SHORT COMMUNICATIONS

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RESPONSIVENESS OF NESTING EURASIAN KESTRELS *FALCO TINNUNCULUS* TO CALL PLAYBACKS

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Many birds of prey, both diurnal and nocturnal, respond to playback of their own calls (Fuller and Mosher 1981, Morrell et al. 1991, Cerasoli and Penteriani 1992, Redpath 1994). This responsiveness has lead to the development of acoustic methods for detecting and counting raptors, particularly in woodland habitats (e.g., Mosher et al. 1990, Cerasoli and Penteriani 1992). By contrast, diurnal raptors found in open habitats are seldom surveyed using taped broadcasts because they are easily detected by observers. Nevertheless, difficulties in locating these raptors can arise, especially when there is a mosaic of habitat types across the landscape or when the architectural complexity of old buildings and ruins in urban areas supplies additional nest sites. The aim of this study was to assess the response of breeding pairs of Eurasian Kestrels (*Falco tinnunculus*), which can be widespread in European urban areas (Village 1990), to the playback of their calls in order to evaluate the efficiency of this method for surveying for nests of this species.

METHODS

The study was carried out on the Eurasian Kestrel population that nests in scaffolding holes of Roman ruins and old buildings in the center of Rome, Italy. This population has been studied since 1995 and has shown a very high breeding density (Piattella et al. 1999). During April–June 1998, 36 taped broadcast sessions were performed at 20 known occupied nests. Nine sessions were performed in April, 16 in May, and 11 in June. To avoid habituation to playback and disturbance during the breeding season, breeding pairs were not tested more than twice (e.g., Redpath 1994) during the entire study period.

Playbacks were performed at each occupied nest in early morning (0700–1000 H, $N = 13$ playback sessions), late morning (1000–1300 H, $N = 9$), early afternoon (1300–1600 H, $N = 7$), and late afternoon (1600–1900 H, $N = 7$). Signal calls, a series of high-pitched trills especially uttered by females denoting the presence of breeding pairs near nests (Village 1990), were used for eliciting responses of kestrels. Each playback session was conducted giving five taped calls lasting approximately 1 min at 2-min intervals. Taped broadcasts were performed using a portable stereo with 6 W amplifiers. Taped calls were stopped once a bird responded (latency time). Broadcast points were located in the streets around buildings used by breeding pairs of kestrels, at a minimum distance ranging 30–40 m. During each playback session, each of the following were recorded: the date and time of stimulation, minimum daily temperature and wind speed (values obtained from the meteorological station of "Ufficio Centrale di Ecologia Agraria" in the city center), latency (time from start of broadcast to first response), sex of the responding individual, and response type classified as (1) appearance of a kestrel at the nest entrance, (2) advertising or alarm calls, (Village 1990), (3) flights around the nest site (taking into account only individuals flying away from nest entrances or from perches close to nest holes), (4) copulation near nests, (5) no response, and (6) behavior of young (only for nests completely visible by the observer). Nearest-neighbor distance (nnd) was also calculated including all breeding pairs, even those not tested by playbacks.

Breeding pairs were located in the study area (about 10 km^2) by visiting known nest sites and checking other suitable nest sites with standard census methods (Village 1990). Breeding success was determined by checking nest sites at least twice and counting all visible fledglings. Nests where complete counts of fledglings could not be made were not included in the analysis.

Percentages of successful playbacks were calculated with reference to the number of playbacks performed in each month and over the study period, respectively. In calculating percentages of successful playbacks, we regarded as successful each playback that caused any type

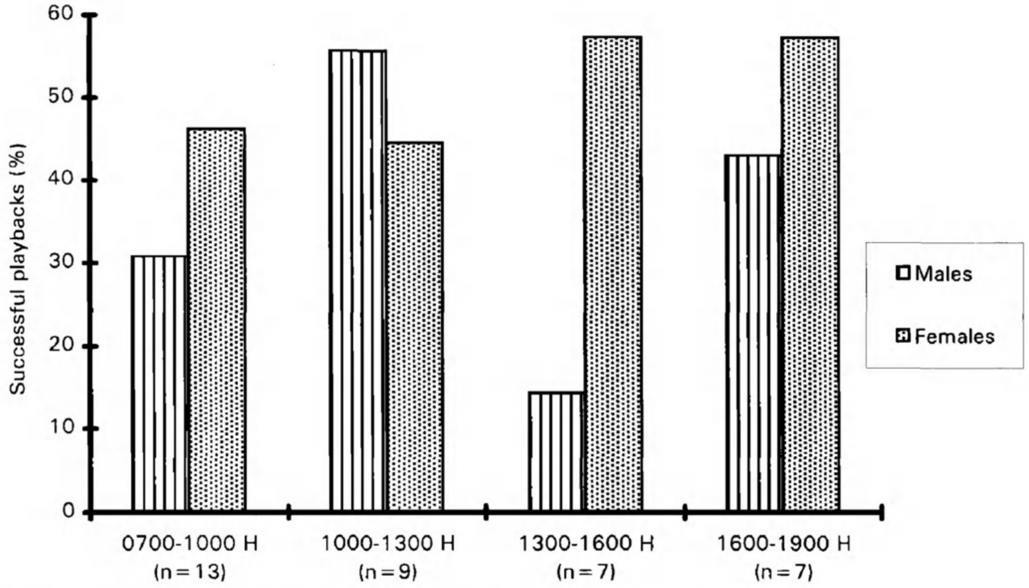

Figure 1. Daily response pattern of breeding Eurasian Kestrels to taped broadcasts.

of response by males, females or both together. Also, we calculated separately the percentages of males and females that responded to playbacks in each month for the total playbacks performed in each month. Finally, a "response index" indicating the intensity of responses was calculated for each pair by summing of all response types of the male and female (giving the value 1 to all positive types of responses) and dividing it by the total number of playbacks. Values of response time and response index recorded for each pair were compared to date, time of stimulation, temperature, wind, nearest-neighbor distance, and breeding success using the Spearman rank correlation tests. Differences between female and male latency were tested by using Mann-Whitney U-test (U-value corrected to a z score). All tests were two-tailed and $\alpha = 0.05$.

Table 1. Responses of breeding Eurasian Kestrels to call playbacks in Rome, Italy. Total responses, appearances, vocalizations, and flights are expressed for each sex as number of observed events and percentages on both sexes Percentage of copulations is calculated for the total number of taped broadcast stimulations. Response time, as well as response index, are expressed as $\bar{x} \pm$ SD.

	FEMALES	MALES	N
Response time(s)	17 ± 28	65 ± 108	36
Total responses	18 (58.1%)	13 (41.9%)	31
Appearances	16 (72.7%)	6 (27.3%)	22
Vocalizations	9 (50.0%)	9 (50.0%)	18
Flights	3 (23.1%)	10 (76.9%)	13
Copulations	4 (11.1%)		36
Response index	2.2 ± 1.5		16

RESULTS

A total of 26 of 36 playbacks resulted in responses by kestrels. Eight (88.9%) of 9 playbacks performed in April, 10 (62.5%) of 16 playbacks performed in May, and 8 (72.7%) of 11 playbacks performed in June resulted in responses. Four playbacks (44.4%, N = 9) in April, 5 (31.3%, N = 16) in May, and 4 (36.4%, N = 11) in June resulted in responses by male kestrels. Seven playbacks (77.8%, N = 9) in April, 7 (43.8%, N = 16) in May, and 4 (36.4%, N = 11) in June resulted in responses by female kestrels. In some cases, males and females of the same pair responded together to the stimulation (Fig. 1, Table 1). Thus, the same playback could have produced a double response. Likewise, multiple types of behavioral reactions were sometimes elicited by a single stimulation All the individuals responded within 5 min from the start of playbacks and the difference between male and female latency was not significant ($z = -1.06$, $P = 0.29$, $N = 31$). During incubation and brooding, females appeared at nest entrances and called regularly for about 1 min, but rarely flew from nests rapidly reentering nests after this display. Males seldom appeared at nest entrances throughout the study period. When males were inside nest-holes, they showed behaviors similar to those shown by females, appearing at nest entrances and excitedly calling, but rapidly reentering nest cavities. At all nests where young birds were observed, young kestrels never responded to taped calls. Instead, they always hid themselves in an internal corner of the hole during playbacks.

No significant correlations were found between response time and the following variables: date ($r_S = 0.28$, $P = 0.124$, $N = 31$), time ($r_S = 0.08$, $P = 0.663$, $N = 31$), temperature ($r_S = 0.32$, $P = 0.076$, $N = 31$), wind ($r_S = -0.02$, $P = 0.921$, $N = 31$), nnd ($r_S = -0.13$, $P = 0.480$,

$N = 31$), and breeding success ($r_S = 0.29$, $P = 0.205$, $N = 21$). Likewise, no significant correlation was found between these variables and the response index: $r_S = -0.17$, $P = 0.349$, $N = 31$ for date; $r_S = -0.24$, $P = 0.184$, $N = 31$ for time; $r_S = -0.18$, $P = 0.326$, $N = 31$ for temperature; $r_S = 0.16$, $P = 0.384$, $N = 31$ for wind; $r_S = 0.04$, $P = 0.829$, $N = 31$ for nnd; or $r_S = -0.30$, $P = 0.185$, $N = 21$ for breeding success.

For a total of 20 nesting pairs, occupation of 16 nest sites (80%) was directly confirmed by playback stimulation.

DISCUSSION

The broadcasting of taped calls is a useful tool in locating nesting raptors in woodland settings (Fuller and Mosher 1981). The technique used in this study may represent a first time such a technique has been used to detect nesting pairs of nonforest species. We found that, after occupation, both male and female kestrels defended nest sites from neighboring and intruding kestrels. Because of this, vocalizations of breeding kestrels could be easily elicited by broadcasting a taped call, such as the "signal call," especially in the first stages of the nesting period. Although kestrels are not highly territorial (Village 1990), their response to playbacks was relatively high compared to other diurnal raptors (Mosher et al. 1990, Cerasoli and Penteriani 1992), indicating that the playback method may integrate other field techniques in locating breeding pairs of Eurasian Kestrel. The playback method may be particularly useful in high density populations where observers must check the occupation of two or more neighboring nest sites. As kestrels are very versatile in their choice of nest sites and their identification can be very difficult (Shrubb 1993), this technique may also be a practical tool in low density situations. For example, in cases where kestrels have a scattered distribution, this technique can be used to cover relatively large areas in a short time and it is a faster method of surveying for kestrels when they nest in uncommon sites and habitats (e.g., crow nests in pine plantations). Nevertheless, because playback methods are invasive, researches should minimize disturbance to the pairs studied by performing playbacks only in the first stage of the breeding season and each nest should not be visited more than twice during the breeding season. Finally, playbacks should not be used in counting fledglings because they do not respond to playbacks and seem to be disturbed when adults respond to calls.

RESÚMEN.—La respuesta de parejas de *Falco tinnunculus* a las vocalizaciones grabadas fue estudiada en una población urbana en Roma, Italia. Los Cernícalos respondieron con varios despliegues cerca de sus nidos. La eficiencia de los "playbacks" y la latencia individual fueron similares entre machos y hembras. No hubo una correlación entre las tasas de respuestas y el clima, o entre las variables de población. Los "playbacks" pueden aumentar el número de técnicas de campo para la localización de parejas en reproducción.

[Traducción de César Márquez]

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