

Using Christmas Bird Counts to Track Population Trends of Four Frugivorous Passerines

by Thomas R. Hamilton

Christmas Bird Counts (CBCs) are a systematic annual survey of winter bird populations, conducted in set geographical areas during a two-week period before or after Christmas. Each count area is a circle fifteen miles in diameter that is surveyed during a twenty-four hour period by teams of observers in cars, on foot, or in homes with bird feeders. Participants identify and count all birds encountered in their assigned areas and report their results to compilers who, in turn, collate the data, summarize field conditions, and report the numbers of observers, parties, and feeders that were watched. Compilers calculate the number of hours spent in the field and miles traveled by foot or car. One party in the field for one hour is called a "party-hour"; a "party-mile" is one party traveling one mile. The National Audubon Society publishes the results of over 1500 North American, Central American, and Caribbean CBCs in *Audubon Field Notes*.

Methods

CBCs, which began in 1900, represent a wealth of data and can be a valuable tool in tracking long-term changes in bird populations and distribution. However, these data cannot be used without some consideration of their obvious weaknesses: the effort and skill of observers may not be consistent from year to year; the number of count participants varies; and weather conditions can skew the probability of some species being sighted (Berry 1992). For those species that regularly visit feeders, inclusion of feeder-watch data in the total counts can introduce a bias (Dunn 1995). Because of the competitive nature of CBCs and participants' emphasis on having a high species total, rare birds may be over-reported while abundant species may be under-reported. (Participants sometimes "scout out" rare birds so that they will be easier to find on the day of the count, and it is a hardy birder who will stand in a cold winter wind to count a flock of starlings.)

But the strength of CBCs lies in the fact that many areas have been surveyed for many years. In an important validation of the utility of CBCs, Butcher et al. (1990) found that population trends for seven species estimated from CBC data could also be estimated from much more carefully controlled Breeding Bird Census data. The researchers concluded that as long as CBC data are reasonably well standardized, long-term trends can be reliably demonstrated in spite of year-to-year variation. However, the many variables in CBCs must be normalized so that counts can be compared from year to year and from area to area. Bock and Lepthien (1974) and Root (1988) suggested that CBC data

should be normalized to birds counted per party-hour. A previous study applying this method to Eastern Massachusetts CBCs has appeared in this journal (Hamilton 1994).

In this article, I will examine long-term winter population trends for four species common in Massachusetts: American Robin (*Turdus migratorius*), Northern Mockingbird (*Mimus polyglottos*), Northern Cardinal (*Cardinalis cardinalis*), and Cedar Waxwing (*Bombycilla cedrorum*). In order to compare inland populations with coastal populations, I collated data published in *Audubon Field Notes* between 1956 and 1996 for four inland count areas (Springfield, Northampton, Central Berkshires, and Worcester) and four coastal areas (Cape Ann, Cape Cod, Marshfield, and Quincy). I chose these count areas because they have been surveyed consistently (with very few exceptions) for at least forty years and are fairly representative of coastal and inland habitats in Massachusetts.

In order to make year-to-year and region-to-region comparisons meaningful, I calculate the numerical value, "birds/party-hour," by dividing the total number of each species reported on each count by the total party-hours. I then calculated the mean number of birds per party-hour for the combined four inland counts and four coastal areas.

Discussion

The American Robin offers a fine illustration of the strengths and limitations of CBC data. Although reports of a few hardy robins wintering in Massachusetts date back many years, during the last few years their numbers on the coastal CBCs have increased dramatically (Figure 1). Inland counts, meanwhile, have shown at most a slight increase. Veit and Petersen (1993) suggest that large flocks of robins may suddenly appear on the coast after midwinter snowstorms, presumably driven to the coast by the storm. To test the hypothesis that this phenomenon has distorted CBC data, I tried to find a relationship between spikes in coastal robin numbers and inland snow cover reported by CBC compilers. A review of weather reports from all eight CBCs from 1975 to 1995 showed no apparent correlation between inland snow cover and robin abundance along the coast.

Despite the many uncontrolled variables, the very strong upswing in coastal robin numbers suggests that a real change in the habits of this species is taking place. Interestingly, an analysis of twenty-eight years of Breeding Bird Survey data indicates that the number of robins breeding in Massachusetts has actually declined at the rate of one percent per year (Sauer et al. 1996). So it appears that more of our breeding robins are lingering along the coast in the winter, or that migrants are wintering there in increasing numbers. Though a number of factors could contribute to this shift, one likely cause would be an increase in food supplies.

Food supply has been convincingly tied to the rapid increase of cardinals and mockingbirds in our region between 1955 and 1975. The range expansion of these formerly southern species has been well documented (Derrickson and Breitwisch 1992, Hill and Hagan 1991), and CBC data confirm that they are now well-established residents of suburban areas of Massachusetts (Figures 2 and 3). Stiles (1982) correlates the northern expansion of mockingbirds with the spread of the naturalized ornamental multiflora rose (*Rosa multiflora*) and describes the importance of the fruit of this plant as a mockingbird food source. A study of the effects of increased backyard bird feeding (Hughes 1989) suggests that feeders have also contributed to the success of these two birds; the cardinal, particularly, relies heavily on seeds in winter.

During the last twenty years, the rate of increase of these two birds appears to have slowed and perhaps reached a plateau. So the CBC data produce an S-shaped population growth curve that is consistent with what one would expect for species that have gone through a period of rapid growth but are now stabilizing. The pronounced spike followed by a sharp drop in inland cardinal populations between 1967 and 1970 is curious; CBC results tell us nothing about what might have caused such a spike.

Some species, such as the Cedar Waxwing (Figure 4), occasionally appear in large numbers during winter in either coastal or inland areas. Such "irruptions" are believed to result from seed crop failure in high-latitude trees on which waxwings feed (Bock and Lepthien 1974). CBC data from the last twenty years suggest that more Cedar Waxwings may be overwintering in Massachusetts; however, the data are erratic, making long-term trends difficult to discern. In some (but not all) years, Waxwing peaks coincide provocatively with peaks in other species, especially robins; but the numbers of this species in our region may be determined in part by large-scale changes in climate or vegetation, permitting waxwing counts to shift in ways unrelated to populations of resident birds with similar diets.

It is noteworthy that, for robins and mockingbirds, coastal CBC numbers are consistently higher than inland results. One cause might be our slightly milder coastal climate, moderated by the proximity of the ocean. Also interesting is the relative abundance of these four birds, which perhaps reflects their life-histories. Robins, highly gregarious in winter, are the most numerous. If CBC counters don't consistently visit the particular areas in which robins are concentrated, the habits of this species may also be reflected in the year-to-year volatility of recent counts. By far the least numerous of the four species is the mockingbird, which remains territorial and fairly solitary through the winter. Finally, it is worth noting that inland and coastal numbers of all four species seem to change in parallel, which suggests that regionwide conditions, as well as differences between coastal and inland areas, influence the winter populations of these birds.

Figure 1. Robins per Party-Hour, 1955 to 1995

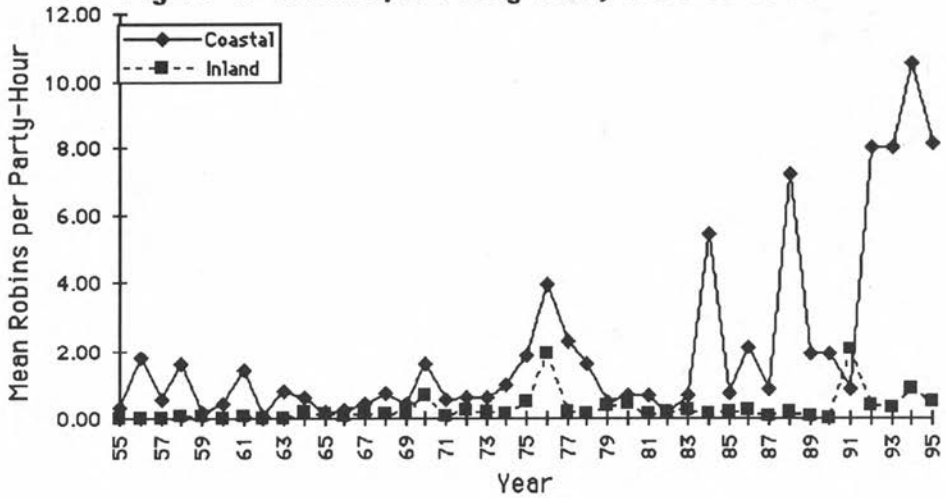


Figure 2. Mockingbirds per Party-Hour, 1955 to 1995

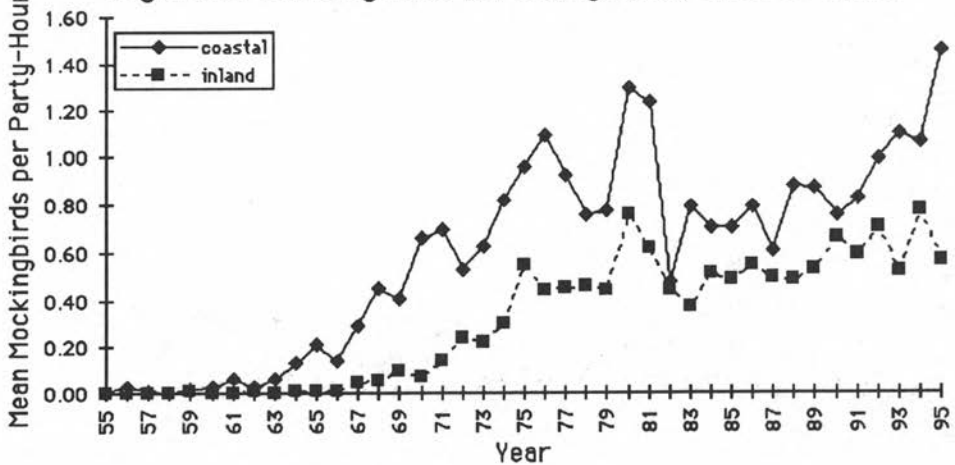


Figure 3. Cardinals per Party-Hour, 1955 to 1995

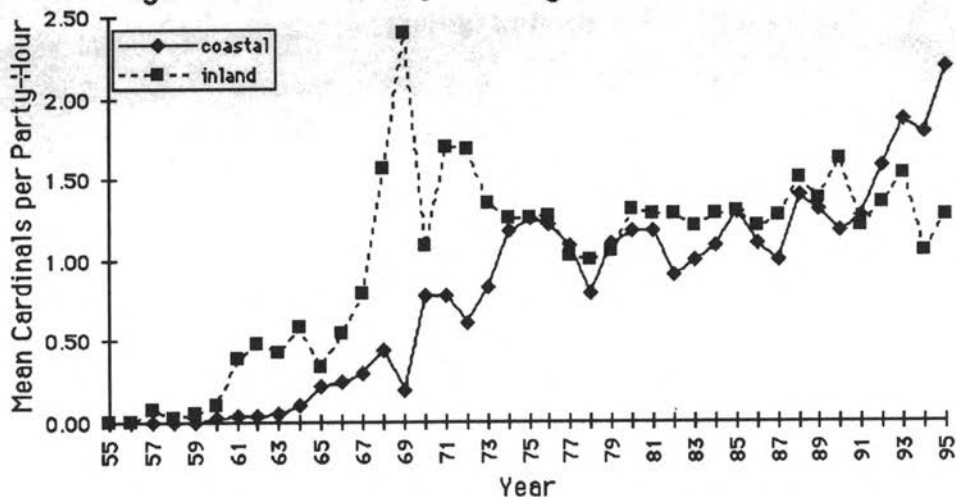
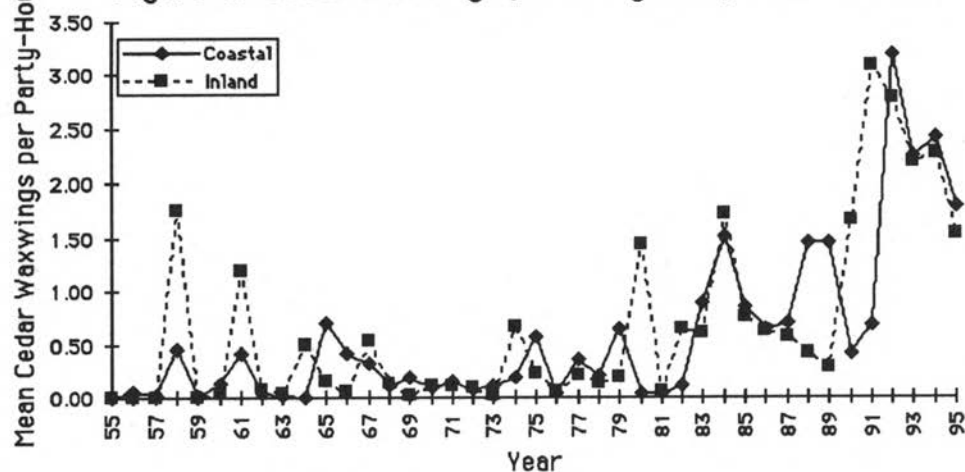


Figure 4. Cedar Waxwings per Party-Hour, 1955 to 1995



Conclusion

This study of CBC data confirms that winter populations of robins, mockingbirds, and cardinals have increased dramatically in Massachusetts over the last few decades. The rapid increase in these species coincided with a period of rapid home construction in suburban towns, especially in the eastern part of the state. Areas that were woods or open fields are now a predictable patchwork of trees and ornamental shrubbery. It is possible that fruit-eating birds greatly benefit from this habitat change. Although robins are often thought of as eating worms and insects, in winter they are largely frugivorous (Willson 1994). Witmer (1996), studying the gut contents of robins and Cedar Waxwings, found that both species readily make use naturalized fruit-bearing plants. It is possible that backyard feeding stations offer a supplemental food source for these birds, as they do for seed-eating birds.

Clearly, changes are taking place in the avifauna of Massachusetts. These change can only be meaningfully monitored through the regular collection of data over many years. Systematic surveys, such as CBCs and Breeding Bird Surveys, are an invaluable source of data on bird populations; without these surveys, and the dedication of those who participate in them, we would have only sketchy, anecdotal evidence of changes over the years.

Of course, additional research is needed to determine the causes of these changes and the factors that limit populations. Human development and landscaping habits appear to be part of the story. But could decreased use of pesticides be a factor? Or could the expanding ranges of mockingbirds and cardinals, and the increasing number of wintering robins be an early response to long-term climatic change?

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Thomas R. Hamilton is Chair of the Biology Department at Phillips Academy, Andover, MA. This study was supported by a summer grant from the Kenan Charitable Trust Fund of Phillips Academy. The author would like to thank the staff of the Peabody Museum of Salem, MA, and is grateful for assistance and suggestions from J. A. Hamilton.

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