

RABBITS, BUZZARDS AND HARES.  
TWO STUDIES ON THE INDIRECT EFFECTS  
OF MYXOMATOSIS

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*Introduction.*

The rabbit (*Oryctolagus cuniculus*) was very abundant in Britain for at least 300 years before 1954. It occupied a central place in the terrestrial ecosystem : all the large predators fed upon it; other herbivorous mammals competed with it for food. Myxomatosis was bound to affect all these species and many others as well. At the same time it provided unique opportunities for studying the ecological relationship between the rabbit and other species.

Most of the larger predators in Britain were virtually exterminated by game preservers in the nineteenth century. Today there are in this country only nine species of predator of mammals and birds — besides Man himself — which are both common and widespread, namely, the fox (*Vulpes vulpes*), the domestic cat (*Felis catus*), the stoat (*Mustela erminea*), the weasel (*Mustela nivalis*), the kestrel (*Falco tinnunculus*), the sparrow hawk (*Accipiter nisus*), the tawny owl (*Strix aluco*), the little owl (*Athene noctua*) and in the western half of Britain the common buzzard (*Buteo buteo*).

The rabbit was probably most important in the diet of the fox, stoat, weasel and buzzard, and so these species were the most likely ones to be directly affected by a catastrophic decline in the rabbit population. Of these the buzzard was the only species whose numbers could be at all accurately determined. Accordingly, at the suggestion of the Nature Conservancy, the British Trust for Ornithology carried out a survey of this species throughout the British Isles.

In recent times the most striking competitive relationships between the rabbit and other animals are those

between the rabbit and domestic stock. Little is known about the nature and extent of competition between rabbits and wild animals. During the last centuries the rabbit has had little competition with the larger wild grazing animals because they have been exterminated or greatly reduced in numbers as a result of enclosure and urbanisation. Outside Scotland the only abundant large species which may, and probably does compete with the rabbit is its close relation the brown hare (*Lepus europaeus*). In many districts both species occurred together in large numbers, but there is a commonly held belief, and some evidence in support of it, that the two species are sometimes mutually exclusive. The arrival of Myxomatosis has given an opportunity to obtain field data for the study of this problem. Accordingly an investigation on Hares was started by the Mammal Society of the British Isles.

#### *Methods.*

In both the investigations — on buzzards and on hares — the aim was to record the position at the outbreak of Myxomatosis, to study changes while the disease spread, and to record the position after the country had been without large populations of rabbits for at least a year.

In the first Buzzard Survey (1954) questionnaires were sent to over 200 members of the B.T.O. and other ornithologists asking them to select a census area and to state how many buzzards were proved to have bred in it, and how many were estimated to be breeding in it, and to furnish record of breeding behaviour and success, and feeding habits. In 1955 breeding records were repeated for the whole country and population density counts made in sample areas of South Wales and Devon. In 1956, a survey similar to that of 1954, is being made.

In the Hare Survey the co-operation of the Ministry of Agriculture was sought and most generously given. All County Post Officers were asked to state whether hares were believed to be very common, common, scarce or absent in each parish in their counties. Their findings are being checked as far as possible by members of the M.S.B.I. who are also being asked to keep an eye on those areas where hares had not been recorded recently, in order to discover whether the disappearance of the rabbit results in colonisation by hares.

#### *Summary of results of Survey 1954-5.*

##### 1. *Buzzard Survey.*

a) The 1954 range of the buzzard is approximately

all Britain west of the line Banff-Stirling-Haltwhistle (S.W. Northumberland) Sheffield-Hastings. It includes most of the islands except the Scillies, Wight, Anglesey, Man, the Orkneys and Shetlands. Ireland, which has only recently been recolonised, has a few breeding pairs in the extreme N.E. The range of the buzzard is much smaller than it was 150 or even 100 years ago, but it is very much greater than in the early years of the present century.

b) The population density varied considerably throughout the range. It was highest in the S.W. of England, South West and Central Wales, and the west coast of Scotland. In these regions it frequently reached, but rarely exceeded two breeding pairs per square mile (0,7 prs per sq. km).

c) There is much variation both seasonal and individual in the feeding habits of the buzzard. Rabbit was the most commonly recorded food in 1954. It appears that young rabbits were the principal food brought to nestlings.

d) In 1954 most pairs bred successfully in the areas studied. In 1955 most pairs did not breed successfully in the areas where there were no rabbits. Breeding was normal in areas where there were still rabbits. Breeding was also normal on Skomer where there was a large alternative food supply (sea birds) and in a part of Central Wales where the rabbit has never been very abundant.

## 2. Hare Survey.

a) The common hare is generally distributed but much rarer in the West than the East. In Cornwall and Pembrokeshire, and some smaller areas, it is extremely rare, and in these it would probably be extinct but for periodic introductions by sportsmen.

b) There has been no large scale recolonisation of areas in which the hare had become extinct, but several well documented instances have been recorded of hares appearing after the disappearance of the rabbits in small areas where they have not been seen for a number of years.

c) Hares were reported as being more abundant in 1955 than 1954.

d) Hares have been reported as being seen in woods more frequently than hitherto.

### *Discussion.*

*Buzzards.* The results of the buzzard survey suggest very strongly that a shortage of rabbits caused a great reduction in breeding activity (the survey of 1956 will show if any changes in distribution and population density have occurred). The spring of 1955 was a very cold one, it has been suggested that the failure to breed was due to this fact. But buzzards bred successfully in areas where there were still rabbits. These areas suffered as bad weather as did the rest of the country. Therefore it is most improbable that bad weather was the main cause of lack of breeding success elsewhere. If failure in breed was due to shortage of food, was it due simply to lack of rabbit prey or to a general food shortage resulting from the disappearance of rabbits? Apparently the latter because when rabbits were abundant, buzzards did not appear to feed on them to a large extent in the critical period before nesting — there are relatively few young ones in the open at this time. Therefore a direct effect of lack of rabbits would not operate until *after* the eggs were laid. Mr. H.N. Southern's work on tawny owls (*Strix aluco*) (1954 and personal communication) has shown very similar results. The rabbit is not a very important part of the diet of this species until after the young have hatched. In 1955 most of the tawny owls of Wytham Wood, Oxford, did not breed. Southern showed by extensive trapping, that the small mammal population at the time was unusually low. A great reduction in the rabbit population had led to a reduction of the other small mammals by all the predators in the wood, who were competing with each other for what was left; a general food shortage ensued. There is evidence that the food shortage was widespread. The buzzard's failure to breed in 1955 was probably due to it rather than to the direct effects of a shortage of rabbit alone.

As long ago as 1678, John Ray noted that the buzzard was a « great destroyer of conies ». For many years British buzzards must have depended on the rabbit to a much greater extent than those on the Continent where voles are the chief article of food (Uttendörfer 1939). The very high population density of the buzzard in the West appears to be peculiar to Britain (a population in an area of S. Germany where buzzards are very common and where there have never been rabbits was studied in 1955. It had a population density of about one pair per sq. mile. c 0,4 per sq. km). The presence of post glacial fossil bones of the buzzard in caves in

Devon, Somerset and Kent, show that the buzzard occurred in Britain before the introduction of the rabbit. Doubtless it would survive the extermination of the rabbit, but probably at a lower population density. The adjustment may result in an extension of range — a special watch is being kept for this in 1956.

The status of the buzzard in Britain in the last two centuries has been largely determined by man. Its decrease was due to game preservation and its recent increase to relaxation of game keeping in two World Wars. It is now protected, but attempts are being made to remove it from the protected list because it is assumed that, now rabbits are scarce, the buzzard is bound to increase its attacks on poultry and game. This assumption is partly justified in some areas, but in general the amount of damage done by buzzards has been greatly exaggerated. The Government intends to keep the rabbit population down. The buzzard and other predators may now have an important role in pest control : in the past the rabbit was far too numerous to be controlled by the predators present, today it may be so rare that the predators can control it if they are allowed by man to do so. The future of the buzzard in Britain largely depends on whether it is considered a pest or an ally by farmers.

*Hares.* The presence and abundance of hares in England and Wales, appears to be determined mainly by three factors.

1. Type of agriculture (crops or grass).
2. Field size.
3. Game preservation.

Hares are most abundant in districts where there are large fields of corn, kale, etc., in kept estates. They are rarest or extinct in districts of permanent grass where the average field size is less than 20 acres (c 8 hectares) and no game preservation occurs. Such areas, until 1954, supported enormous rabbit populations.

1954, owing to bad weather and disease, was a bad season for hares, therefore an increase in 1955 was to be expected; that which was observed cannot be attributed to Myxomatosis alone. Much less rabbit trapping was done in 1955 than in the previous years; since hares often used to be taken in rabbit traps less trapping would favour hares. On the other hand, other predator pressure must have increased.

Hares have always used woods for shelter, but there does appear to be a real increase in their use of this habitat. It may be due to the vegetational changes indirectly caused by Myxomatosis — there is much more grass growing in the woods than before.

So far the evidence for direct ecological competition between rabbits and hares remains slight and its nature unknown.

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#### Summary

1. The advent of Myxomatosis has provided opportunities for the study of ecological relationship between the rabbit (*Oryctolagus cuniculus*) and its predators and with species with which it competes.

2. The British Trust for Ornithology's survey of the common buzzard (*Buteo buteo*) shows a good correlation between absence of rabbits and a great reduction in breeding activity.

3. It appears that lack of rabbits caused increased interspecific competition for the remaining prey species; the failure to breed was due to a general food shortage.

4. The Mammal Society of the British Isles Hare Investigation shows that a few areas were recolonised by hares when rabbits became extinct in them.

#### RESUME

1. La myxomatose a fourni l'occasion d'étudier les rapports écologiques entre le lapin (*Oryctolagus cuniculus*) et ses prédateurs ainsi qu'avec les espèces concurrentes.

2. L'étude entreprise par le *British Trust for Ornithology* sur les buses (*Buteo buteo*) démontre qu'il existe un rapport certain entre la disparition des lapins et le ralentissement de la reproduction chez ces rapaces.

3. Il semble que la raréfaction des lapins ait causé une augmentation de la concurrence interspécifique entre les autres espèces prédatrices; le ralentissement de la reproduction est dû à la diminution des sources de nourriture.

4. D'après les recherches entreprises sur les lièvres par la Société de Mammalogie des Iles Britanniques, diverses régions se seraient repeuplées en lièvres après la disparition du lapin.