

NOTES ON THE SOCIAL BEHAVIOUR OF BLUE TITS

BY

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CIRCUMSTANCES made it impossible to complete the following study on the Blue Tit (*Parus c. obscurus*), but as little is known about even the pair formation of this species, and as work on social dominance has too often been confined to birds in captivity, it is felt that these notes are worth publishing, although unfinished. They are derived from observations on over seventy colour-ringed birds, among which six pairs were known to have bred successfully during 1938 or 1939. The trapping was done in a garden at Lambourn Woodlands, on the Berkshire downs. Feeding hoppers were provided so that the relationship between individuals could be watched; otherwise the population was not interfered with. Some five hundred contacts between individuals were recorded, most of them in December or February.

PAIR FORMATION

Most of the birds which subsequently bred had arrived in the locality by the end of November. In winter, it is difficult to tell whether a bird is paired or not: the most certain way is to watch the roost. Paired Blue Tits do not roost communally, but they often roost close to each other, while they indulge in a "good-night" display which probably has considerable social significance in maintaining the relationship. This display is not performed daily, but it occurs throughout November and December, and also in early spring.

The female nearly always goes to roost before the male. The roosting of a pair has three separate aspects of behaviour, which do not necessarily all operate together; (a) a mutual roosting flight, (b) a visit to the female's roosting hole, apparently to confirm that she has gone to roost, (c) the male roosting close to the female. The evening flight is not easy to observe, but is frequent; it takes place between a perch near the roosting hole and a more distant one. Often it is a chase, often it is a game. The female is silent, but the male may sing several times when he perches by her roost; he is always solicitous of her on these occasions, giving an alarm note on the slightest approach of danger. If she has gone to roost by the time he arrives he may call her out and together they indulge in a chase, or perch near the roosting hole. When she finally enters he accompanies her to it, staying on a perch for two or three minutes, during which he preens himself or sings. If there has been no flight,

or none visible to an observer at the roost, and she has already entered when he arrives, he flies to the entrance, clings there a moment only, and is gone, although sometimes he may linger on a perch for a minute or two. It is rare to find him arriving before she has gone to roost; if he does he is gone in a flash, to return later. At times he enters the hole himself, but never stays long.

The three pairs whose roosting was studied nested in boxes; of these, two females built where they had previously roosted, the third taking possession of the box where her mate had been. But previous to nesting the female has ceased to use the site for roosting at night. When she no longer uses it as a roost she apparently inspects the hole early in the morning—much the same time, in fact, that she would normally emerge.*

The roosting flights have added significance when it is remembered that flight is an essential part of Blue Tit display. One such performance was particularly interesting to watch as it occurred outside the previous year's nesting hole, the male having retained the same territory. The female was a new one, that is, she was first trapped in the previous November. Early on March 3rd the male drove off an unringed Blue Tit from the nesting tree, while the female stayed near the entrance of the hole. On April 5th the male drove off a Marsh-Tit (*Parus p. dresseri*), even following it to a neighbouring tree and chasing it away, while again the female remained inactive by the hole which had been used by her predecessor. A fortnight later I was watching when she began fluttering her wings near the entrance; the male, who was feeding quite close, immediately began vibrating his wings and approached. As she had moved to another branch his pause outside the nesting hole suggested that it was a partner in the display. She did not enter, and he flew to another branch with the typical dipping insect-like flight; both fluttered their wings for a moment, and resumed feeding. When a Marsh-Tit nervously examined the hole half an hour later it was not molested. The Blue Tits successfully reared a brood in this nesting hole.

Another pair began wing fluttering and mutual twittering, which rose to a crescendo as they fluttered round the trunk and landed together on a thick branch. Her vent was clearly visible as he dismounted, and coition was followed by violent wing fluttering and a deliberate pecking at each others' bodies and bills. Wing fluttering was continued afterwards, but the whole after-display was so brief that they had resumed feeding within ten seconds of the mating. In a minute or two the male sang for the first time.

*One of the boxes was fitted with a trigger which completed an electric circuit, and so rang a bell each time the hole was entered or left.

The Blue Tit is a relatively infrequent singer. Early in May I had occasion to spend the whole day near this pair's nesting box. In that part of his territory the male only sang twice during the day.

There were no records of the male helping to clean out a box before nesting. Both male and female, however, remove excrement from the young, and when the latter take their first flight they are immediately fed by one or other of the parents.

In the summer months it is difficult to observe ringed tits, but I have seen a pair which has successfully reared its brood still together in August—for example, visiting a feeding hopper together, no other tits having been there all morning.

DOMINANCE

Dominance is so dependent on the territorial position at the moment of reaction and on the endocrine balance of the individual that even inter-specific variations occur. Thus, although in Nuthatch-Titmouse flocks it is usual for Nuthatches (*Sitta e. affinis*) to dominate Great Tits (*Parus m. newtoni*), Great Tits to dominate Blue Tits, Blue Tits to dominate Marsh-Tits, and so on, a Blue Tit which is not necessarily dominant to all the other Blue Tits may threaten a Great Tit so determinedly as to drive it away from a feeding hopper. One Blue Tit which eluded the trap drove off every species of tit with extraordinary truculence, but was itself dominated by the male holding the territory. But this is unusual; inter-specific dominance is normally recognised by all members of the flock. The most likely factor to upset it is the near proximity of a nest or roost. Of course, should aggressiveness in the dominant species be in abeyance both birds will feed together providing they are not in each others' way.

Relative to its size the Blue Tit is one of the most aggressive of birds. As it crouches to threaten another, with flattened body and bill either pointing straight at its rival or slightly lowered, not only its crest but every feather seems to stand on end—a tiny atom bristling with venom. This is usually enough for the other and it is gone in a flash. The movement is extraordinary quick; a Blue Tit seems to recognise an individual before we can determine the species. So that if A is feeding at a hopper when B is approaching it has either gone before I have had time to confirm that B is a Blue Tit, never mind thinking of its position in the social hierarchy; or else A goes on unconcernedly feeding, while B flutters to the roof of the hopper and awaits its turn. It may be, of course, that rather than recognising the individual A distinguishes between degrees of dominance or confidence in B's

approach, But few who have watched Blue Tits intensively can doubt that they do recognise individuals. Often the dominant feeding bird pauses in its feeding to look at its subordinate, who either flies away at once or else becomes visibly uncomfortable, with a pretence of pecking at something before it edges away.

Because of the quickness of their movements a standing threat is more rare than an approach threat, such as occurs when B darts up to A. Here, A goes before B alights. If the relative dominance is high, B may follow up and chase A out of a neighbouring tree, even for a hundred yards. If the relative dominance is low, A and B may feed side by side. During the winter months it is common to see three or four tits feeding at the same hopper ; it seems that most of these are either temporary visitors or else regular visitors from a distant territory. At any moment a dominant tit may come up and drive off one or all. If it is hungry, as it often is in cold weather, such a despot will threaten by fluttering its wings as it feeds, only threatening with its bill should another fail to be warned and approach too close.

Occasionally an attacking tit may fail in its purpose and be itself driven off, or the threatened tit stands fast, so that both fall into the standing threat position, remaining motionless until one gives way, or, more rarely, until both give way and resume their feeding. I once witnessed a duel in which one tit finally gave way, and was able to record several subsequent contacts in which the bird who had been dominated made no further effort to resist, and always fled at the approach of the other. It must be emphasised that all Blue Tit combat is psychological, and not physical.

Sometimes there occurs a tit very low in the social hierarchy which hangs about on the outskirts, too nervous to feed with any others ; so pronounced is this nervousness that every passing tit will threaten it. At the other end of the dominance scale, a male visiting a neighbouring territory in December was far more aggressive than either of the pair holding the territory in which he fed, although they—and they alone—could both dominate him ; yet in the early spring, while still dominating all Blue Tits except the owning pair, his aggressiveness had declined to normal. His subsequent mate was high in the social hierarchy throughout December, suggesting that they were already mated at that time; if this was so, his abnormal aggressiveness is likely to have been due to individual variation in the activity of gonads or pituitary.

The seasonable variation in this male's aggressiveness was a reversal to that occurring generally in the flock. A definite

decline in aggressiveness towards the end of the calendar year was shown by the number of neutral contacts recorded. When two tits were seen feeding within three inches of each other without any signs of enmity or dominance, their identity marks were entered in the records and united by a plus sign (+); this is called a neutral contact. It is interesting to compare the total number of neutral contacts witnessed at one feeding hopper during the first three weeks of December with those for the first three weeks of February in the following year:

Week ending (1938-9) ...	December			February		
	7	14	21	7	14	21
No. of neutral contacts ...	0	2	20	6	3	1
Per cent. of total contacts ...	0	8	23	7	3	2

All the contacts of the male mentioned above were either positive or negative, that is, he either dominated another or was subordinate to it. The degree of dominance can be measured by observing whether the despot (*a*) is dominant to another but does not drive it off; (*b*) drives it off; (*c*) chases it. There is some evidence to suggest that females are involved in more neutral contacts than males.

Reversed contacts (the normal despot being subordinate) do occur, but are so infrequent that the relative domination of two tits can be determined after witnessing three contacts between them. To observe even this number in a wild population may call for patient and intensive watching.

It was interesting to observe that a tit which had been driven off by a Great Tit, or dominated by another Blue Tit higher in the social order, or which had attempted and failed to drive off another, not infrequently would immediately turn on one or more tits who were its social inferiors and threaten them, while a tit low in the social hierarchy has been seen to show extreme viciousness when it chanced on a tit that it could dominate. These findings are in agreement with previous work on the psychology of dominance in bird or man.

Observations at the same feeding hopper during the winter 1938-39 showed that the following five Blue Tits headed the social hierarchy, in the order shown. The "dominance ratio" is the total number of positive contacts divided by the total number of negative contacts.

Mark	Sex	Total number of contacts recorded	Dominance ratio	Distance to territory
G/Y	♂	59	52.0	owners
GG/-	♀	32	19.0	
RY/-	♂	33	29.0	15 yards
YY/-	♂	52	4.2	c 60 "
B/Y?	♂	40	4.4	50-100 "

In calculating the ratios of G/Y and GG/- all intra-pair dominance has been omitted, as it lowers the ratio for comparison with other individuals. For some reason, which may not have been coincidence (for example, rivalry may have been too intense to permit of ordinary contacts), no contacts were ever seen between RY/- and the owners of the territory; consequently no tit ever opposed him, and his ratio remains abnormally high. He lost his mate, and remated in late February. YY/-'s mate ranked about eighth, with a ratio of 1.7, the remaining birds recorded being less than 1.0. The boundary of B/Y's territory remained unknown, a small field intervening.

The social order of these males at that place was definite and did not change through the winter. They could drive off every Blue Tit in the flock except those immediately above them, and the female GG/-. They roosted in their territories, and bred in them in the following spring.

G/Y was usually dominant over GG/- through the winter, with variations in degree: in early February, however, she definitely became the despot for a few consecutive days, this period being followed by a few neutral contacts before he resumed dominancy. This was known to be her second season in that territory, and she was an amiable despot, driving off every Blue Tit, including the only one of her own brood to return in the winter. Intra-pair dominance is a subject which should repay further study, especially in a species where the degree of dominance can be recorded.

As always in studies on dominance interesting variations occur. For example, a female Blue Tit threatened a Coal-Tit (*Parus a. britannicus*), whereupon the latter turned on the Blue Tit's mate, an aggressive bird high in the social order, and drove him out of the tree. It would seem that the need for self assertion in a thwarted bird can occasionally rough ride that bird's own inferiority.

FLOCK FORMATION.

The demands of reproduction necessarily restrict movement, so that a territory is not often left, except during incubation, when the male has leisure to wander into surrounding areas. But when breeding is over flocking occurs, territories are invaded and, superficially, have ceased to exist. That they still can exist is revealed by the social order at any one point, and by the fact that pairs roost in them.

A winter flock is always on the move, but as the movement is only local it may be assumed that it, too, has a territory. When hourly observations are being made in one place it is

found that tits arrive in waves, a period of great activity being followed by an absence of tit life. Although individuals and the time of their visits were recorded there was no evidence that more than one flock visited the food, or that the flock was sub-divided into sections. But the composition of the flock is extremely mobile, as it is constantly shedding individuals and taking on new ones. This means that many birds have to be trapped and ringed which cannot be observed, and that trapping must continue throughout the winter. Apart from these restless nomads attaching themselves to a flock whose nucleus may be the holders of territory within the flock's territory, there was a much heavier change in the population beginning about the end of 1938. Within a month, apart from a few residents, the ringed flock had become an unringed one and the work of ringing had to begin all over again. Kenrick (1940) seems to suggest that there are no visitors until January; he estimates the residents as three eighths of the population. Maynard (1936) found unringed birds arriving in batches at about five day cycles, and this tendency is confirmed by the present data. Winter flocks of Chickadees (*Parus (Penthestes) atricapillus*) are reported to have a territory (Wallace, 1941), with individuals rarely cruising as much as half-a-mile.

Two broods were seen flocking together in mid-June—a fortnight after fledging. As only one brood was ringed it was interesting to see that they did not mingle, although in one flock. The oldest brood was in the van.

SUMMARY.

Part of the Blue Tit population is paired throughout the year, the tie between the pair being stimulated in winter by mutual display before going to roost. A flock consists of a small nucleus of residents and constantly drifting nomads. A clear social hierarchy exists within the flock in winter; residents are dominant to nomads and the social order of the residents is related to territory. Dominance is subject to seasonal variation, and intra-pair dominance may suffer reversal.

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