

genus (wt. 32.6 g, $n = 9$, Hilty, unpublished data), and it appears slightly larger than the Azure-rumped Tanager in the field (wt. unknown).

Calls of the Azure-rumped Tanager include flat bursts of ticking notes, a lower slower "se-e-eet" or "se-a-weet" (rising inflection) and a louder excited "chip chup swee-e-eet swee-e-et," or "chi-tuck tweetet," usually given just prior, during, or immediately following flight. In Hilty's experience, the Gray-and-gold Tanager is the only other member of the genus that utters calls similar to the latter two vocalizations (very unlike other *Tangara*) and in presumably the same context. These noisy calls make the Gray-and-gold Tanager highly attractive to many flock-forming species. It is not known if the similar sounding calls (to our ears) of the Azure-rumped Tanager are an equally attractive stimulus to flock-forming birds.

Both species occupy widely separated but highly restricted ranges in humid tropical regions, and little is known about the habits of either. The similarities noted here suggest a close phylogenetic relationship. The differentiated populations of Azure-rumped Tanagers and Gray-and-gold Tanagers now isolated at the northern and southern end of the humid tropics in Central America and adjacent northwestern South America, respectively, are paralleled in other passerine groups such as jays of the genus *Cyanocorax*.

Where forest disturbance occurs, small second-growth fruiting shrubs often become temporarily abundant. The resulting food increase may benefit many small frugivores such as the Azure-rumped Tanager. The number of recent sightings of these tanagers at clearings may be attributable in part to the rapid deforestation now occurring in Chiapas.

Robert W. Storer, Louis F. Baptista, Miguel Alvarez del Toro, and Allan R. Phillips kindly supplied information about specimens. Stephen M. Russell commented on the manuscript and Mark B. Robbins, Theodore A. Parker III and Sartor O. Williams III provided observations and read the manuscript.—STEVEN L. HILTY AND DAVID SIMON, *Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85712, and Department of Zoology, University of Texas, Austin, Texas 78712*. Accepted 2 Jul. 76.

A simple technique for analyzing bird transect counts.—Natural resource inventories commonly call for density estimates of all bird species in an area throughout the year. Transect methods (reviewed by Eberhardt 1968, *J. Wildl. Mgmt.* 32: 82 and by Emlen 1971, *Auk* 88: 323) are perhaps the most appropriate means for making such estimates. This paper describes a simple method of analyzing transect counts used by Balph and Balph (MS) to estimate bird densities by species at 2-month intervals through 1 year on a limited budget.

Data for analysis were collected on line transects in each of several vegetation types near an arid-lands river in eastern Utah. Information recorded included the identities of birds seen on transects and the lateral distance from the transect line to the point of first sighting. Lateral distances were grouped into the following meter intervals: 0–5, 6–10, 11–15, 16–20, 21–25, 26–30, 31–40, 41–50, 51–75, 76–100, and >100. The first interval (0–5 m) was judged to be wide enough to obtain a good sample, yet narrow enough to assume reasonably that all birds within the corridor would be seen. Variability was measured by comparing day-to-day counts made on the transects.

Data were used to maximize the density estimate for each species seen during a given transect walk. The procedure is illustrated using hypothetical data presented in Table 1. The largest number of individuals of species A (i.e. 7) occurs in the first (i.e. 0–5 m) interval. Given a transect 2,000 m in length, 7 individuals of species A are estimated to be present in a $5 \times 2,000$ m area doubled to include both sides of the transect—a corridor of 20,000 m². Expressed in number of birds per km², the density of species A is 350. For species B, the density estimate is maximized by averaging the values in the first two intervals, which gives 1.5 birds per

TABLE 1
HYPOTHETICAL DISTRIBUTION OF INDIVIDUALS OF SEVERAL BIRD SPECIES SEEN AT VARIOUS
LATERAL DISTANCES FROM A TRANSECT LINE

Species	Distance from transect line (m)					
	0–5	6–10	11–15	16–20	21–25	26–30
A	7	5	2	2	0	1
B	1	2	0	1	0	0
C	0	0	0	0	1	0

20,000 m² or 75 per km². For species C, the estimated density is 0.2 birds per 20,000 m² or 10 per km². A generalized equation for this procedure is:

$$D = \frac{n}{l \times d \times 2} \times \frac{10^6 \text{m}^2}{\text{km}^2},$$

where D = density of birds (number per km²), n = number of birds observed between transect line and outside edge of last interval used in density estimate, l = length of transect in meters, d = number of meters from transect line to outside edge of last interval used in density estimate, and where the last interval used is that which gives the largest mean number of birds per meter of lateral distance.

This method of analyzing transect counts emphasizes the use of data obtained in the first interval from the transect line. Sightings outside of the first interval are of interest only when, due to small sample size, the number of individuals is largest in an interval other than the first. The logical and mathematical basis for this approach is given by Stoddart (Gross, Stoddart, and Wagner 1974, Wildl. Monogr. 40). No attempt is made to establish a species specific "sighting probability" (Eberhardt *ibid.*) or "coefficient of detectability" (Emlen *ibid.*), because few species occur with sufficient frequency to do so feasibly.

There may be some problems in treating the data in the manner described. The procedure assumes that the numbers of birds seen in the intervals used in the density estimate represent the actual numbers of birds present in those intervals. Since in most cases a progressively smaller proportion of the individuals present are likely to be seen at increasing distances from the transect line, the use of data from intervals other than the first to maximize the density of a particular species may result in an underestimated density figure for that species. However, we believe that the technique described is an adequate solution to the problem of making density estimates for all bird species encountered along a transect.

This paper is an outgrowth of work supported in part by the White River Oil Shale Project and ERDA contract no. E(11-1)-1329.—MARTHA HATCH BALPH, L. CHARLES STODDART, AND DAVID F. BALPH, *Department of Wildlife Science, UMC 52, Utah State University, Logan, Utah 84322*. Accepted 1 Dec. 76. (This paper was subsidized by the authors.)

Eleven-day incubation by an American Robin.—At a nest of the American Robin (*Turdus migratorius*) that I watched at Woodlawn, Baltimore County, Maryland, in 1976 the third and last marked egg of the clutch was laid 10 May between 1028 and 1155 EST and hatched 21 May between 0736 and 1013. Thus its incubation period was somewhere between 10 days 19 hr 41 min and 10 days 23 hr 45 min, or 10 days 21 hr 43 min \pm 2 hr 2 min. This appears to be the first 11-day incubation period ever documented for this species.

Young (1955: 337) reported some periods of 10 and 11 days, but he confirms (*pers. comm.*) what his text indicates: that he computed the period as the time from the laying of the last egg to the first hatching. Eaton (1914: 531) and Forbush (1929: 407) both gave 11 days as the minimum period but without any supporting data.

Howell (1942: 565), timing the marked last eggs of 17 clutches at Ithaca, New York, in the modern manner—from the laying of that egg to its hatching—found periods of 12–14 days. Kendeigh (1952: 127) reported 13 instances of 12 days and 8 instances of 13 days at Gates Mills, Ohio, and Schantz (1939) reported "about 13 days" for 2 closely watched nests at Columbus, Ohio.

In years before 1976 I made 19 determinations at Baltimore, Maryland. Fourteen marked and 5 unmarked last eggs all hatched on the 12th day after they were laid. Within that period of "days," however, there has been variation from 11 days 18 hr 36 min \pm 40 min to something over 12 days 6 hr 50 min. A 20th egg hatched on the 13th day, but I am not sure that that was not really a penultimate egg, I possibly having caused one later egg to be dropped away from the nest.

In view of all these other careful determinations, the 11-day period timed in 1976 appears to be definitely abnormal, rather than a part of normal variation.

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