

THE ALLEGHENY MOUNTAINS AS A BARRIER TO
BIRD MOVEMENT

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THE Allegheny Mountains arise in New York and extend in a south-westerly direction to Virginia. A portion of the Appalachian system, they include a number of more or less parallel ridges, and, as the Allegheny Plateau of physiographers, comprise one of the major physiographic provinces of eastern North America. Beginning with elevations of 3,000 feet or less northward in New York and Pennsylvania, they rise to points almost 5,000 feet high in West Virginia and Virginia.

During Pleistocene times the Allegheny Plateau was, in its entirety, unglaciated. Northern portions were for long periods bounded on north, east, and west by extensive ice sheets. This exposed area extending northward into seas of ice must have exerted a profound influence on bird migration and nesting. It probably had a considerable effect on speciation and racial separation, if we could only read and interpret the riddles which the region holds.

Throughout most of its length, the main axis of the range, known as the Allegheny Backbone, is a secondary continental divide, separating waters which flow to the eastern seaboard from those which reach the Gulf of Mexico through the Mississippi system. The Allegheny Backbone is also a natural dividing line between Atlantic and Mississippi flyways for birds.

Because of elevation and abundant rainfall the higher reaches of the Alleghenies were originally clothed in dense coniferous forest, chiefly of red spruce and hemlock, but with considerable areas of white and pitch pine and other species. These mountains, therefore, constituted both a physiographic and an ecological barrier to bird movement. Probably the ecological influence was greater than was the physiographic. It may be supposed that bird species of the deciduous forest found spruce and hemlock woodlands uncongenial for both breeding and migration. Many species which fan out northward from the Gulf of Mexico seem to find a crossing of the Alleghenies difficult, even under present conditions. The converse is also true, since a number of Atlantic seaboard races and species do not regularly cross the Alleghenies.

Within the last hundred years most of the original forest over the Alleghenies has been cut, and much of the land has been cleared. Under these radically changed conditions the ecological barrier has

tended to become less effective, and many species and races are seemingly in the process of modifying their migration routes and their breeding ranges. Nevertheless, as will appear below, the Allegheny Mountains still exert a profound influence on bird movement.

RACIAL SEPARATION IN BREEDING

Among breeding birds of the region, there are a number of instances in which the Allegheny barrier seems to have influenced racial separation. A good example of this is to be found in the Eastern Yellow-throated and Sycamore Yellow-throated warblers, *Dendroica dominica dominica* and *D. d. albilora*. The Eastern Yellow-throated Warbler is essentially a bird of the southern Atlantic coastal pine forests. It reaches its northern limits in the region to the east of the Alleghenies, and it does not, to any great extent at least, invade the mountains. The Sycamore Yellow-throated Warbler reaches its northeastern breeding limits in the Allegheny Plateau along the Ohio River. Due to its white, rather than yellow, lores, it is morphologically quite distinct from the eastern race. More striking still is its difference in choice of nest sites. The Sycamore race, as the name would suggest, builds its nests in sycamore trees growing on the flood plains of sluggish streams. It is occasionally found on slopes away from streams, but even here its nests are often placed in deciduous, rather than in coniferous, trees. Southward of the Alleghenies there is a zone of overlapping of these two races, and individuals which are intermediate in morphological characteristics may be found. In the zone of overlap, nests may be placed in either deciduous or coniferous trees, but in the Allegheny region the two races are separated and distinct both as to physical characters and breeding habits.

Another example of racial separation at the Allegheny barrier is to be found in the Yellow-throats, *Geothlypis trichas*. According to Dr. Wetmore's determinations, birds of the Allegheny region west of the Backbone are of the northern race, *brachidactyla*, while the breeding Yellow-throats east of the ridge are of the Maryland race, *trichas*.

A striking example is to be found in the Grackles, *Quiscalus quiscula*. East of the Alleghenies the resident Grackle is the Purple Grackle, *Q. q. quiscula*, while to the westward only the Bronzed, *Q. q. versicolor*, is to be found. This is not the place to open a discussion of whether these birds are racially or specifically distinct, but the two populations are constant in their observance of this mountain barrier. Of course, there are the so-called "Ridgway" hybrids, but local collecting of breeding birds does not show many of these.

Perhaps not quite so pertinent is the case of the Carolina and Louisiana paroquets, *Conuropsis carolinensis carolinensis* and *C. c.*

ludovicianus. The Carolina race was seemingly restricted to coastal cypress swamps, and just reached the region east of the Alleghenies. The Louisiana race, however, nested in deciduous woodlands along larger rivers and reached the Allegheny Plateau region, as is attested by the observations of both Audubon and Wilson. In the breeding of these two races we have an ecological situation which parallels strikingly that of Eastern Yellow-throated and Sycamore Yellow-throated warblers.

RACIAL SEPARATION IN MIGRATION

In their patterns of migration certain species and races show a remarkable sensitivity to the Allegheny barrier. The example of Northern Gray-cheeked and Bicknell's Gray-cheeked thrushes, *Hylocichla minima minima* and *H. m. bicknelli*, is an interesting one. Northern Gray-cheeked Thrushes regularly migrate along both sides of the Allegheny Backbone, although they are usually considerably more abundant to the west than to the east. Bicknell's Gray-cheeked Thrush, however, is sharply restricted in migration to the region east of the Alleghenies. From the plateau west of the Backbone we have but a single definite record for this race, an individual taken by Lunk (Auk, 58: 264, 1941) near Morgantown, West Virginia.

The situation between Western Palm and Yellow Palm warblers, *Dendroica palmarum palmarum* and *D. p. hypochrysea*, is even more striking. In spring migration, Western Palm Warblers are unusual east of the Backbone. In autumn they occur eastward, although they are much more abundant westward. The Yellow Palm Warbler, on the other hand, is a common to abundant migrant in both spring and fall right up to the east slopes of the Alleghenies. It is so rare at any time in the region west of the Backbone that we have only uncertain sight records of its occurrence.

The situation of the Northern Water-Thrush, *Seiurus noveboracensis noveboracensis*, and Grinnell's Water-Thrush, *S. n. notabilis*, is somewhat similar. Northern Water-Thrushes breed as far south as the West Virginia mountains, and migrate on both sides of the Alleghenies, although they are much more common to the east. Grinnell's Water-Thrush is not known to breed in the Allegheny Plateau, although it does nest at Pymatuning Lake, Pennsylvania and Ohio, just outside the region. It migrates through the territory west of the Backbone, as has been shown by the collecting of Haller and others.

WARBLERS RARE EAST OF THE ALLEGHENIES

There are many wood warblers which migrate principally through Mexico, and which reach our borders in the Gulf of Mexico region.

Among eastern species are the Tennessee (*Vermivora peregrina*), Nashville (*Vermivora ruficapilla*), Cerulean (*Dendroica cerulea*), Bay-breasted (*Dendroica castanea*), Kentucky (*Oporornis formosus*), Mourning (*Oporornis philadelphia*), and Hooded (*Wilsonia citrina*). As might be expected, these species are common in migration west of the Backbone but are scarce east of it. Five of these species, the Nashville, Cerulean, Kentucky, Mourning, and Hooded warblers, remain to breed in the Allegheny Plateau. In the Allegheny region, all five are uncommon as nesting birds east of the Backbone.

It should be pointed out here, however, that changing conditions accompanying the removal of the forest are apparently affecting migration and breeding patterns of these species. Each year we have more reports of these birds eastward. Apparently the ecological barrier of the mountains is losing some of its force. To the northward in the Alleghenies, where the ridges are not so high, certain species have regularly crossed the mountains eastward to reach New England and the Maritime Provinces.

There is a curious situation as regards certain of the wood warblers which nest in the coniferous forests north of the Allegheny region. I mention it here, although I cannot explain it. One might suppose that such boreal species as Bay-breasted, Black-poll (*Dendroica striata*), Cape May (*Dendroica tigrina*), and Tennessee warblers would be common in migration in the Alleghenian spruce forests. So far as local observers can tell this is not true. Even in fall migration when these species are swarming in the lowlands, they are strangely absent from the heights.

INVASIONS

During the last 50 or 60 years the Allegheny region has been invaded by bird species moving in from south and west. These invaders include the Prairie Horned Lark (*Eremophila alpestris praticola*), Dickcissel (*Spiza americana*) and Eastern Lark Sparrow (*Chondestes grammacus grammacus*) from the west and the Black Vulture (*Coragyps atratus*) and Bachman's Pine Woods Sparrow (*Aimophila aestivalis bachmani*) from the south.

Forbush (Birds of Mass. and Other N. E. States, 2: 366 ff., 1927) gives an extensive review of the literature dealing with the eastward spread of the Prairie Horned Lark. Its appearances followed closely the removal of forests from the Great Lakes states and the Ohio Valley. It seemed to find little to impede its progress along the Great Lakes and in the lower northern portions of the Alleghenies. In the higher Alleghenies of western Maryland, West Virginia, and Virginia, how-

ever, the mountain slopes kept their original forests until a much later date, and while these existed they seemingly formed an effective barrier to the eastward spread of this bird. Only within the last 25 years have Prairie Horned Larks become common in the area just east of the south-central Alleghenies.

In the case of the Dickcissel we have, of course, an ornithological mystery. Just why it bred regularly on the Atlantic seaboard until about 1880 and then ceased to do so, no one can tell. Prior to that date there were very few resident ornithologists in the Allegheny region, and we do not know what the earlier status of this bird may have been in this area. In the late years of the nineteenth, and the early years of the twentieth centuries, however, it was certainly rare or absent from the region. About 1920, alfalfa began to be planted extensively in eastern Ohio, northern West Virginia, and south-central Pennsylvania. As an accompaniment to this new crop, Dickcissels began to appear in small numbers. They are now found locally, but regularly, in the Allegheny Plateau section of Ohio, and in western West Virginia. Still more recently, they have begun to appear sparingly in southeastern Pennsylvania, eastern West Virginia, and the region about the District of Columbia. In the territory east of the high, and generally heavily forested, Allegheny ridges, however, these birds are still practically unknown. In this case, apparently, the barrier is still effective.

The Eastern Lark Sparrow presents the case of an invading species from the west which occupied, and became common in, much of the westward Allegheny Plateau, reached the summits of the Backbone, and apparently receded from much of its newly-occupied range without ever crossing the mountains in numbers. Bird students of the unglaciated parts of Ohio are in agreement that the Lark Sparrow increased greatly in numbers and extended its range during the years around 1900. At about the same time, the birds began to appear regularly in West Virginia and western Pennsylvania. In 1901, Eifrig (*Auk*, 19:83-84, 1902) found them in numbers on the Allegheny Tableland in Garrett County, Maryland. By 1910 they were common breeding birds in central West Virginia, and they continued to be numerous there until about 1925. From that time to the present they have been generally rare and local throughout the region. During the entire period we have few, if any, definite records of the birds in the territory just east of the Alleghenies. It was not until 1932 that a Lark Sparrow's nest was found in Pennsylvania east of the Alleghenies. Boggs (*Redstart*, 3:91, 1936) gives the only two records for the species in West Virginia east of the Alleghenies—in Hampshire and Mineral

counties in 1936. No nest was found in western Virginia until 1937. In the case of this species, the Allegheny Backbone has certainly been an effective barrier to eastward movement.

Although its direction of invasion was different, the case of Bachman's Pine Woods Sparrow in the Allegheny Region closely parallels that of the Lark Sparrow. Long known from Kentucky, these birds seemingly crossed the Ohio River into unglaciated Ohio about 1898 and into West Virginia about 1900. During the early years of the century they spread northward and eastward through West Virginia and southwestern Pennsylvania until they reached the first high Allegheny ridges. Here their invasion was checked, and the birds gradually decreased in numbers throughout the Allegheny Plateau region without ever making a successful crossing of the Allegheny Backbone.

In more recent years Bachman's Pine Woods Sparrows have seemingly made another invasion and extended their range northward through the Shenandoah Valley to the east of the Alleghenies. They are now locally common in portions of northwestern Virginia and the Eastern Panhandle of West Virginia. We still have no evidence, however, that they have crossed the Backbone.

Black Vultures have in recent years certainly become much more common in the territory just east of the high Allegheny ridges. They are, today, fairly common in sections of western Virginia, eastern West Virginia, and central Maryland. One would suppose that for such strong fliers the Allegheny ridges would present no barrier at all, but the fact remains that in only one area have they established themselves in any numbers west of the Allegheny Backbone. From most of the Plateau there are no records whatsoever.

The case of the single establishment west of the Alleghenies is an interesting one, demonstrating the use of a natural port of entry. The New River, rising in North Carolina and flowing northwestward across Virginia, cuts through the high southern Allegheny ridges at Narrows, Virginia, and enters West Virginia shortly thereafter. Northward from Narrows there is a long, and virtually uninterrupted, valley extending through Monroe, Greenbrier, and Pocahontas counties, West Virginia. This valley lies directly west of Allegheny Backbone, and throughout its length Black Vultures are present in fair numbers. Outside this valley there is not a single record for the species in that part of West Virginia west of the Backbone.

CROSSOVERS

Despite what has been written above, it is obvious that many bird species in their migrations must regularly cross the Alleghenies.

Nearly 50 years ago Eifrig was wise enough to speculate that almost any waterfowl species found on Chesapeake Bay might also be found in the mountains of western Maryland. With the construction of artificial lakes in the Alleghenies of Maryland and West Virginia, his speculations have proved to be correct. We now know that a major waterfowl flyway from Lake Erie to Chesapeake Bay crosses southwestern Pennsylvania, western Maryland, and northeastern West Virginia.

There are certain species, both of land and water birds, whose crossing of the Alleghenies in our area is particularly interesting. One of these is Bonaparte's Gull, *Larus philadelphia*. Both in spring and fall these birds may often be found flying over woodlands and mountain meadows, often many miles from an extensive body of water. Their course is generally northwest-southeast, apparently in passage between the Atlantic Coast and Lake Erie.

Two species of migratory passerine birds, the Western Palm Warbler and the White-crowned Sparrow, *Zonotrichia leucophrys*, are often so abundant on the Allegheny crests in autumnal migration as to suggest a major traverse of the mountains. We know, of course, that Western Palm Warblers appear on the Atlantic Coast farther south, so this crossing seems logical. As to the movements of White-crowned Sparrows, we do not yet have sufficient information to justify a guess as to their destination.

The Allegheny Mountains have been here for a long time. They were uplifted in Palaeozoic times, and they have been continually above ice and water. When we know more of the movement of birds along and across them, we can, perhaps, begin to unravel some of the mysteries of migration and speciation.

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