Ecology**Matters**

Following on from the last *Ecology Matters* column (vol. **99**, pp. 39–41), **Jeff Bates** invites members to get involved with a new phenological study to be organized by Silvia Pressel (Natural History Museum, London), focusing on sporulation.

A recent situation report on the BBS Bryophyte Habitats Survey and the related 'behind the scenes' physiological work is now available under 'Bryophyte Ecology Group' on the BBS website. Although not directly discussed there, certain inequalities are becoming evident in the data. Woodland habitats are relatively well visited by BRECOG surveyors, urban habitats are not much recorded and aquatic habitats hardly feature at all. Some of these biases are explained by the tendency, so far, of samples to come from intensively farmed or lowland regions. This, I hope, we can remedy over the next few years. Of course, it takes a particularly thick-skinned individual to record quadrats on a town pavement and I would not include myself in this category. Anyone who enjoys interacting with curious members of the public could make a valuable contribution to our dataset by doing so! My general point is that it is as well for surveyors to become aware of their conscious and unconscious habitat predilections.

In my last *Ecology Matters* I pointed out that, in contrast with several other groups of organisms, there is practically no information about changes in the timing of reproduction of bryophytes in response to global climatic change, and I proposed that we should do something about this gap in knowledge. I am very pleased to report that Dr Silvia Pressel, now in post at the Natural History Museum (London), has agreed to co-ordinate a BBS survey of reproductive phenology of common British bryophytes. The scheme will be launched officially later in 2010 and some details are still being worked out. The following account relies heavily on notes produced by Silvia, derived from discussions at the Natural History Museum between herself, Professor Jeff Duckett and myself.

Background

'*Phenology is the study of the timing of growth and reproductive events*' (Stark, 2002). These events in

△ A forest of *Polytrichum juniperinum* calyptrae at Thursley Common. *I. Atherton*

plants are often strongly controlled by climate. By recording phenological events systematically over time, it becomes possible to evaluate how these might be influenced by climate, thus in the longer term phenology can become a valuable bioindicator of ongoing climate change (Gordo & Sanz, 2010). As recently pointed out by Glime (2007), phenological events for bryophytes are poorly documented; indeed many floras lack information on seasons for any life cycle events.

General approach

BBS members will be invited to submit annual records of sporophyte development for some widely distributed species from chosen localities that they can revisit annually.

1. The selected localities must be easily accessible (e.g. your garden) so that the critical stages are not missed.
2. Ideally, recording should be from the same localities in successive years.
3. Each sequence of fruiting records for a given species should come from a limited area (at most a few square metres) with uniform aspect and exposure to sunlight, and the same patch should be examined each year.
4. If possible, records should be accompanied by photographs illustrating the main features of each chosen habitat patch.
5. The data-gathering procedure will be simple and non-destructive. Observers will be asked to note the dates at which a small number of developmental stages (see below) are reached.
6. The data will be submitted electronically – a downloadable Excel form is currently being prepared and will be made available on the BBS website together with detailed guidelines – and the organizer will collate the information and present updates in *Field Bryology*.

Species selection

There are several advantages in selecting a limited range of common species for the survey. First, employing common and conspicuous species potentially opens the survey to the greatest number of recorders. Second, if several datasets are received for each species from different parts of Britain and Ireland, it may be possible to observe effects of regional climatic differences. Third, we can maximize data input by focusing on the plants that produce sporophytes most regularly. The provisional species list, from which you may chose as many or as few species as you wish, is as follows:

Atrichum undulatum, *Brachythecium rutabulum*, *Bryum capillare*, *Campylopus introflexus*, *Ceratodon purpureus*, *Dicranella heteromalla*, *Dicranoweisia cirrata*, *Diplophyllum albicans*, *Fissidens bryoides*, *F. taxifolius*, *Grimmia pulvinata*, *Hypnum cupressiforme* var. *cupressiforme*, *Isothecium myosuroides*, *Lophocolea heterophylla*, *Mnium hornum*, *Orthodontium lineare*, *Orthotrichum affine*, *O. diaphanum*, *Pellia epiphylla*, *Polytrichastrum formosum*, *Polytrichum juniperinum*, *Pogonatum aloides*, *Radula complanata*, *Rhynchostegium confertum* and *Tortula muralis*.

What to record

Obviously, recording sporophyte development in bryophytes is not as simple as noting when

▽ Dehiscing capsules of *Lophocolea heterophylla*. *David Holyoak*

the flowers of a particular plant have opened. Nevertheless, most developmental stages in bryophyte sporophytes progress slowly and exact 'day-precision' is rarely necessary. The sporophyte phenological 'stages' below, adapted from Forman (1965), appear to be reasonable compromises between what is academically desirable and what is likely to be practicable in a survey of a population of plants, which may show variations in rate of development. Thus, one should record the date for each selected species when the following 'stages' are first reached in ***five instances*** in the patch being observed:

▽ *Tortula muralis* capsules poking through the frost on a wall in Launceston, Cornwall. *I. Atherton*

Mosses

1. Calyptrae first become noticeable among the perichaetial leaves in the population being studied.
2. An emerging seta (representing early growth of embryo) first becomes visible beneath the calyptra.
3. The green capsules (each still with calyptra) are deemed to be fully swollen.
4. Fully-expanded capsules have lost their calyptras (they may be green or yellow/brown).
5. Lids are first lost from the mature capsules permitting spore dispersal.

Liverworts

1. Green capsules are first visible inside perianths or calyptrae (*Pellia*).
2. Capsules first emerge from perianths or calyptrae (*Pellia*).
3. Setae have fully elongated, but capsules remain undehisced.
4. Capsules have dehisced.

Silvia (e s.pressel@nhm.ac.uk) and I (see below) would welcome comments and suggestions on any aspect of the proposed project.

Jeff Bates (e j.bates@imperial.ac.uk)

References

Forman, R.T.T. (1965). A system for studying moss phenology. *Bryologist* **68**, 289–300.

Glime, J.M. (2007). *Bryophyte Ecology, Vol. 1. Physiological Ecology*. Ebook sponsored by Michigan Technological University and the International Association of Bryologists. **www.bryoecol.mtu.edu** (accessed 9 August 2010).

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