

DISTRIBUTION AND ABUNDANCE OF SOME COMMON BREEDING SPECIES IN MIXED HABITATS

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Field observations give qualitative impressions of bird distribution and abundance but quantitative measurements and a standard method of analyzing the data are necessary for valid comparisons between species, time periods, habitats or geographical areas. Quantitative data are being obtained by the North American Cooperative Breeding Bird Survey (NACBBS) (Robbins and Van Velzen, 1969) and a useful method of data analysis was described by Rotenberry and Wiens (1976). The purpose of this paper is to examine the distribution and abundance of some common breeding species in mixed habitats on Long Island using NACBBS data and to demonstrate the usefulness of the method for such data.

METHODS

From 1967 through 1976, two NACBBS routes on central Long Island were covered annually in mid to late June by the writer. Both include small villages, residential areas, farms and woods including the scrub oak-pitch pine woods typical of central Long Island (Raynor, 1976). Since both routes cover a similar range of habitats and are close together, although not overlapping, data from the two were combined for analyses giving a total of 100 stops per year.

Seventeen of the most common breeding species were selected for study: Bobwhite (*Colinus virginianus*), Mourning Dove (*Zenaidura macroura*), Common Flicker (*Colaptes auratus*), Great Crested Flycatcher (*Myiarchus crinitus*), Blue Jay (*Cyanocitta cristata*), Common Crow (*Corvus brachyrhynchos*), Mockingbird (*Mimus polyglottus*), Gray Catbird (*Dumetella carolinensis*), Brown Thrasher (*Toxostoma rufum*), American Robin (*Turdus migratorius*), Starling (*Sturnus vulgaris*), House Sparrow (*Passer domesticus*), Red-winged Blackbird (*Agelaius phoeniceus*), Common Grackle (*Quiscalus quiscula*), Northern Oriole (*Icterus galbula*), Rufous-sided Towhee (*Pipilo erythrophthalmus*) and Song Sparrow (*Melospiza melodia*).

Rotenberry and Wiens (1976) define two terms, incidence and frequency. Incidence = N_i / S_i and frequency = S_i / S_t where N_i = number of individuals of the i th species recorded, S_i = number of census stops at which the i th species was recorded and S_t = total number of census stops.

N_i / S_i is used instead of N_i / S_t to minimize differences in census results caused by weather or other variables since both N_i and S_i are assumed affected by such variables while S_t is a constant. N_i / S_i cannot be less than one but has no upper limit. S_i / S_t may vary from zero to one if expressed as a fraction or from zero to one hundred if expressed as a percentage.

A low value of incidence (N_i / S_i) implies that the species is scarce even where it occurs and a high value that large numbers are present in the habitat occupied. A low value of frequency (S_i / S_t) means that the species is clumped and a high value that it is generally distributed throughout the area sampled. Thus, incidence and frequency give a numerical description of species abundance and distribution and may be readily compared for different sets of data.

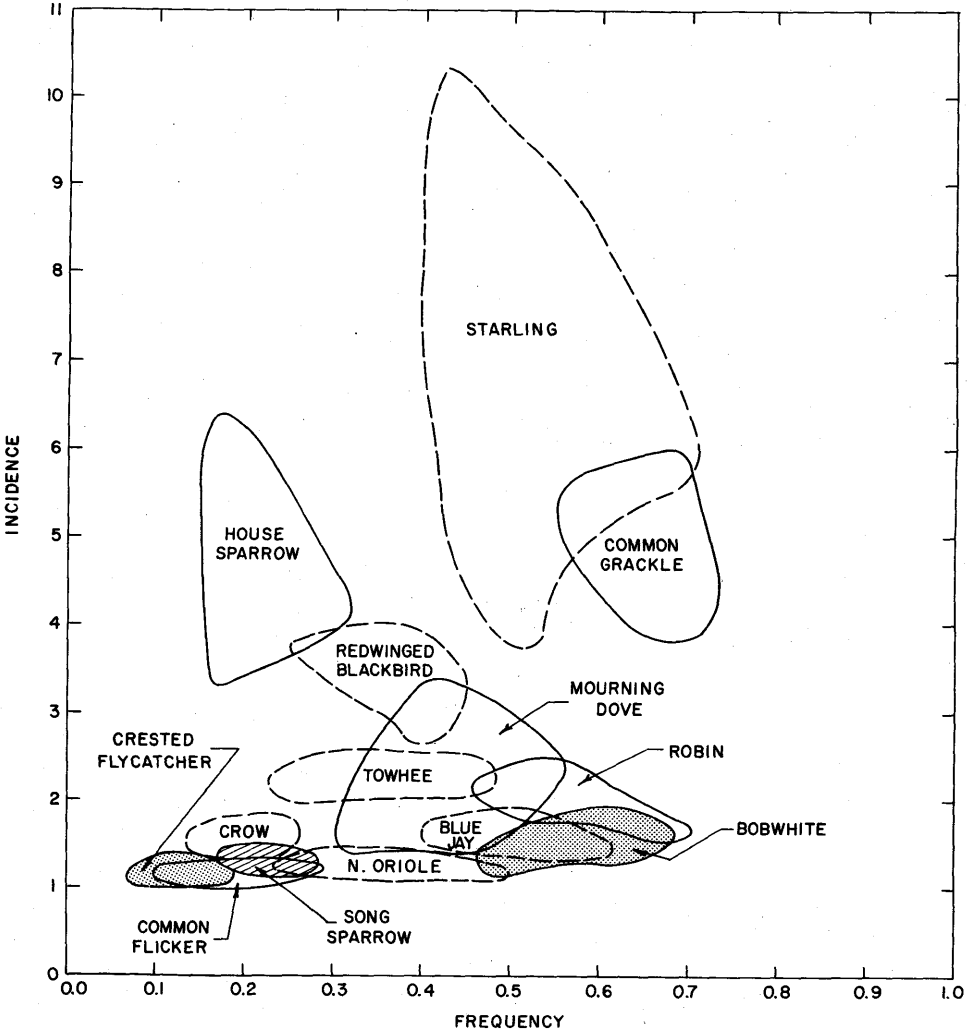
Rotenberry and Wiens (1976) applied the method to a large number of transects apparently covered in one or a few years for the purpose of determining the dispersion and abundance of species in a single habitat type. The method is applied here to a long period of data from the same combined routes for the purpose of describing dispersion and abundance in mixed habitats and relating the results to habitat distribution and species behavior.

The two ratios were computed for the seventeen species for each of the ten years. The intersections of the values for incidence and frequency were plotted on linear graph paper. The ten points for each species were bounded by a line which defined their distribution and constituted an envelope enclosing the area within which the points fell. The mean, standard deviation and range of the points in each coordinate direction could also be described mathematically but the graphical presentation is used here for its ease in visualizing the results.

RESULTS AND DISCUSSION

Envelopes for fourteen species are shown in Figure 1. Large envelopes imply large differences from year to year in either incidence or frequency or both and small envelopes show little year to year change in either. Examples of both types are evident as are examples of both low and high frequency and low and high incidence. The variability within and between species can be explained in terms of habitat distribution along the census routes and behavior of individual species. For instance, high incidence is correlated with flocking and low incidence with territorial spacing. Species with low frequency

Figure 1. Incidence and frequency distributions of fourteen breeding species.



have specialized habitat requirements while species with high frequency are generalists or wide ranging.

The Common Flicker and Great Crested Flycatcher are species of low frequency since both are largely restricted to relatively undisturbed wooded areas with trees large enough for nest holes. Their incidence is also low since both are territorial during the breeding season. Although both have loud calls and are recorded more often by sound than by sight observations, only one or two are usually recorded at a single stop.

The Song Sparrow has only a slightly higher incidence but about double the frequency. It is also detected primarily by song and is highly territorial but occupies a wider range of habitats including brushy areas, edges and some residential areas.

The Northern Oriole has an identical incidence but an appreciably larger and more variable frequency. Orioles are recorded by sight and by sound about equally but seem to be more noisy on some days than others. In some years, young are out of the nest by the time of the count which partially accounts for the wide range of frequency. Orioles are found in all wooded and many of the residential areas.

The Bobwhite is recorded almost entirely by its loud and far-reaching call. Although typically well spaced, individuals occupy a variety of the more open habitats and thus have a relatively high frequency. However, they are probably less abundant numerically than several of the species previously discussed and the high frequency is due largely to the long distances over which the call can be heard. If silent at this season, very few would be recorded.

The Common Crow and the Blue Jay have similar values of incidence but the Blue Jay is much more widely distributed. It is mostly silent near the nest but calls elsewhere and is active, conspicuous and easily seen. It occurs in almost all habitats except large fields. The Common Crow, like the Bobwhite, has a penetrating call and is more often heard than seen, particularly in wooded habitats, but is much more localized to the less settled areas than the Blue Jay.

The Rufous-sided Towhee is found in all the brushy and wooded habitats but is most numerous in the scrub oak-pitch pine woods. It calls frequently and is a persistent singer and is thus readily censused. Although territorial, territories are small for a bird its size and several are often recorded at a single stop. The elongated nature of its envelope is due to a marked decrease in its numbers during the ten year period (Raynor, 1976).

The American Robin is one of the most generally distributed species, being rare or absent only in the larger fields. However, it is a territorial species and individual pairs are well spaced which keeps incidence fairly low.

The Mourning Dove shows considerable range in both incidence and frequency. The species inhabits a variety of habitats and ranges widely from the nest site. Numbers seem to vary considerably from year to year but some of the spread in incidence may be due to weather. The soft note is not heard far in wind and may not be given as often when weather conditions are not favorable.

The House Sparrow shows a rather clumped distribution and rather high incidence. This agrees with field observations which show the species in flocks even during the breeding season, with most birds in village centers and in certain residential areas.

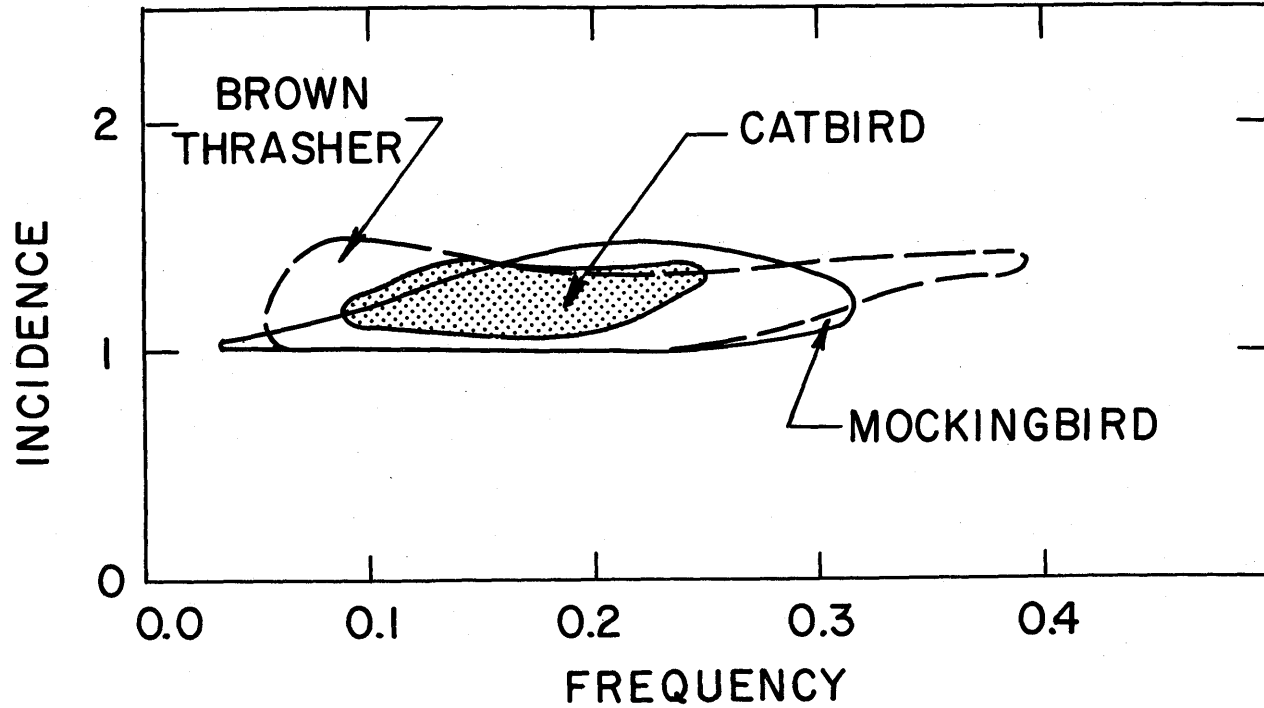
The Red-winged Blackbird is one of the most abundant species and is found at about a third of all stops. Several bodies of water occur along the census routes but the species is found in upland fields as well. Although it tends to breed in colonies, it ranges widely for food. The males are noisy, conspicuous and easily recorded but some females are detected as well.

The Common Grackle is the most widely distributed and one of the most numerous species but its numbers are augmented by recently fledged young in some years. Even though nesting is more or less colonial and nearly restricted to coniferous trees, individuals and groups travel appreciable distances in search of food, thus increasing their frequency compared to a more sedentary species of equal numbers.

Starlings nearly always have young flying by the time of the census and numbers vary widely from year to year depending on how many flocks and family groups happen to be encountered. Starlings are found in all habitats except continuous woods and are typically active and conspicuous. Like the grackle, the Starling travels considerable distances from the nest so frequency is large compared to that of species which restrict themselves to a defined territory.

Data for the three mimic thrushes are shown in Figure 2 and illustrate the effect on frequency of changing population size. Gray Catbirds are somewhat restricted in habitat and are not as easy to detect as more conspicuous species or species with more distinctive songs, but numbers have shown no trend during the ten year period and the envelope is small. Brown Thrashers, however, have decreased

Figure 2. Incidence and frequency distributions of three mimic thrushes.



markedly during that period (Raynor, 1976) which accounts for the elongated shape of the envelope. They are most common in scrub oak-pitch pine woods but breed in other brushy habitats including some residential areas. Since the species is highly territorial, incidence has not changed although frequency has decreased.

The Mockingbird increased greatly during the period so has a similar range of frequency. It occupies an increasing range of habitat types and is conspicuous and easy to record. In the early years of the census, numbers were low and individuals were found primarily in residential areas. Coincident with the increase in numbers, the species occupied an increasing variety of habitats including those favored by the Brown Thrasher. Further spread will increase frequency even more but the strongly territorial nature of the species will probably prevent incidence from increasing significantly.

CONCLUSIONS

The method proposed by Rotenberry and Wiens (1976) may be applied to long term transect data such as single NACBBS routes to quantify the abundance and distribution of species. Numerical results are consistent with habitat distribution along the routes studied, with differences in behavior between species and with population trends.

SUMMARY

A numerical method of describing distribution and abundance of species along transects was applied to ten years of data from two NACBBS routes on Long Island. Seventeen common breeding species were analyzed. The quantitative descriptions of their frequency and incidence are consistent with habitat distribution, species behavior and population trends.

LITERATURE CITED

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