sification is real for the Black-capped Vireo. The 24-fold increase postulated by Benson and Benson (1990) is not substantiated by the data presented and methods used.

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REPLY TO SCOTT AND GARTON

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We commend Scott and Garton for their analysis of our recent article in which we estimated the population of Black-capped Vireos (*V. atricapillus*) in a region of northern Coahuila, Mexico. We welcome the opportunity to expand and clarify elements of the paper.

Scott and Garton suggest that our results may be biased owing to a flawed survey design. They also suggest that we failed to consider appropriate components in our variance calculation that resulted in an estimate too imprecise to be useful. They reanalyzed our data and close with an admonishment that population estimates for endangered species must be calculated with extreme scientific rigor. We agree with the need for rigor. However, Scott and Garton have made several unfortunate errors in their calculations that exaggerated the size of the standard error.

Our motivation for attempting an estimate of the Black-capped Vireo population stemmed from several reconnaissance trips to this region. In contrast to reports by Marshall et al. (1985), we were struck by vast areas of apparently suitable habitat for Black-capped Vireos and surprised by the frequency with which we encountered singing males. Marshall's estimate of a maximum population of 131 pairs in all of northern Mexico seemed incredible, since by surveying only 0.077% of this species' suspected breeding range in Mexico, we had discovered more than 21% of Marshall's estimate of the maximum population. With detailed field notes and good maps of the region we planned the paper to which Scott and Garton refer. Clearly, our sampling scheme leaves much to be desired, however, we feel that the approach yielded an estimate with controlled bias and is sufficiently precise to be useful.

We agree with Scott and Garton that any one of the sampling designs suggested by Scheaffer et al. (1990) would have been more desirable. Methods other than strict random sampling are defensible as an alternative, if potential sampling bias is evaluated and avoided as much as possible. For example, Scott and Garton suggest systematic sampling as one appropriate method. But systematic sampling suffers from possible bias associated with unsuspected periodicity in the data (Cochran 1977). Consequently, investigators must carefully examine the samples to assure that no systematic bias has been introduced. In general, it is incumbent upon investigators to uncover and address any bias introduced by the sampling design.

Many factors work to prevent the application of "textbook" designs in areas like backcountry Mexico. Permission to be on the property was the major controlling factor in the selection of transects in our design. However, we feel that our design is not likely to suffer from excessive bias because: (1) we searched for indications of habitat dissimilarity by overflying large sections in a small airplane, (2) we examined the foothills with binoculars from a vehicle, and (3) we studied aerial photos and topographical maps of the region. We could not find any evidence that the transect areas differed from the other canyon habitat subsequently included in our study. Both of us are familiar with Black-capped Vireos and their habitat in Texas. Additionally, we sought advice on the transect selection from two other biologists regularly involved in Black-capped Vireo work and familiar with the geology associated with the birds in Texas. Our conclusion is that, although the sampling scheme was not one of those mentioned by Scott and Garton, any bias associated with the selection of transects had a minor effect on the value of our estimate.

Our sampling method was that of a strip transect (Seber 1982, Burnham et al. 1980). We chose this method because we had not precisely measured distances to singing males from the transect centerline. All of the vireos encountered along the four transects were within 100 m of the transect center. This estimated distance was judged from parallax as we continued along the transect. For a margin of safety, we arbitrarily chose the maximum detection distance to be 166.5 m (transect width of ⅓ km). This overly long maximum detection distance clearly introduces a conservative bias toward underestimating the total population. It also eliminates the need to consider variances associated with observation distances (discussed later).

As was correctly pointed out, one source of variance not considered in our original paper was that associated with the 100 randomly assigned points on a map of the region. These points allowed us to estimate the total amount of habitat similar to the habitat of the four canyons we surveyed. This source of variance contributes little to the final result, and in the interest of brevity was not included in the original paper. We have included it in the following recalculation of our estimate. Along the way, we point out mistakes in the reanalysis done by Scott and Garton.

Following the notation of Scott and Garton, the estimated population size N is given by:

$$N = Apd \quad (1)$$

Where $A = 11{,}040\ km^2$ is the area of the census zone, $p = 0.4$ is the proportion of similar habitat, and d is the estimated mean density. Mean estimated density for a single transect can be calculated by the methods given in Burnham et al. (1980):

$$d = \frac{n\, f(0)}{2l} \quad (2)$$

where n is the number of singing males, l is the length of the transect, and f(x) is the probability density function of the perpendicular distance data. In the case of a strip transect, f(0) is 1/w, where w is the half width of the transect:

$$d = \frac{n}{2lw} \quad (3)$$

As noted earlier, by choosing $f(0) = 1/w$, the result is biased toward underestimation of the population owing to the increasing probability that birds will be missed as the distance from the centerline increases. In our study, w (166.5 m) was large compared to the expected true detection distance. We have defined f(0) to be a constant value large enough to include all 28 observations. Consequently, no variance need be associated with f(0). By equation (3), the mean estimated densities along individual transects are $d_1 = 1.39/km^2$, $d_2 = 4/km^2$, $d_3 = 1.5/km^2$, and $d_4 = 1.68/km^2$. The weighted average estimated density d (Burnham et al. 1980) is $1.65/km^2$ and by equation (1) the population size of singing males in the census zone is:

$$N(p, d) = 7286 \pm t_{r-1}[Var(N)]^{1/2} \quad (4)$$

where $r - 1$ are the degrees of freedom and t_{r-1} is taken from the t-table.

A general expression (an approximation derived from a Taylor series expansion) for the variance of a function N(x), when N(x) depends on variables that themselves exhibit variance, is given by Seber (1982).

$$Var[N(x)] = \Sigma\, Var[x_i](\delta N/\delta x_i)^2 + 2\,\Sigma\,\Sigma\, cov[x_i, x_j](\delta N/\delta x_i)(\delta N/\delta x_j).$$

By renaming the variables x_1 and x_2 to p and d respectively, and by realizing that the covariance term must be zero, this equation becomes

$$Var[N(x)] = V[p](\delta N/\delta p)^2 + V[d](\delta N/\delta d)^2.$$

Completing the partial differentiation yields

$$Var(N) = A^2[d^2 Var(p) + p^2(Var(d))]. \quad (5)$$

TABLE 1. Data from four transects in northern Mexico.

Transect no.	Length of transect (km)	Singing BCVIs
1	28	13
2	3	4
3	4	2
4	16	9
	51	28

We note that Scott and Garton used the product Var(p)Var(d) as a covariance term in their reanalysis of our data. Choosing points on a map (method for estimating proportion of similar habitat in census zone) is clearly uncorrelated with Black-capped Vireo encounters in the field. Scott and Garton should not have included this term that leads to an unjustified overestimation of the standard error.

Equation (5) can be included in equation (4), and t_{r-1} can be distributed through the variances. However, it must be realized that the degrees of freedom associated with the proportion $(r - 1 = 99)$ and the degrees of freedom associated with the mean estimated density $(r - 1 = 3)$ are not the same. Scott and Garton erroneously use $r - 1 = 3$ with the proportion term that again led to an unjustified increase in the standard error.

A proper equation for the population estimate with a 90% confidence interval is

$$N = 7286 \pm [A^2[(2.353)^2 d^2\, Var(p) + (1.645)^2 p^2(Var(d))]]^{1/2}. \quad (6)$$

To estimate Var(d), we used a method described by Burnham et al. (1980). They directly estimate Var(d) by calculating individual mean estimated densities d_i for each transect (calculated earlier) and then finding a weighted average D based on the length of each transect. The method requires that f(0) be well known. As explained earlier, f(0) in our design is subject to essentially no variance because it is defined to be 1/w and w is large compared to the true detection distance. By this method

$$d = \frac{\Sigma\, l_i d_i}{\Sigma\, l_i}$$

and

$$Var(d) = \frac{\Sigma\, l_i(d_i - d)^2}{L(R - 1)}$$

where $L = \Sigma\, l_i$, R is the number of transects, and the summations are from 1 to R. Hence, Var(d) for our data is $0.34/km^4$. Putting these numbers into equation (6) results in a final population estimate for singing males of 7,286 ± 3,891 ($P < 0.1$).

Scott and Garton also pointed out that the variance associated with the scaling factor used to correct for unpaired males should have been included in our original calculations. We agree, however, we do not know, nor can we estimate this variance. The scaling factor was provided by another investigator and we included it only for completeness. We have deleted the scaling factor from the present estimation. The value stated above is for singing males only.

In their reanalysis, Scott and Garton attempted to scale their final estimate by the correction factor (0.87) but failed to apply this scalar to both the size estimate and the standard error. This led to yet another exaggeration of the standard error, by 13%. Although we commend Scott and Garton for attempting a reanalysis of our data, their compounded errors and misapplication of concepts led to a misleading conclusion.

Finally, we want to stress how important peer review is for maintaining an acceptable level of scientific rigor in endangered species investigations. Scott and Garton contrast our estimate with a previous estimate of 131 pairs for northern Mexico (Marshall et al. 1985). However, the methods supporting the Marshall estimate have not been published in a peer-reviewed journal. Although our study is biased and clearly underestimates the population, it remains the best estimate available, and our lower limit of 3395 singing males should be regarded as the minimum population for the region.

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NEWS AND NOTES

INTERNATIONAL SYMPOSIUM ON THE PRESERVATION AND CONSERVATION OF NATURAL HISTORY COLLECTIONS MADRID, 10–15 MAY 1992

The Symposium will focus on the concerns of the Natural History community for the present and future of Anthropological, Biological and Geological Collections in the world. The first circular will be available from February 1991 and will include an outlined general program of the Symposium and the preliminary registration papers. Information is available from: Julio Gisbert and Fernando Palacios, Museo Nacional de Ciencias Naturales, José Gutiérrez Abascal, 2, 28006 Madrid, SPAIN. FAX no.: 1/5645078. BITNET: MCNMA13@EMDCSIC1.

INTERNATIONAL ORNITHOLOGICAL CONGRESS

The XXI International Ornithological Congress will be held at the Austria Center in Vienna, Austria from August 21–27, 1994. The President of the Congress, C. M. Perrins, General Secretary J. Dittami, and Scientific Program Committee Chair J. C. Wingfield invite suggestions for symposia and discussion groups. Please send any suggestions by July, 1991 to: Professor J. C. Wingfield, Department of Zoology, University of Washington, Seattle, WA 98195, UNITED STATES, or to the organizers at: XXI International Ornithological Congress, Interconvention, Austria Center, A-1450 Vienna, AUSTRIA.

Symposia should be aimed at reviewing topics of general interest while discussion groups can be more specific. Suggestions must include a statement of the general theme as well as a list of prospective conveners and contributors with their topics and, if possible, addresses. Interested participants are asked to contact the organizers to be placed on the mailing list.

BOOK REVIEW EDITOR

Raymond Pierotti has generously agreed to serve as Book Review Editor, commencing with the August 1991 issue of *The Condor*. Dr. Pierotti's address is: Department of Biological Sciences, University of Arkansas, Fayetteville, AR 72701.