DO VAGRANT BIRDS IN MASSACHUSETTS REFLECT POPULATION GROWTH AND DISPERSAL RATHER THAN WEATHER PATTERNS?

by Richard R. Veit

A popular belief articulated by Wilson (1988) is that birds that appear far outside their normal ranges (i.e., vagrants) have been passively transported by the wind. If this hypothesis were true, then we would expect certain years to be especially favorable for the transport of birds outside of their range because the weather conditions in that year were particularly appropriate for transporting them. For example, let us consider the dispersal of birds from western North America to Massachusetts. If Lark Sparrows or Western Kingbirds appear in Massachusetts because they are "drifted" to the east by the wind, then surely there will have been some years in which the weather patterns were more suited than others for transporting western birds east. In such "good" years, we would expect, in general, to see larger than normal numbers of western birds.

An alternative hypothesis is that variation in the number of vagrant birds reaching Massachusetts reflects between-year differences (1) in population growth, i.e., number of young produced, and (2) in the tendency of individual birds to disperse. This hypothesis predicts, for example, that the number of Western Kingbirds reaching Massachusetts in a given year depends uniquely on Western Kingbird behavior and population dynamics. Large numbers of Western Kingbirds would appear in Massachusetts when an especially large number of young were produced or when, due to environmental change within the normal range of Western Kingbirds, individual birds began dispersing farther than they regularly do, a different pattern of occurrence of vagrant birds in Massachusetts than one determined by weather conditions, which then play only a secondary role.

I addressed this question by examining the interannual variation in numbers of vagrant birds from western North America that have appeared in Massachusetts during the last thirty-five years. I have focused on those years in which peak numbers of each species occurred. If vagrancy is governed mainly by weather patterns, then I would expect all species from the same general summer range to occur in Massachusetts in maximum abundance in precisely the same years. That is, if weather patterns in a particular year are conducive to the transport of Western Kingbirds to Massachusetts, then they should transport Western Tanagers, Black-headed Grosbeaks, Lark Sparrows, and Yellow-headed Blackbirds during that year as well. If, however, vagrancy is governed by population dynamics and behavior, then there would not necessarily be any correspondence among species; there would be no reason to expect large numbers of Western Kingbirds and Lark Sparrows to appear in the same year.

Therefore, the fluctuation in number of each western species occurring in Massachusetts should be independent of that of all other species.

Methods. I extracted records of Western Kingbirds, Western Tanagers, Black-headed Grosbeaks, Lark Sparrows, Clay-colored Sparrows, and Yellow-headed Blackbirds from *Records of New England Birds, Bird Observer,* and *Audubon Field Notes/American Birds* for the fall seasons of 1956-1988. I identified the fall season as July 1 to January 1, the last half of any year. I chose the six species above because they share essentially similar breeding ranges, and they occur in Massachusetts with sufficient frequency to permit analysis. If two individuals of the same species were reported at the same place less than four days apart, I considered them to be the same bird. I used *Systat* for all statistical analyses.

Results. The six species I chose each appeared in Massachusetts in peak abundance during different years. See Figures 1a and 1b on the following pages. 1956 was a good year for Western Kingbirds and Western Tanagers, but not for any other species. Lark Sparrows were most numerous during the mid-1960s; Clay-colored Sparrows peaked in the mid-1970s; and Yellow-headed Blackbirds peaked recently in the late 1980s. Even though these birds dispersed to Massachusetts in maximum numbers during different years, there was some correlation in abundance between years. For example, Lark Sparrows and Western Kingbirds were both more common than average in 1979. Such correlation could result from a coordinated response to either weather patterns during migration or to variability in their shared nesting habitat. Both Clay-colored Sparrows and Yellow-headed Blackbirds increased in frequency of occurrence in Massachusetts over the thirty-year period.

Discussion. The patterns of occurrence of western birds in Massachusetts strongly supports the hypothesis that vagrancy is an attribute of populations. In years when relatively large numbers of a particular species occur in Massachusetts, it is likely that that species has produced unusually many young or that the individuals in the population have acquired an exaggerated tendency to disperse. That is, intrusions into Massachusetts of western species such as Lark Sparrows during the mid-1960s or Clay-colored Sparrows during the years 1976-79 are irruptions in the same sense as are irruptions of Snowy Owls or Northern Shrikes. This idea implies that populations of birds ordinarily respond to changes in the environment by redistributing themselves and further implies that all birds are irruptive, not just a select few. The differences between the more obviously irruptive species and those I have analyzed are of degree, not quality.

That populations of birds appear to constantly redistribute themselves is important for environmental monitoring. It seems likely that major irruptions of crossbills (Benkman 1987) and Snowy Owls (Kerlinger and Lein 1988) are

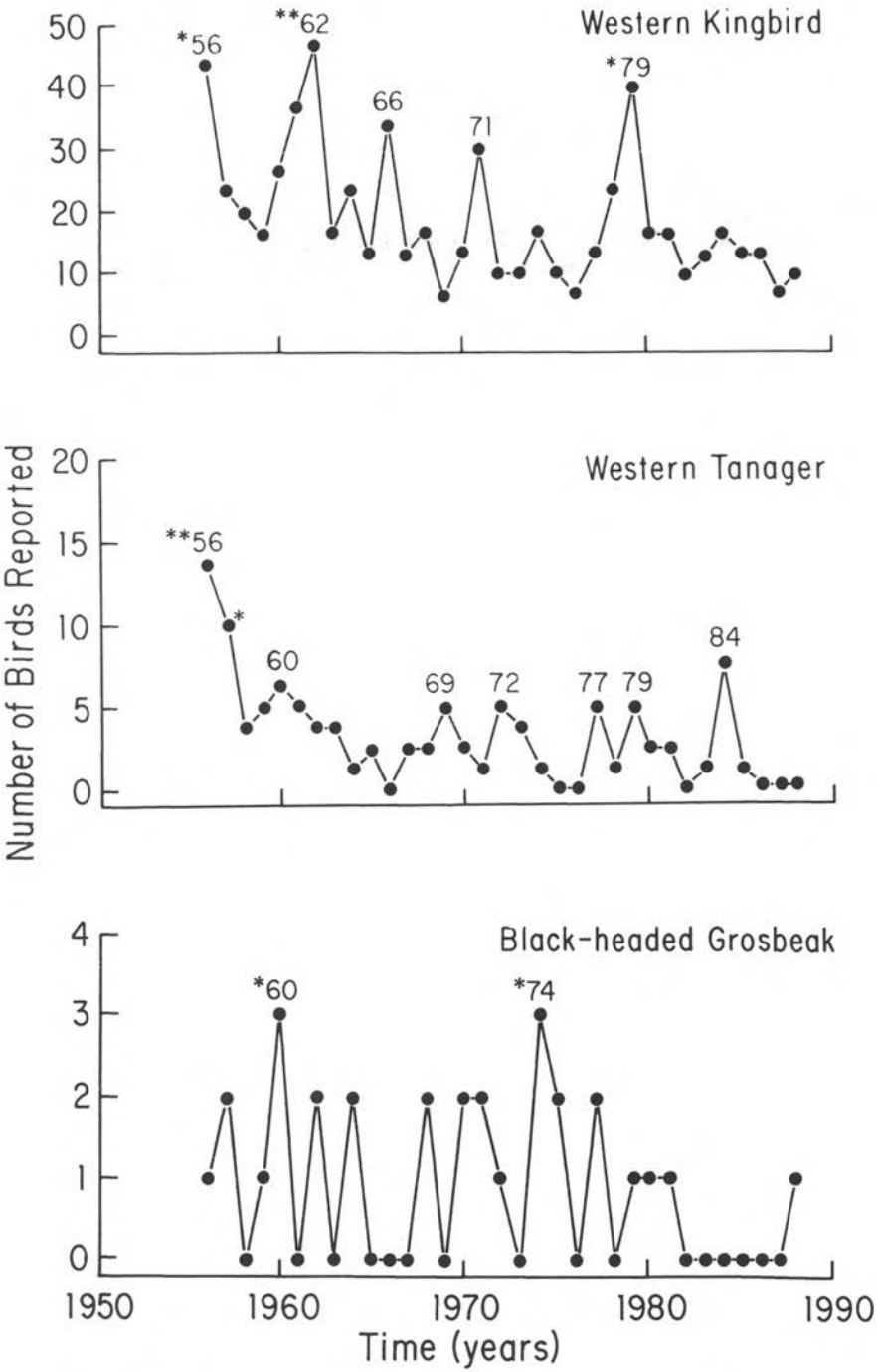

Figure 1a. Occurrence of western birds in Massachusetts, 1956-1988. Asterisks (* and **) indicate significant departure from average abundance. * means $p < 0.05$. ** means $p < 0.01$.

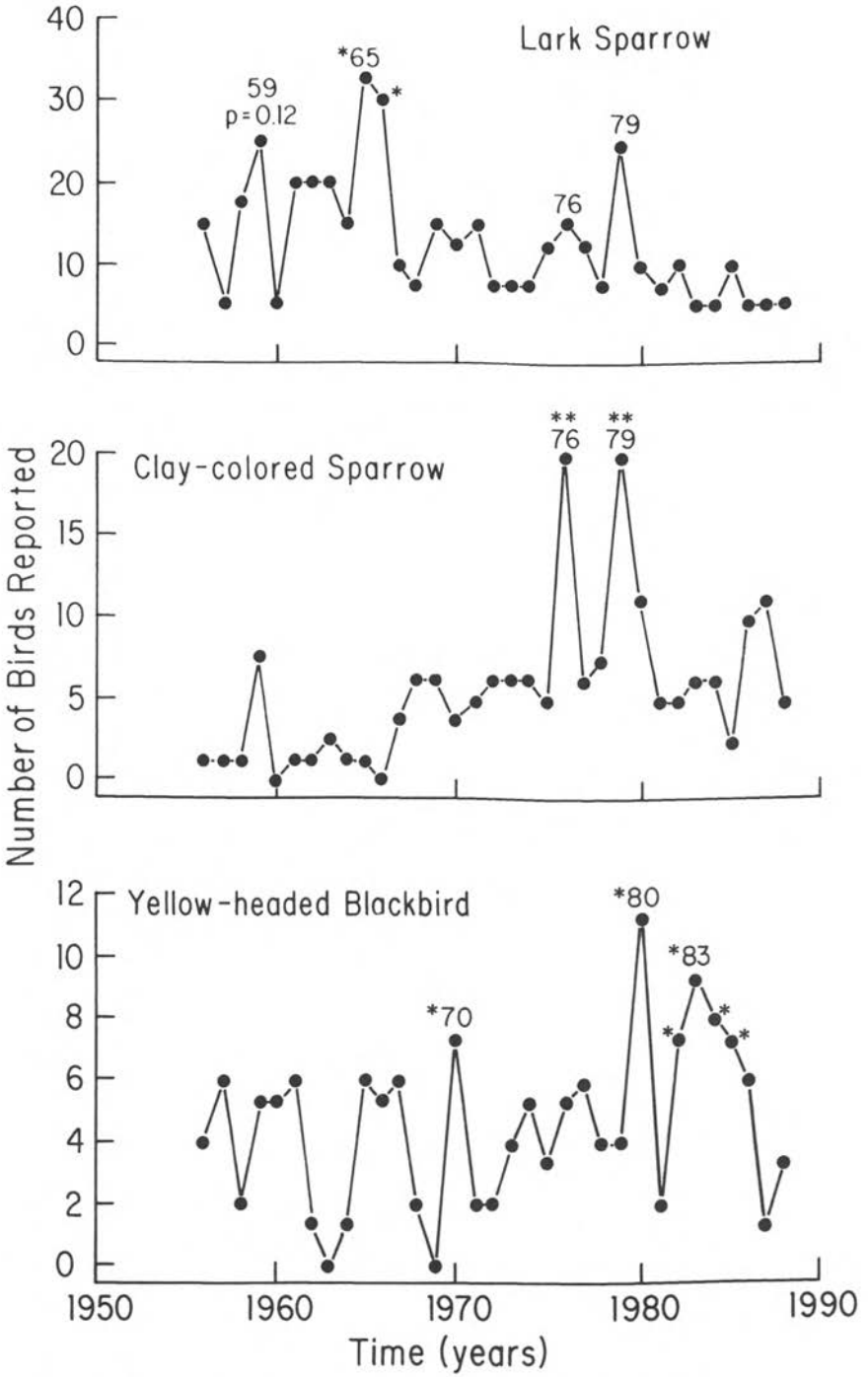

Figure 1b. Occurrence of western birds in Massachusetts, 1956-1988. Asterisks (* and **) indicate significant departure from average abundance. * means $p < 0.05$. ** means $p < 0.01$.

triggered by fast changes in food abundance. My point in this paper is that the same is true of the irruptions illustrated in Figures 1a and 1b, except that the changes in abundance of food probably are smaller or occur more slowly. Thus, vagrancy is not noise, but a signal. The appearance of vagrants is an inevitable consequence of the response by a population to changes in the environment.

It should be the goal of ecologists to learn how to interpret the signals provided by vagrant birds. For example, it may be that the major northward intrusion of herons to the Northeast during the late 1960s and early 1970s had something to do with habitat destruction in the south. The Everglades in Florida suffered catastrophic fires at about that time. Other less dramatic redistributions of birds may reveal changes more subtle than raging fires. Relatively minor changes at the periphery of the ranges of birds probably contain important information. We need to learn how to tap that information.

The patterns of occurrence of these six species in Massachusetts show that irruptions do not seem restricted to a single year. A few years during which a species occurs commonly may be followed by many years during which it is not reported. This means that records compilers and committees must be careful about discarding reports that appear to have no immediate precedent. Griscom and Snyder (1955) decided to ignore reports of Western Grebes in Massachusetts beginning in the late 1940s, because so many were being reported. Their rather feeble justification for this decision was that descriptions of the grebes did not eliminate the similar Great Crested Grebe of Eurasia. The consequence of their decision was that an irruption of Western Grebes into Massachusetts was obscured.

The legitimacy of the patterns evident in data from Massachusetts is supported by the occurrence of the same species in the New York City area. Bull (1964, 1974) showed that Western Tanagers occurred around New York in the late 1950s more frequently than they have since. The years in which Bull (1974) stated that maximum numbers of Western Kingbirds occurred in New York State were 1954 and 1956. The latter year corresponds to a significant peak in Massachusetts data. Thus, groups of years in which large numbers of a certain species appear in Massachusetts are also years when large numbers of that species appear in New York.

The problem with analyzing field records is that perceived changes in abundance may be a consequence of changes in effort. The increase in any species through time could be due to the increase in the number of people birding or to newly developed identification techniques. Western Kingbirds and Western Tanagers have both decreased over the time interval examined. Thus, the patterns I have described are certainly not the result of increased effort. With the exception of Black-headed Grosbeak and Clay-colored Sparrow, the species I have discussed are not difficult to identify, so variation in their abundances is

unlikely to be due to their being overlooked in the past. The lack of a consistent trend in the abundance of these species is surprising given the dramatic increase in number of people birding since the 1950s. It suggests that Massachusetts is saturated with birders with respect to the detection of these particular species. Therefore, these patterns in the occurrences are real and not an artifact of the behavior of birders. This finding suggests the value of the coarse scale at which these data are collected; more detailed data from a smaller area might be more reliable, but less relevant.

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