



△ Food carton at Kilmichael Forest, Argyll, in May 2009, colonized by *C. calyptrifolia*. Ben Averis

Unfortunately, our countryside is often littered with all kinds of rubbish from polystyrene cartons to disused machine parts. But, as **Ben Averis** describes, there is at least one liverwort that appears to be quite happy growing on just about anything that we thoughtlessly discard.

Colura calyptrifolia growing on rubbish in a Scottish conifer plantation

In 2007 I reported my findings of the tiny oceanic liverwort *Colura calyptrifolia* in a wider range of habitats than was previously known for this species in Britain, including occurrences as an epiphyte on planted conifers and as an epiphyll on fern fronds and conifer leaves (Averis, 2007). *Colura* occupies a particularly wide range of habitats within western British conifer plantations, where the shelter and associated high humidity are evidently very favourable for this species. It appears that the combination of high humidity and mild



△ From left to right: *C. calyptrifolia* was found growing on this large plastic bag in Kilmichael Forest, Argyll, in May 2009 (the inset shows two of the many small patches of *C. calyptrifolia* on the plastic bag); the milk carton was packed on 4 January 2007 and thrown into Kilmichael Forest, probably between that date and the 'use by' date of 22 January (unless the owner liked sour milk and kept it longer!), so the *Colura* found on it in May 2009 (tiny patches at left of photo – ringed) colonized in the previous 28 months; the glass bottle is partly colonized by bryophytes, including the liverworts *C. calyptrifolia* and *Lejeunea lamacerina* (found at Kilmichael Forest in May 2009); patches of *C. calyptrifolia* on a yogurt carton (the location of the yogurt carton, half-buried among stones at this well-lit junction of forest roads in Kilmichael Forest, is shown in the far right photograph). Ben Averbis

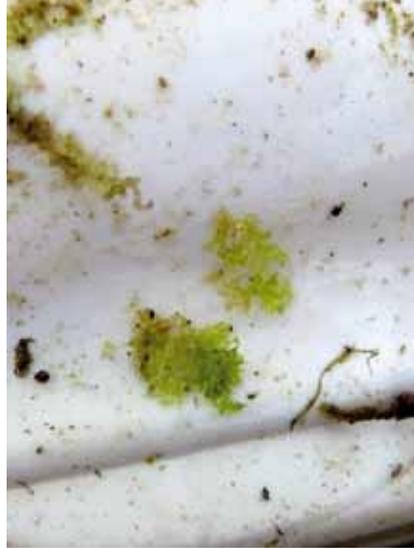
temperatures in these places provides a long growing season, allowing *Colura* to colonize new surfaces relatively quickly, hence the occurrences as an epiphyll in some plantations (and also in some very sheltered heaths). During the last two years, I have continued to find *Colura* on trees and shrubs in more conifer plantations in Scotland, north-west England and north Wales, extending its known distribution in Scotland eastwards into Perthshire and West Lothian, and greatly increasing the number of records in Galloway.

One of my findings reported in 2007 was of *Colura* on old polypropylene rope attached to the wheel of a tractor in a conifer plantation in Morvern, in the mid-western Highlands. I was reminded of this recently while doing habitat survey work for the Forestry Commission at Kilmichael Forest in Argyll, where, on arrival, I saw various items of unsightly rubbish which had obviously been thrown into the forest from the nearby A83 Lochgilphead–Inveraray road. My curiosity overcame me and within seconds I found myself looking at the distinctive yellow-green tufts of *C. calyptrifolia* growing on an

old polystyrene food carton of the type used for fish and chips. There was more *Colura* on another similar carton, *Microlejeunea ulicina* and *Metzgeria consanguinea* on the same cartons, and *M. ulicina* on a nearby crisp packet and a round plastic carton lid.

During my 10 days at Kilmichael Forest, I kept an eye out for *Colura* and found it not only on the bark of trees and shrubs (almost all species examined), heather stems, fronds of hard-fern, old bramble stems, bramble, spruce and rhododendron leaves, old marsh-thistle stems, bracket fungi, foliose lichens, larger bryophytes and a few rocks, but also on the following man-made items:

- polystyrene food cartons
- plastic milk and yogurt cartons
- plastic bottles
- plastic bags
- the inner surface of a plastic bucket
- old, plastic forestry signs and plastic zip ties attached to them
- flexible, rubber-textured, synthetic material on an old air filter (probably from a tree-harvesting machine)



- a glass bottle
- rusty iron (non-galvanized, pre-1950s) on an old hoop (probably from a wooden barrel) and an old bucket
- plywood boards, probably previously used as backing for forestry signposts
- old wooden fence railings

I found other bryophytes in these same habitats: most commonly the liverworts *Lophocolea bidentata*, *Microlejeunea ulicina* and *Metzgeria consanguinea*. *Lejeunea lamacerina* was one of the species accompanying *Colura* on a glass bottle. One milk carton with *Colura* dates from January 2007, so the plant has colonized it within 28 months. I have estimated similar or shorter times for colonization by *Colura* on some fern

fronds and spruce leaves. Mosses such as *Hypnum jutlandicum*, *Kindbergia praelonga*, *Brachythecium rutabulum* and *Rhytidiadelphus squarrosus* can also be present in these habitats, but they tend to creep onto the artificial surfaces from adjacent soil or humus on the ground, or to grow on a shallow layer of soil, humus or leaf litter which has accumulated on the artificial surface, for example among the folds of a plastic bag.

▽ Left. *C. calyptrifolia* was found growing sparingly on this rusty iron hoop, probably originally from an old wooden barrel (Kilmichael Forest, Argyll, May 2009). Right. Small patches of *C. calyptrifolia* are scattered on these old wooden fence railings by the main A83 Lochgilphead–Inveraray road at Lochgair, at the edge of Kilmichael Forest, Argyll. May 2009. Ben Averis



Plastic-based surfaces might be favourable to *Colura* because they are chemically inert and do not break down to release potentially harmful substances, and because competition with other species must be low, especially where surfaces are steeply sloping and bryophyte cover very sparse. The inert substrate appears well-suited to this **ectohydric** species which evidently takes in water and nutrients from rainwater and seepage flows rather than directly from the substrate itself. The liverwort flora on these artificial surfaces shows affinities to certain assemblages found on shaded, neutral to acidic bark and rock. I have noticed affinities between the bryophyte floras of artificial materials and rocks before: for example, when I found *Ptychomitrium polyphyllum*, *Racomitrium lanuginosum*, *R. fasciculare*, *R. aciculare*, *Ulota phyllantha* and *Frullania microphylla* on old polypropylene rope in a friend's garden in Morvern in April 2007. I have yet to find *Colura* on soil, soft textiles or rubber, even though old rubber tyres can look very suitable.

I have yet to deliberately examine the bryo-

Ectohydric species do not take up water and nutrients from the substratum, relying instead on external sources for their supply.

phyte flora of discarded rubbish in other conifer plantations, but it seems quite possible that other sites in the west may have similar species in these habitats. Although these findings in Argyll are of interest, I do remain firmly against the practice of throwing litter into forests and other places... with one possible exception – a deliberate and carefully planned experiment to study bryophyte colonization!

Acknowledgments

My habitat survey work at Kilmichael Forest was commissioned by Forestry Commission Scotland. I thank my wife Alison for reading through a first draft of this article, my neighbour Bobby Anderson (who knows a lot more than I do about machines and manufacturing) for identifying a mystery item as an air filter, and for information about synthetic 'rubber' and old metal materials, and Lesley Walker (Group Quality Assurance Manager at Robert Wiseman Dairies) for checking my photos of a milk carton and finding out exactly when it had been packed.

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Reference

Averis, A.B.G. (2007). Habitats of *Colura calyptriifolia* in north-western Britain. *Field Bryology* 91, 17–21.

