

COMMENTARIES

Do Kirtland's Warblers Migrate in One Hop?

HAROLD F. MAYFIELD¹

Songbirds that migrate long distances are thought to progress in short hops with repeated stops to refuel. This may be true of some species, but there is another possibility. Some species may make most, or all, of their migratory flight in one hop. If so, those we see are dropouts and strays and not necessarily representative of the whole species.

Kirtland's Warbler (*Dendroica kirtlandii*) provides an opportunity to examine these alternatives. In this rare, well-marked species the migratory path is narrow, the migratory season is short, and each sighting is notable among birders. Most of the records from the time of the discovery of the bird in 1851 have been gathered by Stone (1986).

In spring Kirtland's Warbler travels from wintering grounds in the Bahama Islands to a small nesting region in northern Lower Michigan. The most direct route lies a little west of north, with a bearing of about 340°; it traverses South Carolina, North Carolina, western Virginia, West Virginia, Ohio, and southern Michigan. Most spring records lie within or close to this path. The Bahama Islands are about 1,000 km long but narrow and oriented along the direction of migration. After the warblers leave the islands in the direction described, the first quarter of the route is over water.

If the bird proceeds in short hops, it is as likely to occur in one segment of the route as another. It does not do so. The final quarter of the path, from mid-Ohio to mid-Michigan, yields 87% of the spring records. Unless there are almost 10 times as many observers in a slice of two northern states as in all the southeastern states combined, this disparity is significant. The spring records in the migration path are as follows: South Carolina, 3 (1 in this century); North Carolina, 0; Virginia, 0; West Virginia, 4. Thus, the four southern states in the direct path yield only 7 records. In contrast, northern Ohio (30) and southern Michigan (17) together yield 47 records. It may be significant also that the 4 records in West Virginia span the dates 9–19 May, well within the range of the arrival dates on the nesting ground (Mayfield 1960: 42), and the same is true for most other sightings in southern states.

The records in Florida (7) and Georgia (4) are presumably strays because they lie west of the narrow path I have defined. They include all the early April records and may represent premigratory wanderings from the Bahamas. Even if Florida and Georgia are

included, the heavy disproportion of reports in the extreme north remains. Other spring records of presumed strays are: Alabama, 2 (7 and 10 May); Missouri, 1; Indiana, 5; Iowa, 1; Massachusetts, 1 (26 May). Among strays are birds found at or near the latitude of the nesting ground but far to the west or east of it: Wisconsin, 12; Minnesota, 3; Ontario, 29 (1978; Susan Hibband and Paul L. Aird, unpubl. data); Quebec, 1.

The autumnal pattern is similar but less well defined. Observations tend to concentrate late in the southward flight even though fewer birders might be active. The last quarter of the flight is mainly over water except in Florida, which is off the direct route. More than half the fall migrants are young birds that are making their first migrations and may be prone to straying. As in spring, the flight path extends like a searchlight beam, narrow at the start and gradually widening. Final corrections in course probably are made after the main flight is completed.

The first quarter of the flight, from mid-Michigan to mid-Ohio, produces 14 records (5 in Michigan, 9 in Ohio). The southernmost segment on land yields 28 records (Virginia, 2; North Carolina, 3; South Carolina, 11; Georgia, 4; Florida, 8). A scattering of records well outside the normal route are from Pennsylvania (3), Minnesota (1), Illinois (2), and Alabama (1).

The earliest arrivals in the Bahamas (5, 27, 29 August) occur while most Kirtland's Warblers are still on the breeding ground (last date, 29 September). Most migrants in Ohio and Michigan were seen in September, and those in the southern states in September and October.

The idea that a small bird might make a nonstop migratory flight of 2,000 km would have been incredible a few years ago. But the Blackpoll Warbler (*Dendroica striata*), a bird of similar size in the same family, flies three times as far (Nisbet 1970). Other small birds are capable of long migratory flights. Some from Central America cover at least 800 km over the Gulf of Mexico and then ordinarily continue on after passing the first landfall. If the weather is favorable, they fly far inland, creating on the coast "an ornithological vacuum as far as most small transients are concerned" (Lowery 1960: 72).

Cochran (1972) followed individual thrushes carrying radio transmitters, including a Veery (*Catharus fuscescens*) that flew nonstop more than 700 km, and found they were not diverted from their paths by physiographic features below them except occasionally by very large expanses of water.

¹ 1162 Nannette Drive, Toledo, Ohio 43614 USA.

The published records of Kirtland's Warblers in spring and autumn migration indicate that they may not pause enroute until at or near their destinations. If this is true of one warbler, it may also be true of other small land birds.

I thank Cameron B. Kepler, Paul W. Sykes Jr., and Elliot J. Tramer for reading a draft of this manuscript.

LITERATURE CITED

COCHRAN, W. W. 1972. Long-distance tracking of birds. Pp. 39-59 in *Animal orientation and navigation* (Sidney R. Galler, Klaus Schmidt-Koenig, George J. Jacobs, and Richard E. Belleville, Eds.).

Natl. Aeronautics and Space Admin., NASA SP-262.

LOWERY, G. H., JR. 1960. Louisiana birds. Baton Rouge, Louisiana State Univ. Press.

MAYFIELD, H. F. 1960. The Kirtland's Warbler. Bloomfield Hills, Michigan, Cranbrook Inst. Sci.

NISBET, I. C. T. 1970. Autumn migration of Blackpoll Warblers: evidence for long flight provided by regional survey. *Bird-Banding* 41: 207-240.

STONE, A. E. 1986. Migration and wintering records of Kirtland's Warbler: an annotated bibliography. Athens, Georgia, U.S. Fish and Wildl. Serv. (unpublished).

Received 2 July 1987, accepted 7 July 1987.

Bird Migration Terminology

SCOTT B. TERRILL^{1,2} AND KENNETH P. ABLE¹

The patterns of migratory behavior in birds span a continuum from obligate long-distance annual migrations to irregular eruptive movements. Current studies reveal ever more variability in avian migration systems. Effective communication requires that established terminology be used precisely and that some new terms be employed to reflect our increased knowledge of migration patterns. We propose standard usage for several common migration terms. We have been as conservative as possible in retaining established terminology, and where possible we suggest simply adding modifiers that more accurately describe the phenomena.

Much of the variability within migration patterns probably is based on underlying differences in the mechanisms that control migratory behavior. We mention some of these possible differences, but for only a fraction of species do we have any information on the mechanisms. Therefore, the terms we propose are intended to be descriptive of the observed phenomena and carry no implication regarding the specific mechanisms involved.

The term *annual migrant* should be applied to populations (species or geographically defined breeding populations of a species) in which all individuals migrate from their breeding sites on an annual basis. This descriptive term is preferable to others, e.g. obligate, true, or regular migrant, that are often used synonymously. A well-known example is the Black-

poll Warbler (*Dendroica striata*). Data from some extensively studied European species indicate that annual migratory disposition expressed in caged birds is often based on endogenous processes (i.e. occurs in the absence of external stimuli; see Gwinner 1986 for a recent review). It is, however, becoming increasingly clear that the migration of at least some annual migrants may not be entirely the result of an endogenous motivation. Rather, late stages of autumn migration can occur only in response to external stimuli (e.g. failure in food supply, unusually high density of conspecifics, extreme weather conditions) and may not occur annually. For example, field evidence indicates that Yellow-rumped Warblers (*Dendroica coronata*; Terrill and Ohmart 1984), American Tree Sparrows (*Spizella arborea*; Niles et al. 1969), Harris' Sparrows (*Zonotrichia querula*; Rohwer 1978), and some species of Palearctic nocturnal migrants (e.g. Lack 1983, Haila et al. 1986) exhibit a delayed or facultative phase of migratory behavior after the initial portion, or obligate phase, of annual migration. In addition, there is experimental evidence for facultative migration in Dark-eyed Juncos (*Junco hyemalis*; Terrill 1987, 1988) and Garden Warblers (*Sylvia borin*; Gwinner pers. comm.). Thus, in terms of regulatory mechanisms, it is misleading to assume that the entire annual migration is under endogenous control simply because a species is an annual migrant. Indeed, an endogenous component need not be involved in annual migration, although we know of no examples where an annual migration is stimulated exclusively by exogenous factors.

We therefore propose the terms *obligate phase* and *facultative phase* as modifiers to describe the behavior of individual annual migrants. The obligate phase is the initial portion of migration from the breeding

¹ Department of Biological Sciences, State University of New York, Albany, New York 12222 USA.

² Present address: Vogelwarte Radolfzell, Schloss Möggingen, D-7761 Möggingen, Federal Republic of Germany.