

A SURVEY OF BRYOPHYTES IN SOME NORFOLK 'TRADITIONAL' ORCHARDS: A SUMMARY REPORT & CONCLUSIONS.

SUMMARY: Whilst no new vice county records, or startling discoveries were made, a significant number of records of rare species were made - enough to confirm the importance of orchards (particularly in the Fenland basin) for regional bryodiversity. Park Yoke-moss (*Zygodon rupestris*) appears to be confined to old orchards. Dessert apples were confirmed as being significantly better hosts than cooking apples, but the role of micro-climate is also very important. Active management is also confirmed as a significant factor.

RECORDING:

A total of 25 orchards have been recorded *ab initio*. I have taken a reasonably wide definition of 'Traditional' orchard, to include some which are under commercial management (i.e. they are sprayed, and have herbicided strips under the trees) but which consist of older half standard trees.

The vast majority of these orchards were on the list supplied, but one or two were ones that I happened upon, and which looked promising.

I have also included details of some Pear orchards that I have recorded in the past, just to emphasise how good they can be.

As far as possible I have provided enough locational detail to enable someone to go back to each site and relocate individual trees; however, this was not always possible.

Nomenclature follows Hill, Blackstock, Long & Rothero 2008.

Names have been spelled out in full on the Orchard Recording sheets; on the spreadsheets names have often been abbreviated

BACKGROUND:

Orchard bryophytes include a wide number of species. Some of these are everyday common species which occur as epiphytes simply because they have a wide ecological tolerance and can therefore grow on trees, amongst many other habitats. The more interesting (and therefore 'desirable') species are those that **prefer** to grow as epiphytes (these are sometimes known as Obligate epiphytes).

Many of the Preferential epiphytes are intolerant of pollution, to varying degrees.

Prior to the late 1960s or early 1970s few, if any, bryophytes would have been found in orchards owing to the widespread use of Tar Oil. This was sprayed onto trees with the express purpose of killing off bryophytes and lichens, which were thought to afford shelter to insect pests. The end of Tar Oil use also coincided with reductions of air pollution, following the introduction of the Clean Air Acts.

As a consequence there has been a gradual increase in the amount, and range, of bryophytes found in orchards. This has been broadly mirrored by increases in epiphytic bryophytes in other habitats; however, orchards do seem to be exceptionally rich. This may be, in part, to the sheer accessibility of half standard

orchard trees, as opposed to standard trees in more natural habitats, whose upper branches cannot be examined at all readily.

Some populations (of presumably more pollution tolerant) species such as *Orthotrichum affine* recovered quite rapidly; other species, such as *Orthotrichum lyelli* and *Cryphaea heteromalla* recovered more slowly, whilst some others, such as *Orthotrichum tenellum* and *Orthotrichum striatum* are only just recovering. As a consequence they are still comparatively rare, and have rather patchy distribution patterns.

Some of the rarest species, such as *Orthotrichum speciosum* and *Orthotrichum obtusifolium* appear to be re-invading from continental Europe, rather than from their clean air strongholds in upland Britain. *Hypnum cupressiforme* var *heseleri*, which was first found in Britain in a Norfolk orchard, certainly appears to have come from Europe.

METHODOLOGY

- As many trees as possible were sampled in the time available, up to a limit of 50. Usually 10 trees were sampled from 5 rows/part rows. Wherever possible the start and end of each row was located by a ten figure GPS reading. This should allow for future monitoring of the same trees – if they survive.
- Young trees (i.e. < 30 years old) were not recorded systematically, but were simply scanned for interest. (Experience suggests that few bryophytes are present on trees of less than about 30 years old, and they consist of only the commonest species.
- Different cultivars were sampled, if present, as there are significant differences between the ability of cultivars to act as hosts for epiphytic bryophytes.

CONSTRAINTS:

1. I have tried to get a good geographical spread of sites, but, given the sheer number of orchards available, I may not have succeeded.
2. I have adopted a fairly loose definition of 'Traditional' orchard, and have included several that are in commercial use. However, where I have done so, they are traditional in general form, growing half-standard trees.
3. Sites varied considerably in size, age, and in the nature of the plantings. In some instances owners knew what cultivars were present, and how old they were, whilst others had no idea. In a few cases it was not possible to establish contact with the owner. Nor was it always known when active management had ceased, though it could be inferred from the amount of bramble and ivy present. These are all factors which influence the bryoflora.
4. Trees surrounded by brambles or ivy could not be adequately recorded (if at all).
5. Large old Bramleys whose upper branches are inaccessible may have been under-recorded. Experience suggests, however, that the upper branches may not be all that rich anyway.

6. Recording has been done purely on the basis of presence. The fact that a species is present on any particular tree does not say anything about its actual abundance, which may range from a single tuft to extensive sheets. The DAFOR abundances given on the summary sheets are subjective, and are also based on an orchard wide assessment, so a species would be rated as 'Rare' whether it occurred as a single tuft on a tree, or was more abundant – but still only occurring on a few trees.

CAVEATS

1. There are a few groups of mosses which cannot be identified positively unless certain features (notably ripe capsules) are present. The *Ulota crispa* complex (*Ulota bruchii* and *Ulota crispa*) can only be separated accurately when ripe capsules are present. At the time of survey the capsules were immature: as a default everything was recorded as *U. bruchii* since that is the commonest species in the county.
2. *Hypnum cupressiforme* is a complex where taxonomists seem unable to decide whether some of the variations within the group are full species, or simply varieties. For the sake of simplicity the varieties, such as *H. resupinatum* or *H. lacunosum*, were ignored.
3. Many members of the genus *Orthotrichum* cannot be identified unless there are ripe capsules present. In their absence, all members of the genus were recorded as *O. affine*. This may have resulted in an under-recording of some of the rare species, but should not have affected the distribution pattern of *O. affine* itself, which is a very common species.
4. It is impossible to claim that everything has been found: a different recorder, on a different day, and with different weather conditions might well discover additional species.
5. Although an attempt was made to sample different cultivars it was not always possible to do so, especially since – in small orchards – growers often grew mixtures, and even in bigger orchards diseased or dead trees were sometimes replaced by whatever came to hand.

CONCLUSIONS:

1. Plums are confirmed as poor hosts. However, few plums were actually sampled.
2. Pears orchards can be as species rich as apple orchards.
3. Apples, as usual, came out as being the best hosts for bryophytes.
4. The majority of the non-specialist species are common, though a few (e.g. *Isothecium myosuroides*; *Campylopus introflexus*) although widespread elsewhere seem to occur only sparsely in orchards.
5. Apart from *Orthotrichum affine* the majority of the specialist (and pollution sensitive) species are rare, though some are clearly much rarer than others. These patterns of rarity have to be seen in the context of pollution history.
 - a. The present bryoflora has developed since tar oil ceased being used, and since the passing of the Clean Air Acts.
 - b. The order in which species have been reappearing is, presumably, in reverse order to their sensitivity to pollution.

Moderate sensitivity	Sensitive	Highly sensitive
<i>Bryum moravicum</i>	<i>Leucodon sciuroides</i>	[<i>Antitrichia curtispindula</i>]
<i>Cryphaea heteromalla</i>	<i>Orthotrichum pulchellum</i>	<i>Cololejeunea minutissima</i>
<i>Frullania dilatata</i>	<i>Orthotrichum stramineum</i>	[<i>Orthotrichum obtusifolium</i>]
<i>Orthotrichum lyellii</i>	<i>Orthotrichum tenellum</i>	<i>Orthotrichum speciosum</i>
<i>Syntrichia papillosa</i>		
<i>Ulota bruchii</i>		
<i>Ulota phyllantha</i>		
<i>Zygodon conoideus</i>		
<i>Zygodon rupestris</i>		
20 years ago all of the species listed above were regarded as rarities. Now they are comparatively common.	Two star species.	These species are the three star rarities of today. In ten years time they may be common.

6. The most species rich trees may be 'rich' simply because they have a full assemblage of the common species.
7. Trees which host 'good' species may have a low total diversity, and the other species present may be fairly dull.
8. Tree bark chemistry and microclimate may also be important controls and may help to explain the comparative rarity in orchards of species such as *Metzgeria furcata* and *Radula complanata*, which are not uncommon elsewhere.
9. Because of the limited number of trees which could be sampled in any one orchard it was not possible to obtain statistically significant data sets, Nonetheless, observations suggested strongly that the correlations noted by Stevenson & Rowntree (2009) held true in many instances, i.e. that there is a relationship between the number of species present and the nature of the cultivar.
10. Bryomass (i.e. the sheer amount of moss present) appears to increase with the length of time since active management ceased. For instance, old (i.e. 70 years +) Bramley's in active management often have a limited moss cover whilst those that have been abandoned are often extremely mossy.
11. The Bryodiversity of a site appears to be related to
 - a. The nature of the cultivars present. Experience suggests that dessert apples are generally better than cooking varieties; certainly the evidence of Buckley's orchard at Emneth Hungate suggests this.
 - b. The length of time since management ceased. Many of the most desirable species are shade intolerant, and become less frequent (or entirely absent) under the sort of heavy shade that results from a cessation in pruning.
 - c. Random recruitment factors governing the arrival of propagules, such as spores, at any given site.

AREAS FOR FURTHER RESEARCH:

1. What are the causes of differences between sites such as Goodale's orchard at Walton Highway [TF485.132] and Bunting's orchard at [TF500.119], which, are only about 1.5km apart, and house trees of roughly the same age? Why are *Dicranoweisia cirrata* and *Hypnum cupressiforme* so much more abundant at the latter site, and rare at the former? Microclimate? Management?
2. Population dynamics
3. Does Ivy growth have any long term deleterious effect on bark chemistry or texture? How long after its removal do bryophyte populations begin to re-establish themselves – if at all? (Given the expense and difficulty of removing ivy this is an important question.)
4. The role of tree architecture in providing habitat niches. There have been considerable changes in fashion over the years about how trees should be trained. I have a gut feeling that some of these might be significant.

RECOMMENDATIONS:

NB Some of these comments are related specifically to bryophytes, whilst others are of a more general nature which take into account the needs of other groups, which may be of conservation importance. What is good for one group may not necessarily be good for others.

- Some level of active management appears necessary if bryodiversity is to be maintained / encouraged.
- Whilst Stewardship arrangements may help some orchards, not all owners are willing to enter into such arrangements. However, they may be willing to co-operate with organisations such as the Wildlife Trusts, *were they willing to undertake the work necessary*.
- Pruning is one of the most important aspects of orchard management. It is also very expensive. It might be worth exploring co-operation with Cambs Wildlife Trust / Biodiversity Partnership, to see whether, between you, you could provide funds for a pruning team to operate in the Fenland area?
- Specialist bird and bat surveys may confirm the value of the habitat to these groups too, and lead to co-operative ventures with RSPB and Bat Conservation bodies, thus further sharing the financial burdens of management.
- Given that orchards must also represent significant carbon sinks it should be worth exploring the possibility of getting local carbon producers to offset some of their footprint by sponsoring orchard management initiatives. How about some of the big supermarket chains, like Tesco's?
- Given that the majority of derelict orchards that might become County Wildlife Sites are probably old Bramley orchards, then that alone is going to have an influence on the bryofloras. Certain species, such as *Syntrichia papillosa*, are likely to remain sparse. Were it possible to get some old dessert orchards under protection then that would be a good move.
- Given that a substantial number of existing commercial orchards actually house large 'veteran' trees (e.g. Bunting's orchard at Walton Highway) it would possibly be cheaper to 'buy into' these, rather than trying to

revitalise some of the very neglected orchards - which would be an expensive nightmare to restore. All that would be required would be an agreement to keep the trees, and a cessation of spraying, if that is what you want, and a contract to continue with some form of periodic pruning. As the photo below shows, such old trees are frequently interplanted with younger replacements; this would ensure an ecological continuity of habitat.



- Multiple use of old orchards may also represent a way forward. At least one fragment of old orchard I looked at was being used for pheasant rearing; an orchard I looked at last year, in Cambridgeshire, was used for free-range chicken rearing. In one orchard in Emneth horses were being grazed on the grass between tree rows, (using movable electric fencing), and pigs were also allowed to rootle about. What else might be feasible? Apple wood is, for instance, much favoured by wood engravers, yet currently much of it is being burned or left to rot. It might be worth investigating where the market is, and how much it is worth.
- Given the low population densities in most of Fenland, and the abundance of orchards, it is difficult to envisage the sort of community activities which have developed in other parts of the country.

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