

# MANAGEMENT IMPLICATIONS OF ESTIMATING ABUNDANCE OF QUAIL SPECIES INHABITING FOREST ENVIRONS IN MEXICO

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## ABSTRACT

Estimating abundance of forest quail in Mexico offers unique challenges to wildlife managers. Unlike quail inhabiting grassland, forest quail are often cryptic, live in inaccessible mountainous areas, and unpredictably respond to playback census techniques. During 1996–1999, we estimated abundance of singing quail (*Dactylortyx thoracicus*) and bearded wood quail (*Dendrortyx barbatus*) in northeast Mexico. Singing quail were visually counted at El Cielo Biosphere Reserve, Tamaulipas, along 14 transects varying in length from 1,400 to 5,000 m. Because of the cryptic nature of bearded wood quail, visual counts proved unsuccessful in estimating abundance. Therefore, a tape recording of their chorus call was used to determine presence. Vocalizing wood quail were documented at 10 stations on a single 1,000 m transect near Coatepec, Veracruz. Because of the varied habitat types in the area total population estimates were not estimated. Only the numbers present along our transect are reported. Estimates of abundance of singing quail were obtained due to the homogenous habitat. Density estimates from Ejido Lazaro Cardenas for singing quail were 56 quail/45.4 ha (1 quail/0.8 ha). Density estimates for La Cueva were 30 quail/15.9 ha (1 quail/0.53 ha). The management of these quail species presents a substantial challenge for biologists, because of the difficulty in obtaining population estimates. The number of wood quail estimated by each responding individual to the chorus call and possible seasonal elevation shifts of singing quail should be considered when estimates of abundance are used to set harvest regulations.

**Citation:** Eitniewar, J. C. and J. T. Baccus. 2002. Management implications of estimating abundance of quail species inhabiting forest environs in Mexico. Pages 201–205 in S. J. DeMaso, W. P. Kulesky, Jr., F. Hernández, and M. E. Berger eds. Quail V: Proceedings of the Fifth National Quail Symposium. Texas Parks and Wildlife Department, Austin, Texas.

**Key Words:** abundance, bearded wood quail, *Dactylortyx thoracicus*, *Dendrortyx barbatus*, estimating numbers, Mexico, playback, singing quail, strip

## INTRODUCTION

In economic terms, species with economic value receive more monies that can be devoted to enhancing their long-term survival than species without economic value. Such economic value can be consumptive as with hunting or non-consumptive as with ecotourism. For most gamebirds in North America, consumptive strategies apply to their use as a game species (i.e., hunting). Many species of New World quail inhabiting mountainous and tropical forests of Mexico, Central and South America are in desperate need of conservation and management (Leopold 1959). Fostering value and developing management plans are necessary to prevent species extirpation (Collar et al. 1992, Mexico 1994, Carroll and Hoogesteijn 1995, McGowan et al. 1995, Carroll and Eitniewar 2000, Fuller et al. 2000). Information on population status and habitat use is an obvious precursor to the development of a sustainable management strategy. This is especially relevant if the management protocol involves harvest quotas. Such information is lacking for most tropical quail species. While the literature is replete with studies on grassland quail of North America, few, if any, propose methods for the obtaining population and demographic data

and/or the development of management strategies for tropical quail species. This paper addresses the lack of such information and focuses on our studies conducted from 1996–1999 on the status of singing quail and bearded wood quail (Eitniewar et al. In Press) in north-eastern Mexico.

## METHODS

### Singing Quail

The study site was located in the El Cielo Biosphere Reserve in southwestern Tamaulipas immediately south of the Tropic of Cancer between 22°48' and 23°30' north latitude and 99°00' and 99°30' west longitude. The reserve covers 10,000 ha with altitudes ranging from 200–1,600 m and is within the Sierra de Cucharas at the eastern slope of the Sierra Madre Oriental. The vegetation has been described as a mixture of tropical and temperate species (Rzedowski 1983). During 9–10 November 1996, our staff conducted a brief verbal survey of residents in ejidos San Jose, Lazaro Cardenas, Joya de Manantiales, and Alta Cima about their knowledge of singing quail. As a result of the surveys, two areas were chosen for research sites.

These included, Ejido Larzaro Cardenas (9 transects), and La Cueva (5 transects). Transect length ranged from 1,400 to 5,000 m (Eitniear et al. 1997). The location of the 2 areas was separated by 16 km to prevent quail movement between the 2 areas. The abundance of singing quail was obtained using line transect methodology (Roseberry 1982, Ralph et al. 1993) during 1997 (24 Jun–5 Jul, 21–30 Jul, 21 Sep–5 Oct). Transects were walked by an observer and quail were recorded, if they were within 10 m of the transect line. Results were compared to singing quail numbers recorded during the El Cielo Audubon Christmas bird count (CBC) published annually in *American Birds*, an annual publication of the National Audubon Society.

#### Bearded Wood Quail

The playback technique was tested at a site near Coatepec, Veracruz (19°28'51" N, 96°58'50" W). Because bearded wood quail are considered an elusive and secretive species (Johnsgard 1981, Howell and Webb 1995), the study site was located with assistance from local bird trappers (Aguilar 1991, Eitniear et al. 2000). The elevation of the site ranged from 1,219 to 1,376 m above sea level in an area with shaded coffee groves, cloud forest, secondary growth forest, grasslands, and tree fern associations (Rzedowski 1983). A detailed species account of the floral composition of these associations is in Garcia et al. (1993).

A line transect with 10 listening stations (Fig. 3) separated by 100 m, was established using a pedometer. A 3-minute, endless-looped tape was made of the species chorus call (Hardy and Raitt 1997). This call follows the species alarm call and is similar in function to the separation call emitted by the northern bobwhite (*Colinus virginianus*) and Venezuelan wood quail (*Odontophorus columbianus*, Bailey 1978, Carroll and Hoogenstein 1995, Pedro Mota, personal communication).

For the period 20 July 1995 to 2 April 1996, except March, surveys were conducted each month. At each station the tape was played (Marantz PMD 201 cassette player, with 1,165 kh, 25 w 8 ohm Otto speaker) 3 times for 30 seconds followed by 30 seconds of listening. Responses were recorded with respect to direction and estimated distance. All surveys were conducted between 0600 and 1000 hr.

## RESULTS

#### Singing quail

The estimated abundance of singing quail (adults, juvenile and young) observed during 3 surveys on the 14 transects are presented in Fig 1. Survey results of Ejido Lazaro Cardenas showed a quail density of 56 quail/45.4 ha (1 quail/0.8 ha) and La Cueva 30 quail/15.9 ha (1 quail/0.53 ha).

#### Bearded Wood Quail

Seventeen surveys had positive responses at 8 of the 10 stations. The number of responses varied by

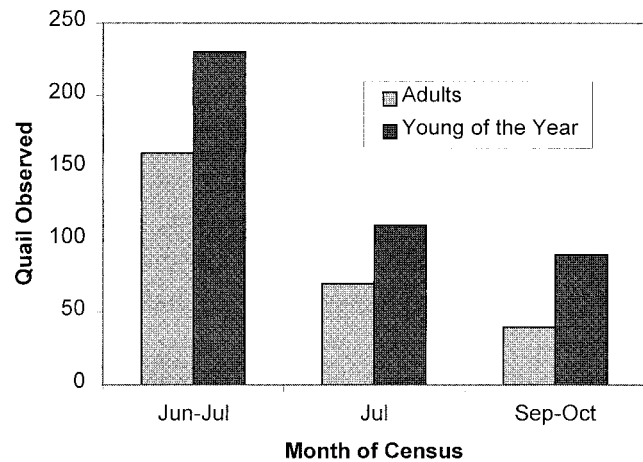


Fig 1. Total number adults and young of the year of singing quail observed in Ejido Lazaro Cardenas (transects 1–9) and La Cueva (transects 1–5) during surveys in El Cielo Biosphere Reserve, Tamaulipas, Jun–Oct 1997.

station and month (Figs. 3 and 4). We recorded 35 responses at 170 individual points (20.6% response rate). The greatest number of responses (51.4%) occurred at station 3, the only station in a cloud forest habitat. The second highest response rate (22.8%) was at station 4 in a shaded coffee grove habitat. Based on responses by this species, tree fern, grassland, coffee grove, and secondary growth forest are less suitable habitats than cloud forest for the bearded wood quail at this site.

The total number of responses varied by month. When the data are normalized (number of responses/number of stations surveyed), the response rates for October and November were greatest (Fig. 4). Response rates diminished substantially from November to April. No responses were heard in January.

## DISCUSSION

#### Singing Quail

The total population and abundance of adult singing quail decreased throughout the summer. We speculate that the species exhibits latitudinal migration moving to lower elevations during cooler months. A preliminary survey conducted on 15 December observed zero birds. Another survey conducted on 03 March 2000 observed 2 individuals. This theory, however, requires additional study. According to Audubon Christmas Bird Count (CBC) data (1972–1996), the abundance of singing quail in El Cielo has steadily increased (Fig. 2). The increase in singing quail at this site is possibly related to the termination of timber harvesting in the early 1970s, resulting in vegetative succession towards a mature forest community. Dense canopy forest environments, which produce a heavy leaf litter layer, are the preferred habitat of singing quail, because they primarily forage in leaf litter (Leopold 1959, Warner and Harrell 1957, Arriaga 1988). In contrast to our density estimates, Harrell (1951) found a density of 1 quail/5.4 ha at El Cielo. Harrell

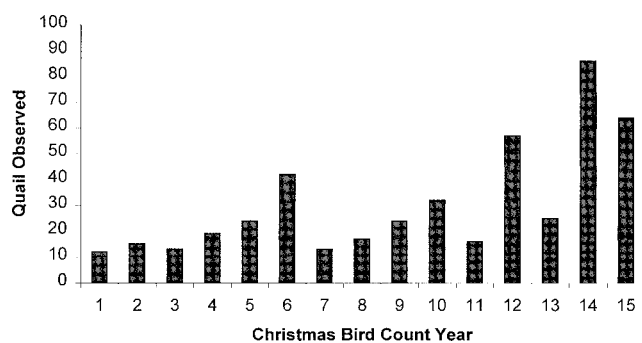


Fig. 2. Singing quail recorded during annual El Cielo CBC from 1972–96. See American Birds (1973) for count site description.

(1951) conducted his study in 1950 when logging activities were ongoing in the El Cielo region. A possible explanation for the abundance of singing quail observed in December (1972–78, 1989–96 CBC counts) may be due to the size and composition of the count circle which includes lowland riverside gallery forest and deciduous forest (American Birds 1973) that likely contain higher invertebrate populations during the winter.

Bearded Wood Quail

The advantages of using recorded calls to locate rare, secretive, or unevenly distributed birds have been compared to the stop-listen methods (Braun et al. 1973, Johnson et al. 1981, Marion et al. 1981, Parker 1991). Bohl (1956) played the species “community” call to locate chukar partridge (*Alectoris graeca*). The results of our study are similar to his findings. Determining population status in addition to establishing the presence or absence of a species requires more knowledge of the species social behavior than currently documented for species of tropical quail. Often, only 1 or 2 individuals in a small group of 2 to 7 birds would respond to played calls. The responding birds are likely adult males, although we could not be certain because the species is not sexually dichromatic. Females and subadults may constitute individuals not responding (McDonald and Winnett-Murray 1989). Further fieldwork is needed to determine how many birds are represented by 1 response. It is not known why the species responded poorly to the recorded calls during January and February. There was no response on a survey conducted in March 1997 (Sergio Aguilar-Rodriguez, personal communication). Differential response rates may be due to changes in social behavior associated with onset of the breeding season (Levy et al. 1966). Stirling and Bendell (1966) concluded that playback of a recorded call resulted in a 4-fold increase in effectiveness in surveying blue grouse (*Dendragapus obscurus*). While we did not compare this technique to the “Walk, look and listen” technique, our results indicate that it is a useful method to determine presence or absence of bearded wood quail in an area from April through December. The technique needs further development but these results suggest that call-playback surveys undertaken from July to De-

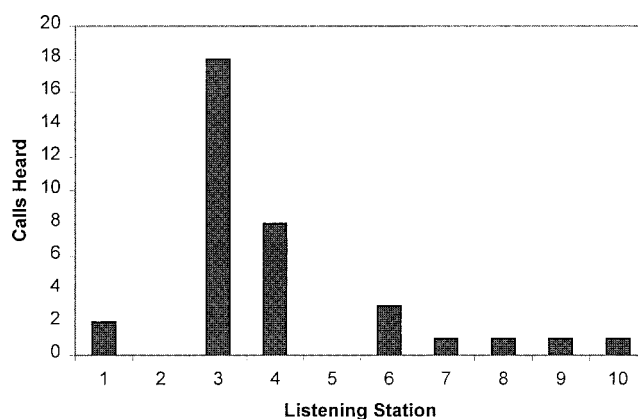


Fig. 3. Number of responding bearded wood quail to call-playbacks of conspecific chorus calls at 10 listening stations in Coatepec, Veracruz, Mexico, from Jul 1995–Apr 1996. Station composition; 1,2,7,8 Shade Coffee with varying amounts of secondary growth, 3 same as previous stations with cloud forest as southern border, stations 9,10 secondary forest with tree ferns.

cember could provide rapid presence-absence data. Better population estimates and habitat assessment of this species will require additional research.

MANAGEMENT IMPLICATIONS

Gamebird conservation initiatives supported through the sale of hunting licenses and stamps have enhanced habitat and benefited game and nongame bird species. Additionally, through the monitoring of gamebird populations, as is required to establish harvest regulations, the viability of populations is enhanced. Robust amounts of published literature on the life history, ecology, and numerous tested population monitoring techniques support the success of such management programs in temperate regions. In tropical regions, standard wildlife monitoring techniques are often less effective to study avifauna. Nevertheless, our results indicate that population status, while often limited to presence or absence, is obtainable for 2 species of tropical quail. However, social situations and seasonal movements differ from the breeding and non-

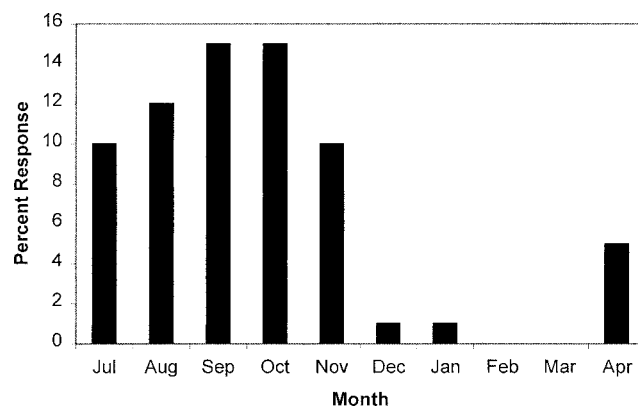


Fig. 4. Percent responses of bearded wood quail to call-playbacks of conspecific chorus calls by month when normalized (number of responses/number of listening stations surveyed).

breeding season considerations of temperate regions (Eitniear et al. 1997). Considering our initial investigations with tropical quail we suggest that game species managers in tropical countries consider the following questions in determining quail management strategies.

1. Opportunities for immigration. Is the managed population within a fragmented landscape?
2. Knowledge of the species life history. Does the species breed sporadically over a long period? Will harvest periods realistically follow periods of reproductive inactivity?
3. Population data. Can population estimates be obtained or is presence/absence data only available? If the latter, a more conservative harvest quota should be considered.
4. Physical/financial resources. Are human and financial resources available to monitor population status throughout the year?
5. Is the managing agency able to establish partnerships with hunting groups, academic institutions, and nongovernmental organizations to aid in the collection of population status data?

## ACKNOWLEDGMENTS

Field data on quail would not be possible without the field assistance of Sergio H. Aquila-R. (Veracruz) and Alvaro Aragon T. (Tamaulipas). John P. Carroll, chair, WPA/Birdlife/SSC Partridge, Quail and Francolin Specialist Group assisted in securing financial support and provided significant guidance for both quail projects. Financial support was received from the World Pheasant Association-International, IUCN-SSC/Birdlife/WPA Partridge, Quail, and Francolin Specialist Group, Prince Bernhard Nature Trust, Panlitet Fentener van Vlissingen Foundation, World Nature Association, Wildlife Preservation Trust International and a Southwest Texas State University faculty research grant to John T. Baccus. Field studies were conducted under permit No. DOQ 550-4627/96 from Secretaria de Medio Ambiente, Recursos Naturales y Pesca-Mexico.

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