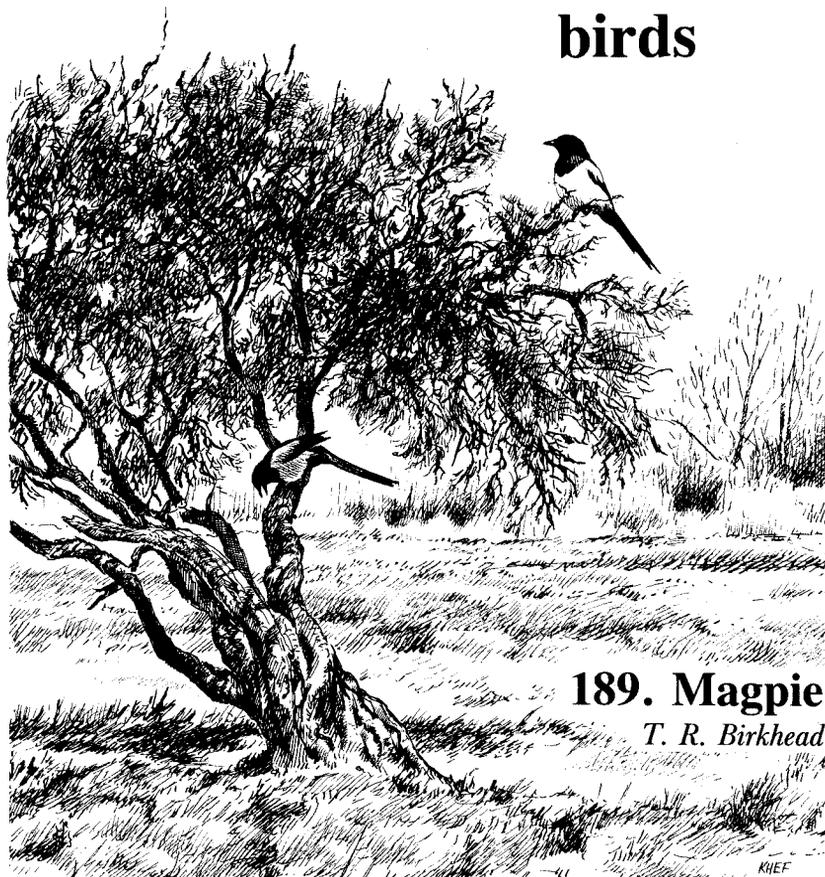


# British Birds

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## Studies of West Palearctic birds



### 189. Magpie

T. R. Birkhead

‘One for sorrow, two for joy . . .’, but what do you get for 100 or even 150 Magpies *Pica pica*? Groups of this size are not uncommon, and indeed the antics of large gatherings of Magpies were described by the

Reverend Darwin Fox to his cousin, Charles Darwin, who subsequently wrote:

*'The common magpie . . . used to assemble from all parts of Delamere Forest, in order to celebrate the 'great magpie marriage'. They had the habit of assembling very early in the spring at particular spots, where they could be seen in flocks, chattering, sometimes fighting, bustling and flying about the trees. The whole affair was evidently considered by the birds as one of the highest importance. Shortly after the meeting they all separated, and were then observed to be paired for the season.'* (Darwin 1871).

I can remember as a child in Leeds in the 1950s seeing Magpies at the bottom of our garden and thereafter being fascinated by their extrovert manner and exotic appearance. On moving to Sheffield in 1976 and finding Magpies to be abundant, I started what was to become a ten-year study of this species. The study area is the Rivelin Valley (plate 353), on the outskirts of Sheffield and on the edge of the Peak District. Although I did not know it at the time, this area had been identified as a Magpie 'hot spot' almost 100 years earlier, by Dixon (1900). This valley was ideal as a study area for several reasons: the high density of Magpies (up to 30 breeding pairs per square kilometre); some extraordinarily co-operative landowners; the proximity to the university; and, being a small valley, the opportunity to overlook the entire study area and watch several pairs of Magpies simultaneously. The main study area comprised 2 km<sup>2</sup> and, in conjunction with three research students, Keith Clarkson, Simon Eden and Sandy Goodburn over the ten years, we found every Magpie nest and colour-ringed virtually every nesting Magpie in the area. We also colour-ringed nestlings in a 0.5-km-wide band around the study area, to monitor immigration (and emigration). Over the ten years, totals of 854 nestlings

353. Rivelin Valley on western edge of Sheffield, South Yorkshire. This is prime habitat for Magpies *Pica pica*: grazing land with scattered trees and woods for nesting



and 37 adults were ringed. Adult Magpies were very difficult to catch, so we concentrated on ringing nestlings and relying on their amazingly sedentary nature (see below) to build up a colour-marked breeding population.

When I started the study, there were two aspects of Magpie biology that I wanted to examine: one was the 'great Magpie marriage' (i.e. ceremonial gatherings), and the other was their reproductive behaviour. Fortunately, my research students had broader outlooks, and over the years we obtained information on many other aspects of Magpie biology which helped to put those two topics in perspective.

There have been several excellent studies of Magpies made elsewhere, notably those of Gert Baeyens (Netherlands), Göran Högstedt (Sweden), Gail Vines (southern England), Deborah Buitron (USA) and K. P. Reese & J. A. Kadlec (USA).

The Magpie is a small-to-medium-sized member of the crow family (Corvidae). In our study area, adult males weighed  $248 \text{ g} \pm 12.9 \text{ S.D.}$  ( $n=12$ ) and adult females  $223.3 \text{ g} \pm 11.3 \text{ S.D.}$  ( $n=11$ ) (Birkhead *et al.* 1986). The sexes are identical in plumage, but the size difference between the sexes is often apparent if they are seen side by side. The Magpie has a wide geographic distribution, breeding throughout most of Europe and Asia, North Africa and western North America. Geographic variation exists, generally in terms of body size and the relative amounts of black and white plumage, and Goodwin (1986) listed 11 subspecies. Inevitably, a species with such a broad geographic range occupies a wide range of habitats, from semi-arid desert in North Africa, and the prairies of North America, to Alaska's boreal forests. In Britain, its habitat includes the lush farmland of lowland England and the windswept moors of the Peak District. Sharrock (1976) estimated the breeding population of Magpies in Britain and Ireland to be about 250,000 to 500,000 pairs. This is a resident population, and there is no immigration into Britain from the Continent. In Britain, the Magpie has undergone a population increase during the past 40-50 years (Prestit 1965; fig. 1), an increase that has also resulted in the spread of Magpies into urban areas. For example, in Sheffield the mean breeding density within the city in 1946 was  $1.3 \text{ pairs/km}^2$ , whereas by 1986 it had increased to  $8.1 \text{ pairs/km}^2$  (Clarkson & Birkhead 1987). This increase in abundance has been met with a variety of responses: obviously, Magpie enthusiasts have welcomed it, but they are pretty thin on the ground. The commonest response has been concern over song-bird populations (see page 598).

Ringling recoveries show that Magpies rarely undertake long-distance movements (Holyoak 1971), and, in our study area, Eden (1987a) showed that the median distance between the natal nest and first-breeding location was just 447 m, equivalent to moving 1.8 territories. As with other passerine species, females tended to move farther (497 m,  $n=30$ ) than males (350 m,  $n=33$ ), although this difference was not statistically significant. The median distance between annual breeding attempts was even less: males 15 m and females 27 m (again, this difference is not statistically significant). A significantly higher proportion of females bred

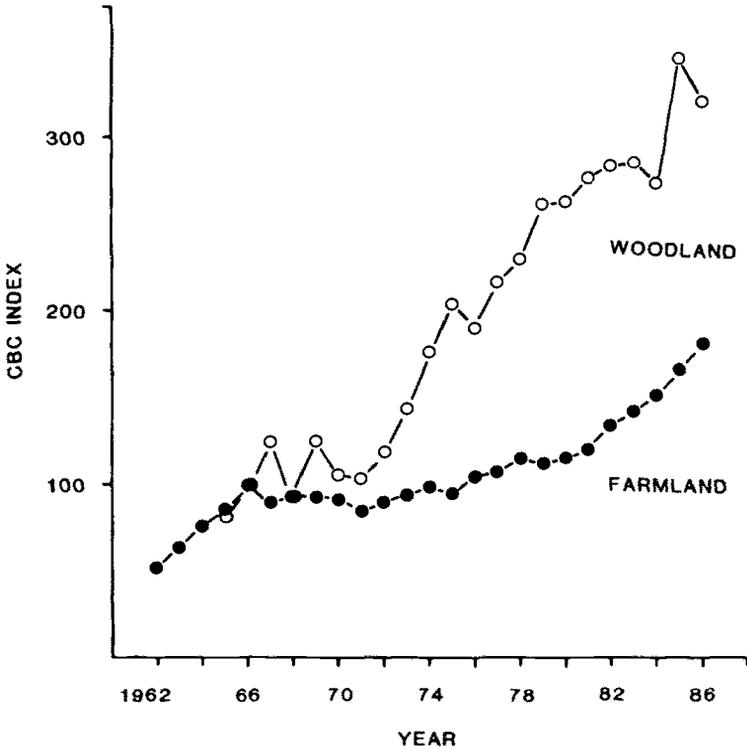


Fig. 1. Changes in numbers of Magpies *Pica pica* as reflected by the BTO's Common Birds Census index on farmland and woodland (1966 = 100) from data supplied by John Marchant

in more than one territory during their life (13/48; 27%) than did males (5/64; 8%). This occurred because males which lost their partner were still able to defend their territory alone and invariably remained there. In contrast, a lone female could not maintain a territory, so, if she lost her partner, she usually moved to another territory to re-pair. These results probably reflect Magpie dispersal fairly accurately; we regularly searched all surrounding areas for colour-ringed birds, and, in ten years of enthusiastic Magpie recording by the Sheffield Bird Study Group, we had only four reported sightings of individuals more than 2 km from where they had been ringed.

Magpies are monogamous, and a breeding pair defends an all-purpose territory. In most studies of Magpies in Britain and the Continent, territories average about 5 ha in extent (e.g. Baeyens 1981; Vines 1981). The population can be divided into two sectors, the breeders and the non-breeders. In some areas, non-breeding individuals may comprise 20-40% of the total Magpie population. Non-breeders are usually one-year-old and two-year-old birds (rarely three- and four-year-olds) that live as part of a loose flock ranging over the territories of established pairs. The flock is organised into a dominance hierarchy, with males generally being dominant over females. This occurs partly as a result of the difference in

body size between the sexes. As Eden (1987b) showed, however, the situation is rather more complex than this: the date that a young Magpie entered the non-breeding flock also had a marked effect on its status, with late arrivals achieving the lowest status (fig. 2). Eden (1987b) confirmed this pattern by performing an ambitious experiment which involved hand-rearing and releasing 44 Magpies into the study area at different times. This result also explains why late-hatched young had the lowest likelihood of surviving to breed.

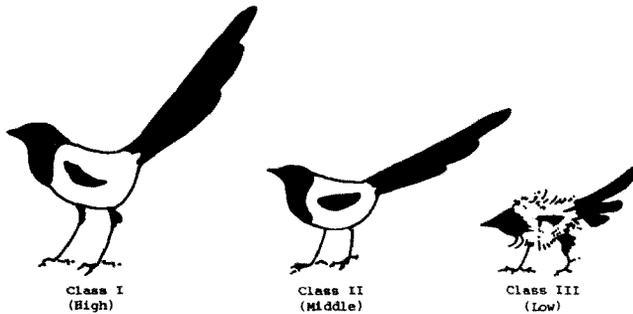


Fig. 2. Dominance classes. Magpies *Pica pica* were ranked as high, middle or low ranking according to the number of aggressive interactions they won. High-ranking birds tended to be males or large (good-looking) individuals, whereas low-ranking birds were often females or small, or sickly individuals

Providing that they survive long enough, Magpies start to breed in their first or second spring: mean ages of first breeding were for males 1.6 years and for females 1.4 years (this difference is not significant). Breeding Magpies in our study area (based on resightings of colour-ringed birds) had a life expectancy of 2.0 (female) to 3.5 years (male). The oldest Magpie we recorded died in its ninth year. BTO ringing recoveries provide a similar longevity record: 9.7 years. Our data were obtained in an area where Magpies were unmolested (except for our activities); obviously, mortality rates will vary in different areas.

### Diet and feeding behaviour

Magpies are omnivores and will eat pretty well anything: we have seen them eat pears, dog faeces with relish, attack a mole *Talpa europaea*, catch, kill and eat voles (Microtinae) as well as eating the berries of whitebeam *Sorbus*, dungflies, acorns and household scraps. It is difficult to build up an accurate picture of any species' diet because different study techniques have different biases associated with them. Paul Tatner (1983), however, made a comprehensive study of the diet of Magpies living in Manchester. He examined the stomach contents of shot Magpies and analysed Magpie pellets and droppings. During summer, the bulk of the adult and nestling diet comprised grassland invertebrates (beetles, caterpillars, spiders, leatherjackets and earthworms). In winter, much more vegetable matter (e.g. seeds, bulbs) was eaten. Tatner found very little evidence that Magpies took many song-bird eggs (see below).

Like many other crows, Magpies hoard excess food. There is, however,



354. Magpie *Pica pica* at nest, Shropshire, May 1986 (John Hawkins)

not the slightest evidence that Magpies are specifically attracted to (or steal) bright objects such as money or rings. Keith Clarkson examined food-hoarding behaviour of Magpies in some detail. Most food-hoarding by Magpies is short-term, with items recovered within just one or two days, unlike the Jay *Garrulus glandarius* and nutcrackers *Nucifraga*, which cache acorns and pine seeds, respectively, in the autumn and eat them in the following breeding season (Bossema 1979; Tomback 1980).

All but one of 3,184 caches by Magpies that Clarkson (1984) saw was made in the ground, usually in areas of short grass. A Magpie typically filled its buccal pouch with food, flew or walked to the cache site and then made a hole in the ground with its bill. It then ejected the food into the hole and covered it with a stone, twig or piece of dead grass. We found caches extraordinarily difficult to relocate. On several occasions, we watched a Magpie hoarding food, and maintained a fix on the hoarding place through a telescope while the other person walked into the field of view. This narrowed our searching area to about 0.2 m<sup>2</sup>, but we rarely found caches without a lot of trouble. So how do Magpies relocate their caches? Although some experiments have shown that Magpies can use

their sense of smell to find hidden food (Buitron & Neuchterlein 1985), they probably rely mainly on their well-developed spatial memory to relocate caches. We regularly saw Magpies fly directly to a point in their territory and recover cached food; unlike us, they found the food immediately, without having to dig up half the field. This strongly suggests that they could remember its precise location.

Squirrels and the Acorn Woodpecker *Melanerpes formicivorus* store food in a single 'larder' which they then defend against other animals, but Magpies are 'scatter hoarders', dispersing their caches over a fairly wide area. Territorial Magpies hoarded within the territory and (by definition) non-breeders cached food within their home range, but these two categories of birds had different hoarding strategies. Territorial Magpies made their caches much closer together (mean nearest-neighbour distance of caches:  $8.3 \text{ m} \pm 1.95 \text{ S.D.}$ ) than did non-breeding Magpies ( $18.5 \text{ m} \pm 9.25 \text{ S.D.}$ ). To determine whether this spacing was adaptive, Clarkson *et al.* (1986) performed some field experiments; their aim was to test the idea that the difference in cache spacing was important in terms of the birds' likelihood of recovering them. Grids of artificial caches at different densities were (laboriously) set out. Each cache, which consisted of 7.5 g of grain, had a two-pence piece placed under it, so that it could be relocated using a metal detector, but without providing any visual cues for Magpies. After four days, the grids were re-examined to record the proportion of caches still present. The experiment showed that the caches placed closest together suffered the greatest losses. Subsequent observations showed that Magpies spaced their caches according to the rate at which the artificial caches had been lost in those same territories. In other words, the Magpies were able to assess the intensity of cache loss (probably through the number of other Magpies in the immediate vicinity) and space their caches accordingly. A territorial Magpie could afford to space its caches close together because no Magpies (other than its mate) were likely to enter the territory and raid the caches. On the other hand, non-breeders generally foraged in a flock, and, once one Magpie discovered a food item (from a cache or otherwise), other flock members rapidly congregated in that area. In other words, if a non-breeder made its caches as close together as a territorial Magpie, it would almost certainly lose much of its hidden food to other flock members. By caching at a low density, flock Magpies reduced this risk.

### Breeding biology

Nest-building may start very early; we have occasionally seen Magpies building on mild days in late December and early January, even though eggs are not laid until late March. Magpies may build a new nest or they may re-use or add to an old one. If a new nest is built, it is constructed in four distinct stages: an anchor, a superstructure, a mud bowl and a lining (Erpino 1968). Once the Magpies have decided upon a nest site, they first place twigs there; these are followed by mud or clay, which forms the anchor. Twigs are added to this to make the superstructure, including the domed roof. Once the superstructure nears completion, the mud bowl is

started; and when this is finished the lining of hair and rootlets is added. Nest-building may be spread over two months, or a new nest may be knocked up in less than a week. Well-constructed nests are very durable and may last many years. One can tell quite a lot about the owners just by examining the nest. One-year-old Magpies and first-time breeders generally build very poor nests—often not much better than bulky nests of Woodpigeon *Columba palumbus*. In contrast, established breeders sometimes build fortress-like nests. One of our long-lived colour-ringed birds built a particularly robust nest every year; the roof was especially dense, such that the nest contents were completely concealed from the outside. Moreover, the roof was interlaced with spiky twigs of hawthorn *Crataegus*, making nest inspection particularly difficult for us (and, I suspect, also for Carrion Crows *Corvus corone*). Most Magpie nests are roofed, and Gert Baeyens (1981b) found that 61 out of 79 nests (77%) were roofed, and that 66% of those produced at least one chick, whereas only 5% of nests without a roof produced young.

Nests are built in a variety of locations, from the tops of 30-m beeches *Fagus sylvatica* to scrubby willows *Salix* or hawthorns just a metre or so high. In some parts of the study area, Magpies had a wide choice of trees in which to nest; in others, at higher altitudes, there was little or no choice, since many territories contained only a single tree or bush. In treeless urban areas of Sheffield, we have found Magpie nests in British Rail watch-towers, on electricity pylons and inside factories (Clarkson & Birkhead 1987).

Egg-laying commenced in late March, and the annual median laying date (the date on which 50% of pairs had laid their first egg) varied from 10th to 24th April. Much of this variation was attributable to spring temperatures: in warmer springs, laying started earlier, and this in turn was almost certainly the result of warmer temperatures increasing the availability of the Magpie's invertebrate food (Goodburn 1987). Magpies are single-brooded, and the clutch consists of three to nine eggs; the mean number varied only slightly between years, from 5.5 to 6.3 eggs. Clutch size also varied within a season, with the earliest breeders generally producing the largest clutches. This in turn was a result of older Magpies breeding earlier and producing larger clutches than young Magpies (Goodburn 1987). If the first clutch is lost, a replacement will be laid, and, in our study area, almost always in a new nest. Replacement nests were always within the territory, but were often difficult to find, because, unlike first nests, they were usually built when the trees were in leaf. Clarkson (1984) found that Magpies would lay up to four clutches in a season if necessary. Incubation lasts for about 18 days and is undertaken entirely by the female. The male feeds the female on the nest, and the extent to which he does this helps to determine their likelihood of success. Females that are not looked after by their partners have to leave their eggs more often to feed themselves, and this increases the risks of the eggs being taken by predators. There were two main causes of egg-loss: small boys (which we cured of the habit rapidly) and Carrion Crows. Carrion Crows and Magpies are arch enemies; they compete for food and probably nest sites,

and Carrion Crows will eat Magpie eggs or chicks at any opportunity. As a result, Magpies breeding close to a pair of Carrion Crows generally had relatively low breeding success. In one year, we estimated that over 30% of all Magpie breeding attempts failed as a result of Carrion Crow predation. In addition, K. Clarkson and I once saw a Carrion Crow catch an adult Magpie in flight and kill it.

Magpie nestlings leave the nest after about 24 days. We weighed, measured and colour-ringed nestlings at 14 days after hatching; later than this and we would have risked them 'exploding' from the nest. After fledging, the young remain with their parents for about six weeks; in one or two cases (out of about 1,000) young Magpies stayed with their parents in the territory until the following breeding season. In our study, breeding success averaged about two nestlings per pair, although some pairs were very successful and raised large broods, whereas others failed to rear any young at all. This is reflected in the lifetime reproductive success of Magpies: 60% of females and 40% of males failed to produce any young during their lives.

During the course of our study, the Magpie population doubled, and Clarkson (1984) examined the effect of this increase in Magpie density on breeding success. Interestingly, there was no effect on either clutch size or breeding success, but there was a strong effect on juvenile survival. The proportion of Magpies surviving through their first year was negatively (and significantly) correlated with breeding density. This indicates that density-dependent mortality of juvenile Magpies is one of the factors regulating Magpie populations.

355. Magpie *Pica pica* on back of sheep, Dyfed, December 1981 (*M. C. Wilkes*)



**Reproductive behaviour**

Many bird species, like the Magpie, traditionally regarded as monogamous, are now known to be less monogamous than once thought. As an undergraduate, I had been fascinated by Geoff Parker's elegant studies of dungflies *Scatophaga stercoraria*; in particular, I was struck by the extent to which male dungflies competed to fertilise females and the trouble they went to to protect their paternity. I wondered if similar things went on among birds: it soon became apparent that they did (Birkhead 1979, 1982). Established pairs of Magpies live in their territories all year around, but the male and female may operate independently for much of the time. From just before and during egg-laying, however, the male never lets the female out of his sight, remaining close beside her and following her every move. If she flies, he follows. If she walks behind a wall, he moves so he can still see her. Why should the male be so keen to keep close to his partner at this time? The answer is that he is guarding her from the sexual advances of other males. Male Magpies are remarkably randy and regularly try to mate with neighbouring females. On several occasions, we saw a male sneak (literally) into the adjacent territory, using the vegetation as cover, approach the female and attempt to mate with her. Most of these extra-pair copulation attempts were unsuccessful because they were cut short by the male partner chasing the intruding male. The closest that I saw a male come to being successful occurred when a guarding male fell asleep. His head lolled onto his breast, and, in so doing, fell below the top of the wall so that he could no longer see his female, who was foraging close by. Within a second or two of this happening, the male from the adjacent territory flew across and mounted the female (fig. 3). I think that cloacal contact was not achieved; the female called during the mating attempt and this alerted her partner, who woke up and flew down and chased the other male and his partner. I thought that this would be the end of the incident, but there was a further development. When this extra-pair copulation attempt occurred, the female had already laid part of her clutch, but her partner immediately started to build a new nest in a tree adjacent to the original nest. The female laid the rest of her clutch in the original nest, but never started to incubate. Instead, she subsequently produced a repeat clutch in the new nest. My interpretation of this was that the male partner did not want to risk the fact that his female may have been fertilised by the other male, and waste his effort by rearing chicks that may not have been his own. Subsequent studies have shown that both mate-guarding and extra-pair copulations are widespread among many bird species and that such extra-pair matings can result in extra-pair paternity (Birkhead 1987).

Magpies showed some interesting extra-pair responses to a tame, caged female placed in their territory. If the male approached the tame female alone he invariably courted and attempted to mount her. But if the pair approached the 'intruder' together, they were always aggressive towards her. Often the male would approach on his own and start to court the female, only to be followed a minute or two later by his partner. As soon as he heard his female approaching, the male's courtship switched to

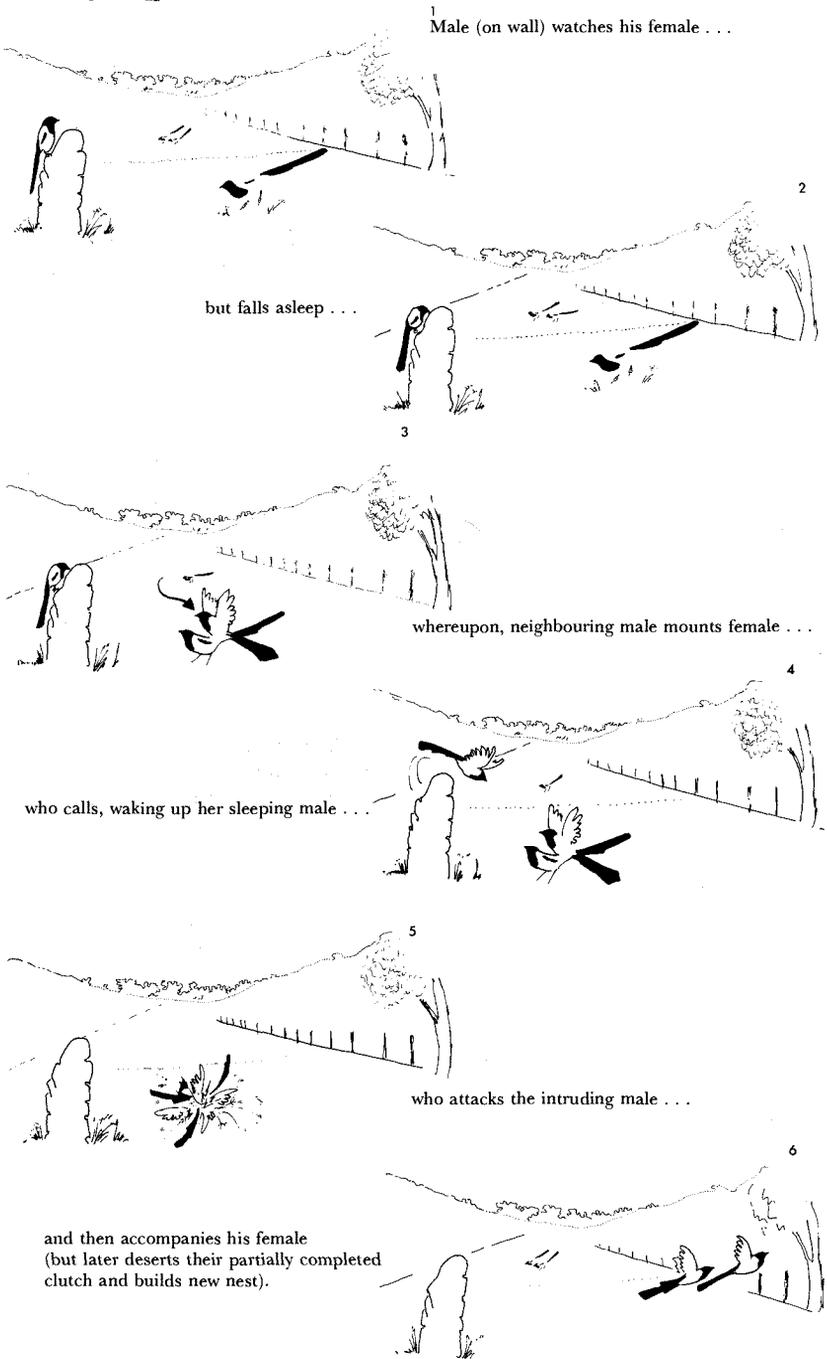


Fig. 3. Sequence of events during an extra-pair mating by Magpies *Pica pica* (see text for full description)

aggression. The human analogy is obvious.

It is perhaps surprising that we have actually seen as many, or probably more, extra-pair mating attempts than we have pair matings. Courtship between Magpies is infrequent: it consists of the male circling the female with his wings flapping and tail held high and twisted to one side. Mating is brief (1-2 seconds) and very rarely seen. On the basis of prolonged and detailed field observations, I estimated that Magpies probably copulate only about three times for a clutch (Birkhead *et al.* 1987).

### Groups and territories

Magpies are regularly seen in groups, from half a dozen to over 100 birds, and these groups may occur for a variety of reasons: mobbing, feeding, roosting and 'ceremonial' purposes. Magpies may assemble to mob predators such as foxes, cats, weasels, rats or owls, but mobbing groups are usually small (up to ten birds) and disintegrate fairly quickly. Non-breeding Magpies live as members of a flock, but these flocks are very loose, and all members come together only if food is locally abundant (e.g. if muck has recently been spread in a field). In our study area, the Magpie population density was high; the largest feeding flocks that we saw consisted of about 50 birds, but feeding groups of 20-30 were not unusual.

Groups also occur where territories abut, and the pairs perform parallel walks along their respective boundaries. If the territory boundaries were unknown to the human observer, these birds would appear to be a 'group'.

The largest groups occur at roosts or pre-roost gatherings, where over 100 may congregate. In our study, most Magpies roosted in small groups (of about 30 individuals) close to or within their daytime range, but, just 2 km away, a roost of 150-200 Magpies existed throughout the autumn and winter. These birds roosted in hawthorn bushes in an area of dense scrub, but they entered the bushes only just before dark. Prior to this, the birds assembled in a pre-roost gathering in a field some 200 m away. Our observations support the idea that Magpie communal roosts contain mainly non-breeding Magpies (Gyllin & Källander 1977), while established breeders roost singly or in pairs within their territory.

The final category of group is that about which Darwin wrote, now generally known as 'ceremonial gatherings'. These groups are rarely as large as pre-roost gatherings, although they have sometimes been depicted as such (fig. 4). We found the average size of 225 ceremonial gatherings to be nine Magpies (range 3-24). Gatherings occurred at all times of year, but were most frequent during January to March (i.e. just before the breeding season). They also tended to occur more frequently in the morning than in the afternoon. The function of ceremonial gatherings has been discussed for a long time, and suggested functions included pair formation (Darwin's 'great magpie marriage') and competition for nest sites or territories. Only through having individually colour-marked birds of known status were we able to work out what was going on in these gatherings. Initially, most gatherings that we observed were in progress when we first saw them, but we soon discovered that the key to understanding them was to see them from their inception (Birkhead &

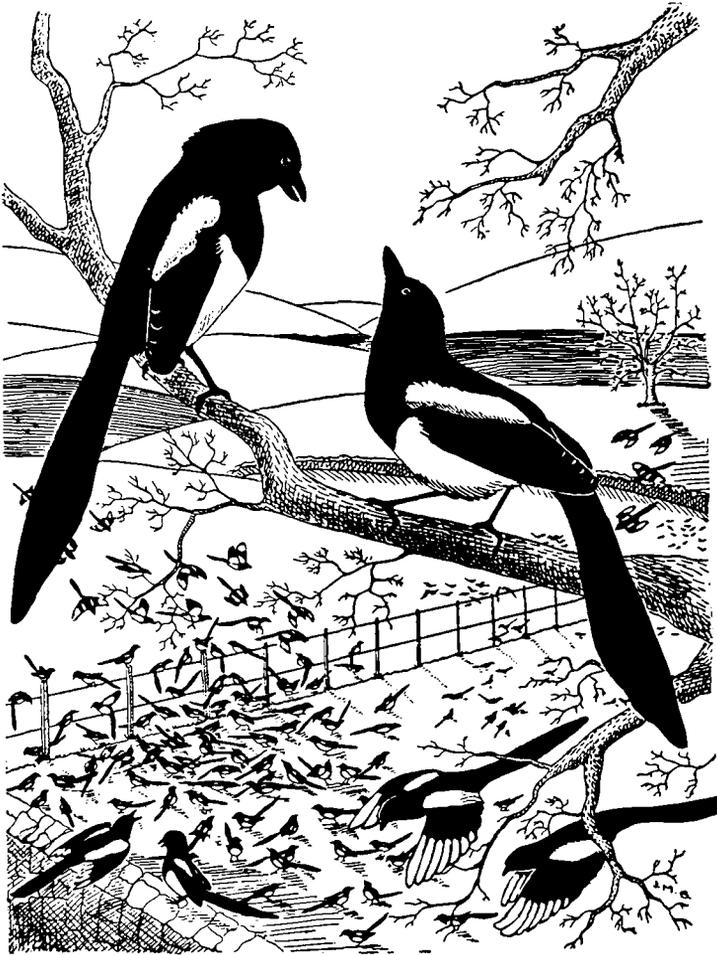


Fig. 4. A ceremonial gathering of Magpies *Pica pica* (Jane Burton from 'Animal Courtship', by permission)

Clarkson 1985). Gatherings were usually initiated by one or two non-breeding Magpies, usually the most dominant members of the non-breeding flock. Single initiators were always males, and 80% of groups of two were paired birds. Gatherings were started in the following way: the bird(s) would fly unusually high and would then swoop directly down into an occupied territory. There they would instantly be met by the territory owners, who would call and chase them. This in turn would attract non-breeders in the vicinity and the holders of adjacent territories (only rarely did breeders 'leapfrog' territories to join a gathering). Almost all the 'action' during a gathering occurred between the initiators and the territory owners. The other birds were present as mere spectators. Sometimes, however, one of these would be accidentally drawn into the chasing and calling if it was attacked by mistake, resulting in the apparent

chaos typical of these gatherings. The mean duration of gatherings was ten minutes, and the maximum 70 minutes. In most cases, the gathering soon subsided and the initiators left the territory, followed by the other individuals dispersing.

What is happening is as follows. Competition for territories is intense. In our study area, all available space was occupied by territorial Magpies and a large pool of potential breeders (the non-breeding flock) existed. Instead of passively waiting for a vacancy to arise, say through a territory owner dying, the most dominant flock birds attempted to obtain a territory by force. They visited territories in a deliberately provocative manner, confronting the owners in order to monitor the strength of their aggression. In most cases, the initiators quickly backed down and left, but, occasionally, they found a pair whose territory was less strongly defended. They then appeared to press home an attack, harassing the owners with repeated visits and prolonged chasing. In a few cases, the territory owners were evicted, in others the gathering initiators carved out a very small piece of ground for themselves. If this occurred, it was usually at the junction of two or three territories (the point where defence was weakest). Once they had obtained a foothold there, the invaders gradually expanded the territory until, after a week or so, it was sufficiently large for breeding. We estimated that a third of territories were obtained in this way. Evicted territory holders usually disappeared (which probably means they died) or became members of the non-breeding flock (which was genetically equivalent to being dead, for none of these birds ever bred again).

Why did other Magpies turn up as spectators at gatherings? I think the reason is that it was in the interests of all nearby birds to know what was going on. A change in territory ownership could, through a domino effect, lead to a change in fortunes for these other birds as well. A change in the ownership of one territory sometimes resulted in a succession of subsequent changes.

There were two other ways in which Magpies could obtain territories: (i) replacement and (ii) what we called 'squeezing-in'. Replacement was straightforward: one or both members of a territorial pair died or disappeared and their places were taken by non-breeders, without a gathering. Squeezing-in consisted of pairs taking advantage of the decline in territorial aggression that occurred after egg-laying (Birkhead 1979). These birds simply squeezed in at the junctions of existing territories, without a gathering. Those that squeezed in, however, usually did so too late to breed in that season.

### **Bird and territory quality**

The effect of bird and territory quality on reproductive success was examined in detail by Goodburn (1987). She analysed data we had collected over ten years, looking first at the patterns of territory occupancy. This showed that some territories were occupied more (and others less) than expected by chance, a result which suggests that territories differed in their quality. Further analysis of territory composi-



**356.** Juvenile Magpie *Pica pica*, Greater Manchester, July 1980; this individual would be in the lower half of the dominance hierarchy, and would be quite likely to die before the next spring (Anthony J. Bond)

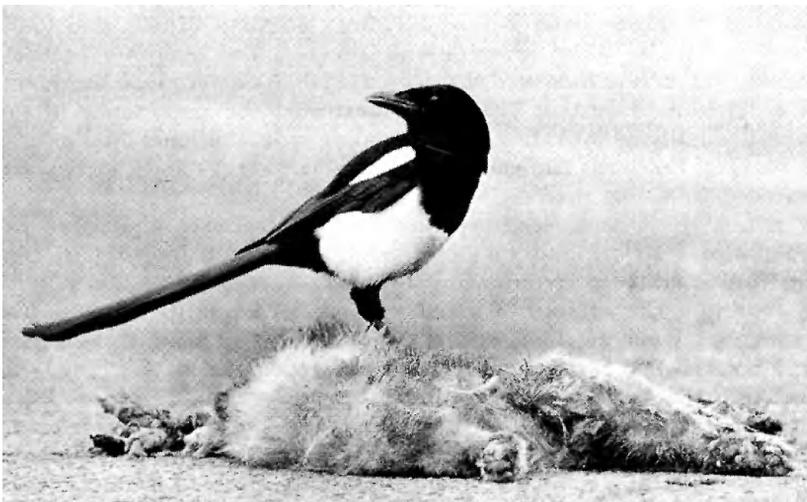
tion showed that the number of years in which the territory was occupied was positively (and significantly) correlated with the relative amount of grazing land (short grass with cattle or horses) in the territory. Several other lines of evidence indicate that this is a good measure of territory quality: (i) Magpies obtain most of their food from such areas (above), and (ii) breeding success was positively correlated with the relative amount of grazing land in the territory. Högstedt (1980) also found territory quality to be important in affecting the Magpie's breeding biology: his studies indicated that food availability determined the quality of a territory. Högstedt (1981) demonstrated the importance of this experimentally by providing some Magpies with additional food prior to egg-laying. Fed birds laid earlier, produced larger eggs and clutches, and reared more young than did unfed birds.

In our study area, territory quality was obviously important, but Goodburn (1987) found that bird quality played a bigger part than territory quality in determining breeding success. She was able to disentangle the effects of territory and bird quality on breeding parameters (such as clutch size and laying date) by looking at (i) these parameters when the same territories were occupied by different birds, and (ii) these parameters for the same birds breeding in different territories. This analysis showed that about 60% of the variation in clutch size, egg size and breeding success was attributable to bird-quality effects, whereas territory quality accounted for less than 10% of the variation in breeding success.

### Magpies and song-birds

Magpies have been much in the news in Britain in recent years: their increasing abundance in urban and suburban areas has evoked some strong reactions regarding their possible effects on garden song-birds. Some city councils have even contemplated Magpie culls. A Magpie killing and eating a young Blackbird *Turdus merula* while the Blackbird parents fly around frantically calling is not a pretty sight. But many of those who would happily shoot Magpies for such behaviour tell of their excitement at seeing a Sparrowhawk *Accipiter nisus* take a Starling *Sturnus vulgaris* from the bird-table. Such double standards mean that there can be no grounds for condemning Magpies for the emotional trauma they cause bird-lovers. The real questions must be whether Magpies take sufficient numbers of song-birds (adults, young or eggs) to reduce their populations significantly. More research is needed to resolve this, but, until that is done, there are several points that should be kept in mind: (i) results from the Common Birds Census (CBC) show that Magpie numbers have increased, but they do not show a decrease in the numbers of Blackbirds, Song Thrushes *Turdus philomelos*, Dunnocks *Prunella modularis* or Collared Doves *Streptopelia decaocto*, which are the main targets of Magpie attacks (most CBC plots are in rural rather than suburban or urban areas, however, so we still need more information on this topic); (ii) suburban song-bird populations exist at densities much greater than they do in traditional, woodland habitats; (iii) ringing recoveries and other types of study indicate that the main predator of garden birds is the domestic cat (e.g. Churcher & Lawton 1987). How many bird-lovers also own a cat? Imagine the outcry if city councils decided to cull cats . . . ; (iv) Paul Tatner's (1983) detailed examination of Magpie diet in Manchester

357. Magpie *Pica pica* feeding on road casualty (a dead domestic cat), Co. Cork, May 1985  
(Richard T. Mills)





358. Magpie *Pica pica* on dead rabbit, Warwickshire, December 1984 (A. R. Hamblin)

provided no evidence that Magpies took many song-bird eggs.

Virtually all the information which we have obtained on Magpies during the past ten years has been obtained through the use of colour-marked individuals. Our studies have been conducted primarily with rural Magpies, but a similar investigation of Magpies in suburban and urban areas would provide an interesting comparison and would allow us to assess the impact of Magpies on song-birds. Clearly, we should reserve judgment on this issue until we have some hard facts.

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