BACKGROUND TO BIRDS

By the same Author

A CHILD'S BIOLOGY

BIRD BIOLOGY FOR BEGINNERS

Heron taking off from the nest

BACKGROUND TO BIRDS

By BRIAN VESEY-FITZGERALD, F.L.S.

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CHAPTER ONE

The Bird's World

IN THE previous book in this series[1] I wrote about the bird purely as a bird. I dealt with its physical appearance and with the factors that helped in the making of that appearance: with feathers and beaks, eggs and nests, songs and flight and senses. But I did not relate the bird to the world around it, for that book was one entirely on the biology of birds. This is a book about the ecology of birds. The word should really be spelt œcology (but nobody does spell it like that nowadays) and it means "that branch of biology dealing with the living organisms' habits, modes of life and relations to their surroundings". Biology and ecology are really complementary, but they must be taken in their right order; the physical appearance of birds and at least a little about the factors that help in the making of that appearance must be known before you can begin to understand the bird and to study the bird in relation to its surroundings.

How do you study the ecology of birds? By watching very carefully and making notes all the time. That sounds quite simple; and at any rate it is a cheap form of amusement—you do not need much equipment just for watching.

A great deal of nonsense is talked and written about the equipment required by a naturalist. The cornerstone of all nature study in the field is *knowing where to look*. And that does not need any equipment at all. But until you know where to look (and what you are looking

[1] *Bird Biology for Beginners*

for) you will not get far. For example, I do not know very much about snails, and I do not study snails at all. Because of this I do not notice many snails about (except in my garden!) and I know very well that I miss seeing a great many snails because I am not really interested in them and do not know where to look for them. I am always looking for something else and so only see snails by accident. But a friend of mine, who is an expert on snails, sees every snail that it is possible to see when he is out for a walk. He knows where to look. Everything springs from that.

You cannot be taught where to look in a book, not even in a library of books. The basis of all field natural history is the ability to recognize and to interpret the signs of the countryside . . . the direction of flight of disturbed birds, tracks and other signs on the ground, disturbed foliage, broken twigs, and so on. And the only way to learn these things is experience in the field. The quickest way of getting that experience is to go into the fields and woods with an experienced naturalist. (Do not make the mistake of thinking that experienced naturalists are only to be found in natural history museums. If you want to know the ways of wild creatures and if you want to be able to read the signs of the countryside you will do a great deal better to make friends with farm labourers and gamekeepers.) But if you cannot find a good naturalist to teach you, then go by yourself and learn from your own experience. It is the slower way, but I am not sure that it is not the better way.

Now, do not think that to get to know animals you have got to go crawling about on your hands and knees, hiding behind ferns and so on. That sort of thing will only disturb every living thing in the neighbourhood, and it will not do the knees of your trousers any good

either! A good naturalist is always a quiet person. He does not disturb things more than he can help. Incidentally, it is not only noise that disturbs wild creatures: bright colours do that just as much. Bright colours on a human being hold no attraction for wild creatures. So dress yourself in quiet colours, colours that match the countryside as closely as possible. Brown, grey or green are the best. And, of course, the older your clothes are the better, so long as they are still strong and serviceable. You may want to wade a stream or climb over a barbed-wire fence or lie down in a ditch, and you should always be prepared for such things.

Beyond clothes, what do you need? Well, the list of equipment is huge. Telescope, field-glasses, microscope, pocket lens, camera, gun, net, collecting box or bottle, killing bottle, scalpel, setting-board, vasculum, storing cabinets, books, and you can go on adding to these almost for ever. They are, no doubt, very useful if you know how to use them. But they are useless if you do not. They are aids, not essentials. You can become a very good naturalist without possessing any of them. The absolutely essential equipment of a naturalist is marvellously cheap: a pocket book and a pencil . . . and brains.

The first business of a naturalist is to observe. The second business of a naturalist is to record what he has observed. Now, that sounds easy enough. And yet, you know, there are very few men and women who can observe; very few people are really observant. They just do not know how to do it. Observation is not a matter of using your eyes only, but of using your eyes in conjunction with your ears and your brains. Most people will walk past a nightingale singing in the daytime, and not know that they have done so. They are not deaf, and the sound must make some impression on their ears, but they do not *hear* it. Most people will tread

on daisies or buttercups, even on a beetle on the road. They are not blind and they see these things, but their eyes do not understand what they see. Very, very few people will notice a bird flying above their heads. Very, very few people ever look upwards. Now, these people . . . and they are the majority . . . are very well able to appreciate music and pretty flowers, and few of them would tread on a beetle just out of spite: but they just cannot observe. Their eyes and their ears and their brains are not as one instrument. It takes time to become really observant. You do become observant with practice. That is not enough though. If you notice things, you must keep a record of what you notice. No matter how good a memory you have, if you do not put everything down on paper, you will forget something, and that something may well be the most important thing of all. I have said "put *everything* down", and I mean *everything*. Yes, even the most trivial little point. If you put down only the things that you think important at the moment, you will miss out something that may well prove very important in later years. The most trivial little point of to-day may become the most vital point of to-morrow, when it fills a bigger picture, fitting into the all-important gap. You cannot begin too early to keep a notebook.

And now about field-glasses. A telescope, of course, gives you greater magnification, but a telescope is a tricky instrument to use. You cannot handle one in a hurry: also the field of vision is limited. So I would advise against a telescope, and recommend binoculars. They are light and easy to carry; they cover a wide field of vision; they are excellent for picking out small objects from a featureless background, such as sky or water. But the term *binoculars* covers a wide range of glasses, some of which are of no use at all to the naturalist, so it

is important that you should know something about them before you go into a shop to choose a glass.

There are two main types of binoculars . . . prismatic and non-prismatic. You should have nothing to do with the non-prismatic sort. They are no more than a couple of parallel tubes that you look directly through. Generally they have a very small magnification, and their field of vision is two small intersecting circles, which are supposed to show side by side but which in my experience are rarely level. Non-prismatic glasses are generally lighter than prismatic, and are also cheaper, but I cannot recommend them at all. If you want something lighter than the prismatic glass, there is not much wrong with the ordinary small opera glasses. I usually carry a pair with me. They fit into the pocket of a jacket very well and often come in handy, for you cannot always carry binoculars about with you.

With prismatic glasses you get the best combination of lightness, magnification, range of vision and reliability that it is possible to obtain at the present time. Prismatic glasses have an angular shape, due to the use of a series of small mirrors, and the field of vision consists, not of two small circles, but of one large one. With a good pair of prismatic glasses the magnification does not result in any blurring, but retains a satisfactory sharpness.

Then there is the question of power. It is a common mistake to imagine when buying binoculars that the thing to go for is power, that you need the most powerful glass obtainable, or at least the most powerful that you can afford. But you want to be very, very careful over this question of magnification. The higher the magnification the more money the glass will cost, but actually the matter goes far beyond money. For example, every increase in magnification is obtained only by a corresponding decrease in range of vision and a restriction in

the light-transmitting capacity. The decrease is heavy. The field of vision in 6x glasses at 1,000 yards is about 150 yards across, in 8x glasses about 100 yards, and in 12x glasses only about 70 yards.

You might think that the range of vision at 1,000 yards a matter of no importance unless you wanted to look at the scenery as a whole, and that for focusing on any particular object the loss of range would not matter. That would be true enough if you could always focus on a particular object and that object was always still. But you have got to pick up your object first and then focus it, and wild life is very rarely still. Think for a moment of a bird settling in a hedgerow. If you have 6x glasses you are quite likely to pick up some recognizable feature in that hedgerow at once and so get on to the bird quickly. If you have 12x glasses you will have an excellent and very highly magnified view of a portion of the hedge, so highly magnified that it will be very difficult to pick up any recognizable feature quickly; and by the time you have got on to the spot where the bird was it will probably have left. There are other drawbacks. Bad light means much strain for the user of high-powered glasses. Focusing is a slower job. Any unsteadiness is magnified to an almost unbearable extent with a high-powered glass. Indeed, I very much doubt whether a 12x can be properly used without a stand, and both 10x and 8x suffer a good deal from vibration. I am, you will see, a 6x man. I think that a very good case can be made out for an 8x glass if it is a first-class instrument made by a first-class firm, but you will get all you can possibly need in a 6x by a good maker. Remember that in field-glasses you have no check whatever on quality and durability other than the manufacturer's name and reputation. It is thus well worth while to pay a high sum for a good glass by a good

maker. There were plenty of cheap French and British glasses on the market before the war: most of them were utterly unsuited to the naturalist's purpose, and many of them were thoroughly unsatisfactory. Therefore, choose your glass from a maker of world-wide reputation, and get the lightest weight and smallest size possible without sacrificing magnification and range. See that the case is a good tough case and that the straps are of leather. My own glasses are 6x Goerz, and they have given me first-class service for many years. I paid £9 for them, and they have proved very cheap.

Armed with your eyes (and glasses to aid them), your ears and your brains, a notebook and a pencil, you may now start to study birds. And this brings us back to the bird in its natural setting.

Comparatively few people think about birds in relation to the rest of wild life. It is strange that it should be so when you come to think of the vast number of books written about birds. There are many books which will help you to recognize the different birds by means of coloured illustrations and which will tell you, briefly, quite a lot about each bird. But they will tell you only about birds. As a result a great many people can recognize a great many varieties of bird, many can recognize the songs and calls of many different birds, but few people ever think of the "why" of birds. People seldom wonder why they have such-and-such a bird nesting in their garden or think why some particular kind of bird should be very common in their neighbourhood, while another should be uncommon or absent altogether. Birds are not haphazard creatures, and, though they do sometimes turn up in the most unexpected places purely by chance, as a general rule there is a very good reason for their being where they are. And that reason in ninety-nine cases out of a hundred

is the *soil*. The soil determines the life of the bird in the air just as, in the last essential, it determines all forms of animal life. Birds are just a part of a greater pattern.

As I told you in the first book in this series[1] almost all life depends upon green plants. You can go further back than that if you like (indeed, you ought to do so) and say that all life depends on the sun. As you know, the earth was once a part of the sun. It was thrown off by the sun ages ago, when it was not solid, as it is now, but so hot that nothing could live on it or even live anywhere near it; just as the sun and the stars (for the sun is a star and rather a small one at that) are so hot now that nothing can live on them or anywhere near them. Yes, the earth was once part of the sun, and it is still controlled by the sun, and so is everything on the earth—absolutely every living thing, be it animal or plant. The sun does much more than just give us light. It gives us life. Without it there could be no animals and no plants.

The plants are most important, for they contain the green colouring matter on which we all live. It will sound a bit odd to you, but you live almost entirely upon grass. So do we all. It has been calculated that every person in Britain eats about £10 worth of grass every year. If you think about it for a moment, you will see how it happens. Mind you, I did not say that we lived *entirely* upon grass; I said *almost* entirely. But we do live entirely upon green plants, or rather upon food derived from green plants. That covers even fish, for in the end fish also depend upon green plants, the almost invisible little green plants called diatoms, about which I told you in the first book. All life depends upon green plants. They are the things that give all living things energy, that replace the energy that is expended in living. A tremendous amount of energy is used up just in remain-

[1] *A Child's Biology*

Marsh Warbler

Wood Lark

ing alive; even things that do not move about from one place to another, things like trees, use up a lot of energy. Your heart, for instance, beats just the same if you are awake or asleep. (As a matter of fact your heart beats between 70 and 80 times a minute, and that means that it beats about 37 million times a year and each beat uses up some energy, and each little bit of energy that is used up has to be replaced.) So what it comes to is this: that all living things get their energy from green plants, and the green plants get their energy from the sun.

You will see that you cannot really study one form of life quite separately from all other forms of life. The bird books with the coloured illustrations that help you to recognize the various birds perform a very useful function, and they tell you a lot about the individual bird as well; how many eggs it lays and so on. But it does not tell you how it lives; it only tells you that it does live. Really to get to know birds you must get to know them against their background.

Plants, which are in the long run the only source of energy that keeps life going, depend upon the soil and the sun for nourishment. Directly or indirectly all living creatures live upon them. Birds cannot get any nourishment from the soil itself. A few, it is true, live entirely on vegetable matter that has come from the soil, but the vast majority live on the insects or other creatures that live on the plants that live on the soil. This is equally true of the birds of prey though they are a stage further removed from the soil. Most birds are directly dependent for their sustenance on the creatures that feed upon the plants.

Now, the kinds of plant determine the kinds of insect and, often, of mammals; and these very largely decide the kinds of bird. The kinds of plant are themselves determined by the composition of the soil . . . that is,

whether it is limestone, sand, chalk, clay or whatever it may be. So you see that, in the long run, it is the sort of soil you have that decides what sort of bird you have.

Just looking casually at plants, looking without thinking very deeply, you might think that they were scattered about indiscriminately without any particular plan or order. That is very far from being the case. Plant ecologists (plant ecology, by the way, is a much older science than animal ecology) have discovered that plants grow in regular societies and that these plant societies are usually made up of a few dominant (that is, ruling) plants of different kinds and a number of other kinds as well, which are subordinated to the ruling species. Each of these societies is restricted to certain kinds of soil, and when the soil changes a new kind of society comes into being. For example, you find on chalk soil beech, yew and holly, and very little undergrowth. Beech is the dominant plant here. In lowland woods you find oaks growing with hazels and with a good deal of undergrowth, such as brambles, bracken, honeysuckle and bluebells. Oak is, of course, the dominant plant here. You will be able to think of other societies . . . like heath and heather on moorland, and so on. In fact, if you think for a moment you will realize that you expect to find certain plants in certain places. You expect to find heath and heather on moorland; you expect to find juniper and yew on the open chalk downs, and you expect to find old man's beard in the hedgerows running up to the downs; you expect to find rushes and buckbean and moss in boggy places, and so on. All these are societies and they are the things that make the landscape.

Just as you find plants in societies, so you will find birds in societies, but bird societies are not so closely knit because birds have the power of flight. So you will find some overlapping, and probably all but the most

specialized birds in two or more societies. Naturally, too, the season of the year plays a part in deciding what sort of a society you will find. For example, it will be different in July from what it was in January, even though the place is the same and the vegetation has not changed much.

Let me give you two examples of societies, which are both very close to my home.

We shall visit the first one in February. It is one mile long by half a mile wide, and between 300 and 400 feet above sea-level. It is a chalk down. The plant society is beech, yew and a good deal of holly; there is a little elder, three small clumps of old spruce trees, some hazel, and four small squares of larch planted for the shooting. There is very little undergrowth, but there are a few brambles.

Skylarks are common. There are five sorts of tits . . . great, blue, coal, marsh and long-tailed. The most common is the coal, the least common the blue. Goldcrests are fairly numerous; there are some tree-creepers and one or two great spotted woodpeckers. Chaffinches are common; there are some bullfinches and one pair of hawfinches. Blackbirds are rare. There are some wrens and a robin or two in the elder. Mistle-thrushes are common, song thrushes are not so common. Large numbers of redwings roost in the spruce. There are four sorts of owls . . . tawny, barn (one solitary bird), long-eared and little . . . and a pair of sparrow-hawks. Dunnocks (that is the proper name for the hedge-sparrow), linnets, yellowhammers and even house-sparrows are to be seen, but they are obviously passing through. There are no starlings. In the thicker bits of wood there are some jays, and woodpigeons are plentiful.

Let us examine the second society in May. It is a common, between 230 and 270 feet above sea-level, and

the soil is Lower Greensand. The plant society is gorse (any amount of it), a few dwarf birches, some pines, and along the southern boundary there are some willows and an ash. There are two or three rather swampy bits with some heather, bog grasses and osiers. The most common birds are the willow wren, the meadow pipit, skylark, linnet, chaffinch, whitethroat .... in that order. Next come stonechats and dunnocks. There are some lapwings and two pairs of wheatears. In the two bigger boggy patches there are usually some snipe (there is, as a rule, at least one nest here each year and some years there are several), one pair of sedge-warblers and two pairs of reed-buntings. The cuckoos prosper. There are a few blackbirds and thrushes, but they are obviously only foraging, and the same is true of the starlings that visit the common every evening. There is one pair of whinchats, one or two pairs of grasshopper-warblers, and one pair of stockdoves. On the southern boundary there are great tits, blue and long-tailed tits, some tree-creepers and nightingales. There are no hawks or owls. But, of course, sparrow-hawks and kestrels hunt across the common, and so do owls.

Now, in this second society there are included migrant birds (the redwing is the only migrant in the first society), and the time of year has made a great difference. But you will see that there are some birds that are common to both societies, and one very common bird is absent from both. In most societies you will find a similar overlap. For example, the black-headed gull has now adapted itself so thoroughly to modern conditions that you find it on the seashore, on ploughland, and in riverside towns. Indeed, cliff societies are about the only ones that are now pure and without any considerable overlap. There may also be some slight change in the composition of a society from year to year, but broadly

speaking you should be able to find the same members each year. In the two examples I have given you the members have been the same for a long while now. Of course, there are temporary additions, and sometimes these are exciting. One year there was a golden oriole in the chalk-down society for a week or two, and another year there was a hoopoe in the common society for quite a long while. And there is all the time a coming and going of birds who are not resident members of the society, but which are continually crossing the ground or coming on to the ground to feed.

You will be able to think for yourself of other bird societies. It is possible to make up any number of them (and you will one day discard most of them, for you will find that they overlap with other and bigger societies) and I expect that you will soon come to the conclusion that one of the most important of all bird societies is that of the garden; another that is very important, but not quite so easy to fix boundaries to, is that of the hedgerow. And when you come to do this for yourself you will come to the conclusion also that you cannot stick too closely to the boundaries of plant societies for your bird societies. And you will be quite right! You cannot stick too closely to the plant societies.

Originally, of course, the association between the plant society and the animal society was very close indeed, much closer than it is to-day, for nowadays Man is continually interfering with nature. The garden is a good example, for the plant societies of gardens are not natural societies. You cannot, therefore, follow the plant ecology too closely; you must not stick to the plant ecology too rigidly. It is a very good indication, and the connexion must never be forgotten; but bird ecology should be studied on its own, as a separate science, the points of contact with plant ecology being carefully

noted, but not allowed to take a dominant position. When we have much more information than we have at the moment, we may be able to interlock the two once more as closely as they were once interlocked before man came to upset the balance of nature.

This does not mean to say that there are not some birds (and mammals) that are not strictly confined to zones by the vegetation—there are. A very good example of this exists in Britain in the game birds. The ptarmigan lives high up, where the vegetation is a purely alpine one; the red grouse lives at a lower elevation where the vegetation is a heather one; the capercaillie is a bird of the coniferous woodlands; the pheasant a bird of the deciduous woodlands; the partridge a bird of the grassland and the cultivated lands. You will never find the ptarmigan outside its vegetation range; you will never find the capercaillie in deciduous woodlands; you will not find the partridge in forests. It is true that you will find the pheasant in all sorts of odd places, but the pheasant, you must remember, is an introduced bird that receives a good deal of attention and care from man, a bird that is reared to be shot. The recent war has proved that it is well able to take care of itself, if uncared for, but the recent war has also proved that it is above all a bird of the deciduous woodlands, for it was in such country that it did better than anywhere else.

But in general there is all the time a flux, a coming and going, in animal communities. All sorts of factors play a part in this. There is always some change with the seasons. Again changes in the weather will mean changes in the personnel of every animal community. And then there will be the changes due to the internal and periodic rhythms of the animals themselves, and this is particularly true of birds. There are many other factors also, which you will begin to understand as you

watch. Animal societies are always altering, though the plant societies may remain fairly constant over a period of years. You can never go on to a piece of ground and expect to see all the members of the animal society of that ground active at any given moment; indeed, you can never go on to a ground and expect to see all the members of the animal community of that ground.

And you must remember that there is a constant change going on in the land itself, in its vegetation and its configuration. Many of these alterations are small, so small that you would not notice them normally, and some of them are so huge that you would have no chance to notice them at all, because they take so long to accomplish. The Ice Ages were changes like that.

But there are little changes going on all the time, and these you can notice if you are observant enough. There is a famous case, which you will find recorded in Elton's book on Animal Ecology. A naturalist watched a hollow in a beech tree for some years, and recorded the changes in the life of the hollow due to the changes in the hollow itself. To begin with, an owl used the hollow as a nesting site. But after a while the tissues of the tree grew round the hole and made the entrance too small for the owl to get through, and then the hollow was occupied by starlings, who also used it as a nesting site. Again after some time the hole grew smaller, and finally it grew too small for the starlings, and indeed too small for any bird to get through. Then it was taken over by a colony of wasps as a nesting site. Finally, the hole closed up altogether, and even the wasps had to depart. Now, the closing of a hollow in a beech tree is a very small change in the countryside, too small a change for most people to notice (but not too small a change for a good naturalist to notice) but, as you will see, it had a considerable effect on the life of that particular and im-

mediate neighbourhood. The gradual closing of the hole drove away an owl and its mate so that they had to go and find another home. They may have found one close by, but they may have not, and that would have made a tremendous difference to the mice just round there. Starlings eat different food from owls, and their coming must have made a difference too, as would their going. And then in the place of birds there were wasps. And all that just from the closing of a hollow in a beech tree!

But that sort of thing is happening everywhere every day, and sometimes on quite a big scale. The ploughing up of a field may make a big difference to the animal life of the immediate neighbourhood and it will certainly make some difference; the draining of a pond, the felling of a wood, the building of houses or of a road, the erection of telegraph posts and wires; all the things that man does to the countryside he lives in have an effect on the animal life of the area, and there are always natural changes going on as well.

You cannot notice all the natural changes that are going on around you, but you should notice some of them and the effect that they have on the bird life. You should certainly notice all the major changes, the different rotation of crops year by year and so on, and the effect on the birds and their distribution. You should certainly notice such major developments as the building of houses and roads, and their effect on the birds. And you should note down all these things in your note-books.

But you must notice these things and others like them incidentally in your watching of birds. It is the birds that you are watching, not the local building or farming operations. You see them because you are watching birds; you do not see birds because you are watching them. The birds and the way they live are the important things for the naturalist.

CHAPTER TWO

The Struggle for Existence

IN THE last chapter I used the words "society" and "community" a good deal. But you must not get the idea that these birds are living together in the sociable sense, that they are "all friends together". That is not the case: for though they are living together in societies, and fairly well defined societies at that, they are also competing and the competition is pretty fierce at all seasons of the year. This competition is not confined to birds . . . it occurs in every branch of nature, even in Man (look in a classified telephone directory and notice the number of men doing the same job in the same town, and you will realize that they are competing the one with the other) . . . but it is more noticeable in the birds simply because the birds are themselves more noticeable than, say, mice.

This competition is called "the struggle for existence". And it comes down in the end to a question of numbers. Many people seem to think that the numbers of the smaller and weaker creatures are kept down by fierce beasts and birds of prey, who hunt continually, and kill and devour anything that they can catch. It is this idea that has given rise to the saying "Nature red in tooth and claw". But it just is not true. Of course, you can divide the bird world, just as you can any other branch of nature, into classes . . . the hunters and the hunted . . . but it is a great mistake to imagine the hunter all-powerful. There are many checks on an increase in numbers: foraging beasts and birds of prey, natural hazards such as floods or gales or epidemic diseases, and

the available food supply. It is the last one that matters. The others are incidental and on the whole trivial. They have some effect, of course, but it is a very small one compared with the food supply. A certain area of land can only support so many birds; if that number is exceeded for any reason, then something happens to adjust the balance, but always there is much suffering first.

All wild creatures multiply very quickly, and they would soon outgrow their food supply if there were no checks. (That, by the way, is true also to a certain extent of Man. Man also multiplies very quickly, but his numbers are kept in check to some extent, even in the civilized world, by wars and epidemic diseases.) In the bird world one of the checks is the bird of prey.

The bird of prey is a most useful member of the bird world. It is, of course, true that if birds were left to multiply on their own without any checks there would soon be far too many for the available food supply; the numbers would then be reduced by starvation, and the whole process would start over again. But this would, you will admit, be a very clumsy method of keeping order, and you can see that it would cause a great deal of trouble not only in the bird world, but also in all the other animal communities that are connected in one way and another with the bird world. The bird of prey helps to prevent this. He helps to bring order into the bird world.

This is a point which is not yet fully understood by those men who shoot and fish. They seem to think that the bird of prey, if not destroyed, will himself destroy all the other birds or all the fish. It is nonsense, of course. Supposing that it did happen, supposing that the birds of prey did destroy all the other birds, supposing that the herons did destroy all the fish, what would they live on

then? It is absolute nonsense. No bird of prey, no heron, is as foolish as that. The bird of prey does not lower the normal population of the ground over which it hunts. Annually it takes a part of the surplus, and not a very large part at that. The bird of prey does not live on its "capital" but on the "interest", which is just what a good business man does.

But there is another point which many men who shoot and fish have not yet understood. They have the birds of prey, they have any bird that kills game or fish, destroyed, being under the impression that the game and fish thus taken would survive but for the birds of prey. This, too, is utter nonsense. The mere shooting of hawks or herons will not make a moor support more birds or a stream more fish. Indeed, neither can support more unless they are understocked to begin with. It is possible to overcrowd a moor temporarily . . . indeed, it used to be done regularly for the opening of the grouse season . . . but the excess is then killed by man. Even so the system has done much harm for it almost certainly led to the spread of grouse disease. (These remarks do not, by the way, apply to pheasants, for you can feed pheasants like hens.) And again, though this is probably impossible of proof, it is at least likely that hawks attack the weaker birds. Even so, the total destroyed each year in this country by hawks and other birds of prey is quite insignificant in relation to those destroyed by other means. Of these other means the hazards of migration, hard weather, and disease (though we do not know very much about disease in wild birds other than the grouse) account for huge numbers. But the main check remains the supply of food.

Now, you can, generally speaking, work out the losses suffered by any species by the number of young it rears. Let us take the blackbird, which is common enough. On

an average each pair of blackbirds lays nine eggs in a season. Only about half of these will be successfully hatched and reared, which means that at the end of each summer every pair of blackbirds ought to have produced four young. That is to say, that for every two blackbirds in April there will be six in August. But if the numbers are to remain steady (and taken over a period of years they do remain remarkably steady) it means that out of every six blackbirds in August only two must survive at the beginning of the next breeding season. Six in August is, of course, almost certainly an over-estimate, for one at least of the four would fail to reach maturity. Of the others one will probably fall a victim to a hawk or a cat, and another will not survive the winter for one reason or another. That leaves one over, and that is a necessary reserve, at least until the breeding season, to make up for accidents.

There must be a reserve to make numbers good in the case of wood-pigeons and starlings, which are shot on a wholesale scale by man, and it seems evident that there must be a reserve in every other case. Once the breeding season is under way, however, the reserve is not wanted and is, indeed, a menace. In some species . . . wood-pigeons and starlings again, for example . . . these unwanted birds form into flocks and forage over a very wide area. In others, they are driven away by the mated birds, and sooner or later fall foul of hawk or cat or die of starvation. So, you see, every year produces an enormous surplus, most of which dies, but some of which goes to replace natural losses.

The blackbird is resident in Britain all the year round, and I think most people would expect to find much greater losses in the migrants that come to us each spring. So, let us now take a very common one, the willow-warbler.

The willow-warbler is a much smaller bird than the sparrow, and it spends the winter in Africa. It is by no means a sturdy bird, and it certainly has not got very noticeable powers of flight. Indeed, in this country in summer, I think you would call it a weak flier. Now, you would expect an enormous death-roll in this one species, when you think of the huge distances it has to fly, and how very small a bird it is and how weak a flier. But this does not seem to be so. It arrives here every April in simply enormous numbers, so that for the summer months it is one of our most common birds. Now, three of our most common resident birds—the blackbird, the robin and the dunnock—lay two, and sometimes three, lots of eggs in a year. The willow-warbler lays only one. True, it lays a rather larger clutch, five to seven eggs as against four to five in the other species, but even so it means that it lays only half as many eggs as the others, and that means that it must suffer only half as many losses. This seems to imply that it is more dangerous to stay at home than to make the long, and, one would think, very dangerous, journey to Africa. You will find that the same thing occurs in other resident and migratory species. Our resident wood-pigeon, for example, lays two or three clutches of two eggs each summer, but the migratory turtle-dove lays only one clutch of two eggs. And this again means that the wood-pigeon must suffer much heavier losses than the turtle-dove. (The turtle-dove seems to be increasing its range as a resident species, for it now winters in Surrey and Hampshire quite frequently, and it will be interesting to see if this change of habit will produce a change in the number of clutches laid in a summer.)

Some birds lay only one egg in a year, and perhaps you will wonder how these species manage to keep their numbers steady. Let us consider the guillemot, which

lays only one egg each year. If there were 1,000 pairs of guillemots in one colony (and there are plenty of colonies much larger than that) and they all bred and there was no loss, that would mean an increase of 500 to the colonies' population in one year, which would be quite fantastic. What happens? Well, to begin with, guillemots do not breed at the end of their first year as do our small birds, so it is safe to assume that all the birds in a colony do not breed every year. Probably in a colony of 1,000 only about 500 will breed in pairs, and of these it is probable that only half will successfully hatch and rear their young. Even that gives an increase of 250 per thousand, which is tremendous. The death-rate must be very high indeed, for if it were not so the numbers of guillemots would be inconceivable. This does not mean that the guillemot is a short-lived bird . . . on the contrary, some guillemots, if they can avoid accident, live to a considerable age, perhaps even as long as Man. *If they can avoid accident.* Obviously, the risks in a guillemot's life are frequent and severe, for if they were not, even with only one egg a year, the numbers of guillemots would be legion.

One egg a year is the least number laid by any British bird. Once the bird starts to breed it goes on breeding. Birds do not breed every second or every third or every fifth year. But there are quite a number of birds that do not breed until they are quite old. Gulls, for example, do not start to breed for several years after they leave the egg. This is another way of maintaining a balance. For it means that only about a third of the gull population is a breeding population. But gulls lay more than one egg, of course, so the same rule applies as in the case of the guillemot . . . that the risks of life are very frequent and very severe.

It is important to realize that if you know the number of birds

born each year you also know the number that die. They must be the same so long as the species is not becoming more rare or more common.

This does not mean that the numbers of birds of different species in different places do not go up and down a good deal, for they do. Very hard winters, for example, play havoc with the numbers of small birds. The winter of 1917 very nearly wiped out the population of long-tailed tits in Britain, and they took many, many years to recover; even to-day I should doubt if there are as many long-tailed tits as there were in 1916. The very hard winters of 1940, 1941 and 1942 did a lot of damage too. The common wren was very uncommon indeed after February 1940, and still remains so, where I live.

Now, sudden gaps in the population, such as those caused by great storms or very hard weather (not to mention the thousand and one other accidents that can overtake a bird or many birds together) have got to be made up. And that can only be done by a high reproduction rate, by the maintenance of a surplus that may hold over any calamity. So, you see the method of the bird world is not quite as wasteful as it appears at first sight. It is wasteful of life, of course, but there is a reason for it. And you should remember that even the waste of life in a normal season, the killing off of the surplus, is not wholly a waste. The high death-rate in birds means life to many other creatures. The dead support other birds and mammals and reptiles and insects. Throughout all the natural world there has to be a tremendous surplus to support the rest of that world. If there were not, there would be fewer insects, flowers, birds, mammals and so on: there would even be fewer men.

But, before we come to the most important thing of all, namely food, there are a number of other factors that

have some effect, and sometimes a very big effect, on the numbers of birds.

You will often hear that the thing that has made so many of our birds rare and some, so far as Britain is concerned, extinct, is egg-collecting. And you will certainly hear the egg-collector say that it is nothing of the sort, but that it is shooting that has done the damage. You will hear just the reverse from the shooting man: it is not the gun that has done the damage but the egg-collector. Each blames the other. The pot calling the kettle black. And each is wrong. Egg-collecting, when it means the taking of the eggs of a bird that is already rare, might possibly make it extinct as a breeding species. Shooting, when it means shooting a bird that is already rare, would probably make it extinct. Consistent shooting over a long period would certainly have that effect. That has, in fact, happened in Britain with a number of birds of prey. The egg-collectors have helped, of course, but it must be remembered that a dead bird cannot breed, whereas a live bird that has lost one clutch may well lay another, and can at any rate breed another year. The osprey may be taken as an example. The osprey is extinct as a breeding species in Britain, and the blame for that must rest squarely on the shoulders of the shooting man. The egg-collector may have helped (and no doubt did help) but the shooting man did the job; and it is the shooting man who prevents the osprey from nesting again in Britain (it does try to do so), for as soon as one appears it is shot. If, by some miracle, a pair escaped the guns and did breed, then the egg-collectors would be on the spot to see that the eggs did not hatch. It would need very stringent protection, of the type given to the kite in Wales, to ensure breeding, but it could be done, if the man with the gun would allow it.

But this is an exception. If the bird's numbers are at all plentiful neither the taking of their eggs nor the shooting of the grown birds has much, if any, effect. Once the numbers are low, then egg-collecting is harmful and shooting disastrous. You must not think that I am upholding egg-collecting at the expense of shooting, or that I am trying to make a case where no case can be made. I am trying to show you that there is a middle line, which is something that the sentimental protectionists will not admit. Very few egg-collectors and very few shooting men are cruel. Quite a lot of them do not know very much about natural history (though they think they do) and a few of them are grossly selfish. But very few of them are actually cruel.

It is neither the egg-collector nor the shooting man, among men and the works of man, that matter, much to bird life. The things that matter are not collecting cabinets or guns, but things that we do not notice because we take them so much for granted. The cutting down of woods, the draining of fens or marshes, the building of roads and houses, the burning of commons, and so forth . . . these are the things that cause decreases in the numbers of certain species, and increases in the numbers of others. It was not the egg-collector or the man with the gun that drove the bittern from Britain: it was the draining of the fens. But you must not think that all the works of man lead to a decrease in bird numbers. Often, though they lead to a decrease in one species or perhaps several species in that one neighbourhood, they lead at the same time to an increase in another species or, perhaps, to an increase in more than one species, in the same neighbourhood. And sometimes, though they may drive one species from the neighbourhood altogether, they will bring another, that has hitherto been a stranger, in its place. For example,

when quarries fill with water they often have that effect. I know of one case where the quarry was made in what had been farm fields. The making of the quarry caused the birds of the fields to leave, for there was no longer the food for them or the nesting sites. For a while there was but little bird life, though some sand martins prospected the site. Then the quarry gradually filled up with water, and in the winter ducks used to come to it, ducks we had never seen in the neighbourhood before. And as the quarry settled down and became a very large pond, other birds came. Now we have great crested grebes and coots and many other birds, and the grebes and the coots nest. It cuts both ways, you see, as often as not.

As I have already told you birds do change their habits to suit the times. These are the birds that prosper. The black-headed gull is a very good example. The lapwing is another. The black-headed gull is a sea bird which is becoming more and more a bird of the land, and is even invading our towns in search of an easy living. The lapwing is really a bird of the marshland, but it has become a bird of the ploughland. The starling is not really a bird of the towns and houses by nature, but it has found that an easier living is to be made in the neighbourhood of Man. The magpie, once so very scarce and shy, has found that Man is often an easy way of getting a meal, and now I have magpies in my garden. This is, I think, very largely due to the cutting down of the woods and the grubbing up of the hedges, for the magpies are birds of the tall hedgerows and the grass fields, and with the disappearance of the one and the lessening of the other in favour of ploughland, it has come to the trees and hedgerows of the gardens, even right into the towns, where it is incidentally also protected from the attentions of the gamekeepers.

Hedge Sparrow with young Cuckoo in nest

Crossbill

But birds do not generally change their habits to suit changing conditions. They just move elsewhere. So when you hear that such and such a bird is getting more and more uncommon, you must not think that it is becoming uncommon everywhere. That is not necessarily so. It probably is not so at all. Probably it has just moved elsewhere. Once upon a time the bittern was a very common bird in eastern England, now only a few come each year . . . and only one or two pairs to breed. But that does not mean to say that there are fewer bitterns in the world. So, too, with wild geese. When I was a small boy the wild geese used to come in thousands, in thousands upon thousands, to the marshes near my home. They do not come now. There are too many houses round the marshes now. Just occasionally, when the weather is very cold, a few hundred may come in for a day or two, but no more and no longer. But that does not mean necessarily that there are fewer grey geese in the world. They have gone elsewhere.

Changing conditions mean changing food supply. The draining of the marshes cuts off the food supply and alters the nesting sites. But most particularly it cuts off the food supply. It is the same with almost every change. And so we come back to the most important controller of numbers . . . the supply of food.

CHAPTER THREE

The Theory of Territory

"THE struggle for existence" resolves itself in the end into a question of food. It is the available food supply that provides the chief check on the increase in numbers, but it is also the available food supply that enables numbers to be kept up. Food is all important. How do birds ensure their food supply? And, particularly, how do they ensure it during the breeding season, which is, of course, the most important season in the bird world?

We have seen that, though there is an enormous destruction of life going on all the time, there are still at the beginning of every season . . . or at any rate at the beginning of every normal season . . . far more birds alive than are required to keep the numbers of the species up. Now all these birds will wish to breed. In most cases (the gulls and the guillemots, as I have told you, are exceptions) all these birds will want to breed after their first winter, and they will all feel the desire to do so at the same time. That is simple enough and understandable enough. But, if they all just mated and set up house wherever they might happen to be, if they just built a nest anywhere and laid their eggs, there would be chaos. You would find that in one place there were, say, fifty pairs of blackbirds and in the next there were none. And there would not be enough food in the first place to feed the fifty pairs and their young, while in the other there would be a great deal of food going to waste. Moreover, this food would be largely composed of insects, who, without any check on their numbers, would

multiply and become a menace. You would get hordes of caterpillars or beetles or something like that in one area, and in the other you would have birds dying of starvation. But that does not happen. Why not?

It does not happen because the birds are spread out, distributed over a wide area, which is another way of saying that each pair is occupying a piece of ground of its own. This piece of ground is known as a "territory".

"The territory theory" was first put forward by the late Eliot Howard, a very great field ornithologist, though it had been suspected for many years by various naturalists. As is the way with new theories it received much attention, and was for a while accepted blindly by a large number of naturalists and denied as strongly by many others. I think it would be quite true to say that Howard based his theory (which he did not regard as a theory so much as a fact) solely upon his own observations on small passerine birds, and that it was therefore, unbalanced from the start. I think, too, that it would be true to say that to-day there are few, if any, field naturalists who accept it wholly. But that does not mean to say that as a broad generalization it does not contain a truth. Let us examine it.

But first we must go back to winter. In the winter, as you will know, from your own observation, many of our resident birds live together in flocks, perfectly happily and without showing any signs of jealousy. You must have noticed that to be true of the finches and sparrows and tits in your own neighbourhood. It is particularly true of the tits. And it is true of all sorts of other birds as well: of plovers and skylarks and starlings and wood-pigeons, for example. But in the spring and the summer you do not see these birds in flocks. You will still see those birds that nest in colonies in flocks together at times, birds like the rook for instance, but you will not

see the flocks of tits, finches, sparrows and wood-pigeons. The flocks have broken up and the birds are now in pairs.

According to Howard what happens is this. In early spring the cock birds, responding to some internal development connected with the sexual organs, begin to regain their individuality, which throughout the winter has been submerged in the individuality of the flock. The return of individuality means that they begin once again to assert themselves. And they do this by leaving the flock and taking up a position from which they sing and near which they dislike the presence of other males of the same species. The departure from the flock is done by degrees. To begin with it is only in the early hours of the day that they leave to sing from their station, for the rest of the day they live with the flock and they roost with the flock at night. But day by day the individual impulse gathers strength, they spend more and more time at or near the singing post, and they show stronger and stronger resentment at the presence of other males of the same species. Finally they cease to return to the flock at all. They settle down permanently at their singing post, which is their "territory", and the flock is thus broken up altogether. Now, a good deal later than the males, the females also feel the urge of the developing sex organs, and as a result they begin to wander. They are attracted by the singing of the males, solitary and lonely by their posts. (But this singing of the males, says Howard, also serves as a warning to other males that the territory is occupied.) After the hens have mated, they assist the cocks in defending the territory, even to the extent of using force if necessary. There is a very considerable competition for territory among the males, for all males feel the urge to acquire territory, and the amount of territory available for each species is limited.

The territory has, therefore, to be defended against the surplus cocks, and cocks that arrive late, or are not bold enough, fail to get a territory, which means that they fail to breed; and in just the same way cocks that are not sufficiently resolute in the defence of their territory will get turned out. It often happens that a cock arriving late is resolute enough to plant himself in a territory already occupied, and to defy all the efforts of the owner to turn him out, and so to carve for himself a territory from the ground already held by two or three neighbouring cocks.

Now, remember that that is what Howard says happens. It is not necessarily what I say happens. All I am doing is to give you the "territory theory" as it was originally formulated.

As a broad generalization it is good enough. It is, indeed, probably a true enough picture of what does happen in many of our small passerine birds, such as the tits and the finches and the buntings. It may even hold good for the small passerine migrants, though in their cases the cutting out and holding of territory is obviously a much more sudden process. *But it is very far from true of all birds.* In many species mating takes place before the winter flocks break up. That is certainly the case with some finches, and it is more than likely that it is the case with a number of other species that flock in winter.

It is noticeable that most birds do not maintain territories in winter. Yet food is not easy to find in the winter, and you would expect to find birds very intolerant of each other in the cold hard weather. What actually happens is just the reverse, and this shows, I think, that birds are naturally friendly and sociable creatures. They become intolerant only when the survival of the young is at stake. The land will not support more than a certain number, it will not permit of overcrowding. And it is the

acquisition of territory that prevents the risk of overcrowding. The territory is taken up by the most resolute and determined birds, and the weaker ones are shut out. Those that gain a place have a reasonable chance of rearing a family, those who do not have no chance of doing so at all. It is for this reason that you see in the summer loosely-knit parties of blackbirds wandering about, loose flocks of finches sometimes as well. These are the unmated birds. Some of them will replace fatalities among mated birds during the season, but the majority will wander about until the autumn and then join up with the big flocks again; those, that is, that do not provide food for the young of the birds of prey in the meanwhile.

But it is a mistake to imagine that the necessity for acquiring a territory is equally urgent for all species. It is not. It depends on a number of factors. On the sort of food that is eaten, on the number of birds of the species in the neighbourhood, on the powers or lack of powers of flight, and so on. One of the greatest mistakes, and one of the most common, made by the enthusiast is to imagine that the territory theory applies equally to all birds.

Take the robin, for example, for the robin is a very strict guardian of territory. The robin is a bird whose powers of flight are limited, and this means that it cannot forage for food over any considerable distance. It has got, therefore, to acquire a sufficiently large territory in the immediate vicinity of its nest and it has got to defend this very carefully against all those robins that have failed to get a territory at all. If it does not, its young will not live. If there are too many robins on the ground that means insufficient food, and it also means a good deal of encroachment by one pair upon another in the matter of food seeking, which also means that the young will suffer. For the robin, with its weak powers of

flight, cannot afford to travel far for food, since any long absence from the nest would mean the death of the young. (Young birds die very easily in the early stages of life, and as a general rule the parents cannot be away from them for more than an hour.) You will see, therefore, that for small passerines of weak flight a carefully guarded territory is absolutely essential.

Then take the swallow, which is a bird with quite remarkable power of flight, and a bird who, moreover, lives entirely upon insects. There is obviously no reason here why an exclusive territory should be maintained, since the swallow can fly far and fast in search of its food. So you will find that the swallow lives in small communities and hunts for its food away from its nest. The same applies, though with rather more force, to the martin, which sometimes lives in very large colonies (though you will also find solitary martin nests) and also, and even more strongly, to the swift. In other words birds with great powers of flight do not require to keep strict territory.

There is, however, one great exception to this. And that is provided by the birds of prey. The birds of prey are the strictest of all keepers of territory, and they have, all of them, very considerable powers of flight. The one exception among birds of prey appears to be the buzzard (which is also the least fierce of the birds of prey) for buzzards do seem to gather together for brief periods of aerial play, an idea that would never enter the head of a sparrow-hawk. But the reason for the maintenance of a strict territory among birds of prey is pretty obvious when you come to think about it. Their food is so very different and must be spread over a much wider area, since it is by no means so plentiful nor so easy to obtain as the food of insectivorous birds.

Then you must remember that the strict territory

keeper keeps its territory only against birds of its own species. A robin will not allow another robin on his ground, but he has no objection to the presence of blackbirds, thrushes and so on. And so it is with the blackbird: he will defend his territory with all his might against other blackbirds, but has no objection to the presence of thrushes, robins, finches and tits, and so on. You can prove this for yourself without any trouble by watching the birds in your own garden. A garden of about half an acre, so long as it has some good hedges and a number of bushes, will hold, for example, a pair of robins, a pair of wrens, a couple of pairs of dunnocks, and blackbirds, thrushes, tits, finches and sparrows as well. And they will all get along perfectly well. In my garden I have two pairs of chaffinches, which keep very much to their own particular places, and two pairs of blackbirds that do just the same, but blackbirds and chaffinches continually overlap, and so do blackbirds and thrushes: this year I have actually had a blackbird and a thrush nesting in the same tree, though there are plenty of other apparently suitable nesting sites available.

This is, of course, because all these birds do not eat exactly the same food. Dunnocks eat more seeds than they do insects; wrens eat more insects than they do seeds; robins eat about half and half. They all eat much the same food, but not exactly the same food in the same proportions. Their diets overlap. But then so do their territories. If the boundaries of their territories exactly coincided, then, perhaps, it would be a different matter. The matter of flight also enters into it, of course.

Then there are many birds, who just refuse to fit into the territory theory as originally set out. Take the linnet or the lesser redpoll or the greenfinch, all of them small passerine birds. There cannot be the slightest doubt that all these birds (the greenfinch, perhaps, the least of the

three) have a strong inclination towards nesting in colonies. There is no need why they should do so: it is obviously done from inclination and not compulsion. The colonies are not large, it is true, and they are not even very well defined, but in these species there is no belligerent holding of territory. These birds are most certainly not intolerant of each other. And you will see them flying about in small parties during the breeding season and paying each other visits at the nests. It seems that, for the most part, these birds feed away from the nesting area and have rather loosely defined feeding territories of their own, in much the same manner as in the case of the starling.

Then there are the purely communal nesters. The sand martin is one example. Sand martins nest in colonies and take quite violent defensive action against intruders. Sand martins have to nest in colonies for the very simple reason that there are not many suitable nesting sites available. Their great powers of flight make the finding of food easier and do not tie them down to limited territories for this purpose. This is a good general rule for the strict communal nesters, that their powers of flight enable them to find their food over a wide area. There is no necessity for each pair to claim an extensive piece of ground around the nest. Indeed, if they did do so, there would not be room for the majority to breed at all. The only territory that a true communal nester has is its own nest, that and no more. This has made some people say that the food item is not all important and that in their case it is the necessity of securing a nesting site that is all important. Howard, indeed, made this point specifically and cited the guillemot as an example, for the guillemot requires a small patch of rock on a cliff ledge on which to lay its single egg, and no more than that. *It cannot be too strongly stressed that the necessity for*

getting food is paramount. It overrides everything else, absolutely everything else. It is not of the slightest use having a nesting site if you cannot get enough food to rear the young: not the slightest use.

Now, there are two quite definite types of communal nesters: those that nest together in colonies because they must, and those that nest in colonies because they wish to do so. The sand martin, the guillemot, the gannet and the kittiwake may be taken as examples of the former; the rook and the jackdaw as examples of the latter. The former have to nest together because of the limitations of nesting sites available. But the rook could nest wherever it liked (as does its very near relative the crow) and so could the jackdaw. There are plenty of nesting sites available. Furthermore, crows are sociable in the winter, just as sociable as rooks. It seems to me that both rooks and jackdaws have found that it pays to keep in flocks and to feed communally, on the principle (well known to the Germans) that so long as you have sufficient numbers you can overrun any opposition. In the case of cliff-nesting birds, of course, there is an inexhaustible supply of food available on the doorstep . . . the fish in the sea.

It is, of course, evident that a certain area of land will only support a certain number of birds . . . so many robins, so many thrushes, so many blackbirds, so many tits, so many finches, and so forth. The number naturally varies with the soil . . . good productive soil will carry a larger number of birds than poor soil of the same area. And that means that the size of the individual territories will vary a great deal according to the type of soil and the amount of food it produces. There is, obviously, a certain minimum necessary for the preservation of life, but it would be most unwise to think that it is always the minimum area that is adopted. As a matter of fact we

know very little indeed about the size of territories. In general it is supposed that the minimum for small passerines is about half an acre a pair, but there is remarkably little evidence to support that view, and it would in any case depend on many outside factors. Observation has led me to believe that a pair of partridges need some ten acres, while I am quite sure that the chaffinches in my garden get along very comfortably with a good deal less than half an acre.

We need much more information on this point. And it is information that could be obtained fairly easily by most observant amateurs. We need actual information about the size of territories, about the extent to which birds will go in foraging away from what might truly be called their territory (for example, how far will rooks travel from the rookery in search of food; how far will jackdaws travel for the same purpose; how far herons; how far linnets?) and we need information also about the defence of territories and the observation of territory boundaries. Do the hens defend the territory in all species? Do hens observe the boundaries of their own territories and the boundaries of the territories of other birds of the same species, as for the most part the males do, or do they go where they will and risk the consequencies? Are mated males as rigorous in defending their territories against females of the same species as they are against males? These and many other questions have not been properly answered yet, and there is an enormous field for the observant naturalist here.

Then there is also the question of *winter* territories. This may seem a silly question to you, since I have been talking about individual territories all the time, and in winter most of the territory keepers join up into flocks. But, while that is true, there is still much to be learnt about these winter flocks of finches, tits, and so forth.

How far do they travel? Do they keep to much the same stretch of country or do they travel over large areas and long distances, wherever the urge prompts them? In other words do the winter flocks observe a winter flock territory or not? Food, it must be remembered, is still important to the birds, just as important as in the summer, for life must still be maintained though there is not the overriding importance of feeding the young and providing for the continuation of the species. And food, remember, is harder to find in winter. So the operation of the rule about overcrowding would still seem to hold good to some extent. We have little or no information on the day to day movements of these winter flocks, save, and then only to a limited extent, in the case of starlings.

Though we can see, roughly, at any rate, how the territory theory operates in the case of those birds that adopt individual territories to keep down numbers and to ensure a supply of food for the young at the same time, we still require information, a great deal of information, on colonial nesters of the type of the rook and the jackdaw. What are the restrictions that operate to limit numbers in such cases? The numbers in a rookery seem to be fairly static year by year, according to my own information anyway. The rookeries that I know well do not grow year by year, the numbers of jackdaws do not seem to increase vastly in our church tower. Why not? What happens to the young? Do the colonies set a limit on their size? It would almost seem so, for there seems to be little doubt that when a colony does get too big (which does happen on occasion) disaster overtakes it. If you follow the history of a rookery or a heronry or a ternery through a number of years you will almost certainly find that at some time in that period there has been a sudden and great drop in the number of nests,

and that then they have been slowly built up again. But these examples, though there are many of them, are picked ones. There is no evidence, so far as I am aware, that *every* such colony has such fluctuations. If we had such evidence we should know a lot more about the economy of colonial nesters. Until we have it we are faced with a very big question mark.

I hope that I have shown you some ways in which you can watch birds in relation to their territories, and a few questions that you can attempt to answer in your own neighbourhood, and for whichever species are the most common and the easiest to watch. Remember that though territory is a fact, most of the theories about territory remain . . . just theories.

CHAPTER FOUR

The Problem of Song

YOU will very soon find that you cannot consider the question of territory without having to consider also the question of song. You will remember that the first choosing of territory by the male is indicated by his taking over a singing post and singing from that post. Indeed, according to Eliot Howard bird-song is inseparable from territory, and many modern ornithologists consider that Howard has conclusively proved his point. I may as well say at once that I do not agree about this.

But before we go any further we must decide what we mean by "song". I suspect that we all know what we mean by the word, but that is not quite good enough, for we may not all mean the same thing. No bird is completely silent, not even the "mute" swan, but all the sounds produced by birds would not qualify in our minds for title as "song". I suspect, too, that we all know what we mean by the terms, "alarm notes" and "call notes" . . . if you cannot distinguish them yet, you will very soon learn to do so . . . and we know that they are not "song". We know, for example, that the harsh cry of the blackbird startled from some hedgerow is not the song of the blackbird, and we know very well what we mean by the "song" of the blackbird. Are we then to suppose that the rook has no song? And the starling, the gulls, the jay, the heron? And what do we call the churring of the grasshopper-warbler? It is not beautiful, granted, but is it song? You see, we must have a definition of the word.

It is, in fact, not at all an easy word to define. The *Oxford English Dictionary* defines song as "vocal music" and as "the musical cry of some birds". That is, obviously, not good enough for us. Newton, in his *Dictionary of Birds*, rejected the idea that one could confine the word to the comparatively few birds that made noises pleasing to our ears, and said that "it is necessary in a scientific spirit to regard every sound made by a bird under the all-powerful influence of love or lust as 'song'". The *Handbook of British Birds* wisely refrains from any attempt at definition. I wish we could do the same! I think that the best definition of song that I have come across is that given by E. M. Nicholson in the Christmas number of *The Field*, 1925. In this he says:

> Bird song is properly a sustained, more or less uninterrupted, repetition of one or more notes conforming recognizably to a constant specific type, and used by the male as an expression of independent sovereignty.

Let us examine this definition. We must examine it very carefully.

I think that the word "sustained" is completely justified. You would not say that a man who just yelled "Oi" at you was singing. Song obviously cannot consist of a single sound. A single sound is a call or a shout or a note, but it is not song. And I think that he is right to stress "more or less uninterrupted", because if it is interrupted it then becomes a series of shouts or calls or notes, but not song. "A repetition of one or more notes" is a little more difficult. Most of us would not describe a repetition of one note, no matter how uninterrupted, as song. Mr. Nicholson is here stretching a point, because if he did not he would have to exclude quite a lot of birds, like the

grasshopper-warbler. The statement that song "must conform recognizably to a constant specific type" needs no justification. It does not mean that there must be no variation between the songs of two birds of the same species, for there is, of course, a great deal of variation between the songs of birds of the same species, especially in the songs of some of the warblers and even in the song of the blackbird. All it means is that the song should always be recognizable as the song of the species, and as a matter of fact, though there is this great variation between the songs of individuals, they are always recognizable for what they are—the song of the species.

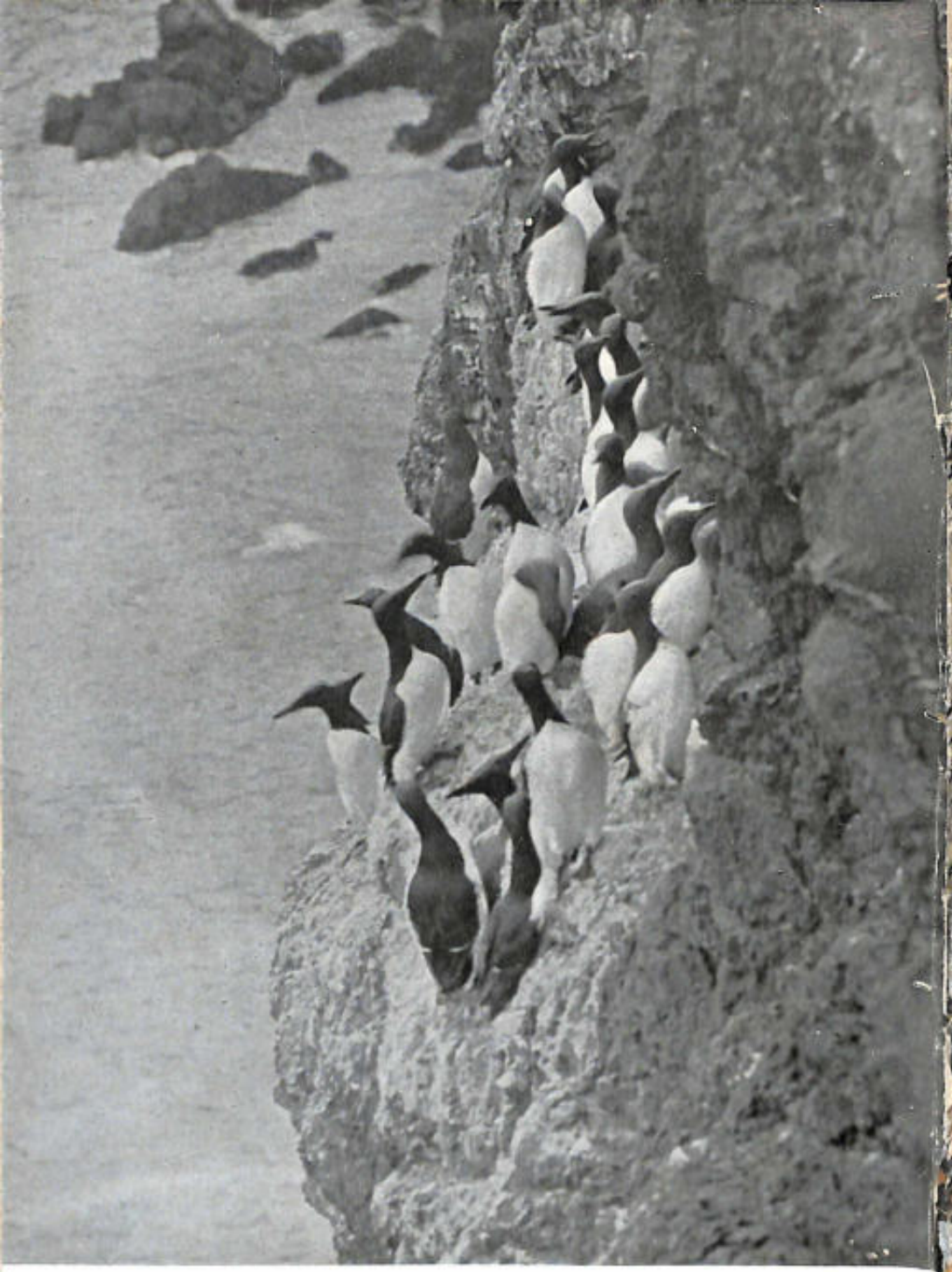
But that is as far as I, at least, am prepared to go with Mr. Nicholson's definition. The last words, "and used by the male as an expression of independent sovereignty", seem to me to go beyond simple definition and deep into the realms of controversy. They take too much altogether for granted. They put into an otherwise excellent definition of bird song something that Mr. Nicholson (and no doubt many other people also) wants to be there, something that Mr. Nicholson (and many other people) *think* is there, but something that they cannot prove is there. The wish here is father to the thought. It is very easy and very tempting to father wishes on to thoughts, but it is something that you must try to avoid doing at all costs.

Of course, these last words of Mr. Nicholson's definition stand or fall by a complete acceptance of the territory theory, which we discussed in the last chapter. Mr. Nicholson is a devout believer in the territory theory. He does not believe, or at any rate he did not believe when he wrote those words, that true song occurs away from territory. He does not say anything about seasons so I do not think that he goes all the way with Howard in this matter. Howard maintained "that in contrast with

Male Lesser Spotted Woodpecker with beak full of aphides

nest

A Long-tailed Tit



Guillemots

the call-notes, the majority of which can be heard at all times of the year, the song is restricted to one season, and that one the season of reproduction". That statement is demonstrably untrue. There is no month of the year in which you cannot hear song, and quite an amount of song at that. For example, the robin, the dunnock, the wren, the song-thrush and the mistle-thrush all sing in winter, in the months of December and January, and there is, apart from this, a considerable volume of song in September. Nicholson would admit this to be true (which is why, I imagine, he has made no mention of season in his definition of song) but he would deny that it invalidated his assertion that song is linked with territory and is, therefore, an "expression of independent sovereignty".

Now, it is quite true that the famous autumn song of the robin is accompanied by most belligerent activity in defence of territory, and I suppose that you could draw from this the conclusion that song is primarily used to express ownership of territory and is not, therefore, directly connected with sex. Indeed, you could say that all the noteworthy winter songsters . . . dunnock, wren, song-thrush and mistle-thrush . . . are resident birds and that they all hold territory more or less continuously throughout the year. But if you do, you would have to prove that the wandering birds of these species (and large numbers of them do wander during the winter; probably more wander than do not, in fact) do not sing, that the song is only uttered by the sedentary birds as a warning to the wanderers that the ground is held. I do not know that this has ever been proved, and I think that it would be very difficult of proof indeed. In any case why warn wanderers off territory when the matter of sex does not enter in at all? And there is another point, which is this: that you do hear song from other

birds in winter and from birds that in winter are controlled by the flock instinct and are purely nomadic. You can hear song, not very often, it is true, but nevertheless it does occur, from buntings, chaffinches and greenfinches. You could dismiss that, perhaps, as being altogether exceptional (I do not know that it is) but what about the song of the skylark and the meadow-pipit? If you live in a thickly populated lark country, as I do, you will know that there is scarcely a day throughout the year when you may not hear a lark singing. You could not possibly call winter song among larks exceptional. And, though I am not as well acquainted with the meadow-pipit, I do know that bird pretty well, and I should hesitate to call it an exceptional winter singer. In none of these cases can the question of territory enter into it, and, therefore, in none of these cases can there be any question of the singer "expressing independent sovereignity".

It used to be said that birds with bright plumage were poor singers. And it has often been pointed out that only small birds are good singers—that you cannot call any large bird a good songster and very few, if any, birds of medium size. Confining ourselves to Britain only, a broad general case could be made out to support that assertion. One could, at least, say that song was used by inconspicuous birds to make up for being inconspicuous; and that is often said by believers in the territory theory who maintain that no true song occurs away from the territory.

But here again, I think, the wish is father to the thought. So much of personal preference must enter into it. What do we mean by "a poor singer"? What do we mean by "bright plumage" and by "inconspicuous"? Do we mean by a poor singer, a singer with a soft voice? Are the good singers only those with loud voices? And

what do we mean by "bright plumage": do we mean a bird that is easily seen?

Let us take singing first. Would you call the grasshopper-warbler a good singer? It has a very loud voice; indeed, you can hear it as much as a quarter of a mile away. I do not think that anyone could possibly call it a beautiful voice, but it is beyond question a very loud one. Now, the grasshopper-warbler is a very small and very inconspicuous bird, a little shabby-coloured bird, drab in appearance and skulking in habit. It can hide behind a small tuft of grass (and does so hide) but it can make itself heard a quarter of a mile away. If loudness is the criterion of good song then the grasshopper is a very good songster indeed, and since it is also among the most inconspicuous of birds, it is a very good example in favour of song being used to make up for lack of bright dress. If every example was as good, there would be no argument at all.

But would you say that the blackbird was an inconspicuous bird? And would you deny that the blackbird has an exceptionally loud, clear and beautiful song? Is the song-thrush so inconspicuous, or the mistle-thrush?

But, on the other side we have three closely related birds . . . the chiff-chaff, the willow-warbler, and the wood-warbler . . . which are very small birds, very similar in appearance, and very inconspicuous in habits. All three have good songs (from the point of view of loudness) and these songs are quite different. You cannot mistake one for another, and you can hear them all quite a long distance away. They may be said to support the grasshopper-warbler and the song in the territory theory.

But again, the chiff-chaff's song is a measured repetition of two simple notes. Chiff chaff, chiff chaff. That and no more. What is the cuckoo's song? It is a mea-

sured repetition of two notes. Cuck-ooo, cuck-ooo. That and no more. And would you call the cuckoo a small, inconspicuous bird?

Now, let us consider colour for a moment. Does "a bright plumage" mean a conspicuous bird? You will usually find listed as birds of bright plumage the bullfinch, the hawfinch, the red-backed shrike, and the kingfisher. Would you call these birds conspicuous? Just think for a moment how often you see a bullfinch. The colours are bright enough, but the bird is certainly not a conspicuous bird and it most certainly has not got conspicuous habits. The hawfinch is also brightly coloured, but it is very far from being conspicuous. Its habits are the reverse of conspicuous. I think that it might truly be said that the red-backed shrike and the kingfisher are both bright in colour and conspicuous in habit, but only those two of the four. Is it true that they have no song? It is very far from true. The bullfinch and the red-backed shrike and the kingfisher have all got songs, and I think myself that those of the red-backed shrike and the kingfisher are exceptionally beautiful. It is true that they are not loud. You cannot hear them a quarter of a mile away, and if loudness is the standard by which we are to judge song then they must be discarded. But if loudness is the standard by which we are to judge, then we must include the cawing of rooks and crows.

And what of the chaffinch, what of the stonechat, what of the goldfinch? The chaffinch has a loud and noticeable song, and is conspicuous in habit. Would you say that it was not brightly coloured? I should say that it was. And the stonechat is most conspicuous in habit, not inconspicuous in dress, and it has quite a loud clear song, and, moreover, quite a pretty one. The goldfinch, too, is brightly coloured and the possessor of a very pleasant song, but, though perhaps the most brightly-

coloured of all our resident birds, it is far from conspicuous in habit.

You will see that one could go on forever like this, giving examples on the one side and the other, examples that cancelled one another out. There is no point in doing so. But there is one other point that must be made. We are considering only British birds. Most of the really brightly coloured birds live abroad and never come to Britain at all. Have they no songs? I think that you would find that they have and that some of them are very loud and clear.

Believers in the territory theory have, of course, realized that there are many arguments against the theory that song is only performed in conjunction with the defence of territory. So they have attempted to distinguish between types of song. I have heard it suggested, for example, that the most complicated songs belong to the rarer species. The nightingale is usually cited as an example of this. It is true that the nightingale has a most complicated and varied song, and it is true that the nightingale is not a common bird in this country. But it would not be true to say that the nightingale is an uncommon bird everywhere. Is its song different in those countries where it is not an uncommon bird? I think not. At least I have found no difficulty in recognizing the nightingale's song abroad. Even if you use the word "diffuse" instead of "complicated", and thus bring in such birds as the grasshopper-warbler and the marsh-warbler, you come up against the same barrier. Neither the grasshopper-warbler nor the marsh-warbler is a really common bird in this country, but that is not true for the whole of their range. There seems to be no difference in their songs, common or rare. I do not think that any distinction can be made between simple and complicated songs.

Another distinction commonly made is between song and sub-song. I suppose that this distinction has led to more confusion on the part of writers about birds than any other. And that is not really surprising, for there is no real distinction. But this is how it is put by those who wish to prove their case at all costs:—

True song is the territorial song . . . the song of Mr. Nicholson's definition. And this song is always produced as loudly as possible. Singing at the top of one's voice, in fact.

Sub-song is a low song, audible at only a few yards.

Sub-song is supposed to be free from all territorial influence, and is not even confined to sex. In fact, when the female sings (as a great many females do) it is a sub-song, with the possible exception of the female robin, which keeps a territory of its own in the winter.

Well, that is what they say. Is it true? What is being said, of course, is that because the red-backed shrike does not shout it does not sing. That its quite marvellous song is only a sub-song. If, instead of singing softly, it shouted at the top of its voice, it would be a song. The same is said of all the soft songs, those of the spotted fly-catcher, of the house-sparrow, the swallow, the house-martin and so on. One could make a good case for sub-song if one only put forward carefully chosen examples in its favour, like those given above. But what of the linnet, the greenfinch, the lesser redpoll, the goldfinch and many others? Their songs are surely not loud enough to be called true songs, and they are not soft enough to qualify for the title of sub-song.

It seems to me that the distinction between song and sub-song is a purely human distinction, and one that has been made to fit in with the territory theory. And as such the distinction is invalid.

That birds have territory in many cases is obviously

true. That many birds use their voices to protect their territory by warning, or trying to warn, off other males seems to be true. That other birds have territory also, and do not use their voices as a warning signal seems equally true. And it is true again that all these birds are not conspicuous either in colouring or in habit, while some of those with very loud songs, though not conspicuous in colouring, are conspicuous in habit.

Come, I beg you, to the question of song in relation to territory with an open mind. Do not swallow whole the theories of those who maintain that the one is inseparable from the other; do not swallow whole the arguments of those who deny that there is any connection. Make up your own mind from your own observations. Take in what other naturalists say, but make up your own mind. If you study the matter carefully, you will, I think, come to the conclusion that there can be no hard and fast rule, no hard and fast distinctions.

But we cannot leave the question of song there. There is much more to it than that. There is, in fact, an enormous field for study and observation in this matter of song.

You can, for example, keep a record of the times of the year during which the different species of bird may be heard singing. You need not go out of your own garden for this purpose. If you could keep an accurate record of the singing of even a blackbird throughout a whole year, with notes on the weather conditions . . . wind, temperature and so on . . . at the same time, you would be doing a very useful piece of work. If you could do that for several species, you would be doing still more useful work.

Again, you can, without going out of your garden, keep a record of the actual time spent by a bird in singing. I mean for how long does each burst of song last and how frequent are the bursts.

Again, you can keep a record of the actual output of a bird in the way of song throughout a whole day, or, preferably, throughout several consecutive days. You can also do this without going out of your garden, but it is a rather more energetic business than it sounds, for remember that a day is twenty-four hours, that is, it includes the night, and that many birds begin to sing before sunrise and continue to sing for quite a long while after sunset.

Then there is the question of the distribution of song. If you go for a walk you can keep a record of all the birds singing on that walk. But you can also keep a particular record of all the birds of just one species that are singing on that walk, how far apart they are and so on. If it is a short walk so much the better.

Perhaps you live in nightingale country. Nightingales sing by day as well as by night. Do they sing more by day than by night? So far as I know there is no reliable information on this point. You might be able to find out.

And there are all sorts of other problems connected with bird song that can be solved by observation, and by observation by amateur enthusiasts at that. For instance, we know that some female birds sing, but we have no complete list of which females sing and which do not, nor have we any reliable information, except for the robin, as to when female birds sing.

We do not even know all that we should know about the songs of male birds. I expect that if you have listened to a blackbird singing you will have come to the conclusion that it has more than one type of song, that it has different songs for different purposes, and for different times of the day, and different times of the year. You might, again without going out of your garden, discover quite a lot about this.

Indeed, while we are talking about the blackbird there

are many problems that I can put up to you for you to think about and, perhaps, solve by watching the blackbirds in your own garden and the immediate neighbourhood. Blackbirds are fond of singing from a perch, as you know. How many perches has each blackbird? Has each blackbird a favourite perch from which it sings more than from others? Then, there is the question of height. Are these perches all the same height? If not, is the favourite perch (if there is a favourite perch) a high one or a low one? And is the song from a low perch (if a low perch is used) different from the song from a high one? This question of perches is a very interesting one. For instance, where are they situated in relation to the nest? Does the height from which the bird sings vary with the season and with the time of day? Does it always sing from the same perch at the same time or not? We have very little information indeed about the relation between perches and song.

We have very little information also about song in relation to the weather. I expect that you will have noticed that birds do not sing so much in a high wind as in calm weather. Just how high has the wind got to be to affect the volume of song? And, then, are all birds affected in the same way? There is a simple answer to that: the mistle-thrush is called the stormcock because it sings so loudly and well in rough and stormy weather; the blackbird very rarely sings in a high wind. But is the stormcock more immune to high winds than any other British singing bird? Is the blackbird more affected than most? Again, you will have noticed that if it is a cold and sunny day the birds will be singing, but if it is cold and the sun is not shining most of them will not sing. On a day with a warm wind from the west and a light rain, all the birds will sing as hard as they can, but a cold rain will make most of them keep silent. Again they do not

seem to like an east wind, but they do not mind a north wind so much. There would seem to be some question of temperature in all this, but we have little or no information on temperature in relation to bird song.

You will see that there is a huge field for inquiry by the curious here. And it is a field in which you need pay no attention to theories. Theories are exciting things, but they are also dangerous things (especially for the beginner) for there is always the danger of allowing oneself, quite unconsciously, to make use of those facts that fit in with the theory and ignoring those that refuse to be so accommodating. Keep to facts. When you have collected a tremendous number of facts, you may begin to form your own theories to fit them (that is the right way round: collect your facts first: do not start with a theory and make any facts you may collect fit it) but it should be a long while before you have enough facts to begin playing around with them.

There are a vast number of questions connected with bird song (and indirectly with bird song in relation to territory) to which we have not as yet concrete answers. If you have the time, and the patience, try to find the answers to just a few of them, even to just one of them, and when you have found that answer, then you may rightly and properly call yourself a naturalist.

CHAPTER FIVE

Courtship and Display

SONG, if it is used as a warning that the territory is occupied, may not always be effective. The warning may be ignored, as, indeed, it frequently is, for in what other way could a late arrival carve out for himself territory from ground already occupied? There must, therefore, be other means of defence for the territory. The ultimate defence is always beak and claw. Of that there can be no doubt at all. But birds do not fight if they can possibly avoid doing so. They will threaten to fight, but actual physical contact between rival birds is a rare occurrence, and fights to the death are rarer still. Threats, however, are common.

And this brings us to the question of display. There are two types of display: display in courtship (that is, display prompted by sexual emotion) and display to frighten off a rival male (that is, display prompted by the ownership of territory).

It is by no means easy to draw a line between the two. Personally, I would not attempt to do so. Indeed, I would go so far as to say that it is not possible to draw a hard and fast line between the two. There are, of course, plenty of instances in which it is obvious that the display is purely aggressive, plenty of instances when it is obvious that it is purely affectionate. But there are also plenty of instances when it is far from obvious.

It should be possible, if Howard's theory that in small passerine birds the males settle down on the territory before they pair is correct, to say that in such cases there can be no battles for females, which is merely another

way of saying that in such cases there can only be battles for territory, which will involve aggressive displays, and that they will be followed by courtship displays. But it is not possible. Howard's theory is a very good theory, but it is not an invariable rule. It is not even an invariable rule among exceptionally individualistic species. Furthermore, it presupposes that the hens mate with the first territorially established cock that they come across, which is very far from being the case.

It has been proved by ringing that there are at least a few hens among robins and swallows which pair with the same cock year after year, apparently for as long as they live. Equally there are at least a few hens among double-brooded species that mate with a different cock for the second brood. I have known that to occur with blackbirds and thrushes and tits.

Moreover, I have witnessed a very considerable battle between two cock blackbirds for territory and female at the same time. No blows were actually struck, but it was a fierce battle all the same. In this case I think that the first male had already acquired both territory and mate (I am sure about the territory and almost sure about the mate) and the second cock was an interloper. The affections of the hen were obviously on the side of the interloper. All the same he was defeated and driven off in the end, and she remained with the original holder of the territory. In this case there were all sorts of displays going on at the same time, for there were two battles going on at the same time . . . the battle to hold or win territory and the battle to win or hold the female. Had the interloper won he would have won a territory and a mate at the same time.

Among blackbirds this sort of thing is, I think, fairly unusual. As a rule blackbirds seem to go through a long period of courtship before they begin to sing and before

they have taken up territory, or at least before it is obvious that they have taken up territory. I have watched cock blackbirds as early as January courting hens in the most passionate manner, fanning their tails, dipping their beaks, even singing a low, broken, husky song quite unlike their proper song. And I believe that when this happens the birds are already paired. And this is a long time before there is any attempt to carve out and hold territory.

You will see that it is not an easy matter to draw lines and say this is courtship display and that is aggressive display. But, I think, that there is one assertion that it is safe to make: that displays in the air have always a territorial significance, while courtship displays are always performed in the presence of the hen, and almost always very close to her.

Let us first consider aggressive displays, remembering always that it is not possible to say definitely where aggressive display ends and courtship display begins, although as a very broad general rule it may be said that aggressive display comes first.

You will not watch birds in display very long before you will come to the conclusion that the form of display used to denote aggression and defiance is the same, in many cases, as the form used to denote affection. The positions taken up are often exactly the same, and so are the actions. The bright colours of birds are used a great deal as advertisement. They are used to show a rival cock that the territory is occupied and will be defended . . . by beak and claw, if necessary . . . and usually the advertisement is sufficient to secure the end without actual combat. This is, obviously, a good thing from all points of view . . . a vast improvement on "going to war". But the same bright colours are used in the same way to charm the female prior to mating. The

actions are the same. The emotions that prompt them are different.

Emotions are not factors that we can catalogue. We know that the emotions must be different for the results are so very different. We should be content with that. The poet may see a different gleam in the eye of the male bird. But I am not concerned with gleams. That is pure anthropomorphism. All sorts of things can be read into a gleam in the eye, and the reading depends on the mind of the reader and may well have (and probably has) nothing whatever do to with the feelings of the bird. It is this transference of the human mind into the mind of the bird that makes all ornithological theories so dangerous. You may note actions; you may say "the bird did this, and this happened after he had done it". It is an allowable inference that if he did the one the other should happen. It is very dangerous to say that a bird or anything else does something because he wishes something else to happen. Wait, if you can, and see what happens before you guess. And even when it has happened, try (it is good advice, if very difficult to follow) to avoid putting your mind or feelings into the bird. There you are playing with the unknown and the unknowable.

On the other hand the purely materialistic approach to this question of display is also filled with dangers. It has been said, for example, that certain aggressive and courtship displays are similar only in those birds in which both sexes are alike in plumage. The idea is that under emotional stress the male will react with a set and definite pattern of postures, no matter what the sex of the bird opposite to him may be: if it is a male then emotional stress will make it act in the same way, and combat (or a long period of bluff leading to the avoidance of combat) will ensue; if it is a female the reactions will be

different, she will not respond in the same way, and then there will be a different set of actions, prompted by sexual recognition.

It is a pleasing theory, for it saves a lot of trouble. But it is altogether too simple, and in any case it is not true of all similarly-coloured birds. It has come about, of course, as a reaction against anthropomorphism. But it goes too far in the other direction. It makes the very large, and I am sure quite false, assumption, that in all these birds the emotional state is the same, and that the whole of the bird's life is controlled by external factors. If that were really the case then there would have been chaos in the bird world long ago.

To draw a line between anthropomorphism and materialism is very difficult. It is a matter on which each naturalist must make up his own mind, and having made it up must expect constant criticism from both sides.

Many experiments have been made on aggressive displays. They are very simple to make. If you take a stuffed robin and put it in your garden, you will find that the live robins will attack it. First they will display before it, and if it does not go away (as it cannot do) then they will actually attack it. It has been found that they will attack a stuffed robin from which the head has been removed. They will even display before, and finally attack, the red feathers from a robin's breast stuck on to a bit of wire. Indeed, they will attack a piece of cloth if it is exactly the right colour. (But if it is a shade off colour they will take absolutely no notice of it.)

It is evident, therefore, that colour plays a big part in the life of the bird during the mating season. And you can easily prove this for yourself by placing a mirror, (or preferably a triple-sided mirror such as women use on their dressing-tables) on the lawn of your garden and watching the result. The birds see their own images and

display before them. Goldcrests show their caps, erecting and vibrating them so that they seem to dance like fire; pied wagtails bow and stretch, showing their black chins and throats; tits hop up and down, showing their bright colours; robins show their red breasts; and so on. And the birds that have no particular bright colours to show, posture and threaten in an unmistakable manner, blackbirds and thrushes crouching and puffing out their feathers and so on. With the aid of a mirror you can learn a lot about the aggressive displays of birds, and you will also learn that when they are displaying in this aggressive manner many of them will also sing. Robins certainly will sing at their own reflections in a mirror, just as in real life many birds sing while they are fighting or threatening to fight. And this type of song, you will notice, is quite different from that used in courtship, if any song is used in courtship at all.

Actual fighting does, of course, occur. I have seen it between moorhens, and coots, and great crested grebe. In one fight between coots, during which a female looked on unmoved, serious injury was done to one of the participants so that it had to "limp" away. But the mixed aggressive display and courtship of the great crested grebe is one of the most interesting and at the same time one of the easiest to watch. The bird is quite a common one, and you should be able to watch it with any luck at all no matter what part of the country you live in. Both courtship and aggressive display in this species has been described many times, for it is a most entertaining spectacle, but sometimes you can see both at once. I have watched this combined display on Frensham Great Pond more than once.

The females take no actual part, but they appear to have a ritual of their own while their mates are about more serious business. The males swim towards each

A Raven

Black-headed Gulls

The Great Crested Grebe

Bittern with her eggs

other with their necks flat against the surface of the water and outstretched, their bodies are nearly submerged, and their ruffs are raised. As they get close to each other they accelerate, so that the impact is made at a great speed. There is no threat about the aggression of the great crested grebe. Serious business is meant from the start. Yet in my experience the first rush is always avoided by one or other of the birds diving. Then they come to the surface, standing almost erect on their tails, threshing their wings, and crying "Kuk-kuk-kuk-kuk" quite loudly, the while they stab at each other with their beaks. The beak of the great crested grebe is no mean weapon and the thrusts are made with great force and venom. The threshing of the wings, the harsh voices and the violent impacts of their bodies can be heard quite a distance away. The two females watched this performance with interest, sometimes with their necks stretched out flat on the water and sometimes standing up on their tails so as to get a better view, but always adopting the same attitude at the same time. Finally one of the males dived under water and made off. The victor pursued for a short distance, but made no real effort to overtake his opponent, and the fight was at an end. Returning from the pursuit, the victor swam towards his mate, who also swam towards him. Coming close together they swam face to face, jerking their heads violently and bowing towards each other, almost touching beaks. After they had done this about a dozen times, they came so close together side by side that they looked as one bird, save that I could see their beaks touching in the act, as it were, of kissing.

This was, it was evident, a fight between already mated cocks and one would suppose that it was a fight for territory, with the vanquished driven to another part of the pond or off the pond altogether. But the next day

and the day after that I saw all four birds together, and apparently quite happy, though later than that each pair kept very strictly to a definite part of the pond.

The jerking and the bowing and the kissing are, of course, a part of the courtship display. Courtship display varies a great deal from species to species, but in general it is an elaborate ceremonial and it is always very interesting to watch. But before we come to a consideration of the various forms of courtship we must go back a bit.

What is the aim and object of all this courtship display? The sole aim is to bring both birds, but especially the hen, to the point of breeding. That is the climax of the whole proceeding from the first seizure of territory by the cock and the first toleration by the cock of a hen on that territory. Everything leads up to that climax. But you must not think that courtship display, even though as is the case with some birds all the work is done by the males while the females remain outwardly impassive, is simply a matter of bringing the hen up to the point. It is not. It is a matter of *mutual* stimulation. The part played by the hen bird varies a great deal from species to species, but always it is a matter of mutual stimulation.

As a rule, you will find, among the smaller birds where the male possesses bright plumage features that are not carried by the females, the part that the female plays in courtship display is a very minor one, and she may, in fact, appear to play no part at all. You may, in fact, see no sign at all of mutual display, and you may, therefore, think that there can be no question of mutual stimulation. But you must remember that you are not a bird. You are judging only by what you can see, and what you can see is obviously not the whole of the matter. There is a good deal going on internally that you cannot see.

And, if you look more closely, if you look at the female and not, as most people do, at the far more noticeable male, you will probably notice that she has a number of small and unelaborate postures and wing movements and the like, which though they are overshadowed by the elaborate performance of the male are not unimportant. And the closer you look the more of such movements you will see, and the more you will realize that it is indeed all a matter of mutual stimulation.

You will often hear propounded another general rule about courtship display. And that is: among those birds in which both sexes are alike or almost alike in plumage, in which both sexes have certain bright colours or prominent features (such as crests or ruffs), then the courtship display will be almost identical in male and female, that stimulation will be truly mutual right through, and not only mutual but almost equal in the work done to arouse it. I do not, myself, regard this as such a good general rule. It is, obviously, true in the case of the grebes, and particularly in the case of the great crèsted grebe. Here the courtship is so similar as to be almost identical, the female copying the actions of the male. But one can immediately think of another case; the shelduck. In the shelduck the plumage and the bright colours are identical in male and female, but the display is not. The courtship display of the shelduck follows the normal type display of the ducks, and in this the female does little or nothing beyond dipping her bill into the water.

Let us consider, first, the courtship of a pair of small passerine birds. The cock has got himself a territory, defended it successfully, acquired a hen and come to tolerate her on the territory. For a few days after that you will notice, if you watch closely enough, that the birds keep fairly close together: as a general rule the

male at his song post and the female in the bushes or trees near by. When they feed, they will feed together, and they will feed more frequently as time passes. After a while you will, probably, see the cock offer the hen some food, and she will crouch down flat and shimmer her wings to receive this food. She will do this quite a lot, and then she will begin to beg for food, crouching her body and shimmering her wings in just the same way, but now opening her beak, and, perhaps (this does not appear to happen in all species), cheeping like a young bird. She is, in fact, copying the actions of a young bird. She is beginning to be stimulated to motherhood. Once this has happened the pair will keep even closer together, and the pattern of courtship will become ever more complicated.

The pattern varies with the species, of course, but it always becomes more complicated and more intense as the climax is approached. If the male has bright colours, these are put to a great deal of use; if there are prominent features, like long tails or crests, these are displayed to their fullest advantage. You will have noticed, I am sure, the use to which the blackbird puts his tail. If there are no bright colours then the males usually display the wonderful patterns that their feathers make. Each species has its own habit. The yellow wagtail puffs out his bright yellow breast feathers and hovers over the female so that she may see them to their greatest advantage; the great crested grebe displays his ruff; the blue tit indulges in a "ghost flight", gliding downwards in slow motion towards the female; and so on.

But there are also much more difficult displays to understand, as, for example, the elaborate displays on certain chosen grounds of the ruff and the blackcock. And there is also a sort of "mass" display, as in gulls and other colonial nesting birds, which is not, as yet, properly

understood. It has been suggested that in colonies there is not only stimulation of the individual within the colony, but also stimulation of the colony through the individual. This is, however, something rather outside the scope of the beginner in bird watching, and we had better return to the more simple and easily understood forms of display.

Complete displays do not take place every day. You must not think that you can go out any day in the breeding season and see the complete display of a cock bird. The cock bird does not run through the whole of his repertoire for the benefit of the female every day, working her up bit by bit each day by showing off until she is ready to breed. That is far from being the case. It is a much more gradual process, and as a matter of fact you would have to watch a very long while and very closely in order to see the whole of a display. Indeed, I should imagine that it is the exception rather than the rule for a bird watcher, even an expert one, to see the whole of a display. It takes time, and time is the one thing that we have not got very much of these days. But you can see parts of the display often enough, and as you will not see the same part every time, you do in the end get a very good idea of the whole display.

Let me quote a paragraph from Brehm:

> The means by which a male bird declares his love and conducts his courtship are very various, but, naturally, they all accord with his most prominent gifts. One woos with his song, another with his wings, this one with his bill, and that with his foot: one displays all the magnificence of his plumage, another some special decoration, and a third some otherwise unused accomplishment. Serious birds indulge in play and joke and dignified pranks, silent ones chatter,

quiet ones become restless, gentle ones combative, timid ones bold, cautious ones careless; in short, all show themselves in an unwonted light. Their whole nature appears changed, for all their movements are more active, more excited than usual, and their conduct differs from their ordinary behaviour in every respect: they are possessed by an intoxication which increases the elasticity of their nature to such an extent that no flagging is ever perceptible. They deprive themselves of sleep, or reduce it to a minimum without weariness, and while they are awake they exert all their powers to the utmost without fatigue.

Up to a point that appears to me to be true. It is a poetic description, of course, but in broad essentials it is not untrue. Song birds do sing better at this season; the birds of prey do put all they have got into flight, soaring and circling and hovering; buntings, for example, do give the most marvellous aerial displays; cocks strut, because they cannot fly well; cranes turn round and round and round until they are dizzy from exhaustion; pheasants and peacocks dance; and so on.

But Brehm seems to suggest an individual variation, which is the natural outlook of the poet, and that is at least open to question. One would expect, if there was much individualism, an equal amount of spontaneity. But I think you will agree after you have watched for a while that this courtship, no matter what the species, is not spontaneous at all, but purely formal. You cannot get away from that. The same procedure is repeated over and over again, year after year, without the slightest variation. It is quite true that certain aspects of plumage are displayed, as I have already shown you, but this is not individualism, and that is proved by the birds which have not got any particular plumage feature

and yet go through the same performance, birds like the dunnock, for example. In other words, it would seem, that the bright plumage did not come first; the males do not display to show off their bright colours, but rather the bright colours have come in certain cases because they are an aid to the display. They help to increase sex-consciousness, and so help to smooth the way for the serious business of reproduction. That and that alone is the whole purpose of courtship display.

But, again, that does not mean that there is no individualism. Many naturalists have watched courtship, many have studied the whole thing very carefully, but it would be idle to pretend that we really understand it. There is a very great deal that we do not understand at all. There are many questions to which we do not know the answers.

Is there for example any individual choice of mates, any preference for this male by that female, for that female by this male? There have been times when I have thought that I could detect a definite preference on the part of a female for a particular male. But I am not sure. It may be that it is not the male, but the territory that he holds. And there we come to another question. Does the tenure of a particularly good territory give to the male holding that territory an advantage in securing a mate? And again, when you think you see signs of preference on the part of one or other of the sexes, you must consider other factors. Does age have anything to do with it? Are young males as quick in securing mates as older males? Do older females make up their minds more quickly than young ones?

In fact, though we know a great deal about the actual courtship performance, about the actual ritual, we know nothing at all about what it is decides the actual choice of mates. There is, as I have told you, evidence obtained

by ringing, that one pair of robins may stay mated to each other for years. But is that because they like each other? Or is it because the male has a particularly favourable territory and the female happens to live in the immediate neighbourhood? We know that there is apparently little power in the plumage of the male . . . what appear to be the best-looking males (in our eyes) are not always the most successful in securing mates . . . we know that there is apparently no particular power in the song (the best songsters, to our ears, are not always the most successful in securing mates) but that does not mean that there is no choice. I should say that there was certainly some degree of choice, of individual preference, but what determines it I do not know. Careful watching might indicate it, however.

CHAPTER SIX

Nesting

THE whole of courtship display, elaborate and complicated as it is, has but one object. And that object is mating. The whole elaborate performance is there simply to pave the way for one very simple act, the act of copulation. The aim of the whole thing is reproduction.

Naturalists spend a lot of time watching migration and marvelling at it. Naturalists spend a lot of time listening to song and marvelling at the complexity of it, and wondering why birds sing. But these things are simple and almost humdrum compared with the marvel, the all too little studied marvel, of reproduction. Reproduction in bird life is one of the greatest and most intricate marvels of all.

For one thing there are so many steps leading up to the final accomplishment, the whole business is so long. You will have some idea of this already from what has already been said about the life of birds, but let us recapitulate it, and let us take a very common bird that we all know as an example. Let us take the chaffinch, which is one of the most common birds in Britain and which occurs almost everywhere.

Almost all chaffinches spend the winter in flocks, and these flocks are sexless. They are composed of males and females, but the birds are sexless and there are no individual territories. Let us start from there. What happens?

First, the male chaffinch must leave the flock. He must throw off the flock instinct and acquire an individuality, a personality. That as a rule is a fairly gradual

process. But, having accomplished it, he must then find himself a territory. Now, that may sound easy enough, for there is a lot of land about and a chaffinch does not, in comparison, need much ground. But it is not as simple as all that. At the time when the chaffinch leaves the flock and establishes himself on a territory the weather is still hard and there is not too much food about. Almost certainly, when he first selects his territory, it is capable only of supporting himself. Later on it has got to support two, and later on still it has got to support a family. He must, therefore, choose his territory fairly carefully, if he is to be successful in securing a mate and rearing a family. Having secured a territory, he has got to protect it against other chaffinches, birds who for some reason or other have not yet got one. This means that he has to do a lot of singing (if song is really used as a warning) to inform them that the ground is already occupied, and he has got to drive off those males that ignore the warning.

Then the chaffinch must secure a mate, which is not so difficult a business. She will have to help him to defend the territory on occasions. He must then go through the long and wearing business of courtship display in order that his mate may be stimulated to actual pairing. That done a site must be found for the nest, materials for the nest must be found, and the nest must be built, and it must be built strongly enough to withstand the rigours of the weather, and strong enough also to hold five young birds who will grow bigger and bigger and stronger and stronger. That done, the eggs must be laid, and, once laid, they must be continuously brooded for a fortnight until they hatch—whatever the weather, and the English weather is often unkind. The young when they are first hatched are very delicate and they, too, have to be brooded. They have to be kept warm and they have

to be encouraged to sleep the greater part of the day, but at the same time they have to be given, each of them, their own weight in food each day. This must be difficult enough at the start, but, remember, that as they grow stronger and are brooded less, so their appetites grow and the hungrier they become and the more food they require, and the more food and the more food, until in the end the parents are feeding four or five young birds that are quite helpless, but are yet as big as themselves, that are very hungry, but are incapable of digesting as wide a variety of diet as an adult bird. And through all this time the nest has got to be kept clean, and enemies have to be watched for and avoided. When the young leave the nest they are usually not able to fly properly, and that means that they have to be watched even more closely, and the look-out for enemies must be even more sharp than usual.

You would think that with all that labour accomplished the parents would be worn out, for remember they are themselves probably not yet a year old and they are small and they are not very clever. But within a few days of the first brood leaving the nest, a second nest will be ready and the whole business will start over again. If you think about that for a moment, and if you remember how very young the parents themselves are and how very small, if you think of all the things that have to be done, you will agree with me when I say that nesting is the most wonderful thing in all bird life.

Now, let us go back to the nest, which is, as it were, the centre of all this. Nest making, as I have already told you, is specific. That means that the character of the nest is distinctive of the species. Each sort of bird keeps to the kind of nest of its sort. Thrushes do not build nests like blackbirds, nor blackbirds nests like thrushes. Everybody knows the difference between the two. It is

the same throughout the bird world. There may be a great variation in the site chosen for the nest, and there may be some variation in the materials with which it is built, depending upon the availability of materials in the neighbourhood, but the nest is always recognizable as the nest of the species. Now, the building of the nest is wonderful enough as we shall see, but it becomes yet more wonderful when you realize that there is no teaching of the young by the parents. Nor is there any imitation. A first-year chaffinch cannot wander around to see how the older birds are doing it. The older birds would drive him or her away very quickly. Nest building is done without any guidance and without any experience. It is as certain as anything can be that the bird has no idea at all of the next step until that step happens. And yet things are not haphazard. The birds are not just left to work things out as they go along, they are not faced with a long series of problems, each of which requires individual solution. They are guided by hereditary custom, thousands upon thousands of years of it, and all each one of them has got to do is to follow the promptings of that custom as they arise, and all will be well. There is no elasticity about this hereditary pattern. It is fixed and it must be followed without deviation. If something does go wrong and the pattern is broken, no attempt is made to solve the problem thus presented. The solution is almost always the same: the birds desert.

You may recall to mind cases you have known in which birds have nested in the most unusual places, and you may think that such cases are examples of a pattern being broken. But I am not certain that I know of any such cases. It is quite true that some birds will build in old boots, old tin cans, in letterboxes, in lamp-posts, even in the skulls of sheep. But the nests they build are true to pattern. It is the situation that is unusual, not the nest.

And if the situation is unusual to us, that does not necessarily mean that it is unusual to the bird: the bird may find nothing strange about it at all. What the bird has got to do is to find a nesting site within its territory, and it chooses the most suitable. We do not know what are the factors that go to influence the actual choice of site. But you can see how important the actual site is because you will find that the same site is used year after year, and some of these sites are what we should call extraordinary. I know of a lamp-post on a main road that has been occupied by blue tits for the last nine years; I know of a letterbox in the front door of a busy house that has been occupied by tits for the last four years. Both sites seem extraordinary to us, but obviously neither is extraordinary to the tits. The fact is that there are not so many suitable nesting sites available as we humans think, and it is this that makes a bird come back again and again to the same spot, even though the nest is pulled down again and again. Tits, sparrows, starlings, house martins will all try to build again and again in the same spot even though you pull each attempt to pieces, as I hope you will not! Now, this is not obstinacy and I do not think that it is stupidity. It merely means that there are no other suitable sites available within the territory, and remember that the bird cannot go elsewhere: all the territory will be taken up, and he will be driven out.

And yet birds will desert. This seems astonishing if the instinct to reproduce is as strong as we know it to be, still more astonishing if the instinct to build in the same place, despite the destruction of nests, is as strong as we know it to be. But astonishing or not, it happens. Why? It is not an easy question to answer. Probably, there is no definite answer. If a nest is destroyed, that may have been accidental. Accidents will happen, and they do not make the site any the less attractive. It is understandable

that a bird should return again and again to that site. But, if the eggs are handled or the nest pulled about without actually being destroyed, then that is hardly likely to have been an accident, and the bird leaves. Desertion is much more common in the early stages of nesting than in the later. At the beginning the parents are usually willing to cut their losses and begin again. But if the clutch is well on the way to hatching, they will put up with a lot before they will desert.

As I have said, we do not know what factors govern the actual selection of the nesting site. Nor do we know which of the pair makes the actual selection. We have a good deal of information in the case of certain species, but we need a great deal more. It is not always easy to make up one's mind which sex has chosen the nesting site, even when one has watched very carefully, for it is very difficult to decide when the actual selection is made. For instance, in some species, like the starling and some of the tits, selection of the nesting site is made a very long time before building begins. It seems likely that in the case of the blackbird and the song thrush the selection is made by the female. If you watch blackbirds carefully, you will notice that for several days before building begins the female will crouch for a few minutes at a time upon a branch or in the naked fork of a tree, and then you will find that the nest is built in that position. But what about the migrant birds? They have not got much time, and the selection has got to be made quickly. It is usually thought that in such species the males make the selection before the arrival of the females (and this is said to be actually the case with the willow-warbler and the redstart). Here, we need much more evidence. I must confess that I would require a lot of convincing that, even in these species, the female had no say whatever in the selection of the site. Certainly I

would say that in most of the small passerine birds the selection of the nesting site is made by the female, but there is room here for much further observation.

Then there is the question of the division of labour between the sexes in nest building. The old idea was that the male sang to encourage his mate while she did all the work. I think that that idea is now dead. That the cock sings during the building of the nest is obvious, but it must not be thought that that is all he does. Now, you might think that we would know a lot about this, for after all it is only a matter of watching. But, you know, very few people have actually watched the complete construction of a nest from the word "go". And it has been watched for very, very few species indeed. So we do not know very much about it. Broadly speaking, I think you can divide birds into the following classes so far as nest-building is concerned.

1. Species in which both birds take an equal share.
2. Species in which the female builds, but the male finds the materials.
3. Species in which the female builds, but both find the materials.
4. Species in which the male builds a "cock's nest" and the female afterwards lines it and uses it as a nest proper.
5. Species in which the female gathers the materials and does the building, the male taking no active part at all.

Let us consider these in order.

1. A very good example is the long-tailed tit, in which both sexes are perfectly able to build, no matter how complicated the work may be.

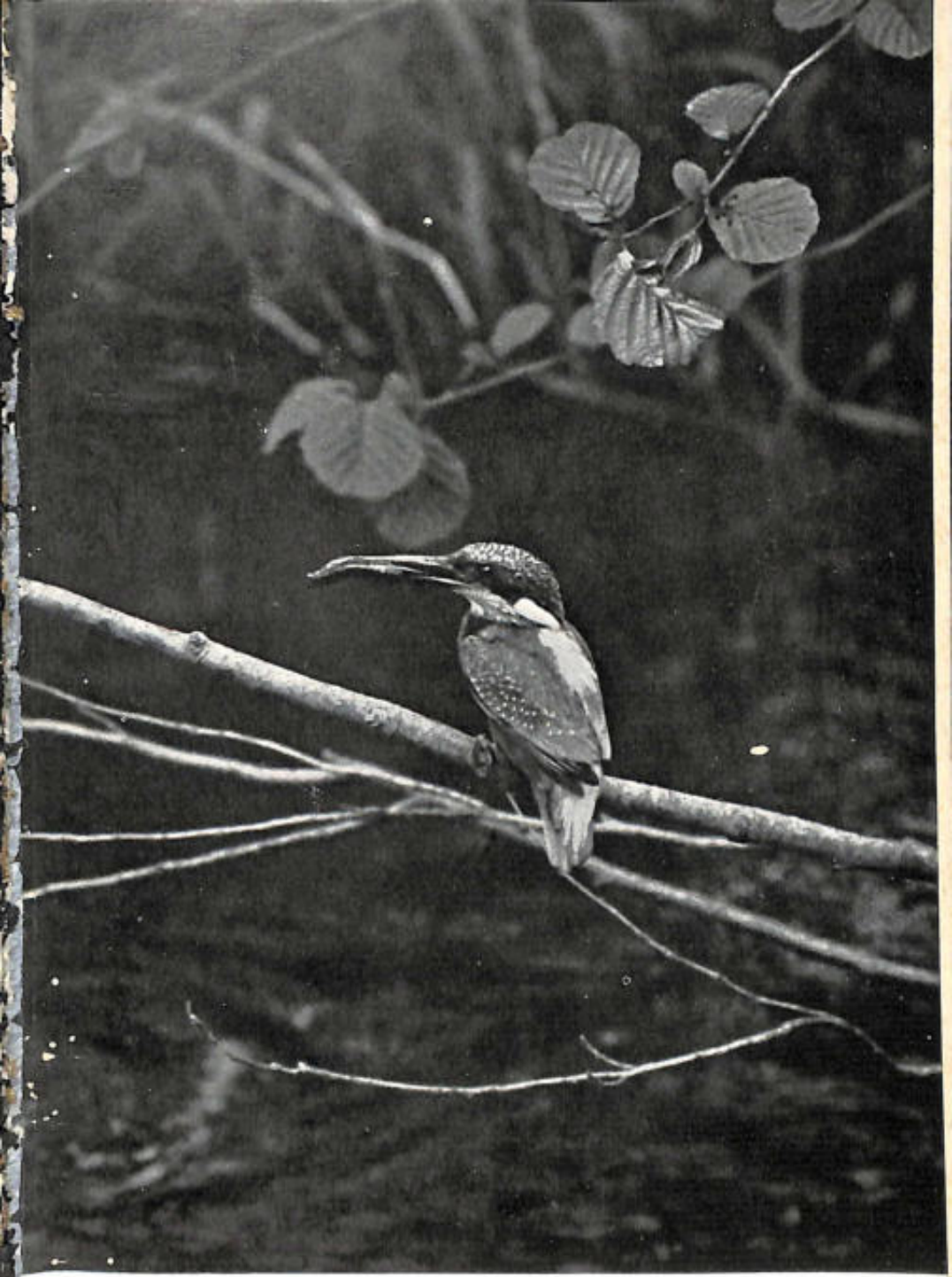
2. Good examples are the wood-pigeon and a number of the birds of prey.
3. Most of the crow family come into this class. In the magpie, the jay, the rook, the raven and the crow, both sexes find the material, but only the female is capable of building the nest.
4. Both the whitethroats and the common wren build "cock's nests" and in the end the female lines them and takes them over as the nest proper. Several "cock's nests" may be built before she finds one to her liking. But these are not the only "cock's nests". It is arguable that the "scrape" of the lapwing is also a "cock's nest" as well as being part of the courtship display. At any rate the female will usually choose one of the smaller "scrapes" made by the courting male, line it with a few grasses, and use it as a nest proper.
5. This is by far the largest group. In it you will find the tits, the warblers, the blackbird and the thrushes, the stonechat, the greenfinch, the bullfinch, and the goldfinch, and many others. Judging by this class alone one would say that the female is the chief creator of the nest and does most of the work.

I am not at all sure that that, in fact, is a correct assumption. It is quite evident, outside nest-building, that as a general rule both sexes apply themselves wholeheartedly to the business of reproduction. If they did not, they would be unable to rear their young at all. It seems to me that even in this fifth class, the male plays in some way, which is not as yet clear, a much greater part or at least a much more important part than the evidence at present at our disposal would suggest.

As one would expect, the actual materials used in the

The Swallow feeding her chicks

The male Whinchat



Kingfisher

Redwing in winter
Blackcock on the 'lek'

building of the nest vary enormously from species to species. I have already described fairly fully the sort of materials used, and there is no need to go much further into the matter here. But it should be stressed more frequently and more strongly than it is (I know of only one modern English ornithologist who even mentions the matter) how very many British birds, and especially resident birds, use mud in their nests. It may not always be as noticeable, as in the nests of the two thrushes and the blackbird, but it is there all the same. It is used even in the nest of the magpie, one of the most wonderful of all our nests, in the form of a cement between the outer ring of sticks. But, if the nest of the magpie is a wonderful creation, it is the "feltwork" nests that particularly arouse our admiration. These nests made of interwoven fibres and hair are the most beautiful works of art. Chaffinch and goldfinch both make open feltwork nests, using spider's silk as well, and camouflaging the whole with lichens and mosses. The little wren and the long-tailed tit make similar nests, but they are domed, and the goldcrest goes one better still and slings her nest like a hammock. (Incidentally, the grosbeaks, which do not nest in Britain, but which also make feltwork nests and suspend them by a string from a suitable bough use mud to balance them! I have often wondered if the goldcrest does the same thing under certain circumstances?) I think that the nest of the long-tailed tit is, perhaps, the most beautiful nest that one can find in this country (and it would be difficult to beat it in any country), while from the point of view of construction it is rivalled only by the nest of the magpie, which is a nest that is usually disregarded when it comes to making comparisons between the building work of the various birds. As many as 2379 feathers have been counted in the nest of a long-tailed tit, which will give you some idea of the labour

entailed in collecting the lining alone, but the real beauty of the nest is provided by the use of spiders' silk which the birds find on the trunks of trees and in holes and cracks in walls. The spiders' silk is woven into the fabric of the nest with moss and forms the main foundation, and outside lichen is added and with the lichen cobwebs. Have you ever looked at a piece of spiders' silk? It is extremely thin and delicate (I believe that the diameter of a strand is less than one-thousandth of an inch). Just think of weaving stuff as thin as that into moss and lichen, and from it, just with the action of your own body, making a nest strong enough to hold a large and steadily growing family, and at the same time to withstand the wind and the rain!

The bulk of the work of building in each species is done by the beak and with the feet, and the body is used to mould the framework, the bird turning round and round inside the growing nest, making a better fit with pokes of the beak or the feet at every turn. So far as is known, this moulding is always done by the female, as one would, indeed, expect to be the case, since she has to sit in the nest for much longer periods than the male.

And now I must say a few words about "unusual" nesting sites. As I have already said they may not be unusual at all to the bird; they may just be nests placed in the most suitable position in the territory. But occasionally, you will come across a nest that is obviously in an unusual site, a site that must be unusual to the bird as well as to the human that finds it. For example, you will sometimes find thrushes and blackbirds nesting on the ground. They will do so if there are no bushes or trees available, and it is more common, I think, in thrushes than in blackbirds, though it is, of course, uncommon in both. Now, this must be unusual for the bird, for both birds are tree or bush nesters and their

inherited instinct must tell them that it is wrong to nest on the ground. (In the case of tits nesting in a lamp-post or a letterbox the same is not true, for they are still nesting in a hole.) But, though the nest is built in such an unusual position, it is still the same thrush nest, just placed down on the ground, generally under the shelter of some overhanging leaves or tall grasses.

Sometimes with an unusual nesting site the bird will make, what appear to us, to be quite ridiculous mistakes. Birds live very largely by "pattern", by visual pattern, and if the site chosen has a number of similar situations close together (if there are a number of identical visual patterns) then the oddest things may happen. Often it leads to "multiple nest building". This has been recorded for blackbirds, chaffinches, robins, redstarts, and song thrushes. In every case in which it has been recorded it has occurred at a man-made site . . . in a series of pigeon-holes, between the rungs of a ladder and so on. The bird gets confused between the similarity of the sites and builds a separate nest in each site. In one case a blackbird built nine nests between the rungs of three ladders, resting against a wall, and all the nests were linked to one another. In another case a blackbird laid the foundations of a nest on the rung of a ladder resting against a wall, became confused between the rungs and proceeded to lay foundations for nests in every rung of the ladder. Finally, she attempted to build up on three of these foundations, and in the end she made a very rudimentary cup in one of them. But she never finished this cup and she laid no eggs, presumably because she was too exhausted by her labours to do so.

Under natural conditions this sort of thing rarely, if ever, occurs. Under natural conditions there is never an exact reproduction of geographical conditions, and the

bird visualizes the geographical conditions exactly. So exactly, in fact, that if you move a nest you will cause the owner a great deal of trouble. The nest as a nest does not seem to be recognized: it is recognized only when it is in a certain position, when all the factors surrounding it are in their proper position. For example, if you remove a tit's nesting box and put it up in the same tree but in a different position you will find that the birds will return to the exact spot where it was before and will ignore it in the new position. If you cut away the branch on which it was placed, then the birds will hover in mid-air at the spot where it used to be. This will happen even if you have only moved the nest by a foot. As a rule the birds will come to the nest again in its new position, though this will take some time and frequently several visits to accomplish. But sometimes they will never get used to the idea that *that* is their nest, moved by some miraculous means to a new position, and will set about building a new nest in the old position or as near to it as they can get.

This, you may say, is highly unintelligent behaviour. And so it is. There is a tyranny in this dominance of visual pattern. But remember that it was *you* that moved the nest, you that put the ladder against the wall. In normal conditions there would be no ladder, and the the nest would not be moved, and under normal conditions visual pattern is not a tyrant, but a help. Remember that all the nests of a species are alike. They are not like the houses of men. They have not got different window curtains, or different numbers; they are not built to a bewildering variety of different architectural designs. They are all exactly the same. There could be no question of recognizing the nest as the nest. But the situations in which they are placed are all different. There may not seem to be much difference to us humans,

but there is a difference. It is this difference that is photographed on to the bird's mind. It is the surroundings of the nest that he remembers, the visual pattern of the surroundings that he recognizes, and having recognized it he or she goes straight to the nest, for then they know their home. So, when we talk of the tyranny of visual pattern, we should remember that there is another side to the question. Visual pattern is very dominant in bird life, but it is a dominance that is on the whole most helpful to the bird.

CHAPTER SEVEN

Young Birds

BEFORE we come to the young bird itself we must consider the egg from which it springs. The study of eggs is a special branch of the science of ornithology and is called oology. This, even if I was competent to deal with it (which I am not), is outside the scope of this book, for oology is concerned with the egg-shell rather than with the contents of the egg, and we, in this book, are concerned with the living bird. So we shall here disregard the shell, beautiful though it very often is, and concentrate only on the contents.

A bird's life may be said to begin within the egg. (Actually, it begins yet further back; it begins with an intimate union between male and female adult birds.) Now what goes on within the egg? Nothing haphazard: it is a smooth and orderly, and extremely punctual, process, more smooth, more orderly, more punctual than are the early stages of any other vertebrate animal. The actual stage within the egg is comparatively long, six weeks in some of the larger birds, three weeks in a domestic fowl, a fortnight in a finch, and even the fortnight is a long time compared with the astonishing speed with which some insects are brought to active life. But it is really a very short time when one considers all the things that must happen, when we remember that it all begins with a single minute cell, a half-paternal, half-maternal nucleus, and that from this minute cell within the shell there develops a bird, which may be able to run as soon as the shell is broken, which in one family (the Mound Birds) can fly as soon as the shell is broken.

When we remember all that, six weeks does not seem a very long while and a fortnight seems extraordinarily quick.

What goes on within the shell is not really the concern of the bird watcher. The bird watcher cannot see within the egg in the nest, and though he should know something of all the early stages (and for some birds we know the early stages with great exactitude from day to day, and I have already told you what happens in a previous book) it is only at the time when the chick is about to leave the shell that it begins to interest the bird watcher as a living thing. You must, therefore, know the incubation periods of the various birds that you are watching. Any handbook will give you these with reasonable accuracy, but here are a few just to give you an idea. In most of the smaller passerine birds the period of incubation is about 14 days, most of the wading birds (snipe, woodcock, plovers, sandpipers and so on) sit on their eggs for between 21 and 28 days, the ducks and the geese for between 28 and 35 days, the hawks, generally speaking, for 35 days, the golden eagle for 45 days. There is, of course, a small variation in each case owing to local conditions, disturbance and so forth. During this incubation period the parent bird, or birds, sits tightly and regularly and will continue to do so until the eggs hatch. Sometimes, of course, something goes wrong, and the sitting period is then lengthened very considerably, and sometimes the clutch fails to hatch altogether (because the eggs are infertile or for some other reason) and then the bird will continue to sit until driven to forsake by sheer physical exhaustion. But normally after the proper period of incubation the eggs will begin to "chip", and then, if you listen closely, you can hear the young bird trying to force its way out of the shell.

The state of development which the young bird has

reached at the time when it leaves the shell varies enormously with the species. For example, in the case of the waders, the young bird is not only quite advanced physically (for it can run as soon as it has left the shell) but also mentally. If you find the eggs of a curlew or a snipe that are about to hatch and pick one of them up and listen, you can hear the young bird chirping within the shell, and the voice is the genuine voice of the adult bird, the voice of the parents. On the other hand, the young of passerine birds are blind when they leave the shell, and quite helpless, and they have no voice at all. Even when they have gained sight and passed the first stage of absolute helplessness their voice is quite unlike that of the parents.

Now, if there is a great change in the young at the time of hatching (and it is evident that there is) there is also a great change in the parents. This is as a rule overlooked. Few people seem to think about it. But it is there all the same. Up to the moment of "chipping" the parents have been content to *sit*, but with the chipping of the egg they are stirred, in the case of passerines particularly, to a frenzied activity. And yet, though there is this frenzied activity, the brooding instinct is not lost. Now the parents must not only keep the young warm, but also provide them with enough to eat. And, if you have any doubt of the part that the male plays in the bringing up of the young and the keeping of the home, if you are of those who think that in most cases the male does nothing, then watch the activities of the parents when the young are hatched. You will, I am sure, have no doubt at all that both parents work wholeheartedly in the interests of their family. It is only in those cases in which the young do not pass through a helpless stage in the nest that the male parent does not help. In all other cases he works very hard indeed.

Now, though we know a very great deal about the egg and the development of the embryo . . . indeed, we know all that there is to know . . . we know very little about the young bird when it leaves the egg. It is a strange thing, but it is true, that we do not really know very much about the active bird until it has grown up. When we watch the nest and the nestlings we really watch the actions of the parents. By watching the parents we have learned some very interesting details. We know, for instance, that though the egg was for a long while the centre of the parent's life, once the young have hatched the shell loses its significance and becomes a thing of no importance and, indeed, something to be got rid of. Some birds will remove the broken shells almost at once and drop them at some distance from the nest, others will not do so for several hours, and in a few cases it may be a day or two before the remnants are removed. But they are removed. It is curious that should an egg-shell be damaged during the incubation period the bird is more likely to desert than not; the cases in which the parent will remove such a shell are few and far between, though there are cases in which it has happened, and even cases in which the parent has eaten such a shell. One would have imagined that the instinct that prompted the removal of broken shells would have operated at any time, and this only goes to show how very strong the incubating urge must be.

Feeding and keeping the young warm is a labour. And in this labour the cock plays a considerable part, not infrequently a greater part than the hen. Even in those cases in which the male has taken but a small part in the building of the nest and the incubation of the eggs, he will take a major part in the brooding of the young and the gathering of the food. In some birds, indeed, as for example the harriers and the sparrow-hawk, it is

the male that does the major part of the food-collecting.

And this food collecting *is* a labour. A young bird has to eat its own weight each day in order to grow properly. This drops a little as the birds grow older but it never drops, I think, to as little as half the body weight. Now, remembering that, think how very, very little an insect weighs, and you will get some idea of the tremendous exertion that must go to the feeding of four or five growing and hungry youngsters. If the weather is bad, if it is cold or wet (as it very often is in England in the summer) then the labour is the greater, for the food is the harder to find.

Now, if you watch parents feeding their young in the nest, you will get some idea of the number of visits to the nest they pay in a day. To begin with, when the young are very young and helpless, you will find that a pair of tits will make about four visits an hour but after the first few days the rate will increase to about fifteen an hour and may even get as high as twenty an hour. (Incidentally, this is a point on which we need much more information, and one which offers a great opportunity to the young bird watcher with a careful and accurate mind. For instance, how soon after hatching are the nestlings first fed? And again, how many visits are made in a day? Does the number increase regularly throughout the period in the nest? Do the number of visits vary with the hour of the day, are they more frequent at some hours than at others and are these peaks of frequency regular day by day? Are the visits to the nest governed by changes in the weather? And so on. There are a great many questions of this kind to which we do not as yet know the answers.)

Curiously enough, considering the devotion with which the parents tend the young, there appears to be

little or no affection for the young as such. It is very important to realize this at the outset. If you do not, you will be led astray down all sorts of by-paths of sentiment that have no place at all in the world of nature. The behaviour of the parents is instinctive. Just as we have seen that much of the behaviour at the nest is governed by a visual pattern, so the behaviour towards the young is governed by a visual pattern. But in this case it is rather more complicated. There can be no doubt that, in certain species at any rate, there is a sense of achievement in the parent birds when the eggs first hatch. Perhaps, but I am not sure about this myself, that is putting rather too human an interpretation on it; perhaps it would be more true to say that in certain species there is at the moment when the eggs hatch a very intense pitch of emotional feeling. Whatever it is, it is there. If you watch partridges when their eggs hatch, you can have no doubt at all that the parents are in a state of great excitement when the first chicks appear. And the same is true of blackbirds and thrushes. Chaffinches have special notes that they use only when the eggs are hatching, and the same is true of woodcock and curlew. Yet, even if this is so, even if some birds do realize that something tremendous has been accomplished when the eggs hatch, behaviour after that is instinctive. That birds are model parents . . . and they have been extolled as model parents in prose and verse for almost as long as either have been written . . . is true, but true only up to a point. Their behaviour is not governed by love, but by instinct.

Take the case of the cuckoo. There is a young cuckoo in the nest. There comes a day when it throws its foster-brothers and sisters out of the nest. It has not got the strength to throw them very far. More often than not they lie just outside the nest and in full view of the

parents as they brood and feed the young cuckoo. Let me quote from W. H. Hudson's *Hampshire Days*.

> The young robin, when ejected, fell a distance of five or six inches and rested on a broad, bright green leaf, where it was an exceedingly conspicuous object; and when the mother robin was on the nest . . . and at this time she was on it the greater part of the time . . . warming that black-skinned toad-like spurious babe of hers, her bright intelligent eyes were looking full at the other one, just beneath her, which she had grown in her body and had hatched with her warmth, and was her very own. I watched her for hours; watched her when warming the cuckoo, when she left the nest, and when she returned with food and warmed it again, and never once did she pay the least attention to the outcast lying there so close to her. There, on its green leaf, it remained, growing colder by degrees, hour after hour, motionless except when it lifted its head as if to receive food, then dropped it again, and then at intervals it twitched its body as if trying to move. During the evening even these slight movements ceased, though the feeblest flame of life was not yet extinguished; but in the morning it was dead and cold and stiff; and just above it, her bright eyes on it, the mother robin sat on the nest as before, warming her cuckoo.

There is nothing special about the cuckoo that prompts this apparently heartless behaviour on the part of the parent bird. If you take the young out of the nest of any small passerine bird (but I very much hope that you will do nothing of the sort) or even out of the nest of so intelligent a bird as the magpie, and lay them just beside

the nest, and put nothing in the nest in their place, you will find that the parents will ignore them absolutely.

In other words it is only while the young are within the nest that they receive attention from the parents. It is not the young bird alone that stimulates the parental instinct, but the young bird in association with the nest. And even this is not wholly true: for, if you pick up an ejected nestling and replace it within the nest, the parents will not feed it, and will, indeed, ignore it, until it has become warm and begins to show the gaping action, when it will be fed. Until this happens, it is just an object in the nest.

It is the gaping action of the nestling, and not the nestling, that prompts feeding. Just as there is an association between the nest and the nestling in the parent's mind without which the nestling is nothing, so there is an association between the gape and feeding without which there is no feeding. There is no "love" about it at all. Break the association and the instinctive reaction is also broken.

The gape association is especially strong. The sight of a young cuckoo on a lawn being fed by small passerine birds is common enough. Many people must have witnessed it. But it is not always realized that it is not only the foster-parents which feed it. It may be fed by any passing adult. The young cuckoo opens its gape and the passing bird stuffs food down it, even though that food may have been intended for nestlings in the home nest. I have watched a young cuckoo on a lawn in Winchester being fed by the foster-parents (robins), and by passing wagtails on their way to their own nest, as well as once by a passing song thrush. It is the instinctive reaction to the open gape. There is a pattern that must be followed. No matter how urgently the youngster may need food, if it does not open its gape it will not get it.

Now, you will have noticed when you have seen young birds in the nest with their beaks open that they very often have very bright colours inside. These bright colours on the phlanges and palates of the gape are an additional stimulant to the parent. Again, you will notice that the tongues of many young birds are also spotted, bright and dark spots alternately, and these serve, of course, to enhance the pattern. If you look into a nesting-box full of young tits you will see, no matter how dark the interior of the box, the linings of the mouths of the young birds, yellow or rose pink as the case may be. The palates of young starlings are bright lemon and the edge of the gape is lined with yellow. Bearded tits (but they are rare birds and you may be a long while before you see a nest full of nestlings) have a most remarkable arrangement of white spots set against a black background and the whole surrounded by bright red. It is often said that these bright markings are to help the parent to place the food in the beaks in the dark and so to save time. No doubt some such effect is obtained when the nest is in a dark place or when the interior of the nest is very dark. But it is not only birds that nest in holes that have these bright colours to the gapes in the young. Most of the buntings, for example, have the insides of the mouths bright red in colour while the gapes are bright yellow, and the buntings do not nest in holes nor are their nests very dark inside. No, the prime purpose of the colours is undoubtedly stimulative. When the parent bird arrives at the nest and is greeted with the sudden and simultaneous opening of very brightly coloured mouths, he or she is driven to move downwards towards the colour and to place the food in the beaks.

As the young grow, and need food more insistently, other stimulants are added. The chief of these is move-

ment. The young reach up towards the parent, thrusting the colour towards the food. Some thrust up and down, some move their heads from side to side, and so on, but all these movements enhance the value of the colour and increase the driving force on the parents. There are also, of course, feeding cries used by young birds. Or at least after a while young birds begin to beg for food and to use their voices while they do so. Whether this cry actually has much effect I am not sure. Judging by the cuckoo it has an enormous effect. The cuckoo has a very large and very brilliant gape (bright yellow gape and brilliant orange mouth) and it has a most insistent and penetrating wheezy cry. There can be no doubt of the effect on other birds. But whether the cry of young birds has much effect on their parents is another matter. My own observations have made me doubtful (I admit that in this I disagree with most of the authorities) but I have no doubt at all of the value of the colouring of the gape and the mouth.

This instinctive behaviour in feeding the young is not confined to the small passerines, of course. All birds are subject to the visual pattern or at any rate to pattern. In the birds of prey it is usual for the male to catch the prey and to bring it to the female, who will feed the young. That is the pattern. Now, let me give you an example of what happens when the pattern is broken. Dewar in his *Birds at the Nest* quotes an observation by J. H. Owen on sparrow-hawks. Owen was watching a brood of young sparrow-hawks and, when they were about a fortnight old the mother was killed. He says: "When we examined the nest a day or two later we found all the young dead and a pile of six dressed finches and buntings on the edge of the nest." Now, it is the practice of sparrow-hawks (as it is the practice of most raptorial birds) for the male to capture food for the young and to

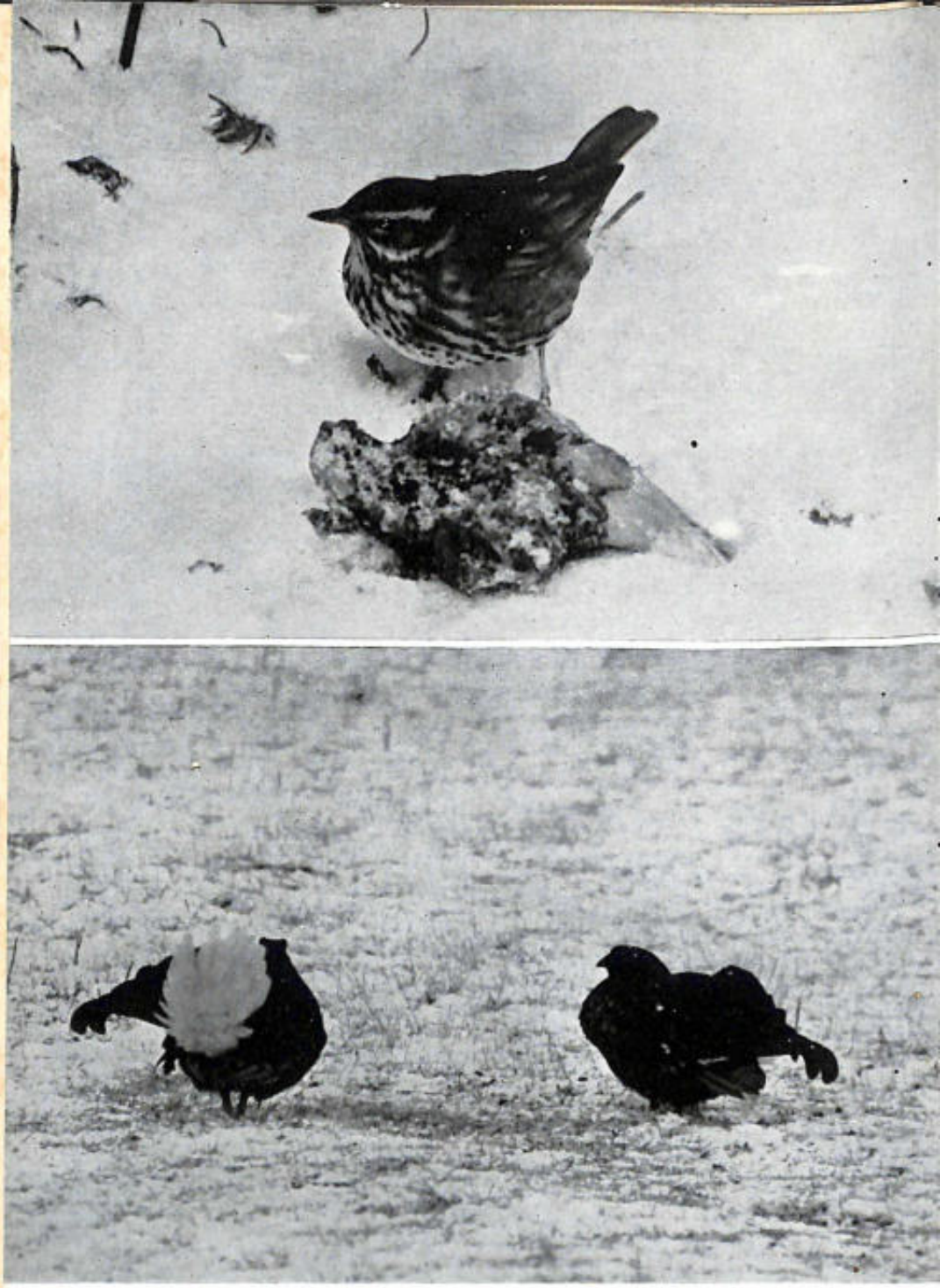
bring it plucked to the nest, and the female then picks it to pieces and feeds it to the young. In this case, the female having been killed, the male carried on with his job, but he was unable to do the female's job, and the young could not feed themselves and died. The male could well have fed them. He is as well able to pick dressed carcasses to pieces and give them to the young as the female. But he was not able to break the pattern. As Dewar says: "Here we have proof that feeding the young is a purely instinctive operation, of which the parents do not appreciate the significance."

The parent birds do more than just keep the young warm and feed them; they also keep the nest clean. You will know how important it is to keep clean in order to avoid disease. It is just the same with birds and animals. Young birds have not got lavatories to use, and so they use the nest, and the parents remove the excrement. If it was not removed it would be a real danger. This removal of the excrement from the nest is called "nest-sanitation". To begin with, when the young are very helpless, the parents take the *faecal sac* as it appears and usually swallow it, but as the young grow they are able to deposit it themselves on the edge of the nest or in some other spot in the nest, and then the parents take it up in their beaks and fly away with it.

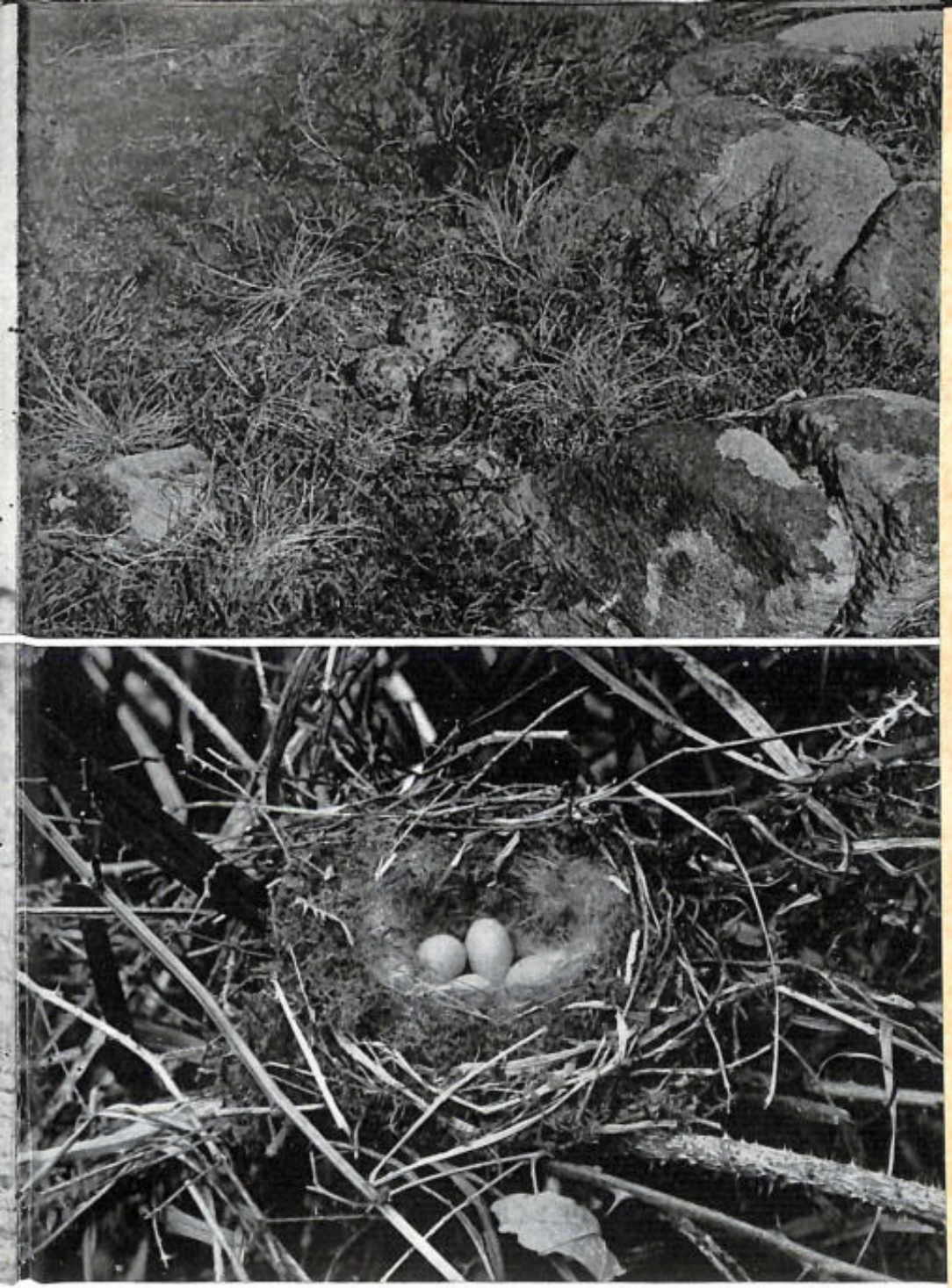
So much for the parents and the young. What about the young themselves? What do we know about them? The answer is, practically nothing. We do know that the young bird is for a while just a stationary, almost lifeless, object in a nest and that everything is done for it by its parents. When does it begin to do anything for itself? When does it begin to show signs of consciousness, so to speak?

The first sign of consciousness, of which we humans are aware, in the young birds is the evidence of fear. This

Kingfisher

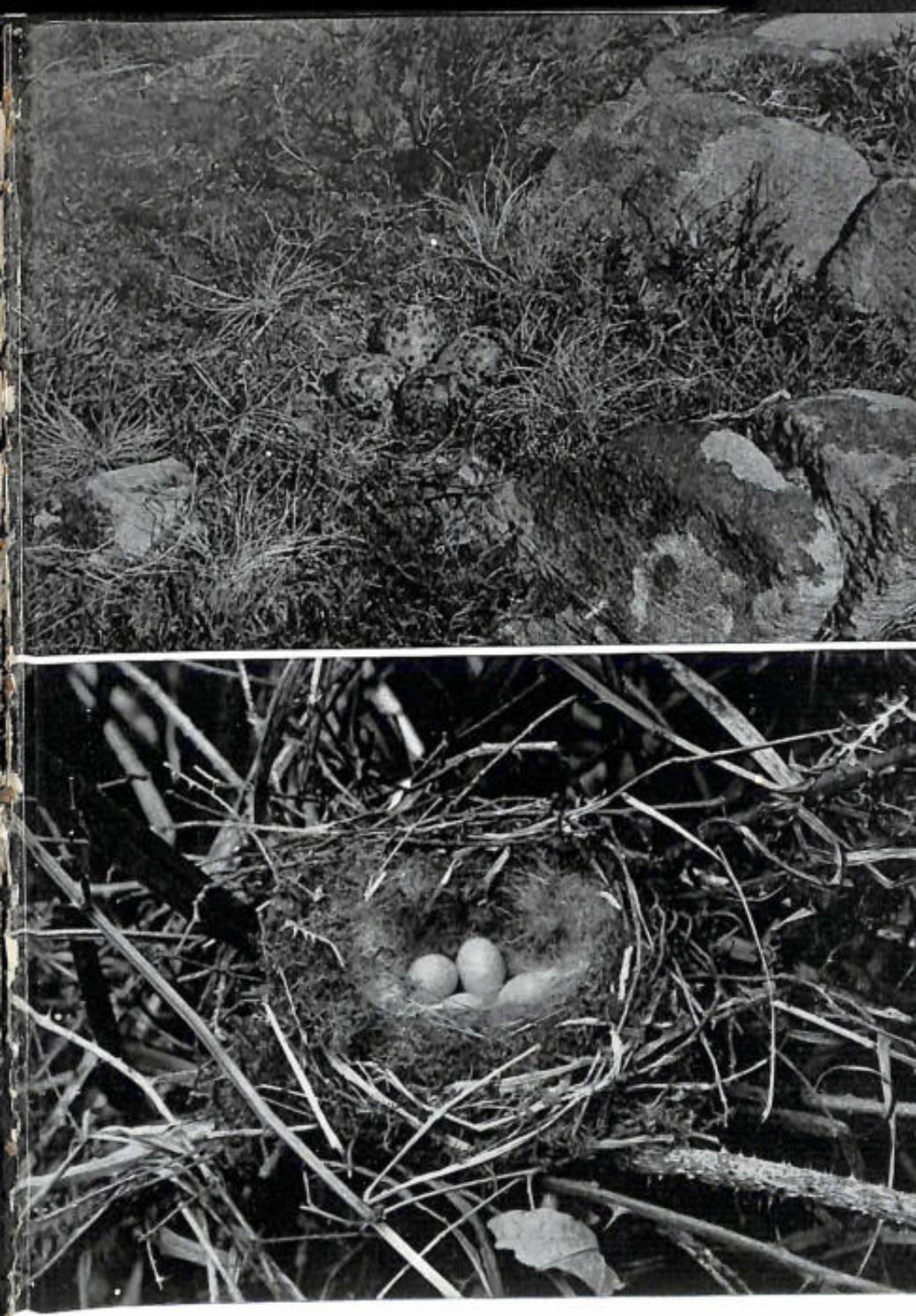


Redwing in winter
Blackcock on the 'lek'

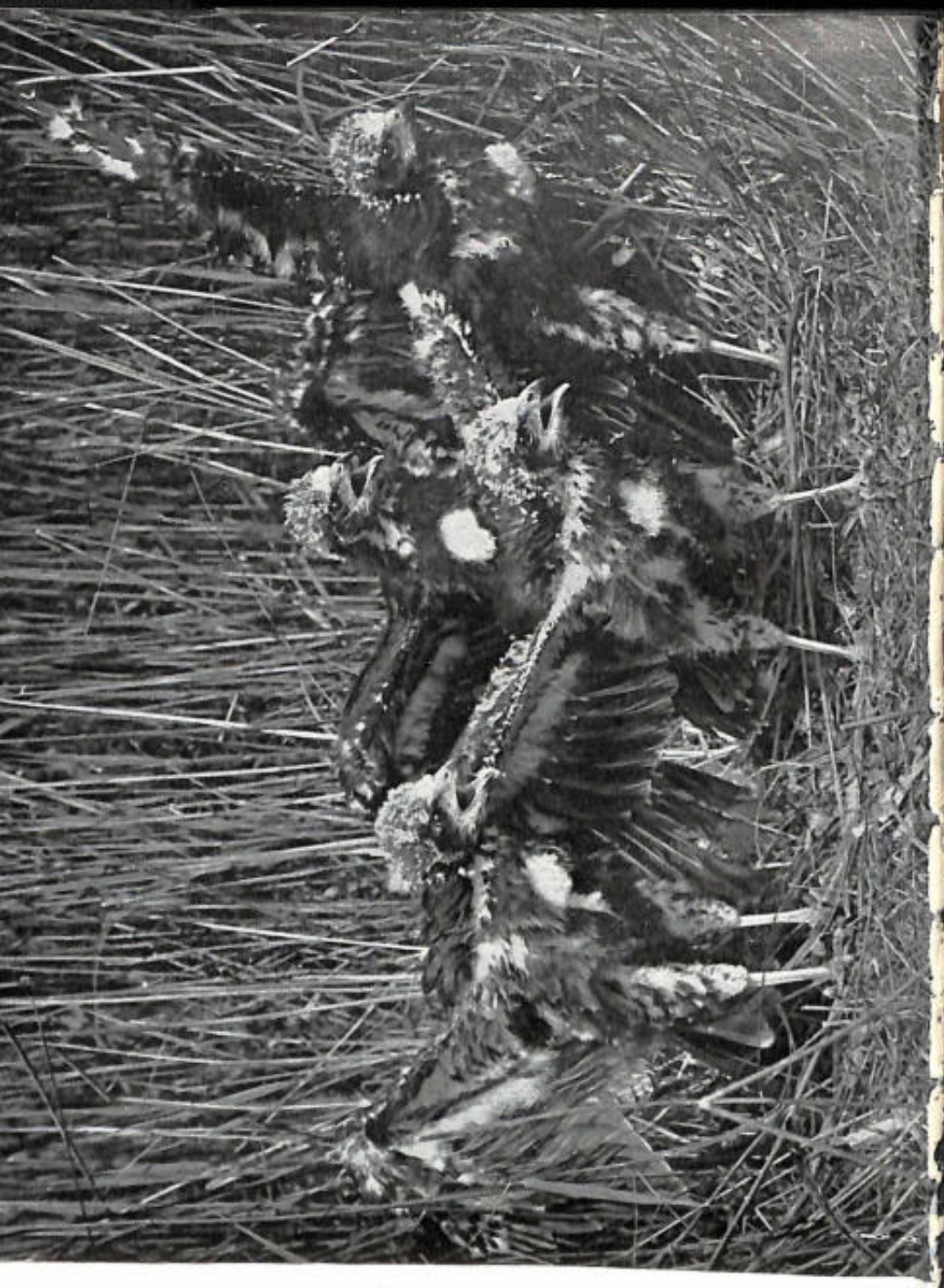


Nests and eggs of Greenshank (*above*)
and Hedge Sparrow

Young Marsh Harriers



Nests and eggs of Greenshank (*above*)
and Hedge Sparrow



Young Marsh Harriers

Male Cirl Bunting removing excreta

Little Owl

comes while the young bird is still in the nest, and to all intents and purposes helpless. When it comes varies with the species, and the matter has not been studied properly by naturalists as yet. According to Stuart Smith, who has watched birds very carefully from this point of view, the reaction to fear is first apparent in the tree-sparrow about eight days after it has hatched, in the yellow wagtail at seven days' old, but not in the cuckoo until sixteen days' old. Here is a study that any young bird watcher can undertake, and much valuable information could be gathered in almost any back garden. At any rate there comes a time, and it comes very suddenly and without any warning, when the young bird is made aware of danger and reacts promptly to the awareness. But we do not know what it is that so suddenly makes the bird aware of something that it did not know a day previously, and of which it can have had no experience whatever.

It is different, of course, with those young birds that are hatched in an advanced state of development. The young of the wading birds and the game birds are hatched with their eyes open, with a patterned down, and they are able to run as soon as they are dry. These birds will respond to danger calls from the parents as soon as they are able to move. At the danger call they will crouch motionless, and so well does the pattern of their down harmonize with the background of the countryside that if they stay still (as they do) then they are almost invisible and pretty safe. But you must not think that this action is intelligent. It is not. It is a purely instinctive reaction to the stimulus of the parents' call. It is quite rigid, and is incapable of alteration to meet altered circumstances. Julian Huxley has shown that the young of these birds "will crouch just as readily on a lawn or a carpet, against which they are con-

spicuous in the extreme". But you must also remember that such conditions do not occur very often under natural conditions, and that the instinctive response to the stimulus is quite good enough under normal conditions.

Generally speaking birds will not defend their young or their nest. There are exceptions, of course. You may have acquaintance with a swan, and you will know that the swan can be a fearsome beast in defence of its nest. Swans will even attack man. So will a few, a very few, of the birds of prey. Some of the gulls will demonstrate quite close to the face of an intruder. But for the most part birds will fly away rather than face a human intruder. It is not surprising. Few birds have much chance of putting up a successful defence of the nest, even against other birds, unless they live in colonies and can enlist the aid of their neighbours to mob the intruder. So a number of birds have developed wiles of their own to lead the aggressor away from the nest or the young. The redshank is extraordinarily successful at this. I suppose that the best known of these wiles is the "broken wing trick", in which the parent bird flutters around with one or both wings dragging as though they had been broken. If you are not acquainted with the trick it can be astonishingly convincing, and you can be led a dance for quite a while by the crippled bird before it suddenly gets up and flies away, as whole and as sound as you are. The trick is not, of course, put on only for the benefit of man but also for the benefit of dogs and so forth. There is a point to remember in connexion with all these tricks (there is more than the one with the broken wing) and that is that they are reactions to fear. They will be deliberately staged on occasions, but as a rule they are instinctive reactions to sudden danger. If the bird knows that danger is

coming then it merely leaves the place until the danger is passed. But if it is taken by surprise, then it will resort to this trick or that to avoid danger and to lure danger away from its young.

But there comes a time when the young must leave their parents. Indeed, there comes a time with some birds when the parents drive their young away. How do they fare then? Well, it is obvious that they fare, on the whole, pretty well, for if they did not the species would die out. But how have they learnt enough to survive in a world full of dangers? Young birds are not taught. I know that it is a commonplace to say that young birds are taught to fly by their parents. But they are not. No one has ever seen a young bird being taught to fly by the parents, and no one will ever see such a thing, because it does not happen. You may see, sometimes, young birds being *encouraged* to fly by the parents, but that is a very different thing, and in the vast majority of cases it is not necessary even to encourage the young. Most of them take their first flight quite suddenly, and, as often as not, while their parents are away from the nest. No, the young bird is not taught by its parents. How then does it learn? I think that the answer is "by imitation".

It is, of course, born with a large number of instincts that have been inherited from previous generations, and these are extremely valuable to it throughout life, especially in the early stages. These instincts are something that we cannot fathom or catalogue by rule of thumb. We can guess a lot about them, and one man's guess is as good as another's, but guessing is dangerous work and full of pitfalls, and in natural history is to be avoided above almost everything else. We must just take them for granted, as something that we, who have lost almost all our instincts (if we have not lost them all)

cannot understand. But there still remains imitation. You may ask how we can know that birds imitate one another. Well, there is the imitation of the song or calls of one species by the birds of another. But we are here talking of the imitation of older birds by young birds. How can we know that that does occur? We do not, of course, know that all young birds imitate older birds, but we do know that it does happen sometimes, and, if it does happen sometimes in some species, it is at least likely that it happens at other times in other species.

For example, the young of the first brood will sometimes help the parents to feed the young of the second brood. This can only be imitation. I have seen it happen in the blackbird and the thrush and the dunnock and the house-sparrow. It is quite a common sight in September among house-martins. Here, in all these birds, it can only be imitation. If it happens in these birds (mind you, it does not always happen in all these birds; every young blackbird of the first brood does not help its parents to feed the young of the second brood) there seems to be no reason why it should not happen in other species also. The fact that we have no information on the point does not mean that it does not happen. There has been very little work done on this particular point, and there is a wide field for work here for the enthusiastic bird watcher.

CHAPTER EIGHT

Movement and Migration

WITH all birds, no matter what their species or nesting habits, there comes a great change with the growing up of the young. There is, of course, a great physical change with the diminution of the sex organs, and all the other changes spring from that fundamental change. We will accept the fundamental change, and consider here only the changes in habit that it brings about.

It is a commonplace that as the year approaches autumn, and the moult is over, a restlessness begins to seize the birds. Throughout the summer the birds have been for the most part static in their territories. In the spring there was much restlessness to secure territories, in the summer the birds were concentrating on the business of reproduction within the small limits of those territories, now the movement is reversed. In all but a few species jealousy now ceases and territorial boundaries go by the board. A drift sets in. As soon as the young are fit to travel, they begin to move.

Actually this movement started long before, a point which is too often overlooked. There are families of mistle-thrushes and lapwings on the move as early as late May, before the last of the summer visitors have occupied territory. By the middle of June there is movement on a tremendous scale by starlings. They have left the nesting sites . . . starling nesting sites are rather restricted, you know . . . and are travelling where they will over the country in search of food. A little later

there are vast numbers of young warblers on the move. This happens about mid-July, and these young birds are absolutely without respect for territory and, since it is impossible to defend the territory against them, the beginning of their movement hastens the breaking up of the warbler territories throughout the country. In the same way you begin to see, after the middle of July, swallows and house-martins in areas where they have not bred. They have been forced away from the breeding grounds and they, like the starlings, wander where they will in search of food.

Altogether there is a big summer movement of birds, mostly young birds, and this movement gets bigger and bigger after mid-summer. It has been noticed often enough, of course, but it has not been studied properly and has generally been dismissed as a sort of preliminary to migration proper. The movement is called "dispersal", is admitted to be puzzling, parts of it are recorded, and that is about all.

But if you begin to study a few dates I think that you will agree that "dispersal" is not quite a sufficient word. Let us take the willow-warbler, which is a very common bird indeed in this country in summer. The willow-warbler arrives about the second week in April and it is a common bird in this country for at least twenty-three weeks. Now, within eight weeks of its arrival, all the young are fledged and the territories are being broken up. But it is not until the beginning of August . . . that is another eight weeks . . . before there is any considerable movement from our shores, that is before there is any considerable emigration. And there will be yet another eight weeks before the numbers are down to what they were in the second week in April. Thus territory is held for less than eight weeks, eight weeks at the very outside, and there are about eight weeks when

the birds are on the move. There are other birds that hold their territory for even less time than this, notably, I think, the garden warbler and possibly the nightingale. What happens between the break up of the territories and the movement overseas? "Dispersal" suggests "scattering". Do the birds just scatter, without any definite programme, just go where the spirit moves them?

The fact is that this period of the birds' year has not received sufficient attention, and we do not know enough about it. I commend it to your consideration.

One thing that you will notice is that there is a striking tendency on the part of certain species to gather together into flocks for roosting. Pied wagtails will commence to do this as early as midsummer. Yellow wagtails begin to do so about the end of July. Willow-warblers join up in loose flocks and you will even find them mixed up, though loosely, in flocks of titmice, which is an extraordinary thing in so strongly individualistic a species. The flocks of wagtails seem to be made up of young birds and adults, and it must be admitted that we know very little about the reason for this flocking.

It is fairly evident that there is a considerable movement by these flocks, but it would be very unsafe to assume that these movements form part of the general drift southwards which begins early in August. There is, as a matter of fact, actual proof that some young birds travel north and not south at this time of the year. It is true that most of the records are for Sandwich terns, common terns and gulls, but there is at least one record for a wheatear, and time may well show that there is for a while, at least among insect eaters, a tendency to move northwards for a short time just after midsummer.

We have, you will have noticed, been hovering on the

fringe of migration for some little while, and we had better come to that enthralling but very complicated subject now.

Now, what is migration? We generally think in terms of a long journey, and in this country we think of that journey as involving a crossing of the sea. In other words we think of migrants as birds that come to us from overseas for a short period either in the summer or in the winter. Those birds are, of course, migrants. But that is not the whole migration. Another definition is that migration is a movement in which there is a definite shifting of the main population from one area to another. And this, I think, is the definition that is most widely accepted. But it is not a very satisfactory definition for all that. You have got to have a very accurate knowledge of the population numbers to be able to say that "the main population" has shifted. Easy enough in the case of very common birds with the flocking habit, for then you will notice that there are very few of them about; but far from easy in the case of a bird that has not got the flocking habit and is not present in great numbers at any time of the year. The fact is, of course, that any bird that moves from one district to another at certain seasons is a migrant. The operative word is "season". Movement at any time of the year, haphazard movement, is not migration, nor is continuous movement; these are nomadic impulses. Birds that live so (if there are any) are nomads in just the same way as tramps and gypsies are nomads.

Migration is a seasonal movement from a home headquarters to some other place for a season. It has nothing whatever to do with the main population. It has nothing whatever to do with bulk. A definite seasonal movement whether in bulk or in individuals is migration. Nor has distance anything to do with it. Distance captures the

imagination, but there is plenty of migration that does not cover great distances.

The swallow that nests in Britain and winters in Natal covers an enormous distance and is a migrant. But the blackbird that leaves the high ground of Cumberland to spend the winter in the valleys is also a migrant. And so is the thrush that nests in Durham but spends the winter in Surrey.

It is most important to realize that there are degrees of migration so far as distance is concerned, for otherwise you will get a most distorted view of the whole phenomenon. And also that it is a *seasonal* movement, and has nothing to do with "dispersal".

The wonder of migration has impressed man for just about as long as man has been impressed by anything at all. You will find in the Old Testament a Hebrew prophet saying: "Yea, the stork in the heavens knoweth her appointed times; and the turtle and the crane and the swallow observe the time of their coming." (The turtle in that sentence is, of course, the turtle-dove.) And just as that old Hebrew prophet looked for the coming of the birds in the spring, so do we. Even the most unbird-minded of us look for the coming of the cuckoo each year, and there are many people in this country who look each year for the coming of the summer visitors and keep notes of the dates. Yet, though man has been watching bird migration for thousands of years, our ignorance of the whole subject is profound.

What causes birds to migrate? What are the factors governing this huge movement? Let me, at least, be quite frank about this. I do not know. And nor does anybody else. And that is all there is to it. Migration was a mystery to the Hebrew prophet of old: it is just as much a mystery to us. Mind you, there are plenty of theories about it. But they are only theories.

One of these theories is what is known as the "glacial theory". This theory is still widely held by a great number of people and you are bound to come across it sooner or later, so we may as well spend a few moments discussing it.

The "glacial theory" is based on the fact that the northern part of the earth was for a very long while covered by an ice-cap in just the same way as the greater part of Greenland is covered with ice to-day. This ice-cap existed for millions of years. Sometimes it advanced and sometimes it retreated, and it is suggested that the migratory impulse arose because with each advance of the ice the birds retreated and with each retreat of the ice the birds advanced. In this way the birds established a rhythm, which in the passage of millions of years has become hereditary.

People who hold this theory do not seem to realize that each advance of the ice lasted for thousands of years . . . it was not a quick back and forth swing of the ice-pendulum . . . and it is very unlikely indeed that the birds could have inherited so strong a homing instinct that it would last over thousands of years.

Quite apart from that the "glacial theory" does not answer the facts as we know them. All the birds of a species do not migrate. All the birds of some species are migratory, but that is not the same thing by any means. In Britain we divide our birds up into classes, into two main classes, residents and migrants. But there are some birds which do not fall properly into either class. These birds are called "partial migrants". (Incidentally, that is a very good example of loose terminology. A bird cannot be a partial migrant. It must be either a migrant or a resident. A *species* can be partially migratory.) Some of them remain with us all the year round, some of them migrate. The pied wagtail, the song thrush,

the lapwing are good examples. And to make it even more complicated, of one brood of song thrushes, say, one bird may go to Ireland for the winter, one may go to France, one may go to Spain, and the rest may stay in the home area. Again, of those who do stay in Britain, some may stay in the area of the nest for the winter and some may go off to another part of the country altogether.

This hits the theory that the prime cause of migration is food bang on the head. Presumably all the birds of one brood will require the same sort of food. So a lack of an adequate food supply cannot be the answer. And nor can climatic conditions. And nor, despite all the very interesting work that has been done by scientists in laboratories on the sex organs and reactions to light, can we put down the migratory impulse to some psychological revolution.

All the theories remain just theories. And that is what they are likely to remain. Let us leave theories and come down to facts.

There are a number of different types of migratory birds that visit us. First, those that come to us in the spring to nest and leave in the autumn to spend the winter elsewhere. These are called *summer visitors*. Examples are the swallow, the willow-warbler, the nightingale, the red-backed shrike, the spotted flycatcher, the garden warbler. Secondly, there are the birds that having nested abroad come to us to spend the winter. These are called *winter visitors*. Examples are the fieldfare, the redwing, the brambling, many waders, many ducks and geese, and many continental starlings, redpolls, etc. Thirdly, there are the birds which pass through the British Isles on their way to and from their breeding quarters, but which do not remain here. These are called *passage migrants*. Examples are the

Greenland wheatear, many waders, ducks, terns, etc. Fourthly, there are those species which are partially migratory. These are called, inaccurately, *partial migrants*. Examples are the song thrush, the blackbird, the lapwing, the robin, the woodcock, the meadow-pipit, etc. Quite apart from these there are those species which occasionally invade this country in very large numbers. Examples are the crossbill, the waxwing, the Pallas's sand-grouse, the rose-coloured starling. Sometimes the crossbills will stay to breed. These invasions are called *irruptions*, and these birds since their movements are not regularly seasonal are not, so far as the British Isles are concerned, true migrants. In addition, we do get what are called *vagrants*, which are birds which only turn up occasionally in very small numbers, one or two at a time, and these are birds which appear to come here by accident, having lost their way or been storm-blown.

Obviously there is a great deal of overlapping between these various classes. There is some overlap between our resident birds and those that are partially migratory. There is some overlap between our resident birds and those that are summer visitors; for example, the chiff-chaff is a summer visitor, but there are generally a few that spend the winter in Cornwall and Devon, and even in Surrey and Hampshire, and again the turtle-dove is a summer visitor but there are sometimes a few that spend the winter in our southern counties. There is a very considerable overlap between our winter visitors and our passage migrants. For example, many of the waders, like the knot and the sanderling, come to spend the winter with us from the north, but a great many merely pass through and spend the winter further south.

Through ringing we know quite a lot of the journeys that these migrants make each year. They are ringed

here as nestlings or as adults, and a proportion are picked up again in the winter, or at another time of the year, abroad. Thus, we know that many of our swallows spend the winter in South Africa. But that does not mean that *all* our swallows go there for the winter. In the same way we know that some of our willow-warblers spend the winter in West Africa, and that some of our cuckoos do the same thing; that the red-backed shrike comes to us from south-eastern Europe, the fieldfare and the redwing from Scandinavia, our winter flocks of teal and widgeon from the Baltic, many of our winter flocks of starlings from the Baltic and eastern Europe, many of our waders from Greenland and the far north of Europe. We can go even further than that for we can draw maps that show very clearly the rate at which the main body of these migrants (in the spring) move northwards across Europe. These maps are very accurate. The same cannot be said for the maps that you sometimes see showing the routes that the migrants take on their journeys. Most of these are just guesswork.

We see very little of migration. Most of it takes place at night, and all we know of it is that we are suddenly aware that the birds have arrived. The capture of a ringed bird does no more than tell us that that bird has arrived at a certain place; it does not tell us how it got there, by which route it travelled. All we can really say about the swallow, for instance, is that it flies north in spring and south in winter. Large numbers are to be seen flying down the west coast of Africa in the autumn, and perhaps these reach the Cape; large numbers also pass down the Nile valley, and perhaps some of these also reach the Cape. But we cannot be sure that all our swallows go by the west coast route or that all swallows from eastern Europe travel by the Nile valley route. There may be a good deal of wandering in autumn.

Indeed, it seems probable that the routes taken in the spring are direct, or at any rate much more direct, than those taken in the autumn, for in the spring the urgency is much more imperative.

You will hear the most astonishing estimates of the speed at which migration is undertaken by individual birds. Here it should be said at once that we do not know the speed at which any individual bird travels on migration. You will sometimes hear it said that the swallow that arrives in Britain, say, on the Monday left Africa on the Sunday or the Saturday, and had travelled at a speed of a hundred miles an hour or more. That is certainly a gross exaggeration. We know that the migration overland is a drift rather than a spurt, and that it is to be counted, as a general rule, in miles per day and not in miles per hour. The birds move steadily on their way, but they rest and feed as they go, and they may spend a day or more in one place if the conditions are favourable for resting and feeding before moving on. But it seems certain that migration over the sea is a speedier business, though that is as far as we can go with safety at the moment.

In addition to the mass movement across water taking place at night (there is also a considerable movement over land at night, for I have more than once heard the cries of flocks passing overhead in the night at migration time) which prevents us seeing the movement unless we go to a lighthouse, or happen to be on a ship in a thick fog at the right time and on the right route, as I once had the good fortune to be, there is also the fact that most migration takes place at a considerable elevation. Here again there have been some astonishing estimates of height. But since the advent of the aeroplane we have been able to get a better idea of the height at which birds fly on migration. It seems unlikely that small

birds ever fly at a much greater height than 3,000 feet, but that larger birds may fly at 5,000 feet or more, and there has been a record of geese at 9,000 feet. The reason for flying at a height is because the atmospherics are much more helpful. On a still day on the ground there is quite a strong breeze at a height of 1,000 feet and a stronger one still at a height of 3,000 feet.

And then how do birds find their way? This is the greatest mystery of all. One might begin to understand it, perhaps, if the birds always travelled in the company of an old bird that had made the journey several times. But that does not happen. Take the cuckoo: young cuckoos leave this country several weeks *after* the adults have gone. In some species, such as the gannet, the young begin their journey *before* the old birds. The vast majority of young migrant birds take their journey without a guide, with nothing to help them but a hereditary instinct. They leave the place where they were born and set off across the world for a place they have never seen. And they get there.

You might think that the return journey was a different matter and an easier one, for the birds will have made the trip in the opposite direction at any rate. But actually there is very little evidence that the outward journey and the homeward journey are made by the same route, and a great deal of evidence that they are not. The best example, perhaps, is of a bird that is not a British bird at all, but an American one. The North American golden plover breeds in northern Canada and spends the winter in South America. To get there it passes south-east over Labrador and goes to Nova Scotia, then it crosses an enormous stretch of the Atlantic to the Bermudas and then flies over another huge stretch of water to South America. On the way back in the spring, however, it flies by way of Central America

and the Gulf of Mexico, and then up right through the middle of the United States. It is an enormous journey anyway. But the most remarkable thing about it is that the young birds of the year (that is, the birds that are going to do their first migration) do not fly by the ocean route, but they take the overland route down through the centre of the United States and by way of Central America, the route by which they will return with the adults in the following spring. That means that these young birds make a journey of more than 5,000 miles overland by a route that they have never seen before and which no adult bird ever travels in that direction. And by so doing they are saved the very dangerous ocean crossing.

How do they do it? The usual answer given is "orientation", and that is a good enough answer, if you know what it means. I do not, and I have never met anybody who could tell me what it is. There is some power here that we do not understand. It is a power possessed in some degree by many animals, even in a very limited degree by certain men (Arabs in deserts, Gypsies, pygmies in thick forest) and in no case has it been adequately explained. But it is beyond doubt most highly developed in the birds.

In thinking about migration it is a mistake to think of any species as entirely stationary. Entirely stationary species are the exceptions not the rule. I know that you will at once think of a number that you will call entirely stationary . . . the robin, the blackbird, the thrush that you see all the year round in your garden. Perhaps these do spend the entire year in your garden. But are you sure that they are the same birds all the time? In any case, even if they are, that does not make the statement that a stationary bird is the exception rather than the rule any the less valid. You must remember that most

Male Kestrel. The chick on the left is dealing with a small rodent already skinned

Curlew chicks

of the birds that we regard as resident wander almost as much as the pure resident, only we see some of them all the time. Now, if you think about the origin of migration (and personally I think that that is waste of time, but it is quite an amusing pastime) this is most important . . . indeed, it is important in any case . . . for it means that by nature birds are wanderers. And that means that it is not a case of a stationary species becoming migratory (because of Ice Ages or land bridges or sudden rises in the sea or any other phenomenon), but that some wanderers have given up the habit or are giving it up and have become stationary.

If you think back to the beginning of this chapter you will see what I mean. Some meadow-pipits appear to remain stationary in the winter, others to wander. Some pied wagtails seem to remain stationary in the winter, others to wander southwards (a few seem to go northwards) without crossing the Channel, while yet others spend the winter in Europe. The lapwing, as you know, does the same. Here you may think is the migratory instinct in the making. And it is at least as good a theory as any other.

And there will be another question that will strike you. What is the advantage of migration?

Quite obviously there is for some species a climatic advantage. The swallow and the cuckoo could not survive the winter in this country, for they are delicate birds. But, on the other hand, there are migrants which, it would appear, could stand the winter in this country without coming to any harm, for example the turtle-dove and Montagu's harrier (both of which do occasionally spend the winter here) and the quail and the corncrake. Then there are some apparently delicate birds which spend the whole year in Britain, such as the Dartford warbler and the long-tailed tit. I do not

think that climate can have very much to do with it. Certainly, if there is any advantage to be got out of leaving Britain in the winter it is impossible to say what the advantage is, for there are so many species that contradict others in this relation. And in the same way I can see little advantage from the food point of view.

The swift provides a very good example of the many puzzles that face the theorizer about migration, puzzles that are insoluble. No sooner have the swifts completed breeding than they are off. You will see them at the end of July in flocks screaming across the sky. Early in August they will have gone. There may be a few left, birds from further north, but the main body has gone. Why so early? There is no lack of food, the climate in our August is not much worse than it is at any other time in the summer. The swallows and the martins will be with us for another two months yet.

We are back again, you will see, to theorizing. You cannot keep away from it when you think about migration. Lack of knowledge makes us theorize.

But there are a number of things that the ordinary bird watcher can do about migration in the course of his ordinary watching.

He can keep notes of the dates of arrival of the summer visitors in his neighbourhood; the first time that he hears them sing; the first time that he actually sees them. (You will probably do that anyhow, you may do it already.) But these records are not really of very great value without other data. You should also keep a note of the temperature, of the direction of the wind on that day, and of the state of the vegetation. In what state are the trees and the flowers when you see your first chiff-chaff or garden-warbler or nightingale or spotted flycatcher, what is the temperature on each occasion and so forth? In a few years you will have built up quite a mass of most

interesting (and I believe valuable) data. And I think that you will find that, though the dates may vary a little from year to year, there will be very little difference in the temperature and the flowers and the trees will be at very much the same state of advancement each year.

But do not neglect the departure of the summer migrants and the arrival of the winter ones. We all know when the summer ones have arrived. We hardly ever realize that they have gone until they have gone. There is a vast field for study here. The swift is a good example. We could do with a lot of data about conditions at the time of the departure of the swifts, as indeed we could about the departure of all our other summer visitors.

One final word about migration. Everyone seems to speak of it as beginning, in the case of our summer visitors in the spring. That is because we speak, quite correctly, of the arrival of the summer birds and later of their departure. Actually, of course, in the case of our summer visitors, migration begins with their *departure in the autumn.* This is their home: this is where they breed. And when they come here in the spring they are returning home. Return cannot be the beginning.

CHAPTER NINE

Dangers and Rewards of Ideas

YOU will not have been watching birds for long before you will find yourself confronted by the greatest problem that faces the bird watcher . . . the interpretation of the behaviour you see.

This is a very difficult problem, as difficult, perhaps more difficult, for the expert than for the amateur. For the more you know of birds, the more familiar you become with them, the more inclined you will be to say that a bird does this because of that.

There are, of course, certain actions of birds which are easily and obviously interpreted. There are certain things in the outside world which do, obviously, control certain actions of birds . . . danger, hunger, cold, thirst, warmth, and so on. There is no difficulty in interpreting actions governed by such factors. But even these apparently obvious reactions to apparently obvious outside factors are really very dangerous. For in every case you are putting your mind into the mind of the bird, and you do not know that the bird, in fact, thinks or feels in the same way as you do. The trouble is that we both, men and birds, live in the same world; or, rather, apparently in the same world. We are surrounded by the same things, our environment is the same, but our worlds are very different.

You must realize that right at the start. Our worlds are very different. Men do not live at the same pitch of intensity, at nothing like the same pitch of intensity.

We have brains. Our brains have become very over-developed. They have out-paced our bodies to such an

extent, they have left our feelings so far behind, that they have become our greatest enemies. If man ever becomes extinct on this earth, if civilization is ever destroyed, it will be because man has destroyed himself through some horrible invention of his own brain. Our brains are both an aid to life and a vast handicap in life.

Now a bird is not handicapped by an over-developed brain. A bird has no imagination (so far as one can see, absolutely none at all) and no power of deductive thought whatsoever. He is not subject, as we are, to profound and complicated mental processes. As a matter of fact he has no interest in anything at all but the present, and the present that affects himself at that. Birds are very highly-strung, keyed up to a pitch of intensity that we are quite unable to imagine, and they are extraordinarily receptive. But that is all: they do not indulge in the luxury of thinking. They live entirely in the present, the absolute and immediate present.

Man does not. Man exists in the present, of course, but he thinks back to the past and he looks forward to the future. He lives, in fact, in three worlds . . . the past, the present and the future. Birds live only in the present.

Man is not very highly-strung and he is certainly far from receptive. Birds are both, and both to a degree beyond our comprehension.

So, though we live surrounded by the same things, though we are both warm-blooded animals and subject to very much the same outside influences (we both get hungry, we both get thirsty, we both feel the cold and the heat), though all this is true, *we live in quite different worlds.*

Too many people (scientists included) when they try to interpret the behaviour of birds forget that. You must try never to do so.

All birds, but especially small birds, seem to be at the command of stimuli, which will always make them act without any need for thought on their part. A great many of the actions of birds are of this nature . . . an immediate and absolutely involuntary response to a stimulus. I have already given you one good example, the cuckoo. It is the insistent food-cry and the huge and brilliantly coloured gape of the young cuckoo that forces birds, which are not its foster-parents and have no connexion with it at all, to feed it, even to go and collect food for it. If these birds thought for a moment they would do nothing of the sort. But they cannot think; they *must* respond to the stimulus. There are all sorts of other examples, and the reaction to them is so invariably the same that after a while you will come to know how birds will behave in certain circumstances. The stimulus and the reaction are always the same. And it is always immediate.

Man has to think. His eye takes in something and transmits that something to the brain. There it is thought about (very quickly in many cases, it is true) and then the thought is transmitted to the proper muscles for the occasion, and then comes action. It may all happen so quickly that it appears to be instantaneous, but in Man it is never instantaneous. Man is comparatively slow to act. Not so birds. In birds what the eye sees or the ear hears seems to be transmitted immediately to the muscles. And the smaller the bird the quicker the transmission.

You will not be long at this fascinating game of bird-watching before you realize that large birds lead quite a different sort of life from small birds. In the bird world size does seem to have something to do with intensity. Small birds are more highly-strung and more receptive than large ones. Conversely, as a broad generalization,

it appears to be true to say that large birds are more intelligent than small ones. The rook and the jackdaw, the magpie and the raven (all members of the crow family) appear to be very intelligent birds. If you look at them closely you will notice that the lives they lead are much slower than the lives led by, say, finches or tits or thrushes or starlings. They walk about more slowly, they do not fly in short rapid bursts, they are quite incapable of the ordered precise flock flight movements so characteristic of the small waders, like the knot or the dunlin or the golden plover, all of which are highly-strung nervous birds. They cannot perform the mass manœuvres of starlings. If you look at a flock of rooks in flight, you will see that it is a pretty ragged performance. It would seem that the rook, the jackdaw, the magpie and the raven are developing a brain, and that inevitably means a slowing down in the tempo of life.

You see, the smaller the bird the more—and more sudden—are the dangers that beset it throughout each day of its life. Speed in movement, instant response to stimulus, is absolutely essential to the small bird if it is to survive. But large birds are not faced with quite the same conditions. They are not constantly beset by sudden and immediate dangers. So they have time to consider, or at least (if that is going too far) they are not under the urgent necessity of moving instantaneously. (There are a few exceptions to this: constant persecution has made the pigeon extremely wary of a gun, and the sound of a shot will make the pigeon move immediately. This is also more or less true of the rook, and if you go out with a walking-stick you will find that the rooks take little or no notice of you, but lift that stick to your shoulder and you will find that every rook within range of a gun will at once take wing.) But even so it would be a mistake to credit the rook or the raven with a brain as

we know it. They have, perhaps, the rudimentary beginnings of a brain; no more. Birds are made up of emotion. They live on their *nerves*.

But that does not mean that they are simply automatons. They are very far from that. Exceptionally nervous and highly-strung human beings are always strongly individualistic. And so it is with birds. Though they are controlled by stimuli, though they have very strongly developed the clan-spirit, the spirit of the flock, (especially noticeable in winter and in such colonial birds as the gulls and the terns) they have yet personalities. They are, therefore, contradictory creatures. Though you know, or will know when you have watched a little while, exactly how certain birds will respond to certain conditions, you will at the same time continually be finding yourself surprised by their behaviour. Bird watching would be a dull business if this were not so.

How then to interpret the behaviour of birds? It would surely be better not to try? On the whole I think I agree. It would be better. *If we could.* But we cannot. We are incurably curious. We must be for ever "finding out", and if we cannot find out, then we must be for ever guessing. And let us admit at once that on the whole bird watching would become a dull business very soon if we did not try to find out, and from the scientific point of view it would be quite useless.

So I do not agree, having regard to the condition of our own minds, with those who maintain that all the bird watcher needs to do is to keep himself strictly to actual description of what he *sees*, and to leave out all speculation as to "why". I know, perfectly well, that this is the strictly scientific attitude. I know, well enough, that we cannot say "why" a bird does this or that. I am well aware that all the dangers in the world are inherent

in any speculation about birds. But I also know that no matter what is correct bird watchers will speculate, will try to fathom the reasons governing bird behaviour.

In any case, I find myself quite unable to agree with the point of view of some of the modern young naturalists, who refuse to believe anything that is not *proved*. Remarkably little in this world can be proved, and such an attitude would kill all speculation, and all theorizing, and all generalization. Such great naturalists as Charles Darwin could never have worked had they subscribed to such a belief.

No, speculate by all means. But understand while you do so that it is speculation, that there is nothing definite about it at all. Above everything else remember that we have evolved a vocabulary to cover our actions and feelings, that we use words with definite meanings for various emotions. You will use the same words for feelings and so forth in birds. We talk about "love", "hate", "greed" and so on, and we also use much more abstract words like "duty", "sacrifice", "affection" and "pleasure". We know what we mean by such words when they are applied to men and women, and we know, or think that we know, what they mean when we apply them (as we all do—even the scientists) to birds. We have got to use them because we have no others, and it would mean inventing a complete new vocabulary for bird watching if we did not. But we should never lose sight of the fact that when we say that one bird "loves" another; that one bird "hates" another; that one bird is "glad to see" another; that this bird takes "pleasure" in doing that and that that bird has "sacrificed" herself to save her young; we should never forget that in all these cases, and in every similar case, we are attributing to the bird emotions and thoughts that we would expect to find in Man under similar circumstances, and which

we do not know, and have absolutely no right to assume, exist in birds.

The whole subject is, as you will have seen, crammed with difficulties and dangers. Each of us must find our own way through them, for no two men see things in just the same light. I can, however, give you a word of advice on the matter. *Always* think of the bird as being without intelligence. It is much safer. In judging any bird's actions always take the most simple and obvious explanation. You are much more likely to be correct.

So far I have been warning you against what the scientist calls anthropomorphism. But there is another side to this question of interpretation: the scientific side.

The scientist is so determined to avoid the pitfalls of false analogy based on human interpretation, so determined to avoid the mists that sentiment will cast over knowledge, that he is often inclined to go to the other extreme. The "describe only what you see and avoid all speculation" attitude is one symptom of this. The scientist will, too often, remove all the clothing and all the flesh and leave only the dry bones. Dry bones are remarkably interesting in a museum. You are studying a *living* creature. Yet the true scientist, even when he gives us the hard fact unclothed, is not entirely divorced from the living creatures.

It is the pseudo-scientist . . . of which unsavoury race we have produced a good crop in the past twenty years or so . . . who is, as a rule, divorced from reality. Above everything else avoid becoming a pseudo-scientist.

The pseudo-scientist is very likely to lose all sight of reality, all sight of the living creature, in his ardent pursuit of some particular pet theory. Natural history is as subject to fashions as women's hats, and if you become really keen on natural history you will doubtless find yourself following some fashion or other before long.

There have been many fashions in my time. Egg-collecting was a leading and popular one when I was a young man: now it is census taking. Nowadays the young naturalists count the numbers of birds, the numbers to be found in a garden, in a field, in a town, in a wood, in several woods, in a county, in a country, in the world. Some very valuable work has been done in this way, and I would be the last to deny it. But there has also been an immense amount of time and talent wasted. These things are of value only so long as they are not divorced from the whole. A cabinet full of birds' eggs is a meaningless thing in itself. The knowledge that there are ten million blackbirds in Britain or three thousand corncrakes (or whatever the figures may be; and there are some men who maintain that they know just how many blackbirds there are in the country) is quite useless by itself. You can become too absorbed in facts and statistics just as you can become too bemused by wonder. And remember that fashions in bird watching change just as much as women's hats change, though not quite as frequently.

You will, as you watch birds, begin to form your own ideas about all sorts of things. I shall not try to give you any more guidance than I have already done through this book. Your own ideas may well be wrong, but that does not matter very much. When I first began to study birds seriously I read a great many books and my ideas were based on the ideas put forward in those books. But gradually I began to notice things that did not quite fit in with the ideas I was learning from the books. Now, I have quite a number of ideas of my own, and often they do not agree with those of other people. So, too, you will find you form some ideas of your own that do not agree with those that are generally accepted. Do not mind that. Read all the books, but form your own ideas. The more

time you spend in watching birds the more ideas you will form, and since most of them will ultimately prove to be wrong (that has been my experience anyway) the more you will learn. I am still learning.

Learning sounds horribly serious . . . as if you were back at school. But learning about birds is not in the least like that. I am still learning and I find it very exciting. And I know a man who is almost double my age, who still finds immense excitement in the short walks he is able to take, and in watching the birds in his garden. That is the great beauty of watching birds. There is always something to see, and so often there is something new.

So why worry about being an expert? Why bother to become a specialist? There are too many specialists in the world already. You may make birds your career . . . a few people do. But you will almost certainly have to earn your living in some other way. Birds are more often than not a hobby, not a career. Be content to take them as such, and be glad that you have a hobby that will never pall and which will always be fresh. Try to be as knowledgeable as possible, of course, for the more knowledgeable you are the more fun you will get.

I have just said that I would not try to give you guidance about ideas. But I will give you one golden rule for the study of birds whether as a hobby or as a profession. Indeed, it is a golden rule for all natural history. *Never be dogmatic.* Never say, "This cannot happen" or "This will happen". Remember always that you are exploring a world about which we really know very little despite all the books that have been written. We are a long, long way from final knowledge, a very long way from the day when we can say, "There is no more to be learned about this."

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