

PRESIDENTIAL ADDRESS

THE ECOLOGY OF THE BADGER IN SOMERSET

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To those of you who are archaeologists my subject may at first sight appear to be unrelated to your main interests; however it is my hope that we shall find some common ground — indeed — the word 'badger' comes from the French 'bêcheur' — a digger, a characteristic shared by some archaeologists! What is more a badger can be a most effective archaeologist in its own right because in its diggings it has occasionally brought to light some extremely interesting remains.

I had a letter from Mr. Henry Cleeve last February who was excavating an 11th century Roman Iron Smelting site. A badger set had been dug into the very large slag and rubbish bank. During spring-cleaning the badgers had unearthed some excellent Roman pottery including a magnificent piece of a samian red-glass mortarium. The badgers in fact confirmed Mr. Cleeve's theory that pottery had been manufactured on that site. So perhaps our Somerset badgers one day may play their part in archaeological research.

The badger has been described as one of the oldest landowners in Britain, and in fact, there is much evidence that long before Britain was an island badgers were common in the deciduous forests which covered most of the southern part of England in those times.

The late Mr. Balch when excavating 'Badger Hole' in the Mendips found the bones of badgers which he estimated as sixty thousand years old; badgers are living in the same caves today.

I would like to interpret my subject this afternoon in the wide sense of the ways in which the badger is adapted to its physical and biotic environment in Somerset. To do this I must first give you some of the morphological features which fit it so admirably for filling the niche of a large burrowing nocturnal omnivore at the end of its food chain.

In this county the average weight of adult males is 28 lbs. and adult females 25 lbs. The length is on average 36 ins., including a 4 in. tail. The body is wedge shaped and held low on the ground. The fore legs are particularly strong for digging and the claws are long and are not retractile. The feet are plantigrade with five toes and broad heel giving a very characteristic spoor.

The sexes are difficult to distinguish with certainty in the field but the boar has a wider head and thicker neck — especially in older animals. The wider head is not reflected in the size of the skull but appears to be due to stronger musculature and deposits of fat in the cheek region. In most males the tail is rather thin and tapering and is light in colour. The sow is generally sleeker in appearance with narrower head and a shorter and more fluffy tail. The age of the animal can only roughly be determined by the skull, but the interparietal ridge is a useful indication. It does not start to develop until

about ten months and it reaches its maximum depth by the time it is three years old. The wearing of the teeth is also useful confirmatory evidence.

The facial pattern which is so characteristic of the species undoubtedly serves as a recognition sign amongst badgers. When little light is available the pattern is conspicuous, and experiments with masks confirm that the animals recognise this pattern. It also appears to act towards other animals as a type of warning colouration best seen at night. Although the rest of the body is inconspicuous the head is easily seen. This explanation fits in well with other animals having similar dark and light patterns. They are mainly fairly large animals at the end of their food chain, with a formidable defence if attacked; usually they are nocturnal and omnivorous. A skunk is another species which has these characteristics.

There is considerable variation in hair colour. The normal guard hairs from the dorsal region are light in colour with a dark patch near the tip but the light region ranges from nearly white to sandy yellow and the darker part from nearly black to a gingery colour in erythristic forms. The latter are not very common in Somerset. Albinos occur rarely in this county but over the border in Dorset there is an area where they turn up fairly regularly.

In a normally coloured badger the hairs on the legs and under side are much darker than those on the back and sides — a reversal of the usual condition in mammals.

Badger communities may reach a large size in Somerset. Sometimes a whole wood may be taken over and the vegetation altered in consequence. When looking for sets the presence of elders is often a useful clue to their whereabouts. About 80% of the sets in Somerset have elders in the vicinity. This is not because badgers choose elders, but the latter are the consequence of badger activity. There are three reasons for this. Firstly, elders grow well in soil rich in nitrogen and this is true of the surroundings to badger sets due to urination and the digging of dung pits. Secondly, the badgers are fond of eating elderberries and the seeds pass through them and are deposited with the dung. Thirdly, there is selection by badgers of seedlings which spring up on the disturbed soil where they have been digging; badgers eat some seedlings but elders are bitter and are left to develop.

In some woods there may be at least four sets belonging to the same badger community. From the entrances well worn badger paths radiate out and lead to feeding grounds or to other sets.

Where a path leaves the wood, if there is barbed wire near ground level, badger hairs can usually be found caught in it — another useful clue when looking for sets. These paths may be followed for long distances. Centuries ago when Britain's population was small and deciduous forest was the typical vegetation it is likely that these animal tracks were found to be most useful by people travelling from

village to village. Perhaps these are the origins of some of our winding country lanes.

Near the set it is usual to find some tree with mud marks on the bark and scratches up to a height of about three feet. These are scratching trees and are often elders. Badgers clean the mud from between their toes on these trees — an action you can watch most often at dawn when they come home muddy from foraging. It is possible that this habit is also concerned with stretching and toning up the muscles after the animal has woken up.

A typical set has several entrances each of about 15 ins. in diameter. Some are considerably larger due to constant use but the tunnel soon narrows. Outside each is a large spoil heap of discarded earth — sometimes tens of tons of it. Incorporated in the earth is vegetation of various kinds which has been used as bedding and discarded. This at once distinguishes it from a fox's earth, although it should be remembered that foxes often live in badger sets.

The bedding which may consist of bracken, hay, moss, bluebell leaves and many other substances is renewed at intervals throughout the year, but especially in the autumn. It is laboriously collected into bundles and kept in position by forelegs and chin as the badger shuffles backwards to the set. A badger may make many journeys on a single night and bring back vast quantities to fill the underground chambers. Underground, the set consists of an elaborate system of tunnels and chambers. The plan varies greatly according to ease of digging and the age of the set. One set investigated in the Quantocks had 36 entrances open at one time, but it is unlikely that all of these were connected below ground. The chambers which are usually about 2½ feet in diameter and about 18 ins. high are not very deep under the soil, but this again varies according to slope and geological strata. A usual depth is between one and three yards from the surface. Chambers used for breeding are often within ten yards of an entrance where the circulation of air is better.

Occasionally there are ventilation holes passing from the surface of the ground into a tunnel, but whether these are accidentally or deliberately made is not certain. Where they do occur they are used by the badgers prior to emergence for scenting the air.

Over the past six years work has gone on in Somerset mapping the badger sets as part of the national scheme organized by the Mammal Society. At the present time about three hundred sets have been documented, but this is only a fraction of the total number. Some parts of the county have hardly been touched and I should be grateful for any further information of sets known to members of the Society.

Already some interesting data have come in and certain generalizations may be made not only about the density of sets but also about the factors which are most important to the badger in choosing a suitable home.

There is no doubt that good cover near the set is important as it enables the animals to emerge unseen. 82% of all the reported sets had good ground cover. Some of those in more open situations had bracken cover later in the year and it seems to be significant that some of them are only used during the months when this cover is available. 62% of the sets were in woods or copses and of these the majority were in deciduous woods. Again the absence of undergrowth in coniferous woods probably explains why they are unpopular. 20% of the sets were in hedgerows and these were particularly common in areas where woods and copses were less numerous, suggesting that a hedgerow is the next best thing to a wood or copse from a badger's point of view.

The great majority of sets were on slopes. This facilitates the disposal of the excavated earth and probably also enables a badger to find the best stratum of soil to dig into.

Choice of soil is very significant and in any district where both sand and clay are available, they will choose the former. However, clay is constantly used where there is no better soil for digging, but the excavations are not nearly as extensive. In limestone districts badgers choose the looser strata using the hard carboniferous limestone as a roof to their tunnels.

One of the important factors in the choice of situation is drainage. The set is remarkably dry after the first six feet or so, and the slope of the tunnels usually ensures that the chambers are very well drained.

So far there have been too few returns to estimate density in all but a few districts, but certain sample areas have been investigated with great thoroughness. Mr. L. J. Kent and his helpers found 42 sets in 35 sq. kms. in the Yarlinton region which works out at about 3 sets to the square mile. This is a very high density indeed.

From evidence so far received from the north of the county there is quite a high density in the Mendip region, especially in the combes. The badgers also choose old quarrying and mining areas where digging is easier.

In the Bath and Frome districts badgers are numerous in the oolitic limestones and clays. There are also plenty of badgers near Bristol, some of them within the city boundaries.

On the central moorlands no sets are present on the parts subject to flooding but, wherever the land rises to 20 feet or more above sea level and where cover is available, sets are found. Most sets occur round the edges of the moors and they are plentiful on the Poldens.

On the Quantocks there is a fairly high density especially in the foothills and combes on both sides of the range.

In Taunton Vale sets occur wherever suitable sites are available; they are more common on the more hilly parts, but where cultivation is more intense they are mainly confined to hedgerows, copses and the banks of the old canal.

On the Blackdowns the density is high over the whole area but especially in the greensand of the north-facing escarpment where sets form an interrupted chain for many miles.

The Brendons are excellent for badgers as there is easy digging in the new red sandstone, but there are far fewer sets above the 500 ft. contour line. Little mapping has been done in this area.

In the Chard and Ilminster region sets are frequent in wooded areas on the lias and the greensand, and in chalky pockets. West of Chard the density is particularly high.

On Exmoor sets are not numerous on the higher moors, but in the lower combes and pastures where more food is available sets are frequent.

When studying the ecology of the badger the animal's senses need to be taken into account as it is through these that it detects environmental changes. A glance at the skull shows the great surface area of the scroll bones in the nasal chambers and this reflects the acuteness of the badger's sense of smell. Scent in fact plays a major part in badger behaviour: it lives in a world of scent. When a badger first emerges from its set in the evening it scents the air carefully for the slightest trace of danger. When it feeds it finds its prey largely by scent. It also uses scent to find its way about. Musk glands are present in the anal region and it is not unusual to see a badger squat for a moment on the path or some object like a stone and leave its scent behind. This serves to mark out territory and in unfamiliar country helps the animal to find its way back.

Although the external ears are small, hearing is acute and is its second best sense, but sight is poorly developed. The cubs are extremely short-sighted. As they get older their sight improves but it is never very good except over short distances.

Badgers are social animals in the sense that the family is a social unit which keeps together for many months and it is not unusual for several families to live together in some of the larger sets. The number of individuals in one set is limited by the available food and the suitability of the surrounding country for digging other sets.

In the early spring the largest sets may contain up to three families. This means that there may be adult males, adult females, yearling immature males, yearling females becoming mature, and cubs — all present at the same time.

Badgers are playful animals and both adults and cubs join in, although play is more characteristic of the young animals. Patterns of play such as "Tag" and "King of the Castle" can be observed, and when the cubs get really excited the fur is fluffed up, they emit constant wickering noises, and the air is full of the characteristic pungent musky odour.

A special tree is often selected for play, especially one previously blown over in a storm. Mud marks may be seen where the badgers

have clambered over it and the ground round about is devoid of vegetation where they have chased each other round and round.

One reason for the family keeping together is the long lactation period of over three months; but after weaning they still may forage together as a family.

The food ecology is now fairly well known as a result of systematic analysis of dung and stomach contents at all seasons of the year. Although, by dentition, an obvious member of the Carnivora there is no doubt that in its feeding the badger is omnivorous.

The most important single item of diet is undoubtedly the earthworm. These are eaten in large numbers whenever the ground is wet enough and warm enough for them to lie on the surface when they become an easy prey. I have found more than 200 large earthworms in the stomach of a single badger and in more than half the stomachs analysed earthworms have been present. Earthworms are particularly important for the sows in the spring as, when lactating, they need a plentiful supply of food quickly obtainable. This is probably a factor in choosing a breeding set and would explain why woods bordering pasture are so popular.

During spring and summer beetles and young mammals form a high proportion of the diet, while in the late summer and autumn badgers turn to a more vegetarian diet, doing some gleaning in the cornfields and later eating any fruits they can find. These include windfall apples, pears and plums, blackberries, elderberries and acorns. These last are especially important when there is a heavy crop.

Whenever food is scarce badgers will root for bluebell bulbs and the rhizomes of woodland plants, and in a good wasp season they will destroy many nests and eat the grubs.

The badger is certainly an opportunist feeder going for the food that is most abundant on any particular night. It is also most adaptable, learning to feed on scraps in built-up areas and, on high moorland such as Exmoor, on black slugs, dung beetles and whortleberries.

The badger's breeding ecology is closely related to its complicated reproductive cycle. Mating can take place in every month of the year from February to October but it is of two kinds: long duration of 15 minutes or more, or short duration — under 2 minutes. It is the former that brings about fertilization and usually takes place in the February — May period, but occasionally much later in the year. It is curious that with such a variable mating period the birth times should be so restricted. In Somerset this birth period is from January — March, with a peak during the first fortnight in February. This discrepancy between mating and birth period is due to the fact that, after the egg is fertilized, there is a period of delay before implantation of the blastocyst takes place. This usually takes place in December irrespective of when fertilization occurred, thus ensuring that births

occur at the best season. After implantation there is a period of eight weeks of true gestation before birth takes place. The total period from fertilization to birth may thus be nearly twelve months if fertilization occurs in February and only four months if it occurs as late as October. Fertilization in the autumn is usually the result of a young sow not becoming mature until late in the year — they are usually mature as yearlings.

A litter consists of one to five cubs, the average for Somerset being just under three. The cubs bury into the mass of bedding which acts as an insulator. Most of the heat which comes from the body of the mother is kept in and the nest reaches quite a high temperature. Very occasionally nests above ground are made. One of these was found in a hedgerow on the moors where digging was impossible due to the waterlogged nature of the ground.

The cubs do not appear above ground until at least eight weeks old and are usually about three quarters grown by the autumn.

What is the significance of this strange cycle with its long period of delayed implantation? I can only speculate; but it is clear that it results in the cubs being born at the best possible time of year. February may not seem ideal for birth underground, but in fact it is. Heating is supplied by the mother and lactation lasts until May. By that time there is food in plenty and the cub has until November to grow strong and big and lay down fat, so that, however severe the winter, it can survive.

Finally, I can say with confidence that our Somerset badgers— in spite of grave losses on our roads and through the digging, snaring and especially the gassing that goes on far too much — are holding their own as they have done successfully since the last glaciation.