

# Historical and biological studies on english hedges

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## INTRODUCTION

Most of lowland England is intensively farmed and yet still supports a great variety of wild life. A superficial study will show that most of these plants and animals are either confined to hedgerows or are dependent upon them in some way.

The total number of organisms which occur in hedges, either as characteristic inhabitants or temporary sojourners, has never been accurately estimated. About 130 higher plants are more frequently found in hedges than elsewhere and apart from a few ubiquitous plants, such as some of the grasses, alternative habitats for these species are infrequent and, with increasing intensification of agriculture and expanding towns, these habitats are becoming less and less common so that the destruction of hedges can result in a serious loss to the flora.

Also the association of plants forming the hedge provides a habitat for animals. Hawthorn (*Crataegus monogyna*) alone is a food plant for the caterpillars of 85 species of moth, and of these 85 species some 28 do not have an alternative food apart from other hedgerow plants. Hedges, however, can be very different from one another and some preliminary work to identify the factors causing this diversity has been done. So far the two major factors appear to be origin and management.

## 1 – Birds

The earliest observations were on birds. Investigators at Monks Wood found that while an average 1,000 metre post and wire fence might have 3 pairs of 3 species nesting in it, a hawthorn (*Crataegus monogyna*) hedge would have 10 pairs and 8 species nesting, but a hedge with a variety of shrubs and trees in it would have perhaps 40 pairs of 20 species of bird nesting in a 1,000 metre length.

It appeared that the diversity of the woody plants controlled the bird populations but what controlled the plants?

## 2 – Shrubs

As a first hypothesis we at Monks Wood suggested that climate, soil type and management would control the plants. All these factors can be shown to operate upon individual species of plant in fairly predictable ways. For example Spindle (*Evonymus europaeus*) and Dogwood (*Cornus sanguinea*) only occur in hedges on calcareous soils and on a broader scale there are good correlations between hedge type and soil type. On the Isle of Purbeck we find mixed hedges on sandy soils, Blackthorn (*Prunus spinosa*) hedges on Kimmeridge Clay, Elm (*Ulmus procera*) hedges on London Clay and Hawthorn (*Crataegus monogyna*) hedges on chalk soils.

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The soil factor cannot be the only significant factor because in areas other than the Isle of Purbeck we find mixed hedges on the chalk and Hawthorn (*C. monagyna*) on the clays

One obvious possibility causing such variation is local difference in management. It is possible to find significant differences in individual species frequency — Ash (*Fraxinus excelsior*), Oak (*Quercus robur*) and Field Maple (*Acer campestre*) are all about twice as frequent in unmanaged hedges as they are in hedges which are regularly clipped. A similar situation exists with some climbers such as *Bryonia dioica* and *Solanum dulcamara* but most of such species are about twice as frequent in clipped hedges as in those left unmanaged (e.g. *Rubus fruticosus*, *Galium aparine*, *Rosa* spp, *Lonicera periclymenum* and *Hedera helix*).

All this is very well but it is diversity — the number of different kinds of shrub in a unit length of hedge — that appears to control the numbers of kinds and number of pairs of bird in a hedge. The reactions to management or soils of individual species tend to cancel one another out so that on any soil a hedge, managed in whatever way, could have one or a dozen woody plants species in it.

### 3 — Hoopers Hedgerow Hypothesis

At this stage in our studies I had the idea that the older a hedge was the more species it would have in it. By examining a large number of documents, cadastral surveys and maps I was able to date a sample of over 200 lengths of hedge from a variety of areas in southern England. In all these hedges I counted the number of species of tree and shrub in a standard length as a measure of diversity. The age and number of species were highly correlated with  $r = 0.85$ .

and the regression equation came to :

$$\text{age} = (\text{No. Spp} \times 110) + 30.$$

Very roughly one can say that each century the standard length of hedge adds one new species.

It is very rough. A correlation coefficient of 0.85 suggests that only 70 % of the variation in diversity is explained by the age factor but the samples came from a variety of areas so the immediate question was : is there a better correlation within a single area, when perhaps confounding factors such as local climates or local traditions of management are ruled out?

The answer to this is yes. For example in the East Midlands area around Monks Wood, where we have again examined documents and counted species, we find a correlation coefficient

of 0.92 and the regression equation is  
age = (No. Spp × 99) – 16.

Again we can say a hedge gains one new species each century and this time about 85 % of the variation in diversity is explained by age.

### 4 — The Hedge as a succession

From the observation that hedges exhibit a correlation between diversity and age one can go in a variety of directions. English Historians and historical Geographers have been interested in dating field systems by counting species but for the biologist it is perhaps more interesting to enquire how the correlation has come about.

My first idea was that it could be caused by succession. Although I have used a simple linear equation for the regression analysis the more common sigmoid relation is possible. The available data on age and number of species are not sufficient to discriminate between linear and curvilinear relationships and I merely chose the linear as the more simple.

If it is succession we are dealing with, however, then some species might come in at specific points in time. We might for example suggest that Field maple (*A. campestre*) comes in at about 400 years or Spindle (*E. europaeus*) comes in at 600 years or again the Midland Thorn (*C. laevigata*) comes into the hedge when it is 1,000 years old. Such statements about all three species could be supported by casual observations in the neighbourhood of Monks Wood but when one examines the data for these, and other, species over the whole of southern England there appear, for all species, *linear* relationships between their frequency and the age of the hedges with only the slopes differing between species. Thus I now conclude that hedges are to be regarded as a random concatenation of species whose individual rate of entry is dependent upon the probability that a seed will arrive in the hedge which in turn depends upon the frequency and fecundity of that species in the neighbourhood.

### 5 — Pollard's postulate

Of course that is largely hypothetical and others prefer other explanations. My colleague, Dr. Pollard, has a plausible alternative.

He suggests that older hedges are richer, not because they are old, but because they were formed in ways different from those in more recent times. He makes a distinction between hedges which were planted mostly in the 18th and 19th centuries and those which in much earlier times, he believes, were hacked out of woodland by the mediaeval peasant. He argued that if the trees and shrubs of the woodland were converted to hedges then some of the ground flora might also survi-

ve. His examination of hedges and documents shows that there is an association between the presence of Bluebell (*Endymion nonscriptus*), Dogs Mercury (*Mercurialis perennis*) and Wood Anemone (*Anemone nemorosa*) in the hedge bottom and former woodland adjacent to the hedge. This he

would cite as evidence for some hedges being woodland relics while I, knowing the observation to be accurate, explain it away by suggesting facilitated colonization of a planted hedge by such species on account of the large neighbouring seed source in the woodland.

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