used to study several aspects of owl behavior, ecology and distribution (Eastern Screech Owl, *Otus asio* (Cink 1975, Nowicki 1974), Western Screech Owl, *O. kennicottii* and Elf Owl, *Microthene whitneyi* (Johnson et al. 1979, 1981), Spotted Owl, *Strix occidentalis* (Forsman et al. 1977), and Burrowing Owl, *Athene cunicularia* (Martin 1973)).

The Mottled Owl (*Ciccaba virgata*) is widely distributed through the Neotropics, from Mexico to northeastern Argentina (Peterson and Chalif 1973). It is the most abundant of the larger tropical owls in Mexico (Blake 1953) and probably the most common forest owl of the humid lowlands of Honduras (Monroe 1968). Conversely, the Mottled Owl seemingly exists in very small numbers in Guyana and Trinidad (Buchanan 1971) and Surinam (Haverschmidt 1968). Little is known of the food habits and nesting behavior of this nocturnal owl. Indeed, even the taxonomic position of this and other tropical woodland species remains in some doubt (Norberg 1977, Peters 1938, Voous 1964).

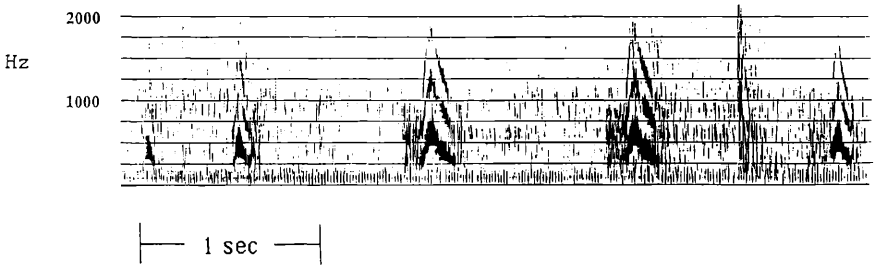

FIGURE 1. Sonogram of male Mottled Owl (*Ciccaba virgata*) from Tikal National Park, Guatemala.

Mottled Owls produce a wide variety of calls. The territorial call is a series of deep hoots, described as *bru bru* and *bu bu bu* (Wetmore 1968) or *keeooweeyo* or *cowooawoo* (Ridgeley 1976). A whistled screech has also been ascribed to this species (Eisenmann 1955). In an interesting anatomical study, Miller (1963) discovered that the voice box is more enlarged and more specialized than that of other owls. This enables the Mottled Owl to produce an especially low-pitched note for a bird of its size.

In Tikal National Park, Guatemala, Mottled Owls typically utter a 4–6-note call, with one or two low, muffled preliminary notes followed by three higher, booming notes (Fig. 1). Another low, muffled note may or may not complete the series. Occasionally, a single or double hoot may be heard; this, however, seems never to be associated with a calling bout and may represent an alarm call. The female also produces a cat-like yowl which seems to be used as a food solicitation call.

No calling surveys have been reported for Mottled Owls. In fact, Blake (1953) and Meyer de Schauensee and Phelps (1978) provide the only previous suggestion of decoying this species by imitating its call, and Kricher (1989) states that this species does not tend to be attracted to tapes.

I initiated this study to determine if Mottled Owls respond to broadcasts of conspecific calls and to evaluate factors that might influence responsiveness.

STUDY AREA AND METHODS

Tikal National Park is located in the Peten forest of northern Guatemala. This semi-deciduous, lowland forest is classified as part of the tropical dry life zone (Holdridge 1957). Annual rainfall ranges from 1136 to 1761 mm, with distinct wet and dry seasons, the latter being December–April (Smithe 1966). This region is one of the most ornithologically diverse of Central America (Land 1970).

A cassette tape was made by recording a pair of Mottled Owls in the field at a distance of approximately 20 m. A Marantz PMD 221 recorder and Sennheiser ME 80 directional microphone were used. This tape, used for the entire study, consisted of 4 min of a male's hoot call repeated

13 times, followed by 1 min of a female's solicitation call repeated 4 times. Calls were spaced at intervals of 15–20 s, which allowed the observer to hear responses during the broadcast period.

Surveys were conducted along 14.4 km of road in the southern half of the Park. Eighteen points were spaced at intervals of 0.8 km along this transect (Fuller and Mosher 1987). A single survey consisted of a trial at each of these 18 points. Data were collected between 11 April and 22 May 1989. Three time periods were surveyed: 1930–2200 (eight surveys), 2300–0130 (eight surveys), and 0230–0500 (seven surveys), to determine if time of night has an effect on responsiveness of Mottled Owls. Eastern Screech Owls have been shown to respond more towards dawn (Beatty 1977), while nesting Barred Owls, *Strix varia,* are more responsive near the middle of the night (Smith 1978).

I conducted a total of 23 surveys. During 18 of the surveys, recorded Mottled Owl calls were played. Five control surveys (during which no call was played) were conducted randomly throughout the study period. Broadcasting was done using a Cassette Game Caller (Johnny Stewart Game Calls of Waco, Texas). The speaker in this system has an effective frequency range of 275–14,000 Hz, which includes the frequencies found in the owl calls (Fig. 1). Playback levels were measured with a Realistic sound level meter. At 1 m from the speaker, on axis, the SPL was 88 ± 2 dB impulse, with settings at c-weighting and fast response. The tape was played for 5 min at each point, after which I moved on to the next point. During control trials, I listened for 5 min at each point without broadcasting a call.

Upon hearing an owl (or owls) respond, the elapsed time (since the onset of playback) was recorded. Also recorded for each trial point was temperature, the position of the moon relative to the horizon (moon phase was recorded for each survey date), and cloud cover and wind indexed on a 0, 1, 2 scale. For wind, this corresponded to no wind, slight breeze, and wind noise in the trees, respectively. The road created a break in the canopy, which allowed me to determine cloud cover and moon position. In addition, light (including moon phase, cloud cover, and position of moon) was indexed on a 0, 1, 2, 3 scale, with 3 being a clear, moonlit night. No surveys were conducted during rain.

Data were analyzed using stepwise logistic regression, which determines the effects of several independent variables (which may be either categorical or continuous) on a single dependent variable (SAS procedure Logist; Harrell 1986). Presence or absence of response was the dependent variable. Independent variables analyzed were date, location, time of night, moon phase, cloud cover, wind and temperature. A similar analysis was also performed in which the light index was substituted for moon phase and cloud cover.

Because two different calls (male and female) were used, I could not say whether a bird responding during the fifth minute of playback was responding to the male's call belatedly or to the female's call. Therefore, to avoid the possibility of confounding the results, only results from the

TABLE 1. Results of stepwise logistic regression. All other variables (date, time of night, temperature, moon phase and light) were not significant at the level of $P = 0.1$. (Analysis performed using SAS procedure Logist.)

Variable	χ^2	P	R
Stimulus	26.46	0.0001	0.216
Wind	7.36	0.0067	−0.101
Location	4.90	0.0268	0.074

first 4 min of the broadcast (during the broadcast of the male's vocalization) or the control trials were used in the analysis.

RESULTS AND DISCUSSION

There were 414 observations, 324 trials with taped calls and 90 control trials. A response was obtained on 136 of the 414 total trials (33%).

Three independent variables had significant effects on the potential for owls to be heard (Table 1). This was the case both when the regression analysis was performed with all independent variables and when the light variable was substituted for moon phase and cloud cover.

Broadcasting the taped calls was the most important factor for hearing an owl (Table 1). Owls responded to the taped calls 40% ($N = 128$) of the time, while owls were heard during only 9% ($N = 8$) of the control trials. This indicates that Mottled Owls are highly responsive to playbacks of conspecific calls, a result not previously reported.

Not surprisingly, wind had a significant negative effect on response observations (Table 1). Wind hampers the observer's ability to hear a response and, presumably, the range at which the owl can hear the recording. Whether the bird's propensity to call is actually affected by wind is unknown. However, a greater number of responses were heard under windless conditions; owls were heard calling 45% of the time under calm conditions but only 21% when windy.

There was a significant relationship between certain locations and the potential to hear an owl call (Table 1). Response varied from 22% to 61% among the 18 calling locations during the 23 surveys. Several factors may account for this observed heterogeneity among luring points. While the habitat appeared similar at all points, there did exist some differences in topography. This may have caused variability in the effective calling range from one point to another. The more important cause, however, probably had to do with the territory location of the owl pairs. A calling point located in the center of a pair's territory would be expected to elicit a greater number of responses than a calling point that is more distant.

None of the other parameters evaluated were statistically significant (Table 1). For example, time of night appeared to have no effect on the response of Mottled Owls. Nor did response percentage vary significantly over the course of the study period. This suggests that Mottled Owls are responsive to conspecific calls throughout their nesting season. I believe

that the survey period spanned the time from incubation to fledging and that these birds were relatively synchronous in their nesting. This study ended when I began to hear the first fledglings. Habituation did not appear to be a problem in the acoustical luring of the owls. Response numbers were as high at the end of 6 wk as at the beginning, though calling was done at each point 23 times in 42 nights and on as many as three consecutive nights.

The results of this study indicate that Mottled Owls are abundant in the portion of Tikal surveyed, as evidenced by different owls responding consistently at each of the 18 points. Calling under a wide variety of conditions of moon phase, time of night, temperature, and wind yielded a response 40% of the time.

Taped broadcast calls may be useful in indexing population size and distribution of Mottled Owls. Such a census technique may also be a valuable tool in determining home range size and densities, the degree of territorial defense and aggressiveness, and the behavioral role of vocalizations.

ACKNOWLEDGMENTS

I would like to thank J. C. Munger for help with statistical analysis, and A. M. Dufty, J. C. Munger, W. A. Burnham, and D. M. Gerhardt for helpful comments on the manuscript. This study was conducted as a part of the Maya Project of The Peregrine Fund, Inc. with additional funding from Boise State University. Support was also provided by a Grant-in-Aid of Research from Sigma Xi, the Scientific Research Society.

LITERATURE CITED

BEATTY, W. H. 1977. Attracting screech owls. Redstart 44:102–104.

BLAKE, E. R. 1953. Birds of Mexico. Univ. Chicago Press, Chicago, Illinois. 219 pp.

BUCHANAN, O. 1971. The Mottled Owl *Ciccaba virgata* in Trinidad. Ibis 113:105–106.

CINK, C. L. 1975. Population densities of screech owls in northeastern Kansas. Kansas Ornithol. Soc. Bull. 26:13–16.

EISENMANN, E. 1955. The species of Middle American birds. Trans. Linnaen Soc. New York, Vol. 7. 128 pp.

FORSMAN, E. D., E. C. MESLOW, AND M. J. STRUB. 1977. Spotted owl abundance in young versus old-growth forests, Oregon. Wildl. Soc. Bull. 5:43–47.

FULLER, M. R., AND J. A. MOSHER. 1987. Raptor survey techniques. Pp. 37–65 *in* B. A. Giron Pendleton, B. A. Millsap, K. W. Cline and D. M. Bird, eds. Raptor management techniques manual. Natl. Wildl. Fed., Washington, D.C.

HARRELL, F. E. 1986. The LOGIST procedure. Sugi Supplemental Library Guide, Version 5 edition. SAS Institute, Cary, North Carolina.

HAVERSCHMIDT, F. 1968. The birds of Surinam. Oliver and Boyd, Edinburgh, Scotland. 445 pp.

HOLDRIDGE, L. 1957. The vegetation of mainland Middle America. Proc. 8th Pacific Congr. 4:148–161.

JOHNSON, R. R., B. T. BROWN, L. T. HAIGHT, AND J. M. SIMPSON. 1981. Playback records as a special avian censusing technique. Pp. 68–75 *in* C. J. Ralph, and J. M. Scott, eds. Estimating numbers of terrestrial birds. Studies in Avian Biology Vol. 6.

———, L. T. HAIGHT, AND J. M. SIMPSON. 1979. Owl populations and species status in the southwestern United States. Pp. 40–59 *in* P. P. Schaeffer, and S. M. Ehlers, eds. Proceedings of the symposium on owls of the West: their ecology and conservation. Natl. Audubon Soc. West Education Cent., Tiburon, California.

KRICHER, J. C. 1989. A neotropical companion. Princeton Univ. Press, Princeton, New Jersey. 272 pp.

LAND, H. C. 1970. Birds of Guatemala. Livingston, Wynnewood, Pennsylvania. 381 pp.

MARTIN, D. J. 1973. Selected aspects of burrowing owl ecology and behavior. Condor 75:446–456.

MEYER DE SCHAUENSEE, R., AND W. H. PHELPS, JR. 1978. A guide to the birds of Venezuela. Princeton Univ. Press, Princeton, New Jersey. 424 pp.

MILLER, A. H. 1963. The vocal apparatus of two South American owls. Condor 65:440–441.

MONROE, B. L., JR. 1968. Distributional survey of the birds of Honduras. Ornithological Monographs, No. 7. 160 pp.

NORBERG, R. A. 1977. Occurrence and independent evolution of bilateral ear symmetry in owls and implications on owl taxonomy. Phil. Trans. Royal Soc. Lond. Series B, Vol. 280.

NOWICKI, T. 1974. A census of screech owls using tape-recorded calls. Jack-Pine Warbler. 52:98–101.

PETERS, J. L. 1938. Systematic position of the genus *Ciccaba* Wagler. Auk 55:179–186.

PETERSON, R. T., AND E. L. CHALIF. 1973. A field guide to Mexican birds. Houghton Mifflin, Boston, Massachusetts. 298 pp.

RIDGELEY, R. S. 1976. A guide to the birds of Panama. Princeton Univ. Press, Princeton, New Jersey.

SMITH, C. F. 1978. Distributional ecology of barred and great horned owls in relation to human disturbance. M.S. thesis, Univ. Connecticut, Storrs, Connecticut.

SMITHE, F. B. 1966. The birds of Tikal. Natural History Press, Garden City, New York. 350 pp.

VOOUS, K. H. 1964. Wood owls of the genera *Strix* and *Caccaba*. Zool. Mededelinger 39: 471–478.

WETMORE, A. 1968. The birds of the Republic of Panama, 2. Smithsonian Misc. Coll., Vol. 150. 605 pp.

Received 6 Mar. 1990; accepted 30 Sep. 1990.