

AVIAN HABITATS IN THE THORN-BUSH AREAS OF NATAL

BY RAYMOND B. COWLES

THE following observations were made by the writer while engaged in collecting and research in the thorn-bush area of the Umzumbi valley about sixteen miles northeast of Port Shepstone, Natal, South Africa. Most of the records were obtained during a period of eighteen months spent in this territory in 1925 and 1926. At that time no organization of the data dealing with this particular topic was attempted and it was not until several years later, when the notes were being coördinated for other purposes, that the ideas expressed here began to appear.

As a result of these studies, it appears probable that nearly identical habitats require entirely different degrees of specialization. At one extreme there are those habitats requiring little adaptation and at the other, those which impose unexpectedly rigorous demands upon their avian inhabitants despite the fact that birds are ordinarily very mobile forms and therefore might be expected to show sufficient versatility to enable them to meet conditions in what appear to be similar habitats. In the habitats that seemingly require less rigid conformity there is no doubt the factor of greater adaptability of many species of birds and their consequent penetration into floristic areas other than those which are particularly favorable to them. This behavior is also facilitated by the fact that the differences between the zones are not as great as in some places where the bird fauna is sharply confined to restricted areas.

In discussing the local distribution of the fauna the following general types of vegetation seem of greatest importance:¹ the *coastal mesophytic bush*; *thorn bush*; and *scattered bush* which may be of two types, that is, allied to either the coastal bush or the thorn bush, and characterized by the plants of either area forming clumps of from ten or fifteen feet to twenty or thirty yards in diameter. These scattered clumps of trees and shrubs may be subdivided, from a botanical point of view, into three kinds: (a) a vestigial bush, that is the remnants of the larger bush; (b) nuclear clumps, progressing from a single tree to an aggregation of other plants; and (c) areas that appear to be clumps in a static condition, existing because of some small, clearly delimited aggregation of factors necessary for their existence, but which will neither spread nor contract under normal conditions. From the zoological point of view, scattered bush, irrespective of its type other than the major divisions of coastal or thorn-bush nature, can be considered as of one kind only. This, however, probably holds true only

¹ For detailed study see Bews, J. W., The plant ecology of the coast belt of Natal. *Ann. Natal Mus.*, vol. 4, pp. 367-470, 1919.

when considering the larger forms of life with greater powers of locomotion. A study of the invertebrate life in these isolated clumps of bush might reveal interesting cases of origin and distribution, that would prove excellent subjects for ecological research.

In addition to the bush and scattered bush, there is the tree association. This may again show affiliations with either the coastal bush or the thorn bush. Between scattered bush and scattered trees are clumps or patches of shrubby growth, limited in extent and with only a few obvious faunal differences. However, there may exist a greater difference than was observed by the writer. The scrubby growths are intermediate in character, and fill the gap between the bush on the one hand and the grassy areas on the other. The grass areas fall into two categories as seen from the zoological standpoint. These are composed of the areas lying between bush, scattered bush, and scattered tree, never large in extent and frequently interspersed with clumps of shrubs. The other type is found on the ridges and hills and is much more extensive, contains fewer trees and scattered bush, and these are therefore much farther apart, so that such country is composed largely of wide, open fields.

Along the rivers and streams are swampy areas. These are again divisible, but the differences are not well defined, although it is obvious that the reed beds and smaller marshy areas at the edge of a pool are different in nature from the more extensive and almost entirely marshy areas in some of the valley bottoms. Birds, and apparently mammals, may be found in one type, while absent in the other, but there is some penetration from one to the other in both cases.

In noting the local distribution of the various species of animals, these habitats will be used, and yet it is obvious that many species are not strictly confined to any one of the smaller divisions that have been listed, and the following note from the writer's field journal relating to the distribution of the Black Cuckoo-shrike, *Campephaga flava*, illustrates fairly well how a comparatively small difference in habits may affect distribution in these areas. "Like many other birds found to occur in similar situations it (*Campephaga flava*) doubtless wanders freely through the treetops of the larger bush areas, keeping in the sunshine and living under conditions which are essentially the same whether occurring in large bush or a smaller one growing in the open by itself. It is probably due to this habit that it and many other species are not confined to either type of bush, or for that matter to bush at all, as several species range about among the scattered trees as well." The species which appear to be most closely confined in their distribution within the types of bush are those living lower down in the thickets of undergrowth or in the ground cover or on the ground. Birds from the scattered bush are usually present along the edges of the

large bush but not inside it. Birds that seem to be more typically scattered-bush forms, but which live at the higher levels, seem to penetrate widely into the large bush, but the reverse is not true. Birds which live in the thickets of the large areas of bush are almost entirely confined to the large bush, and are only occasionally found in a few particularly favorable localities in the smaller scattered bush. Tree-top birds, found mainly in the larger bush, are seldom found in smaller areas; in other words, the dwellers of the scattered bush are not as specialized in habits as are the others. All of these facts apply with even greater force to the larger species of birds.

It is regrettable that more opportunity for collecting mammals, amphibians and reptiles was not available, as in these forms one might expect to find greater specialization in response to minute differences in environment. The mammals, especially the smaller members of the groups, are able to fit into more minute niches and since they are for the most part more directly dependent on plants for food, as well as shelter, they might be expected to furnish good corroboration of facts discovered in botanical ecology. The amphibians are ordinarily strictly confined to definite types of environment and many reptiles are dependent on both the mammals and amphibians for their existence.

It will be noted that the main vegetational areas are bush; scattered bush; edge of the bush, including marginal areas of both types; shrubby areas; grass; and marsh. These areas are again subdivided, the bush habitats into three zones, grass into two, and marshes into two scarcely distinguishable types so that here they will be included as one.

The bush and scattered bush are subdivided on the basis of layers. The uppermost, or tree tops, includes only the greater amount of foliage, the free, projecting portions and the liana-free limbs. Below this zone is the intermediate layer, composed for the most part of liana-draped limbs of the larger trees, a mixture of lianas, and tree foliage of the smaller trees including the tops of those of intermediate height, shade-loving, smaller trees and bushes. The lowest layer contains the ground-cover plants, including the predominant herbaceous *Isoglossa woodii* of from ten to twenty inches and other fairly tall annuals and low perennials, and the ground-surface itself. These three divisions are most conspicuous in the bush, but occur also in the patches of scattered bush, especially the larger ones, where they are necessarily less sharply defined since there is some lateral penetration of light. There would be even less differentiation between the layers were it not for the character of bush in these inland valleys, that is, low growing, and invariably having thickets along the margins reaching high enough to approach the roof-like upper strata.

The grassy fields as before noted, fall into two main types, although a third feebly characterized area is present. This third area has been in-

cluded with the lowland grass association, with which it has such close affinities from an ornithological standpoint as scarcely to justify separation. It is the tall, clumpy grass zone usually found in proximity to trees and scattered bush, and separated from these sections by the shrubby area into which it merges.

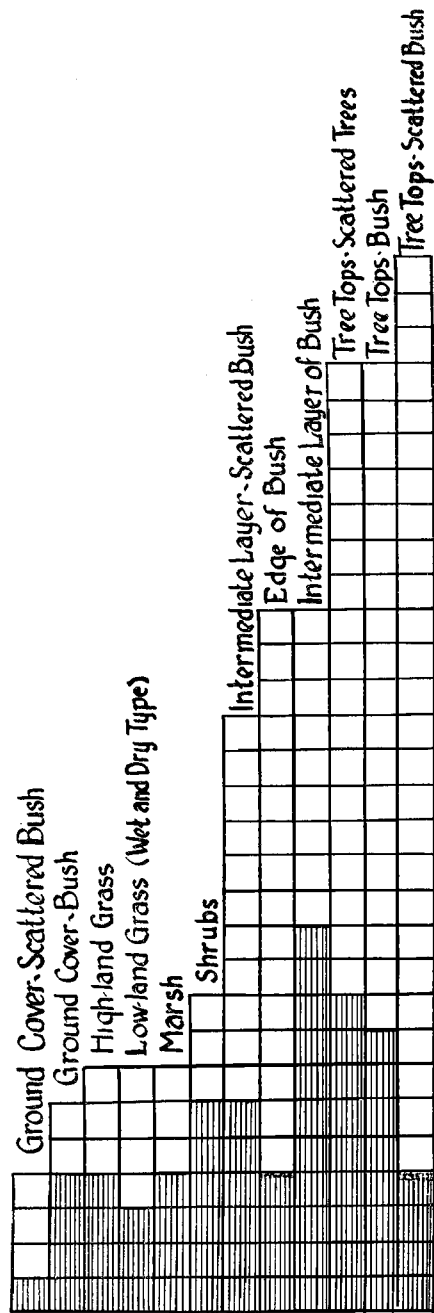
When an attempt is made to assign the birds to these various habitats, some interesting facts appear. Certain species are easily and clearly placed without confusion; these species are sedentary or at any rate never wander from the specific zone to which they are particularly adapted. Others cannot be so easily placed and are found to pass readily from one of the habitats to another. These habitats obviously are either less differentiated or the birds inhabiting them are not restricted to them by specialization. It is noticeable that it is easier to place bush birds in their respective layer than it is to assign them to their place in the horizontal distribution. There is considerable vertical movement but the birds in the lower areas are seemingly more closely restricted to their habitat than are those of the tree tops, and the ground-cover forms are the most restricted of all. This may indicate that there are great differences between tree-top zones and the tree tops of the bush and scattered bush. This is also indicative of the apparently greater adaptation to a specific habitat in the lower layers of the bush, a theory that is well illustrated by listing the birds remaining in any given location following deforestation and the planting of fruit trees, or non-native trees such as *Eucalyptus*, *Grevillea*, *Acacia* of the tanbark-wattle type (*Acacia nigra*), umbrella or China-berry tree, etc. A rather satisfactory list of tree-top birds can be obtained under such conditions, but the garden thickets composed of roses, weeds, berry vines, etc., scarcely ever harbor species found habitually in the lower layers of the bush. They are unable to survive the drastic change.

When the facts are considered with a view to determining which habitats require the greatest degree of specialization, it seems probable that those having the greatest proportion of fixed-habitat species are also those requiring the greatest degree of specialization. It is exceedingly difficult to determine which species should be considered fixed in habitat since the criteria applied may be varied according to the point of view as to which are of greatest importance. The nesting place might be considered as a basis for placement of a species but here one encounters those birds having a fixed type of nesting place in which they may spend sixty or seventy per cent of the time but only during a comparatively brief period of the year, while the rest of their existence is passed in their feeding and resting territory, often very different from the nesting area. If classified solely on the basis of feeding grounds which they inhabit, the species are not accurately placed since this also represents only a small portion of their existence, the

daytime habitat. Probably the best basis on which to judge the true habitat is a consideration of the areas to which they retire in the presence of danger. When the collector appears on the scene most species of birds tend to select a certain section of their general habitat into which to retire. Judged on this basis the birds can be assigned with some degree of accuracy to habitats, using what is probably one of the most important elements in their existence as a guide. It is admitted, however, that when confronted by danger in the form of a hawk, certain species dive into the nearest available cover while the same species upon being frightened by man, seeks safety in the higher trees or takes refuge in flight. Another difficulty is encountered in placing even some of the most closely restricted species, as for instance *Camaroptera brachyura brachyura*. A condition is sometimes reached in the development or reduction of an area that is in transition, so that it may provide, to a limited extent at least, conditions similar to those typical of the habitat of a certain species. The occurrence of individuals of the species adapted to such a habitat can easily be included as an example of overlapping and so species actually quite restricted may be classified incorrectly, as less restricted. If the situation involves a species of bird in a very small group of types such an error may change appearances considerably.

In compiling the data for the accompanying chart an attempt was made to balance certain habits against others of seemingly equal importance. Also it should be noted that the data suggesting these results were compiled without any intention of explaining distribution or conditions in habitats. The ideas followed the arranging of the data. It is well understood that the attempt to balance one factor of apparent importance against another of seemingly equal importance is likely to result in errors, but such a procedure was necessitated by the fact that the data, while being collected, were not critically examined with a view to the present use. The chart, which has resulted from a study of field notes, is in its present form merely an attempt to attain a happy medium with a minimum of misinterpretation. It presents a phase of distribution that seems rather interesting, but it should not be considered as complete.

Certain interesting speculations arise from a consideration of the chart. Birds fall into two classes for which the terms itinerant and sedentary are used. Those species inhabiting the tree tops of scattered bush are the least specialized in habits, suggesting that this is the most generalized type of habitat. The greatest discrepancy between number of itinerant and sedentary forms exists here. Birds of tree tops of the larger areas of the bush and birds of the tops of trees in the open show somewhat less generalization, there being fewer itinerants in proportion to sedentary forms in these habitats. The reason for this is somewhat obscure. The natural



HABITAT DISTRIBUTION OF
BIRDS (114 SPECIES)
NATAL, SOUTH AFRICA

- ITINERANT SPECIES
- ▨ SEDENTARY SPECIES

supposition is that trees in the open would present fewer demands in the way of specialization than those in the bush, or scattered bush, and would therefore stand in the first place as regards simplicity. It is probable, however, that these two areas are more specialized. Tree-dwelling birds of the bush apparently require a wide expanse of leafy foliage below them for shelter and for roosting places at night when they must depend on secretiveness for escaping their enemies. In the daytime they depend on their own alertness and activity to escape danger. On the other hand, birds of the open living in the trees depend upon the fields of grass as a source of food, and would be unable to obtain food from the customary place, lower levels, in the bush. A hawk dependent on field mice would obviously be unable to subsist in a forest without drastic changes in habit, and on the other hand, a Purple-crested Lourie dependent for protection at night on the thick vegetation below it, would be unable to find much satisfaction in a night spent in a tree top out in the open. Birds living in the scattered bush, however, find no such extremes in their environment and roam to trees in the open and trees in the bush with almost equal satisfaction.

The ratio between sedentary birds and vagrants in the intermediate layer of the bush indicates that these species are even more confined to, and dependent on a special habitat than those of the preceding areas, and it is obvious that there is little similarity between an intermediate layer of the bush and any of the other areas with the single exception of intermediate layers in scattered bush. Therefore, while tree-top birds find three somewhat similar areas in which to move about, the intermediate-zone birds find only two, and the figures suggest that this area of the scattered bush is less specialized than the same layer in the bush. The intermediate layer of the bush contains eleven sedentary and nine itinerants; the intermediate layer of the scattered bush only six sedentary to eleven itinerants.

As might be expected the next habitat, edge of the bush, an area having close affinities with shrubby areas and in places overlapping, indicates that it requires little adaptation on the part of its inhabitants,

Shrubby growths, since so similar to edge of the bush might be expected to resemble it in most respects but when examined as it stands in the open, not connected with the bush, it seems to have requirement affinities almost as dictatorial as the next three areas; *i. e.* marsh, grass of two types, and ground cover in the bush, all of them apparently imposing sharply defined requirements on resident forms, therefore containing only species definitely fitted to cope with special conditions existing within their confines.

The last habitat, ground cover in scattered bush, suggests that little specialization is required in order to exist within its rather unspecialized territory.