

OBSERVATIONS ON THE COLLECTION AND BURIAL OF ACORNS BY JAYS IN HAINAULT FOREST.

BY

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The Handbook states that the Jay (*Garrulus glandarius*) shares with several other *Corvidæ* the habit of burying surplus food. During the autumn of 1951, observations were made in Hainault Forest, in Essex, on the intensity of this habit with acorns. Although it is well known that the Jay does bury, or hide away acorns, there appears to be comparatively little literature on the subject, especially concerning the quantitative aspects and apparent importance of the habit. In 1950, L. Schuster wrote a paper based on work done by him in Vogelsberg, Germany, (briefly reviewed in *Ibis*, 93: 158) and, where appropriate, I have tried to compare his results with my own, but, for a more strict comparison, reference to the paper can be made.

Hainault Forest is an area about $1\frac{1}{2}$ miles long by 1 mile wide. Except for the new housing estate that borders the western side, it is completely surrounded by agricultural country, which is comparatively devoid of Jays. Single oak trees are found scattered all over the area, but only in one place can it be said to be the dominant tree, and it is here, in a separate wood apart from the rest of the forest, that several grow side by side. This small wood, which in the spring normally holds two breeding pairs of Jays, was apparently the only place from which acorns were collected, presumably due to the fact that the greatest number of oak trees were to be found there.

The collection and burial of acorns commenced, as far as we could ascertain, on or about September 9th. On that date no more than eight birds were taking part, and this continued until about September 28th. From then the intensity grew, and this number gradually increased until the middle of October, when some 35 to 40 birds were involved. As at this time no other Jays were ever seen elsewhere it seems possible that the majority, if not all, of the population had congregated in this one area where acorns were most abundant. After about October 20th the number of birds collecting began gradually to decrease, until November 16th, when Jays were last seen transporting acorns. As in Germany, it appeared that the end of the activity coincided, as far as it was possible to ascertain, with the removal of all the acorns.

At the beginning of the collecting period (i.e. in September) the birds worked mainly between 09.00 and 12.00 hours G.M.T., but as the movement neared its peak, around October 14th, they were working from sunrise until just after sunset, about 10 hours

per day. At this time it was possible to witness a continuous stream of birds flying to and from the collecting area. One might even say that at this time one could not see a Jay that was not either collecting, transporting, feeding on or burying acorns. By recording the number of birds flying to and fro per hour, we were able to ascertain that there was a greater activity between 09.30 and 11.30 hours; Schuster found the same for the mid-day hours. Apart from this however, we could find nothing to indicate that the number of transport flights varied with the time of day or with the weather.

During the peak period the average time taken by a Jay in collecting, carrying and burying an acorn and in returning to the trees was about ten minutes. The peak period (around October 14th) lasted about ten days in which time each bird made an average of about six flights per hour, *i.e.* about sixty flights per day. If, say, 35 birds were taking part, this meant 2,100 flights per day—a total of 21,000 for the whole ten days.

When a Jay arrived at the collecting trees it would bound about the branches until it spied a favoured acorn and it would then lean over, sometimes flapping its wings to avoid over-balancing, seize the acorn from its cup and "swallow" it. This would be repeated until it had two or three acorns in its gullet, and usually with another held in the bill it would then depart for the burial areas. Very occasionally only one would be placed in the gullet, but we never observed more than three, and two seemed the usual number, with another in the bill. Therefore, assuming that the average transport flight carried three acorns, in the ten days of the peak period alone, at least 63,000 acorns were buried. At the very commencement of the operations (with about eight birds working only three hours per day) between 140 and 170 flights were being made each day and in the region of 450 or 500 acorns were being buried, but owing to variation in the number of Jays working outside the peak period it is more difficult to state the total number of acorns buried in the whole autumn, but we have calculated it to be approaching the 200,000 mark. Schuster found that his sixty-five birds, working for approximately one month, buried about 300,000 acorns. On this basis just over half that number of birds (*i.e.* our thirty-five), in ten days (our peak period), would bury something over 50,000. Shortage of space here prevents a fuller discussion of our figures, but points to be borne in mind when comparing them with Schuster's results are the greater average number of flights per hour in Hainault, and the longer distances flown by the Vogelsberg Jays (up to 4 or 5 km., about four times as far as the maximum recorded at Hainault). A greater activity on one side may be possible. In considering the facts, however, one must bear in mind that Schuster suggested the minimum number of acorns carried per flight to be five, and based his calculations of a total of 300,000

on that number. However, he believed more to be usual and he thought eight or nine acorns could be carried in the gullet, and gives instances of birds engaged on transport flights being shot and found to be carrying that number.

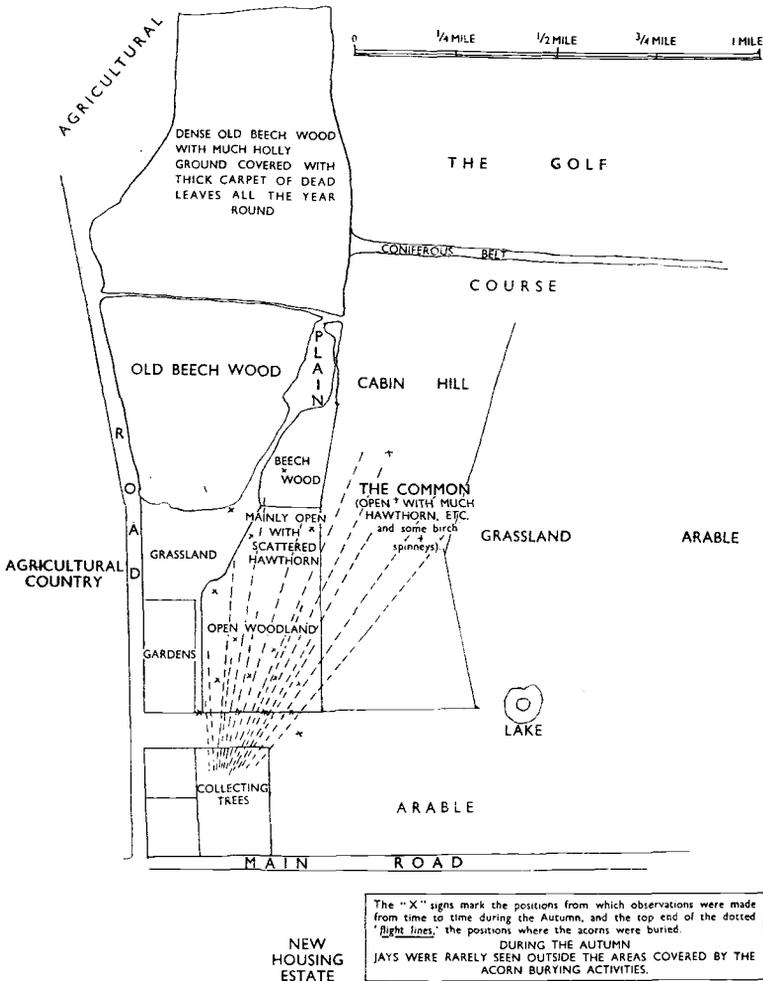


FIG. 1. HAINAULT FOREST. MAP TO SHOW WHERE ACORNS WERE COLLECTED AND BURIED

The accompanying map (fig. 1) shows the routes taken by the Jays, which we, unlike Schuster, found did not zig-zag or wind, probably due to the shorter distances. The birds would fly from the collecting trees and down these routes singly and showed no

tendency whatsoever to follow any other Jays or fly out in groups or parties as Schuster's did, and it appeared that each was to all intents and purposes only concerned with the transporting of its own acorns. Of course, occasionally two or three Jays might leave the collecting trees within seconds of one another, but in such circumstances, more often than not, they took different flight lines to different burial areas. It appeared that an individual would fly to one burial area several times in succession, but if disturbed there would change it for another (rather than wait for the intruder to leave) as they appeared to do of their own accord from time to time during the day. Why the Jays never went further than three quarters of a mile to hide their acorns we were not able to tell (Schuster's birds flew up to 4 or 5 km.) but it may have been that, whereas Hainault's thirty-five Jays had their most popular and suitable burial places within a mile of the collecting trees, Schuster's birds had to fly (and were prepared to fly) much further to reach theirs. This habit of course results in a more widespread planting of oak trees (*i.e.* from those acorns not recovered in the ensuing winter). When burying in the more open woodland nearer the collecting trees the Jays flew much lower than when they were burying in the further areas. In the former case, the birds rarely flew above tree-top height and were in the habit—after crossing the green that separates the rest of the forest from the collecting wood—of making their way from tree to tree until over the selected spot. Later however, when that part had been deserted as a burial ground, they would fly right over it, keeping at between fifteen and thirty feet above the tree tops. When they reached the burial ground (if a spinney) they would drop down into it and make their way to the actual position through the tree tops in the manner just described. Schuster found that his birds did the same thing, even if the burial place lay right in the heart of a wood.

The most favoured place for hiding an acorn was under a thin covering of dead leaves. Here the Jays could find many small holes, depressions, cracks or crevices into which an acorn could easily be ejected and then covered up. If such a hole or depression was not readily available the acorns would be pushed under the trailing root of a bramble or other plant, or under the roots of a tree or generally into any niche capable of hiding an acorn. Sometimes a Jay would appear to dig its own hole (having therefore temporarily to put down the acorn in its bill), but natural holes were much preferred. Unlike Schuster, we could find no evidence of these acorns being forgotten when laid on one side, or of a bird apparently marking a spot where an acorn was buried with a large leaf, pebble, clod of earth, etc. (Goodwin 1951). Nor did we see a Jay place two acorns in one hole, possibly due to the abundance of suitable places. It also

appeared that a Jay did not like to bury its acorns far away from covering bushes or trees nor were they recorded pushing acorns into the bark above ground level. When burying acorns, as when collecting them, the Jays did not show any aggressiveness towards other birds of their own or another species.

The birds first appeared to dig up the buried acorns about a week after the end of the movement. The number of small oaks scattered here and there far away from mature oak trees seems to suggest that the Jay does not find all the acorns it buries, although of course the Jay might not be the reason for all the young trees as other agencies also bury surplus food and in Hainault young boys indulge in throwing acorns at one another in the autumn. Whether a Jay actually remembers the place where an acorn is buried is a debatable point, but from over a score of records (which are rather difficult to obtain in the area in question) it would appear that it does, and does not just find them by random searches in likely places. On every occasion I have witnessed a Jay retrieve an acorn a similar routine has been performed. Each bird, after perching on the lower branches of a tree, has hopped onto the ground, bounded straight to a given spot, stopped, dug furiously with its bill and in due course taken out an acorn; it has then flown away with it—sometimes acorns are reburied elsewhere (Goodwin, private communication). The digging when a buried acorn is to be found is very different from the tentative pecking of a casual food-search. Of course there is always a chance that when searching at random a Jay might come across a hidden acorn, but I personally have never known such an instance. We have noticed that Jays in the winter were more often seen in the areas where they had previously buried acorns and it is possibly correct to assume that some Jays rely to some extent on acorns buried the previous autumn as their winter food. Like Schuster, we found that Jays were very bold when collecting and burying acorns, but this was not so when they were digging them up and unfortunately their shyness often leads to their flying away at the approach of an observer, thereby preventing observation long enough to see how much they rely on buried acorns for winter food.

SUMMARY.

1. Observations were made on the intensity of acorn-burying by Jays in Hainault Forest, Essex.
2. Acorns were collected from one part of the area only, *i.e.* from where they were most abundant.
3. The activity, which commenced on or about September 9th, increased to a peak lasting ten days around October 14th and thereafter decreased gradually until it ceased altogether on November 16th.

4. In the peak period, when activity was at its height, it is calculated that some 63,000 acorns were buried. A figure of 200,000 is estimated for the whole period.

5. Acorns were buried up to three-quarters of a mile from the collection area.

6. The general behaviour of the Jays at this time is discussed and the observations are compared with similar ones made in Germany.

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