A test to determine if Bobwhite Quail hunt crickets by sound.—After a Lockheed Electra crash in Boston caused by a large number of Starlings (*Sturnus vulgaris*) choking the engines (Anon., 1960), Swearingen and Mohler (1962) of the Federal Aviation Agency reported that a component of the noise produced by the Lockheed Electra engines is similar to the sound of singing crickets. They hypothesized that the Starlings were hunting by sound and mistook the engine noises for a food source of singing crickets. They suggested that the Electra engine might be modified to prevent further trouble. In response to this report, the Lockheed Aircraft Company and the Allison Division of General Motors Corporation analyzed the sounds of some crickets and of Electra engines and concluded that the sounds were not similar (Briggs and Winograd, 1962). Because of this difference in opinion, the Bird Damage Control Project of the Denver Wildlife Research Center, U. S. Department of the Interior, was asked to continue the study. The investigators, E. W. Pearson and P. R. Skon (1967), concluded that Electra engine noises are *not* similar to cricket noises. They also attempted to answer the biologically interesting question raised by Swearingen and Mohler's report: Do birds that eat crickets learn to hunt them by sound?

In a series of tests exposing caged and free-living Starlings to broadcast and live cricket sounds, Pearson and Skon (1967) found no evidence that Starling hunted crickets by sound. However, the crickets (*Gryllus* sp.) they used came from different localities than the Starlings and were not known to have been an item of diet for the birds tested.

We decided that a stronger test of whether birds use the sound of their prey in hunting crickets would involve a more careful selection of both birds and crickets. We chose the Bobwhite Quail (*Colinus virginianus*) because it feeds on crickets and is amenable to caging, and the cricket *Pteronemobius ambitiosus* because it lives in the ground in the same habitat as the Bobwhite and persistently produces its brief trills during daylight.

A pair of domestic Bobwhites, obtained from the Florida Game and Wildlife Commission, were enclosed outdoors in a screen cage (60″ × 24″ × 28″). Turkey oak leaves on the dirt floor of the cage provided natural cover for the crickets. A high-frequency speaker was buried near the center of the cage with the exposed diaphragm camouflaged by leaves. A wire ran underground 7 feet to a blind concealing a Nagra III tape recorder and an observer.

A control was run at the beginning of the experiment to see whether the presumably naive Bobwhites would respond to the calling song of *Pteronemobius ambitiosus*. A tape recording of the song was played for 10 sec followed by 50 sec of silence. The process was repeated three times at normal intensity (75db measured at 10 cm on the A scale of a General Radio 1551-B sound level meter) and then once at 100 db. The experiment was continued by presenting the Bobwhites wild-bird chow from 8:00 to 12:00 on days 1, 2, 4, and 6. The birds were starved from 12:00 until 8:00 the following day, at which time on days 3, 5, 7, and 8 a group of 20 freshly caught male crickets was released in the cage. At the end of the experiment, the song was played at the same intervals and intensities as were used during the control.

During the control the Bobwhites showed no response to the broadcast calling song at 75 db intensity; both Bobwhites raised their heads when the intensity was 100 db.

When the first group of 20 crickets was put in the cage, several immediately sang but were unnoticed by the Bobwhites. After 24 hours only one cricket remained. As the second group of 20 crickets was put in the cage, the birds quickly ate three

that were in an open area and scratched the leaves as if searching for more. The second, third, and fourth groups of crickets had no survivors after the 24-hour exposure to the Bobwhites. When the calling song was played at the end of the experiment, the Bobwhites did not respond.

Thus two Bobwhite Quail caged on natural leaf litter during 6 days ate 79 out of 80 male crickets, yet acquired no response to the crickets' song.

Other than Pearson and Skon's (1967) study, the only experimental study of song birds localizing prey by sound is that of Heppner (1965), who concluded that Robins (*Turdus migratorius*) do not use sound in hunting earthworms and rely solely on visual cues. The Barn Owl (*Tyto alba*) is the only bird that has been shown experimentally to use sound in detecting and localizing prey (Payne and Drury, 1958; Payne, 1962), and the domestic cat (*Felis domestica*) is the only predator that has been shown experimentally to use sound in detecting and localizing singing insects (Walker, 1964).

The failure of our Bobwhites to learn to hunt crickets by sound does not prove they would fail under different circumstances, such as a chaining conditioning technique. This would involve playing a cricket song as a cricket was released just above a speaker diaphragm in sight of a hungry Bobwhite. Later the cricket's release would be concealed more and more by leaves. If the chaining were successful, the Bobwhite would learn to turn over leaves at the source of the sound each time a cricket song was played.

Even if Bobwhites could not be successfully conditioned to hunt by sound, certain other birds, especially insectivorous owls, would still seem likely prospects as acoustically orienting cricket hunters.

We gratefully acknowledge the following assistance: C. T. Lee and A. W. Gaylord for donating the Bobwhites; L. C. Kuitert, for use of his walk-in cage; D. L. Mays for collecting many of the crickets; and J. E. Lloyd and David W. Johnston for suggestions and advice.

Literature Cited

Anon. 1962. Aviation: diversity in death. Time, 10 August 1962, p. 14.

Briggs, E. J., and L. Winograd. 1962. Report on June 27, 1962, conference: Survey of bird ingestion and the influence of Lockheed Electra powerplant sound on bird encounters. Federal Aviation Agency, p. 16.

Heppner, F. 1965. Sensory mechanisms and environmental clues used by the American Robin in locating earthworms. Condor, 67: 247–256.

Payne, R. S. 1962. How the Barn Owl locates prey by hearing. Living Bird, 1: 151–159.

Payne, R. S., and W. H. Drury, Jr. 1958. Marksman of the darkness. Nat. Hist. 67: 316–323.

Pearson, E. W., and P. R. Skon. 1967. Completion report for work unit F-10.2: the reactions of starlings to sounds of crickets and Electra engines. Denver, Colorado, Denver Wildlife Research Center, Bureau of Sport Fisheries and Wildlife.

Swearingen, J. J., and S. R. Mohler. 1962. Sonotropic effects of commercial air transport sound on birds. Civil Aeromedical Res. Inst. Rept. No. 62-4, Oklahoma City, Oklahoma, Federal Aviation Agency, Aeronautical Center.

Walker, T. J. 1964. Experimental demonstration of a cat locating Orthopterean prey by the prey's calling song. Florida Entomol., 47: 163–165.

J. J. Whitesell and T. J. Walker, *Department of Entomology and Nematology, University of Florida, Gainesville, Florida 32601.*