SOME THOUGHTS ABOUT COUNTING BIRDS

by Leif J. Robinson, Wellesley

In preparation for revising Charlotte E. Smith's An Annotated List of the Birds of Weston, Massachusetts (1952), I have examined several methods for estimating the abundance of species. Adjectives such as "common," "rare," "increasing," or "decreasing" are insufficient to describe the status of a species; such terms are relative and largely subjective.

Imagine yourself in 1900 trying to characterize the numbers of House Sparrows. "Abundant" would have been an obvious choice, just as it still is today! But, in fact, the House Sparrow has decreased markedly since the automobile replaced the horse. Thus, the same adjective would have been used to describe two very different population densities.

For several years I have surveyed various Weston habitats, recording the number of each species seen as well as the exact time spent afield. From this data, the number of birds per hour (BPH) can be calculated. As I subsequently learned, this technique is not new. In a news-letter dated November 1, 1963, Allen H. Morgan of Massachusetts Audubon Society compared his BPH estimates in the Sudbury Valley for 1949 and 1963, in an effort to assess the effect of pesticides. He also compared his data with the weighted opinions of 26 active birders, who were asked whether they thought various species had increased, decreased, or remained the same.

Reexamining Morgan's summary, I find that the birders' opinions concur only vaguely with his quantitative data. In Fig. 1 is plotted an abundance (Morgan) index for 28 species (for which Morgan recorded at least 0.5 BPH in 1949) against the percent of birders who believed a decrease had taken place between 1949 and 1963. The abundance index derived from Morgan's data is 2 x (BPH in 1963) / (BPH in 1949) + (BPH in 1963). (If this index is 0, the species was not seen in 1963; 1 indicates no change; values greater than 1 reveal an increase.)

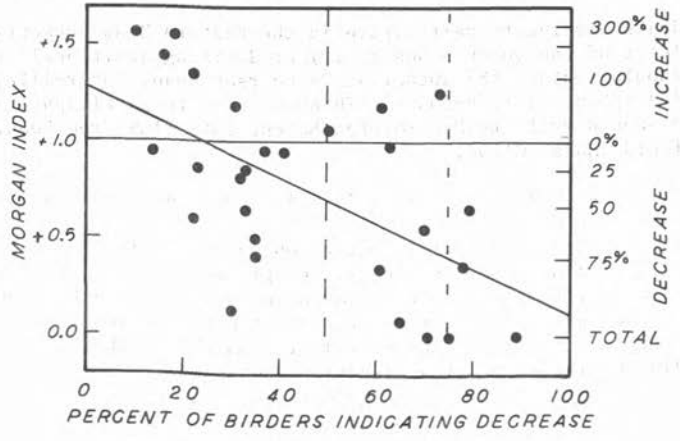

Fig. 1. The degree of decline of 28 species between 1949 and 1963 (Morgan Index) is compared to the percent of birders who believed that a decline had taken place (line of long dashes, 50 percent; short dashes, 75 percent). Note that three species which Morgan found absent in 1963 were still not regarded as declining by 29, 25, and 11 percent of the birders!

Two species on this graph deserve special mention, for they show the greatest difference between Morgan's data and the collective opinion of the birders. Why, for example, did 73 percent of the birders believe that Barn Swallow had decreased, while Morgan found an increase of 71 percent? And why did only 30 percent of the birders note the decline of Chimney Swift, while Morgan found 93 percent fewer birds in 1963 than in 1949? Why should these two aerial insect-catching species, with presumably similar "visibility profiles," also produce the most discordant data?

The diagonal line shows the best fit to the data. Though there is great scatter (coefficient of determination, $r^2 = 0.32$), there does seem to be a weak correlation; that is, species for which Morgan found the greatest decrease also tended to receive the greatest percentage of "decline" opinions. But let's look more closely at what the diagram implies.

In Table I are compared the number of species for which Morgan found various degrees of decline to those for which 50 percent or more and also 75 percent or more of the birders agreed. In parentheses is the precent of agreement between Morgan and other birders. Clearly, the greater the decline of a species in BPH, the more unanimous is the concensus among birders.

Table I. Comparison of Morgan's and birders' estimates of decline in species numbers.

		50% or more birders agree	75% or more birders agree
All species Morgan found declining	20	9 (45%)	4 (20%)
Morgan decline:			
25% or more	15	8 (53%)	4 (27%)
50% or more	13	8 (62%)	4 (31%)
75% or more	7	6 (86%)	3 (43%)
Total	3	3 (100%)	2 (67%)

But what does this prove: that 26 expert birders collectively had a greatly inferior idea of population changes than did one individual who kept meaningful records? If so, how do we know that Morgan's data are correct?

I believe that the validity of the BPH method is proven in Fig. 2, which shows the average number of Hairy and Downy Woodpeckers seen in Massachusetts per party hour during Christmas counts from 1946 through 1975 (except 1949) for which I had no data).

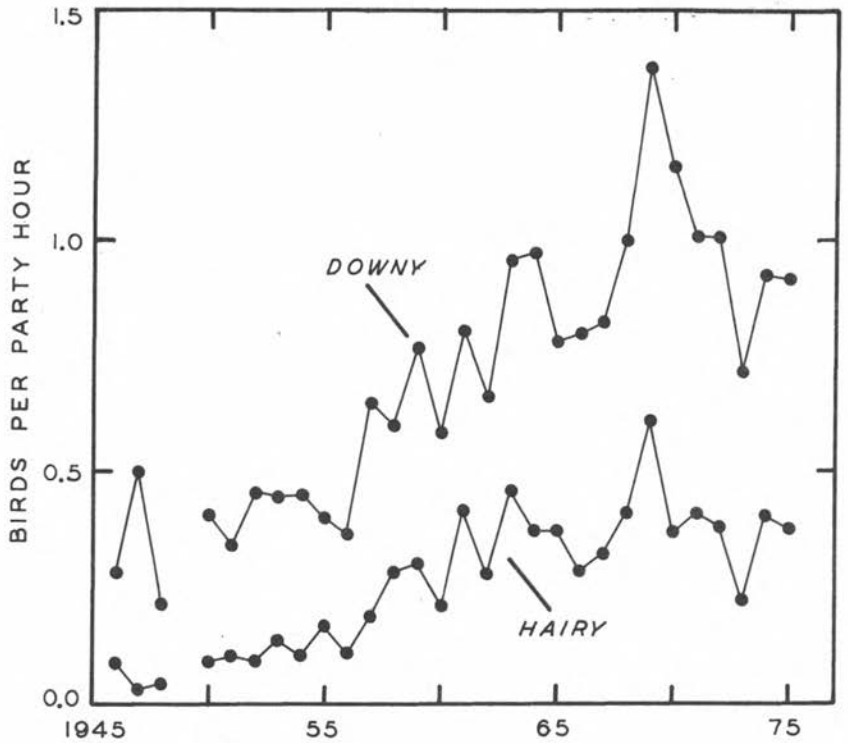

Fig. 2. The number of Hairy and Downy Woodpeckers seen per party hour on Christmas censuses from 1946 to 1975.

These averages stem from the efforts of many individuals: 186 partaking in 13 counts in 1946 to 666 in 22 counts in 1975. But that is my point! Though the personnel have completely changed during the past three decades and the participation has more than tripled, the curves for both species are remarkably similar: when Downys increase or decline, so do the Hairys. This is exactly what one would expect for two very closely related species that depend largely on the same habitats and foodstuffs and should be similarly affected by weather or disease.

Mathematically, the correlation coefficient for the two curves is +0.94, indicating excellent agreement. (+1.00 would be a perfect match--as one species increased or decreased, so would the other in proportion; 0.00 would indicate no correlation; -1.00 would indicate perfect opposites--as one species increased, the other would decrease, or vice versa.)

Why both Downy and Hairy Woodpeckers exhibit a gradual increase during

the past three decades is not clear, though it is probably due to more thorough coverage than any real increase in population. Any why was the pronounced dip from 1964 to 1967 followed by the peak in 1969? Are we now on the downslope of a very long cycle? Only continued monitoring will yield answers.

One other result gleaned from Morgan's data deserves mention. That is, the average abundance index for families of birds seems somewhat correlated with the rank of the family in the evolutionary hierarchy. In general, the less evolved the family, the smaller is its abundance index. In Table II, note that all nine families from Ardeidae (herons) through Parulidae (wood warblers) had depressed populations, whereas two of the three highest families i.e., Icteridae (blackbirds) and Fringillidae (finches) showed gains.

Table II. The average abundance index for families of birds and the abundance index for each species, as determined from Allen H. Morgan's data in 1949 and 1963.

Family	Av. Abund. Index	Species	Abund. Index
ARDEIDAE	0.19	Green Heron	0.56
		B.-c. Night Heron	0.00
		American Bittern	0.00
APODIDAE	0.13	Chimney Swift	0.13
TYRANNIDAE	0.60	Eastern Kingbird	0.87
		Gr. Cr. Flycatcher	0.61
		Eastern Phoebe	0.08
		Least Flycatcher	0.37
		E. Wood Peewee	1.07
HIRUNDINIDAE	0.96	Tree Swallow	0.65
		Barn Swallow	1.26
TROGLODYTIDAE	0.64	House Wren	0.64
MIMIDAE	0.94	Gray Catbird	0.94
TURDIDAE	0.79	Wood Thrush	1.19
		Veery	1.18
		Eastern Bluebird	0.00
VIREONIDAE	0.72	Red-eyed Vireo	0.50
		Warbling Vireo	0.93
PARULIDAE	0.82	Bl. & Wh. Warbler	0.41
		Yellow Warbler	0.95
		Ovenbird	0.33
		N. Yellowthroat	1.44
		American Redstart	0.99
ICTERIDAE	1.57	Common Grackle	1.57

	Av. Abund. Index	Species	Abund. Index
THRAUPIDAE	0.85	Scarlet Tanager	0.85
FRINGILLIDAE	1.24	Rose-br. Grosbeak	1.35
		Swamp Sparrow	0.81
		Song Sparrow	1.55

It is temptimg to imagine that this result illustrates the progressive inability of primitive life forms to cope with alterations of habitat or environment. Though that explanation is surely oversimplified, the trend of the data is provocative.

I believe Morgan appreciated the power of the BPH method and the failing of many birders to supply meaningful information. In his 1963 newsletter he wrote: "This survey data also seems to bear out the opinion long [and still] held by professional biologists that a major decline can take place in a bird population without being detected by active birders until it has become very great indeed ... . It is my most earnest plea that anyone who is active in the field take the very small amount of time necessary to keep accurate and complete notes. They are of crucial value, and should include notation of the route covered, the time of day and temperature [also wind velocity] at start and end of the trip, and your best estimate of the number of all birds seen! ... Such data can be reduced to a 'birds per hour' basis and will reveal general trends in bird populations even when observers and routes vary considerably."

As a final example of the usefulness of BPH data, I present Fig. 3, a preliminary year-round curve for Blue Jay based on my three years of observations in Weston. Each point is the monthly average BPH, and the vertical bars are one standard deviation long. This curve shows the annual ebb and flow of Blue Jays--or more accurately, the variation in the number of birds and their conspicuousness (a male defending territory is more noticeable than a bird half-frozen inside the canopy of a pine!).

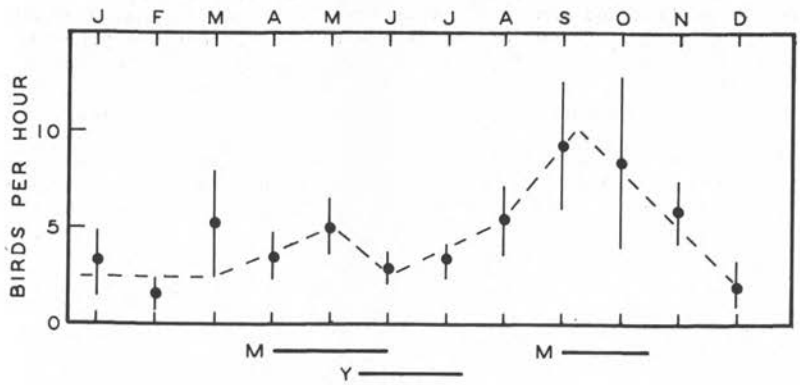

Fig. 3. Monthly averages of Blue Jays recorded per hour in Weston, Massachusetts, derived from 246 field trips between April, 1974, and December, 1976. The symbols across the top represent mid-month. For an interpretation of the dashed line, see text. "M" indicates usually cited periods of migration, "Y" fledging.

From December through February, about 2 1/2 Blue Jays per hour represent the local winter population. Spring migration seems to begin in mid-March, culminates in May (some 5 BPH), and is over by July. Then the curve rises again, slowly at first as local young are fledged, and then faster as autumn migrants begin to appear. From mid-September through mid-October, Blue Jays reach their annual peak numbers (about 10 BPH), after which they decline to the winter-population level.

For comparison, the bars below the curve indicate the limits of migration and fledging usually cited for Massachusetts. The only apparent difference between the curve and common experience is that my limits for migration seem somewhat broader. Yet, this would be expected in a quantitative survey--recall Morgan's comments regarding the degree of population change necessary for an increase or decrease in numbers to become widely evident.

In time, as more data are accumulated and better statistical procedures are used, I hope curves such as the one for Blue Jay will yield information about breeding success and mortality for local residents as well as for migrants. Even in its preliminary form, the Blue Jay curve is provocative. Imagine that the spring migration peak of 5 BPH represents one pair of birds. The autumn peak of 10 BPH, therefore, equals two pairs--that is, two adults plus two young, the average nesting success for Blue Jays that migrate through our region. The same relation seems to hold for Weston: if the June average of about 2 1/2 BPH represents the local breeding population and the August average of 5 1/2 BPH the local adults and their young, the fledging success again equals about two young per pair.

But is an average production of two young per nest reasonable? I could find no concrete data--how little we know about our most common birds--but consider the following: average clutch 4.5 eggs, one brood per year in northern latitudes, assumed egg success 0.5. The result is 2 1/4 young per nest, in substantial agreement with my BPH curve.

Though the above discussion is preliminary and oversimplified, it seems to indicate that BPH data and what we "know" about birds are not inconsistent. Hopefully, some birder 50 or 75 years hence will duplicate my Weston census, thereby revealing any quantitative change in the quality of bird life. I wish such comparative data were available to me today for the revision of the town's checklist.

But more important, <u>both surveys would measure birds, not the fadisms of birders</u>! Recently, a long-time birder told me of the difficulty the BBC once had (even with Ludlow Griscom's support) in getting leaders to record numbers of each species as well as the species themselves. Perhaps the next generation will record the hours afield as well. Incidentally, in revising the Massachusetts Audubon Society <u>Daily Field Card</u>, the editors removed the "Time" entry provided on earlier editions. I hope they put it back!