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Kentucky Warbler

*"To sift the
sparkling from the
dull, and the true*



*from the false, is
the aim of
every Ornithologist."*

Vol. XIX

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No. 4

THE RELATION OF VEGETATIONAL LIFE-FORMS TO THE DISTRIBUTION OF BREEDING BIRDS

By LEONARD C. BRECHER, Louisville

(Presented before the Kentucky Academy of Science, Spring, 1943)

Why do the various species of birds nest where they do? This is a question that has intrigued scientists and bird lovers for generations. Why, for instance, in building does the Warbling Vireo (*Vireo gilvus*) select the topmost branches of a tree, the Yellow-throated (*Vireo flavifrons*) choose the middle branches, the Red-eyed (*Vireo olivaceus*) the lowest branches; yet all three sing and hunt their food together in the treetops? Or, viewed from another angle, why does the Chuck-will's widow (*Antrostomus carolinensis*) breed north to Muldraugh's Hill in Kentucky and then disappear, leaving the semi-wooded forest edges to its smaller cousin, the Whip-poor-will (*Antrostomus vociferus*), which, after appearing in Tennessee, nests north to the coniferous forests in Canada?

This article does not pretend to offer an answer to these questions but rather to summarize the leading current thought about them, pointing the way to further investigations along lines that seem pertinent in the light of our present knowledge.

Dr. Merriam¹ attempted to find the answer in 1899, when he made a survey of the flora and fauna of San Francisco Peak, located in Arizona. He noted that there was a correlation between certain species of birds and vegetation and that the areas of their occurrence were bounded by isotherms. He thereupon formulated his well-known Life Zone Theory, which he published in 1890.² By 1895 he had worked out zones, based on summations of temperatures, for the whole of North America. The theory of temperature summing is founded on the century-old idea that the same stage of vegetation is attained in any year when the mean daily temperatures reach the same value. He then declared that "in its broader aspects the study of geographic distribution of life in North America is completed. The primary regions and their subdivisions have been defined and mapped, the problems involved in the control of distribution have been solved, and the laws themselves have been formulated."³ His final life-zone classification included three regions, crossing the continent horizontally:

- I. Boreal (Northern) Region
 1. Arctic Alpine Zone
 2. Hudsonian Zone
 3. Canadian Zone

II. Austral (Southern) Region

1. Transition Zone
 - a. Alleghanian Faunal Area (Eastern)
 - b. Arid Transition Faunal Area (Western)
 - c. Pacific Coast Faunal Area
2. Upper Austral Zone
 - a. Carolinian Faunal Area (Eastern)
 - b. Upper Sonoran Faunal Area (Western)
3. Lower Austral Zone
 - a. Austroriparian Faunal Area (Eastern)
 - b. Lower Sonoran Faunal Area (Western)

III. Tropical Region (consisting of the tip of Florida and the tip of Lower California).

One can determine from the life zone map (Map I) that Kentucky falls into the Upper Austral Zone. As will be noted from the



Map I, Life Zones, published through the courtesy of Roger Tory Peterson and THE AUDUBON MAGAZINE.

preceding table, the transcontinental zones of the Austral Region have been divided into an eastern humid area and a western arid area. Thus Kentucky also falls into the Carolinian Faunal Area. In the eastern mountain regions, though, the Transition Zone, or the Alleghanian Faunal Area, replaces the Carolinian Faunal Area south into northern Georgia. A bird that is characteristic of the Alleghanian Area is the Chestnut-sided Warbler (*Dendroica pensylvanica*). It breeds throughout the area in low brushy clearings or bushy borders of second growth woodland, choosing the same habitat, whether in southern Saskatchewan, Maine, or eastern Kentucky.

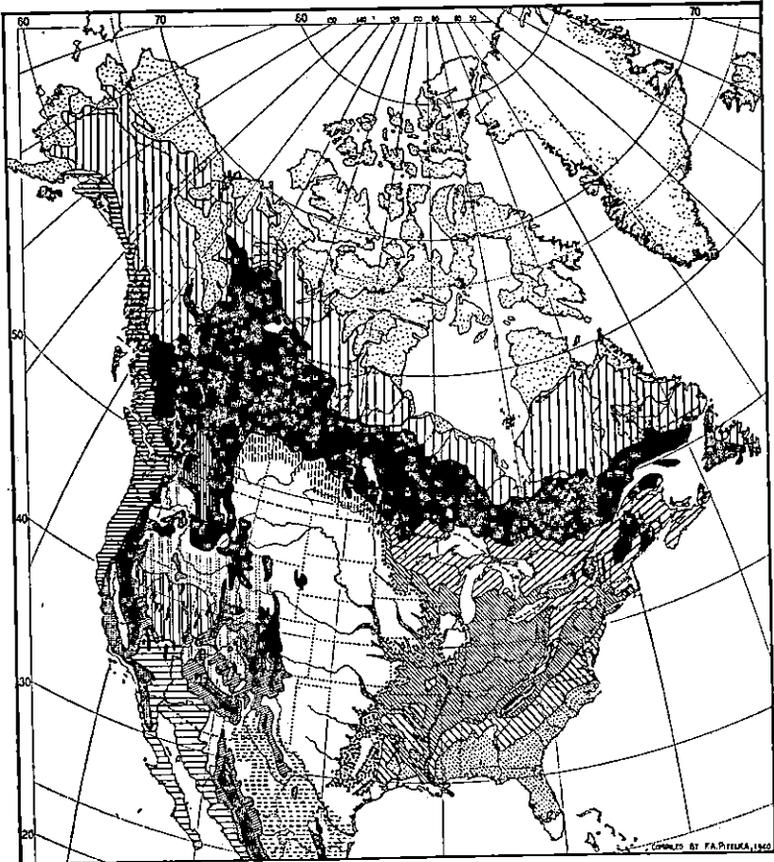
In some of the higher elevations in Kentucky, as well as in many other spots in Tennessee, North Carolina, West Virginia, etc., local areas of the more northerly Canadian Zone are found. Merriam stated that these areas were defined by the same temperatures, but they are all also characterized by coniferous trees and associate vegetation. One of our well-known winter residents in central Kentucky is the Slate-colored Junco (*Junco hyemalis hyemalis*), which builds its nest of moss on or near the ground under spruces or pines, whether at Hudson Bay or in the mountains of New York. However, the breeding form in the southern Appalachians becomes slightly modified in color and size and is given the sub-specific name of Carolina Junco (*Junco hyemalis carolinensis*).

Similarly, Merriam and his followers have selected certain species of the flora and fauna for each of the faunal areas and have called them indicators of that particular area. On critical examination, however, it will be found that these avian indicators bear a definite and peculiar relationship to the vegetation of the area in which they are found.

Since this life-zone system bore the authority of the national government, it was adopted by ornithologists without critical analysis and has become firmly entrenched in the fifty years of its use. However, while the Boreal Region correlates well with known biological facts, the remaining divisions violate biotic communities and present so many discrepancies that the value of the zones lies chiefly now in a designation of a geographic area. Suffice it to say here that Dice (1923)⁴, Kendeigh (1932)⁵, Shelford (1932)⁶, and Daubenmire (1933)⁷, among others, have seriously questioned this theory.

During the past several decades, plant and animal ecologists have evolved a theory, based on the correlation of plant and animal life within biotic communities and involving the principles of plant successions. In brief, bare land such as tilled fields, if located in Kentucky, would in time, if left alone, be successively covered by grass, herbs, shrubs, open woodland, and mature forest. This series of stages is known as a sere, and the early stages are called seral. The final stage, which is self-perpetuating, is called the climax, and its immediate predecessor is the sub-climax. Major units of landscape are called biomes, such as grassland, deciduous forest, coniferous forest, tundra, etc. Biomes may be called "the largest plant and animal communities in dynamic equilibrium in the final climax state." The biome includes not only the characteristic vegetational dominants, but it includes all other vegetation of a developmental or subordinate nature. Transition areas between biomes are characterized by intergradation of the two vegetation types; these areas of blending are called ecotones.

One may see from the accompanying map (Map II) that the extreme northern area of the continent is called the tundra biome, corresponding to the Arctic Alpine Life Zone; the next area (verti-



Map II, Biomes, published through the courtesy of Frank A. Pitelka, *THE AMERICAN MIDLAND NATURALIST*, and its editor, Dr. Theodor Just, Notre Dame, Indiana.

cally hatched) is the tundra-coniferous forest ecotone, or sub-arctic forest, corresponding to the Hudsonian Life Zone; the black area is the coniferous forest biome, corresponding to the Canadian Life Zone. That these three areas roughly coincide in the two systems is due to the fact that the life zones, based on temperature, coincidentally agree with the vegetation.

The remaining areas differ in the two systems, the biomes running rather vertically, while the life zones cross the continent horizontally. Thus the great grassland biome, extending from Texas into Canada, is one unit instead of being cut up transversally into three life zones.

Pitelka (1941)⁸ has stated that the evolution of birds doubtlessly involves the fitting of each species into an ecological niche; that is, a particular position of the biotic environment in relation to shelter, food, predators, or that place in the environment characteristically

frequented by the species. -Habitat niches that make up the developmental stages of a biome are very frequently found in several biomes. This is due not only to the numerous natural (or primary) plant successions but also to man-made (or secondary) successions such as those caused by forest fires or clearings, causing nature to start its chain of plant succession over again. While certain species agree well with the limits of biotic communities, such as our Tufted Titmouse (*Baeolophus bicolor*) in the deciduous forest biome, the Prairie Chicken (*Tympanuchus cupido*) in the tall-grass associations of the grassland biome, and the Ptarmigans (*Lagopus reptestr*, etc.) in the tundra biome, yet many others are characteristic of the seral stages and thus range over several biomes. The Ruffed Grouse (*Bonasa umbellus*) is an example of this class. It is a game bird of the sub-climax forest edge and brushy thickets, formerly found all through Kentucky but now, because of man, restricted to our eastern mountains and to a few isolated areas in other portions of the state.

The Red-eyed Vireo (*Vireo olivaceus*), abundant here in Kentucky and throughout the deciduous forest biome, also occupies sub-climax associations in the coniferous forest portion of its range. The Ovenbird (*Selurus aurocapillus*), an inhabitant of the climax deciduous forest floor, common in the Kentucky mountains and occasionally found breeding adjacent to Louisville, falls also to a sub-climax position in the coniferous forest biome.

These last three species are examples that occupy niches occurring in several biomes. The question arises, then, as to what are the factors which govern the suitability or availability of the niche. The more important are the following: 1—temperature, which is a delimiting factor (by this is meant not the summation of temperatures as in the life-zone theory but rather the extremes of hot and cold, which mark northern and southern boundaries).; 2—the availability of the proper type of food supply; 3—the availability of shelter; 4—the degree of humidity; 5—miscellaneous factors, such as competition with other species, geographical barriers, etc., which, while relatively unimportant in themselves, yet in some cases may change the balance of other major factors (for instance, within local situations the absence of a singing post for some species may cause an otherwise altogether suitable niche to be unoccupied.); 6—the vegetational life-form, which is very important. This last-named term is used to designate the physical aspect of the 'vegetation, or the material in, on, or from which the bird builds its nest, seeks its food, and finds its shelter. It may also be said to include a few forms that are not life but rather physical forms on which the bird nests. For example, the Duck Hawk (*Falco peregrinus*) nests locally on inaccessible cliff ledges in the mountains of Tennessee, in Greenland, in Alaska, and in California, places located in various life zones and biomes. The nesting material is negligible, and the physical characters of the nesting site, together with the proximity of water and food supply, seem to be the controlling factors; not the temperature. The Cliff Swallow (*Petrochelidon albifrons*), too, adopts a physical form. In this case it builds its gourd-shaped nest of mud pellets and fastens it to the face of a cliff or building.

The Spotted Sandpiper (*Actitis macularia*), in common with many other shore birds, chooses a depression in the dry ground near water, for its nest. It breeds from the tree line in the north to Texas and the Carolinas. Thus it also nests in many life zones and biomes,

and the presence of the physical form of its breeding locale and the availability of its specialized food supply constitute its niche.

In Kentucky, as well as in Michigan, the Prothonotary Warbler (*Prothonotaria citrea*) nests in the holes of old rotted stumps near water; yet recently it has been reported that in Kentucky⁹ three different families used mail boxes because of lack of natural facilities. This emphasizes the importance of the life-form in the selection of the nesting site.

Petersen¹⁰ has pointed out that the Redstart (*Sethophaga ruticilla*) chooses slender deciduous trees, twenty or thirty or forty years old as its life-form. This warbler prefers the second-growth trees in the deciduous forest biome, but also occupies the birch and aspen areas in the coniferous forest biome. In these sub-climax areas the original spruces have been burned or cut away, and the slender birches and aspens have grown in, later to be replaced in turn by the conifers.

The Horned Larks (*Otocoris alpestris*) furnish a good illustration of the importance of life-forms. In this case the life-forms consist of broad expanses of short grass. The various races breed from the equatorial highlands of Columbia, through the hot plains regions, on up to the Arctic tundra, ranging through at least five life zones and several biomes. The Prairie Horned Lark (*Otocoris alpestris praticola*) has constantly extended its range since the advent of the white man. The name prairie is a misnomer, as this race does not occupy the tall-grass associations of the climax prairie but prefers areas of low grass or even plowed fields where there is little or no grass. It was originally not found in Kentucky,¹¹ but as clearings were made, it moved in, and this year and last it has been found nesting at Louisville. It has also worked its way to the Atlantic seaboard, utilizing golf links and the grassy stretches bordering the highways.

A much different life-form is presented in the case of the Osprey (*Pandion haliaetus*), which depends on fish for its food. This bird generally builds its bulky nest in the top of a tree near water, and it is not only found in many biomes or life zones but is represented generally throughout the world. Nests built in the coniferous forest biome on the coast of Maine appear to be identical in structure and location with nests built on the shore of Chesapeake Bay, in the Lower Austral Zone.

The Flicker (*Colaptes auratus*), with which we are all familiar, nests in every Kentucky orchard or park where a dead limb is available. Breeding north to the tree line in the subarctic ecotone, this ant-eating woodpecker illustrates the importance of the life-form, regardless of the zone or biome.

The correlation of species with seral stages can be demonstrated in two of the areas in Kentucky under the supervision of the National Park Service. In both the Mammoth Cave National Park and the Otter Creek Recreational Area farm lands have been taken out of tillage, and human habitations removed. In the last ten years the fields have grown into shrubs and young woodlands. Such species as the English Sparrow (*Passer domesticus*), Meadowlark (*Sturnella magna*), Robin (*Turdus migratorius*), and Bluebird (*Sialia sialis*) are disappearing, while other species are moving in to occupy the new niches in the making. As the fields grow into low brush, the Field Sparrow (*Spizella pusilla*) moves in. Into these same areas comes the Song Sparrow (*Melospiza melodia*) wherever wet spots or streams

are found. When the brushy areas grow into open woodland, we find the Yellow-throated Vireo (*Vireo flavifrons*). As the wooded areas mature and some of the older orchards decay, we find the Downy Woodpecker (*Dryobates pubescens*), which utilizes the dead limbs for its home. During these years the life zone of these regions has not shifted, but the bird population has. This has been due to the advancement of the seral stages of the biome, with their attendant change in the life-form of the dominant vegetation.

All last fall and winter in our eastern mountains lumbermen were cutting large areas of climax timber to supply our war needs. With the coming of spring these areas were exposed to sun, wind, and weather without the protection of trees. As a result, when summer came, the usual flora and fauna found on the forest floor faced adverse conditions and died away. Along with this change the Veery (*Hylocichla fuscescens*) left, too, as its niche in the ferns and mosses had been destroyed. Along the stream edges, in the brush and thickets of these newly opened areas the Northern Yellowthroat (*Geothlypis trichas*) came in, but its similarly colored relative, the Kentucky Warbler (*Oporornis formosus*), deserted its former haunts, since the dense shade of the forest had gone, and the ground flora had changed. But, taking its place on the drier hillsides in the brushy debris of the logging operations, could be found the Red-eyed Towhee (*Pipilo erythrophthalmus*.) Here again the same life zone that designated the area last year still designates it this year. Yet the flora and fauna have changed in nearly every respect. Man has caused the climax community to revert to a much earlier seral stage of the biome. The characteristic vegetation of the new stage has introduced a new life-form and created different niches, which offer breeding sites for the species adapted to them and exclude those that are not adapted.

It may be of interest to note here that the more varied the vegetation, the more niches there will be. These in turn provide nesting sites for more species, so that the nesting population of a certain area increases with an increasing variation in its vegetational life forms. Beecher¹² found that small plots of one type of vegetation, interspersed with areas of a different vegetational type, gave a higher population density per unit area than that same unit would have given had it been covered by a uniform vegetational type. His study indicates that the increase in population density is due to the amount of edge, or border vegetation, separating two different types of plant communities.

Space does not permit further elaboration, but suffice it to say, the niche may be very localized, or it may be widespread. It may be found in various biomes. However, because of competition with other species or because climatic or other factors exceed its limit of tolerance, a species may not occupy the entire niche available to it. Often species are found to reach the boundaries of their abundance deep within or off to one side of their supposedly normal range.

An illustration of the influence of these delimiting factors is afforded by a consideration of the Parula Warbler (*Compothlypis americana*). Audubon and Alexander Wilson, both of whom called it the Blue Yellow-backed Warbler, and also Nuttall, who called it the Particolored Warbler, stated that it breeds abundantly in Kentucky. Yet it is much localized now. Wilson¹³ admits that he never had found its nest, while Nuttall¹⁴ quotes Audubon¹⁵ as saying that the nest is built of lichens in the outermost fork of a swaying branch in the top of the tree. For many years standard works of reference

have given the range of the Parula as the eastern United States but assert that the nest is built in the hanging moss, which certainly would tend to restrict its range. Even after the taxonomists designated the northern race of this warbler as a sub-species, making it *Compsothlypis americana pusilla*, leading texts still describe the southern form as nesting in the hanging moss, *Tillandsia*, while they give the northern form as nesting in the *Usnea* "moss," which is in reality a lichen. However, Forbush, in his *BIRDS OF MASSACHUSETTS*, states that other nesting materials are sometimes used, but even then this warbler attempts to affix bits of usnea to the outside, perhaps for concealment. These two traditional nesting materials occurring in totally different biomes or life zones are botanically unrelated, though their physical form is alike to the bird. Just recently, though, Petrides¹⁶ has pointed out that various observers have found Parulas nesting in New York, Washington, D. C., and West Virginia, areas in which hanging moss is not generally available. Two nests were found in clumps of debris caught on overhanging branches while the Potomac River was flooded. Others were built, pendant fashion, of leaf skeletons, bits of twine, hickory catkins, etc. The interesting fact to note here is that the birds occupying the intermediate area between the southern cypress swamps and the northern coniferous forest have used substitute materials which in a general way give the stringy, moss-like appearance to the nest. To be facetious, one might say, "To attract Parulas to your home, tie clumps of excelsior to the highest branches of your trees."

The question arises as to how the numbers of these warblers in the Carolinian Area, where there is normally no moss, compare with its concentrations in its Austro-riparian and Alleghanian Areas, where its favorite life-form, the moss, is readily available. If their occurrence is comparatively sparse where the moss is lacking, might it not logically be due to this fact? And might not the comparatively few individuals that do breed in the Carolinian Faunal Area be pioneer spirits, venturing out and making use of the best substitutes that nature in this area would provide?

In summary, I have attempted to show that:

1. The basic concept of the life-zone theory is invalid, and that while temperature is an important factor, the value of the life-zone concept now lies in the designation of certain geographic areas.
2. The more recent concept of the relationships between the flora and fauna of a biotic community accord with known biological facts and embrace the biome with its various developmental stages.
3. Breeding birds generally show a fidelity to a particular life-form which is vegetational in character, though some species use a physical form, both of which are usually associated with a niche or habitat.
4. The extension or limitation of this life-form is a major factor in the complex which governs the distribution of breeding birds. (Grateful acknowledgment is made to Frank A. Pitelka for helpful suggestions in the preparation of this paper).

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SOME PLANS FOR 1944

In spite of the war our members are carrying on their study of birds. In our next volume, 1944, we are to have a number of interesting things, articles that will further the cause of ornithology. Dr. Lovell is working on an article about the late nesting of the Mourning Dove. Miss Schneider is collecting material on the nesting range of the Chuck-will's-widow; an excellent cut has already been made to accompany this article. Mrs. Stamm is making a study of the nesting range of the House Wren in Kentucky. Miss Slack is to publish serially her exhaustive bibliography of Kentucky ornithology. Miss Mason is working on a range study of the Song Sparrow. Our composite "Non-breeding Birds of Kentucky" is nearing completion.

Then there are to be many short notes, items of interest about our members, the annual censuses taken at Christmas, the winning Junior Academy article, and a new feature—notes and items of interest from the Beckham Bird Club. Stand by us in spirit and financially during the trying months ahead of us.

Dr. Lovell will welcome any record of the nesting of the Mourning Dove in September. Write him a card at once for his forthcoming article.

* * * * *

SEASON FOR SHOOTING DOVES

I wonder why man wants to kill . . . I heard
 A shot fired, saw a dove fall wounded—dying—
 And then lie still. The frightened mate, desecrating
 What had befallen the poor, hapless bird,
 First circled far above, then flew to cover.
 Last spring I liked to watch them bill and coo;
 I envied her whom he would gently woo;
 I fear I coveted her faithful lover.
 In our peach tree I saw them build their nest,
 Brave storms together, hatch and feed their young.
 They knew me for their friend, a frequent guest.
 Now, tearful notes from feathered throat are sung.
 Sweet innocence, betrayed by man, is left
 To mourn, inhuman hearts make Earth bereft!

—SUE WYATT SEMPLE, Providence.

* * * * *

CHRISTMAS CENSUSES

Be sure to take a Christmas census again this year if you have normally done so; if you have never sent in a census, do so this year. We need more and more areas in the state represented in this annual bird count. Stay out all day, choose as many types of habitat as possible, count species and individuals, and mail the results to the editor not later than January 5, so the censuses can appear in the winter issue. Be sure to state the temperature, the weather conditions, the names of all participants in the census, the places visited, and the distances covered. Organize as many parties as you have trained leaders and pool the results of your day in the open.

* * * * *

DR. FRAZER HONORED

Dr. T. Atchison Frazer, our "grand old man" of the K. O. S. was honored by the Kentucky Medical Society at their annual meeting in October, 1943, by being voted the most outstanding general practitioner in the state. An excellent picture of him and a good, sympathetic article appeared in the COURIER-JOURNAL.

THE NEST OF A KENTUCKY WARBLER

By HARVEY B. LOVELL, Louisville

Although our official publication is named after the Kentucky Warbler (*Oporornis formosus*), no complete description of its nest has as yet appeared in this journal. Because of its retiring habits, which cause it to nest in deep woods far from the crowded centers of population, few members of the K. O. S. have ever seen its nest. Only Mrs. John H. Mayer, of Cynthiana, has reported the discovery of a nest, this one containing four young, in Harrison County (KENTUCKY WARBLER, XVII (1941), 14). Yet in its proper habitat the Kentucky Warbler is one of our commonest woodland birds. Alexander Wilson, its discoverer in his journey through Kentucky in 1810, could hardly have picked a more suitable one from the still undescribed avian fauna than this beautiful, plaintive songster to bear the title Kentucky Warbler. He gave it the scientific name of *Sylvia formosa* and thus describes it in his *American Ornithology*:

"This new and beautiful species inhabits the country whose name it bears. It is also found generally in all the intermediate tracts between Nashville and New Orleans, and below that as far as the Balize, or mouths of the Mississippi, where I heard it several times, twittering among the high rank grass and low bushes of those solitary and desolate looking morasses. In Kentucky and Tennessee it is particularly numerous, frequenting low damp woods, and builds its nest in the middle of a thick tuft of rank grass, sometimes in the fork of a low bush, and sometimes on the ground: in all of which situations I have found it. The materials are loose dry grass, mixed with the light pith of weeds, and lined with hair. The female lays four, and sometimes six eggs, pure white, sprinkled with specks of reddish. I observed her sitting early in May. This species is seldom seen among the high branches; but loves to frequent low bushes and cane swamps, and is an active sprightly bird. Its notes are loud, and in threes, resembling tweedle, tweedle, tweedle. It appears in Kentucky from the south about the middle of April; and leaves the territory of New Orleans on the approach of cold weather; at least I was assured that it does not remain there during the winter. It appeared to me to be a restless, fighting species; almost always engaged in pursuing some of its fellows; though this might have been occasioned by its numbers, and the particular season of spring, when love and jealousy rage with violence in the breasts of the feathered tenants of the grove; who experience all the ardency of those passions no less than their lord and sovereign man.

"The Kentucky Warbler is five inches and a half long, and eight inches in extent; the upper parts are an olive green; line over the eye and partly under it, and whole lower parts, rich brilliant yellow; head slightly crested, the crown deep black, towards the hind part spotted with light ash; lores, and spot curving down the neck, also black; tail nearly even at the end, and of a rich olive green; interior vanes of that and the wings dusky; legs an almost transparent pale flesh color.

"The female wants the black under the eye, and the greater part of that on the crown, having those parts yellowish. This bird is very abundant in the moist woods along the Tennessee and Cumberland rivers."

When I arrived at Otter Creek on June 7, 1943, to spend a week

in the study of the natural history of the area, one of my aims was to find the nest of the Kentucky Warbler. At least two singing males proclaiming their territory could be heard constantly from the lodge at Big Bend Camps, where we made our headquarters, and others were seen and heard daily throughout the more wooded areas. For two days I scoured the surrounding forest floor, and although I found several interesting things, such as the tway-blade orchid (*Liparis liliifolia*) and nests of the Downy Woodpecker, Wood Pewee, Phoebe, and Prothonotary Warbler, the home of the Kentucky Warbler eluded me.

Finally late in the afternoon of June 9, as I was following the song of a Hooded Warbler, near the crest of the ridge between Big Bend and Lover's Leap, overlooking the Ohio River, I saw a small bird scurry out of a tuft of plants not five feet from me. She ran along the sparse understory of shrubs and vines until she was twenty feet from the nest before she flew up and uttered an alarm note for the first time. It was a Kentucky Warbler. Then the male appeared, but he discreetly remained at a much greater distance. He was more timid and seemed to lack the strong parental instinct of the female. His throat was a more brilliant yellow, and the markings on the side of his neck were darker, but otherwise the two parents were much alike. I had never heard the male singing in this particular area, and so it was only by accident that I succeeded in locating the nest.

The nest was in a grove of tall trees and about fifteen feet from the edge of a small open area. It was well hidden in a clump of vines and low seedlings forming a cover not over two feet high. Among these were a young hickory, some coralberry, a Virginia creeper, and other vines. The nest was on the ground and consisted of several layers of leaves, mostly oak, making a large, bulky mass and raising the cavity about four inches off the ground. The lining was of finer materials, chiefly grass and rootlets.

The nest measured 12.5 cm. by 13.5 cm. in diameter outside and was 10 cm. high. The inside measurements of the cavity were 5.5 cm. by 6.8 cm. in diameter by 4.5 cm. deep. The cavity was distinctly oval in appearance, as indicated by the measurements. The four eggs were white, covered with numerous brown spots concentrated at the larger ends. They measured 20 mm. by 16 mm.

The next day we returned cautiously to the nest. The mother allowed us to come within less than four feet. She was incubating with her body placed the longer diameter of the oval nest, and her back towards us, but she watched us with one eye. She remained entirely motionless except for a slight rise and fall of her body in breathing. After five minutes she slipped off the nest, and as she crept noiselessly away under the low vegetation, she seemed to hug the ground. It was not until the bird was twenty-five feet away that she flew up to a low branch and began her loud chirping. In order not to frighten her too much, we quickly departed, but fifteen minutes later as we passed by, I trained my field glasses on the spot and observed that she was already back on the nest and in the same position.

When we had to leave Otter Creek three days later, the mother was still incubating. Only gasoline rationing prevented us from returning again to observe the habits of the nestlings and to identify them by bands.

FERRY BOAT ATTRACTS PROTHONOTARY WARBLERS

By FRED W. BINNEWIES, Chief Ranger, Mammoth Cave National Park

A pair of Prothonotary Warblers (*Prothonotaria citrea*), which usually haunt overhanging trees and shrubs near streams but occasionally build their nests in strange places, assured themselves of a safe place for their nest when they selected the ferry boat at Mammoth Cave National Park for their home last summer. The



Prothonotary Warbler near Its Ferry-boat Nest at Mammoth Cave, published through the courtesy of the National Park Service, Department of Interior.

ferry was in operation all the time, but this did not affect the desire of the birds to put their nest where it would not be molested, much to the delight of the ferry operators and the many persons that crossed the ferry. The people were thus offered an unusual opportunity of seeing this brilliant bird at close range and could keep daily watch on the development of the young.

The ferry boat was formerly propelled by means of cables, but a more recent installation of a paddle wheel on the side left a large pulley wheel at one end of the boat not in use. The wheel had a metal guard around it to drain water to the outside of the boat, and it was in the guard that the Prothonotary decided to build its nest. It was well protected from the weather, and the thoughtful ferry operator placed an additional piece of tin over the wheel for further protec-

tion. The holes in the chive provided an excellent entrance into and exit from the nest.

At first the birds were confused when they would return to the boat only to find it on the opposite side of the river. They would sometimes wait until the boat returned to the side of the river from which they had started, and at other times they would fly to the boat but would have to go to both ends of it before locating the nest. In a few days, however, they learned to go directly to the nest regardless of which side of the river the boat was on. During the incubation period the birds rode back and forth on the boat and did not leave when persons crossing the river paused to look at them.

Four brown and white eggs were laid in the nest, and three of them hatched successfully. The young birds were gray with tinges of blue on the wings and back. They grew rapidly and left the nest before it was realized that they were big enough to fly.

The period of feeding the young is always most interesting, and many visitors to the park would sit for some time for the flash of color that meant that one of the old birds was returning to the nest with a worm or bug. Usually the returning bird would pause on a tree or bush near the ferry and utter its sharp "tweet" before flying to the boat. It would then fly to the boat and alight on the chain at the end of the boat (see cut) and pause there for an instant before going to the nest. This was the time that the watchers were waiting for, because it afforded them an unusual opportunity to see at close range the brilliant orange yellow and gray of the male bird and the paler yellow and ashy gray of the female. The birds would come back to the boat from almost any direction but would warn the observer of their arrival by giving their call before flying to the nest. After entering the nest and feeding the young, the birds would emerge and pause for an instant on the wheel before flashing off in search of food.

This incident of the Prothonotary Warbler is only one of the many that a bird lover can find in the Mammoth Cave National Park, where all wild life is protected and allowed to live in natural conditions that are remote from the influences of man.

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ORNITHOLOGICAL NEWS

Mrs. Sue Wyatt Semple, whose "Season for Shooting Doves" appears in this issue and whose "Ruby-throated Hummingbird" and "Harbingers of Spring" were in the summer and spring issues, respectively, is Poet Laureate of Kentucky and a member of our society. She is a graduate of Western Teachers College, who gave up teaching some time ago to devote her time exclusively to writing. Her poems have appeared in many magazines, and she is widely recognized for her verse. Mrs. Semple has promised, as her contribution to our magazine and its work, to supply us with a poem for each issue henceforth.

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Leonard C. Brecher, whose article leads in this issue, received much praise from the Kentucky Academy of Science for it. The editor immediately requested it for our magazine.

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SHORT NOTES

A CITY SPARROW HAWK

One day toward the end of June, 1941, I was disturbed by the Robins in my back yard. They were making such an unusual fuss

about something that I left my work and went to investigate. Their attention was centered on a Sparrow Hawk sitting on the brick walk near the kitchen door. There were more than a dozen Robins on various perches near the house, calling anxiously to each other. Occasionally one would fly down near the hawk, as if to inspect it, but I saw none of them actually peck it.

As I live in an old and thickly settled part of Louisville, I was very much surprised to see a Sparrow Hawk at all. Indeed, I have never seen any others there, before or since this time. This one, however, was definitely there and apparently a little puzzled about it. Its feathers were all fluffed up, and I thought at first it was a young bird, but I am not so sure now that it was.

When I went out on the walk, the hawk walked before me around the house; then it climbed the trunk of a maple tree next door. As it climbed, it raised its wings occasionally, but the wings, though apparently uninjured, would not bear it up. About twenty feet up in the tree the hawk settled itself and remained there the rest of the day, as I could tell by the fussing of the Robins and its own infrequent call.

About five o'clock in the afternoon two other Sparrow Hawks came to visit it and sat on the telephone wires across the street, calling anxiously. My hawk answered them but did not try to leave its perch. The visitors were not seen to leave theirs until they left an hour later.

The next morning my Sparrow Hawk was gone. I examined the tree and ground carefully but could not find so much as a feather. I like to think that the bird recovered from its indisposition and left under its own power.

Burt Monroe, to whom I told this story, suggested that the bird may have been stunned by flying into a wire.

—ESTHER E. MASON, Louisville

THE NIGHT HAWK'S SITTING POSTURE

Of course, everybody who knows the Nighthawk has observed its habit of sitting lengthwise on a limb. I have often found it sitting thus. On July 24, 1943, I found one sitting lengthwise on the top of the outer wall of our library building at Western, even though the stone was much thicker than the bird was long. About August 16, 1943, I saw a Nighthawk sitting on a telephone wire in front of my house, the first one I recall having seen in that position. In spite of its having to clutch the small wire to maintain its position, the bird was turned almost straight with the wire, forming a pattern that contrasted strangely with the usual pattern of birds on wires.

—GORDON WILSON, Bowling Green.

SPARROWS DROWN IN RECORD DOWNPOUR

We who have been wanting rain got our wish a week ago when the heaviest rain in the memory of man fell on London and the country all about. In forty-five minutes, between 6:35 and 7:20, exactly four inches of rain was registered in the water company lot, and the light rain that followed added another three-tenths of an inch. When John Hardin told me that he picked up 158 English Sparrows, which had been drowned, under one tree at his home at Fariston, I thought it surely must be an all-time record for such

destruction. But Jailer R. W. Dyche went him several better. In the courthouse yard Monday morning he picked up (or had picked up) 942 English Sparrows, 220 under one tree, and two Flickers. There has been no report of any Starlings being drowned.

—London, (Ky.) SENTINEL-ECHO, quoted in LOUISVILLE TIMES, August 10, 1943.

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BIRDS NESTING ON A CITY LOT

During the last two years I have made observations on birds breeding on the lot where my home is located, 104 Northwestern Parkway. The lot, 50 by 250 feet, is at the edge of a rather thickly populated area, about four blocks from Shawnee Park, and separated from the Ohio River by a steep slope and a broad field about 900 feet in width. There are about twenty trees on the lot, including dogwood, American elm, wild cherry, black locust, spruce, water maple, and sycamore. We also have considerable shrubbery around the house and along the fence rows.

In the spring of 1942 we counted six nests: two of the Mourning Dove, about 15 feet from the ground, one in a small elm, one in a spruce; one of the Brown Thrasher in a honeysuckle bush, about seven feet from the ground; one of a Cardinal in a honeysuckle, which did not contain any eggs; and two of English Sparrows under the eaves of the house. Two Doves were brought to maturity in each nest, and the Thrashers also raised two. This year, 1943, we counted eleven nests. Mourning Doves built a nest again in the small elm and successfully raised two broods. Doves also nested about ten feet from the ground in a water maple. A third nest of this species was built in a spruce. Eggs were laid twice within two weeks in this nest, but unfortunately they were destroyed both times by predators, apparently Blue Jays. Two nests were built by Catbirds in mock-orange bushes, both about seven feet from the ground. In one nest several young were raised, but the other nest was abandoned almost immediately after construction. Wood Thrushes built two nests, both in elm trees, one about twenty-five feet from the ground, the other about thirty-five. Broods were reared in both nests. We also found one Robin's nest in a honeysuckle bush about seven feet from the ground, where young were successfully raised. Two pairs of English Sparrows nested under the eaves of the house, another pair about forty feet up in an elm. In the field back of the lot a pair of Bobwhites raised a brood of fifteen. A Song Sparrow was seen carrying nesting material into a bush in the next lot. In the two years we have found seventeen nests in a typical city lot, from which thirty-five young were brought off.

We have counted about forty different species in our yard, including, besides those already mentioned, the following: Sparrow Hawk, Yellow-billed Cuckoo, Screech Owl, Nighthawk, Chimney Swift, Ruby-throated Hummingbird, Flicker, Red-headed Woodpecker, Downy Woodpecker, Crested Flycatcher, Wood Pewee, Purple Martin, Blue Jay, Carolina Chickadee, Tufted Titmouse, White-breasted Nuthatch, Brown Creeper, House Wren, Carolina Wren, Mockingbird, Cedar Waxwing, Starling, Yellow Warbler, Maryland Yellow-throat, Meadowlark, Baltimore Oriole, Bronzed Grackle, Cowbird, Indigo Bunting, Goldfinch, Slate-colored Junco, Chipping Sparrow, White-crowned Sparrow, and Song Sparrow.

—GEORGE G. MCKINLEY, Louisville.