EVALUATION OF AN ELECTRONIC DEVICE FOR COUNTING THE CALLS OF WHITE-WINGED DOVES

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ABSTRACT

In Texas, white-winged dove *(Zenaida asiatica)* populations are indexed by subjective determinations of their level of calling. An electronic call-counter was developed and tested as a potentially more objective way to measure level of calling in white-winged dove colonies. Major features were a frequency filter to eliminate non-whitewing noise, use of a parabolic reflector to reduce the sound-reception angle, and a sensitivity switch to control the signal amplitude accepted. The call-counter worked satisfactorily during extensive field testing. The relationship between calling measured by the device and active nests was positive. Additional research is needed on the relationship between calling and nest density in white-winged dove populations.

INTRODUCTION

Estimates of spring breeding populations are critical for proper management of white-winged doves in Texas (Waggerman, 1976). Texas white-winged doves concentrate in the southernmost counties of Willacy, Cameron, Hidalgo, and Starr. Nesting occurs in heavily foliated native brush and mature citrus groves, making visual counts difficult.

Furthermore, active nest counts to index populations are too expensive for management purposes. Thus for years the population has been surveyed through call-counts, which may be roughly linked to nesting density, and ultimately, population size (Uzzell, 1949). In quality habitat, white-winged doves nest in dense colonies (Blankinship, 1966) where their calling merges into a continuous sound. Once calling noise becomes continuous (in colonies of about 20 pairs/acre), the human ear has difficulty differentiating between colonies having high, but different numbers of birds. Waggerman (1976) estimated that 15% of the extreme south Texas population nests at these high densities.

Electronic devices have been used to measure bird calls more objectively. Graber and Cochran (1959) used a parabolic reflector to study nocturnal migration of birds. Calls from birds flying overhead were received with the aid of the reflector and stored on tape. This technique gave an indication of what species were migrating at night and also their relative abundance. Mangold (1974) used a high fidelity tape recorder to reduce the effects of differences in observer's abilities to hear clapper rail *(Rallus longirostris)* calls. He also found that a parabolic reflector was a useful sound gathering device.

We developed and field-tested an electronic call-counter that could be used to count bird calls in many applications, but particularly in dense white-winged dove colonies. We field tested the electronic call-counter by comparing the level of calling measured by the device to the density of whitewing nests in the vicinity.

DESIGN OF THE COUNTER

The major design objectives for the counter were that it (1) receive and register whitewing calls but little else, and (2) allow the operator to reduce the area monitored until calls no longer overlapped (single calls are much easier to count versus a continuous sound).

An audiospectrogram and a low frequency spectrum analyzer were used to determine the frequency of tape-recorded whitewing calls. The calls were $625 + 30$ H_z with a wave length of one-half a meter. A frequency band-pass filter was used to eliminate extraneous sounds outside the calling frequency range. Sound was gathered by a Realistic Super Cardiod Dynamic, Model No. 33-922 microphone.

Two parts of the counter aided in reducing the overlap of calls. First, a six-position sensitivity switch allowed the operator to select different amplitudes. The higher the calling level of a colony, the more restricted the amplitude setting selected (to receive only separate, high amplitude calls). Second, the microphone was mounted on a parabolic reflector of 1.2-m diameter in order to reduce the sound reception angle to less than 180 degrees (Halliday and Resnick, 1965). The microphone was located at the focal point of the reflector, which was determined by adjusting the microphone to find the point of maximum reception (Thourel, 1960). The shape and size of the monitoring area at each of the six sensitivity settings was determined by moving a constant 625 H_z sound source across a grid in front of the reflector. Varying strengths of signal reception, which were measured with an ammeter, revealed sample area shape. Sample area at each setting was calculated in square meters and all data were standardized to the largest area (resulting from setting six).

The sound of whitewings was ultimately displayed on a counter which registered from 0 to 225 counts. A small red light on the counter also flashed each time the equipment registered a count. Fig. 1 contains a block diagram of the equipment and processes. Complete circuit diagrams and major electronic components of the call-counter were given by Waechtler (1977).

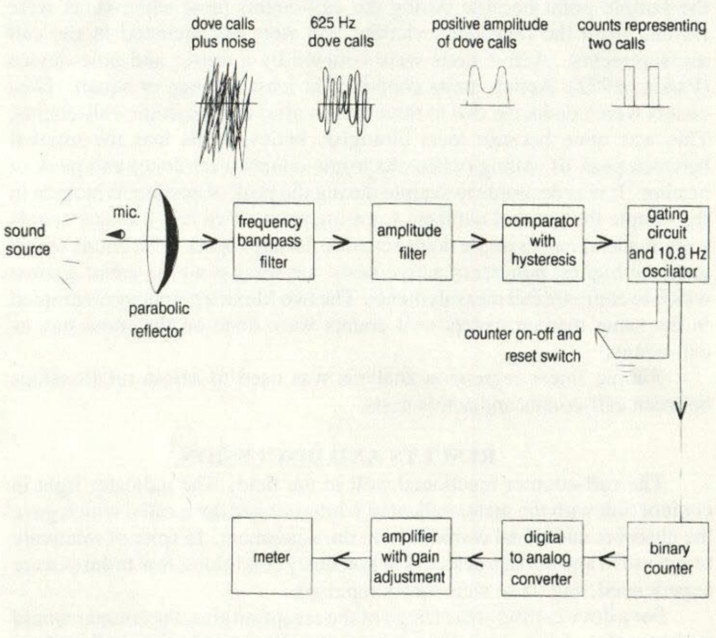

Fig. 1. Diagram Showing major components and processes of an electronic device for counting the calls of white-winged doves.

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FIELD METHODS

The electronic call-counter was field tested in south Texas and Mexico. A good representation of equipment operation was obtained by listening to calling whitewings and simultaneously watching the meter and indicator light on the counter. As an additional step, nest counts were conducted in areas where calls had been monitored by the counter to determine any correlation between measured calling and observed nesting density.

Local biologists recommended field sites which contained high-density whitewing colonies. In Texas, three native brush colonies and two citrus areas were selected for testing the call-counter. The Kelly and La Paloma brush areas were about 50 acres in size whereas the Abrams brush area was about 40 acres. The City Refuge and Rio Queen citrus areas were in Hidalgo County. In an effort to measure calls from an extremely high density whitewing colony, another study area was established in Mexico near San Rafael. This native brush track, about 30 acres in size, was about 150 miles south of McAllen, Texas.

Thirty-six sampling points (34 in Texas and two in Mexico) for call counts were established along the edges of the areas at sites of high-intensity calling. Calls were recorded as counts registered by the meter of the call-counter, and were not necessarily individual dove calls. On the Texas areas, calling was measured on four separate days at each sampling point during the peak calling period (Waggerman, 1976). The daily call-count at each point was the average of three, one-minute counts: a center count with the reflector aimed directly into the brush, and counts with the reflector aimed 30 degrees left and right of center. While reading calls, the reflector was tilted 5 degrees backward to direct it toward the calling birds which were 12-30 ft above ground level. The daily average counts for each point were averaged for the four sampling days to obtain an overall mean count for each point. The same number of counts were recorded at the two Mexico points, but all were done in one day rather than four. All call-counts were conductede in the first two hours of daylight.

Minute-by-minute variations in calling of individual birds at each sample point appeared to effect the consistency of electronic call-counts. To sample this variation, calls were measured every 15 minutes from 0600 to 1200 hrs on two consecutive days at a point in the Kelly study area.

Counts of active nests were made at each sampling point to determine if a correlation existed with the electronic counts. At each point, transects 40-yards long by 10-yards wide radiated from the sample point in the center and 30 degrees left and right of center. Transects began about 10 yards from the sample point because during the call-counts most whitewings were flushed from the immediate vicinity and were not included in the call measurements. Active nests were counted by a mirror and pole device (Parker, 1972). Active nests contained at least one egg or squab. Nest counts were conducted two to three weeks after the electronic call-counts. This was done because local biologists believed this was the interval between peak of calling (when electronic counts were done) and peak of nesting. It was desirable to sample during the peak of nesting to include in the sample the greatest number of nesting pairs. Two nest transect counts were made at each sample point seven to 10 days apart. The count which gave the highest number of active nests was used as a base count against which to compare call measurements. The two Mexico points were sampled in the same manner except nest counts were done on the same day as call-counts.

Simple linear regression analysis was used to assess relationships between call-counts and active nests.

RESULTS AND DISCUSSION

The call-counter functioned well in the field. The indicator light in conjunction with the meter indicated white-winged dove calls, which gave the observer additional confidence in the equipment. In spite of relatively rough use in and out of trucks and in hot, dusty conditions, few failures were experienced, and these were easily repaired.

For a dove calling at the fringe of the reception area, the counter would register only a few counts. However, birds calling within about 15 yards of the reflector registered many counts. This occasionally led to problems with a close, loud bird overwhelming the meter's capacity with counts far out of proportion to its representation in the calling population. The same phenomenon occasionally occurred when loud extraneous noises caused the equipment to register many counts of non-whitewing noise. This happened because the frequency spectrum of the extraneous source at close range overlapped into the frequency range of whitewing calls. Such an erroneous sample was disregarded by the observer.

Counts of active nests revealed a range of 4 to 76/acre in Texas; whereas, the Mexico points yielded 180 and 204/acre. Regression analysis of averaged call-counts versus active nests/acre for the 36 sample points yielded a high R^2 value of 0.87 (Fig. 2). However, there was a large gap in the data between the Texas and Mexico points, causing the two Mexico points to exert a large influence on the relationship. A regression without the Mexico points yielded a R^2 of 0.29. Thus, there was a positive relationship between the electronically measured calls and active nest counts, but additional data will be needed to determine its usefulness.

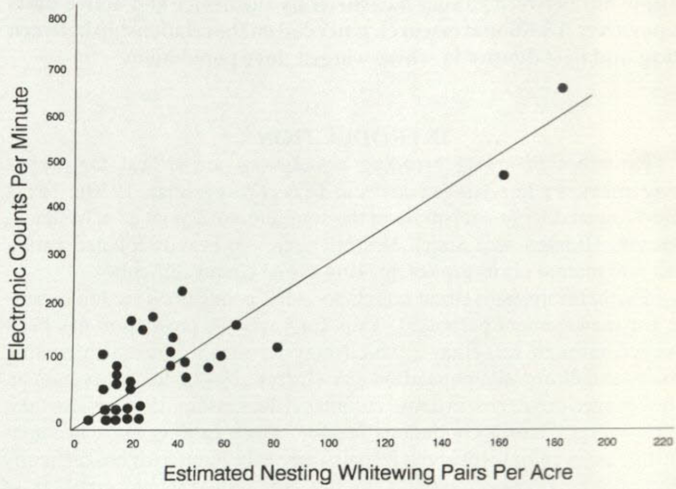

Fig. 2. Relationship in white-winged dove colonies between electronically mesaured calling level and nest density.

Both white-winged dove calling and counts of active nests were variable. The calls measured on two mornings at the Kelly area illustrate this fact (Fig 3). During the first two hours of daylight, calling levels varied considerably. Furthermore, nesting activity versus calling intensity ap-

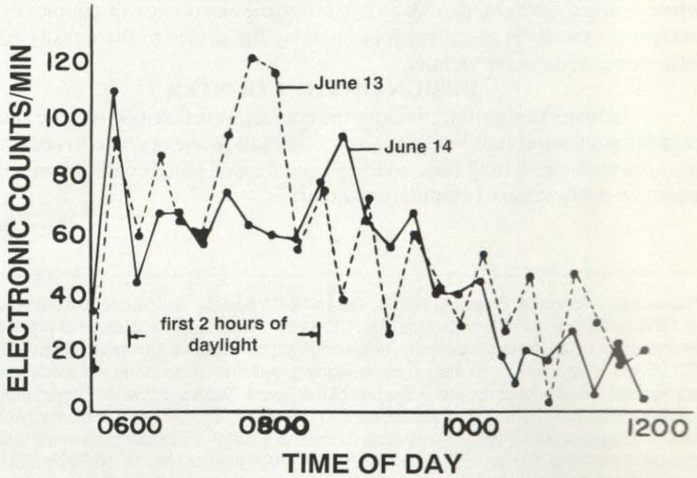

Fig. 3. Calls from a white-winged dove colony measured with an electronic device every 15 minutes for two consecutive mornings.

peared to differ between colonies. Some of the areas with high calling levels seemedto have few active nests and others with less calling had many active nests. Additional research is needed to better understand the relationship between nesting and calling in whitewings. Different levels of nest predation among colonies may have contributed to the variation (Blankinship, 1966). Overall, the electronic call-counter developed in this study worked satisfactorily and should be a useful aid in surveying whitewing colonies in the spring. Additionally, the device should be useful for many purposes in ornithology. To adapt to another species would involve merely changing the frequency and amplitude filters.

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