

Additions to the bryophyte flora of Cambridgeshire (v.c. 29) in the last 50 years

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M.C.F. Proctor's paper 'A bryophyte flora of Cambridgeshire' was published on 13 July 1956, 50 years ago. This flora, in Proctor's words, "embodies the accumulation of Cambridgeshire bryophyte records begun by Prof. P.W. Richards in 1927". Paul Richards decision to begin a flora in 1927 initiated a revival of bryological recording in the county which has since continued without interruption. His records were passed to Michael Proctor after he left Cambridge for Bangor in 1949. The resulting flora was the first detailed account of the bryophytes of Cambridgeshire since the third edition of Relhan's *Flora Cantabrigiensis* (1820). It is perhaps less well-known than most county floras as it was soon succeeded by Harold Whitehouse's account of the bryophytes in *A Flora of Cambridgeshire* (1964). Nevertheless, the 1956 flora is the more detailed work, and it remains an invaluable source of localised records, as well (of course) as an account of the state of bryological knowledge at the time.

This paper celebrates the 50th anniversary of Proctor's flora by reviewing the bryophytes added to the Cambridgeshire list since 1956. Its scope is deliberately limited to additions, as a full discussion of changes in the flora is best postponed until the date set for the completion of recording for the current bryophyte flora project, December 2009 (see Preston & Hill 2000). Nomenclature follows Blockeel & Long (1998).

Listing the additions to the Cambridgeshire flora since 1956

It is fairly straightforward to list the additions to the Cambridgeshire flora by comparison of the current list with that published by Proctor (1956). The electronic version of the British Bryological Society's Census Catalogue, available on the Society's website, provides an almost complete list of species for v.c. 29. To this I have added a few species accepted by the B.B.S. for the vice-county since the electronic version of the Census Catalogue was compiled, and three species not accepted for the vice-county by the national recording scheme. These are *Neckera crispa* and *Scorpiurium circinatum*, known from our county only as introductions on rockery stones, and a species, *Hedwigia stellata*, for which the voucher was sent to the BBS recorder but lost in the post. (The latter has recently been recorded by Robin Stevenson at Walsoken, West Norfolk, close to the Cambridgeshire border, and with luck it will soon be refound in Cambridgeshire.) The taxonomy follows the electronic checklist and taxa that have been recorded from the county but are reduced to synonymy in this checklist are disregarded.

The only difficulties in listing first records are in cases of taxonomic revision. For *Gyroweisia tenuis* and *Leptobarbula berica* see Preston & Whitehouse (1986) and for the *Grimmia trichophylla* aggregate see Porley *et al.* (2004). Other species that have been subdivided are *Schistidium apocarpum* and *Racomitrium canescens*. Although *S. apocarpum* has been divided into numerous species since 1956 only *S. crassipilum* has been found in Cambridgeshire, so I have assumed that the first record of the aggregate was this. However, Relhan's record of *Racomitrium canescens* cannot be identified as one of the three segregates now recognised, so I have treated S.J.P. Waters' record of *R. ericoides* as the first record of the only segregate recorded in the vice-county.

How many species have been added since 1956?

A total of 100 taxa have been added to the county flora between 1956 and 2005, exactly 2 species per year (Table 1). This is a remarkably high proportion, 43%, of the flora known at the start of the period. The proportion of liverworts added to the flora, 61%, is higher than that of mosses, 40%.

How common are the new species in the county?

A striking feature of the 100 additions to the flora is that many are apparently very rare in the vice-county. Over half have been found in just one or two sites: 38 are still known only from the site of the first discovery and a further 14 have been found in just one additional site. Most of the rest are uncommon and only nine are frequent in the vice-county. Eight of these nine are plants that were not known (or not understood) in Britain in 1956 – they were added to the British flora between 1959 and 1973. These include *Syntrichia virescens*, first reported from Britain in 1959, *Bryum rubens*, misunderstood until 1964, *B. subelegans*, separated from the very common *B. capillare* in 1973, and *Campylopus introflexus*, an alien species which has spread rapidly since it was first collected in Britain in 1941 and recognised as distinct from its native look-alike *C. pilifer* in 1963. The single widespread plant that was known to British bryologists in 1956, *Dicranella schreberiana*, grows on disturbed ground (especially arable fields) and was added to the Cambridgeshire flora in 1959.

How many people have been responsible for discovering them?

Surprisingly, 36 people are credited with the sole or joint discovery of at least one of the 95 species first collected in the county in the last 50 years (the remaining 5 species were collected earlier but not recognised as distinct). This is more than the number who had added species to the county list in the 300 or so years of recording up to the 1956 Flora. Able field botanists working in the University's Botany School between the mid 1950s and the mid 1970s often took an interest in bryophytes, inspired in many cases by Harold Whitehouse. Well-known botanists who appear on the list but spent most of their later careers elsewhere include Paul Adam, David Chamberlain, Jim Dickson, Jeff Duckett, Alan Leslie, Geoffrey Halliday and Mike Martin. Only five bryologists have a share in the discovery of more than four species, and not surprisingly they were all resident in the county for a long period: Harold Whitehouse (18 taxa), Mark Hill (14), Chris Preston (9), John Birks (7) and Mike Lock (6). Paul Richards' discovery of *Ulota phyllantha* in 1986, 58 years after his first new record from Cambridgeshire (*Fissidens crassipes* in 1928), deserves a special mention.

What are the habitats of the bryophytes added since 1956?

I have divided the 100 additions into categories, based on their habitats and native status (Table 2). This is a fairly rough and ready classification, but shows the main groups added to the flora in the last 50 years. Rather surprisingly, as acidic habitats are uncommon in Cambridgeshire, the largest single category is 'terrestrial calcifuges'. These include ten species first discovered at Gamlingay. This area of acid soils on the Lower Cretaceous Greensand has been known to bryologists since the 18th century, but is still turning up additions to the county list. The last five have been

found at Great Heath Plantation, four on a single day in 1988 (*Calypogeia arguta*, *Diplophyllum albicans*, *Fossombronia wondraczekii* and *Pohlia lescuriana*), and the latest, *Pellia neesiana*, in 2002. A further seven species were discovered at Wicken Fen, where the carr was colonised in the 1960s and 1970s by a wide range of calcifuges at a period when the fen was not regularly flooded and the surface of the peat became acidified. Several were rather transient colonists (e.g. *Campylopus brevipilus*, *Hookeria lucens*), but *Sphagnum fimbriatum*, one of the first to be discovered, in 1963, was still present in 2003. Some of the other terrestrial calcifuges are also casual species, including the three *Racomitrium* species (*R. ericoides*, *R. heterostichum*, *R. lanuginosum*) discovered on the clinker of a filter bed at Madingley Hall sewage farm in 1961 and *Lophozia excisa*, found in 1968 on the disused railway line alongside Hayley Wood.

Epiphytes are the next largest habitat group, discounting the ragbag category 'other habitats'. This is not surprising, as in recent years the falling level of atmospheric SO₂ pollution in eastern England has allowed numerous species to increase in abundance or to colonise or re-colonise from less polluted areas. This probably explains the presence in the county of *Frullania tamarisci*, *Orthotrichum pulchellum*, *O. stramineum*, *O. striatum*, *O. tenellum*, *Ulota bruchii*, *U. phyllantha* and *Zygodon conoideus*. The reasons for the apparent spread of *Platygyrium repens* in England are uncertain, and it is too early to comment on *Pylaisia polyantha* and *Sanionia uncinata*, recently found by Robin Stevenson in apple orchards. Most of the other epiphytes are closely related to more widespread species and might easily have been overlooked in earlier years.

There is a substantial group of arable species amongst the additions to the flora, reflecting the greatly increased interest in this habitat in the last 50 years. The majority of these are tuber-bearing species that were scarcely known until their taxonomy was worked out by Harold Whitehouse and his contemporaries in the late 1950s and 1960s. The other two well-represented habitats are more surprising. The chalk habitats of the county have, like the acidic areas at Gamlingay, long been studied by bryologists. *Tortella inflexa* is the most frequent of the additions and is easily overlooked; the others taxa, such as *Pottiopsis caespitosa*, *Aloina brevirostris* and *Seligeria donniana*, appear to be very rare in the vice-county. Seven species have been found in well-studied woodland sites on rotting wood. Their appearance appears to relate to a general national increase in the rotting wood flora, perhaps a response to the decline of traditional woodland management and the return of some sites to a more natural state in which this substrate is more frequent.

The plants of 'other habitats' are a heterogeneous group of species, including four species of watersides and wetlands (*Amblystegium humile*, *Bryum tenuisetum*, *Cinclidotus fontinaloides*, *Plagiomnium ellipticum*), two saltmarsh species discovered at Foul Anchor (*Henediella heimii*, *Tortula acaulon* var. *pilifera*), three summer-fruiting and rather weedy *Bryum* species (*Bryum algovicum*, *B. creberrimum*, *B. pallescens*), one small and very inconspicuous plant (*Gyroweisia tenuis*) and two more which, although larger, hide away in highly shaded sites (*Rhynchostegiella curviseta*, *R. teneriffae*).

The introduced species include four that are believed to be alien in Britain as a whole. In addition to *Campylopus introflexus*, there is one much less frequent aquatic

liverwort, *Riccia rhenana*, first found in Britain in 1952, and three more moss species with a less clear history, all added to the British list after 1956. The remaining plants were introduced to Cambridgeshire from elsewhere in Britain, two on limestone imported for rockery stone (*Neckera crispa*, *Scorpiurium circinatum*) and one on an acidic boulder (*Grimmia trichophylla*).

Variations in the rate of addition of species since 1956

The number of first records is shown in Figure 1. This figure excludes five species added to the list since Proctor's flora but with a first date before 1955: *Bryum rubens* (1834) and *B. laevifilum* (1952), segregates recognised after 1956 but which turned out to have been collected earlier, and *Weissia longifolia* var. *longifolia* (1952), *Plagiomnium ellipticum* (1953) and *Neckera crispa* (1955), which for various reasons were not reported by Proctor.

Up to 1963, there was a high rate of addition as fieldwork continued for the 1964 *Flora of Cambridgeshire*, and as taxonomic studies of tuberous arable bryophytes led to the discovery of several species in the county. From 1964 until 1968 further additions included plants found by keen-eyed young bryologists such as John Birks, Jeff Duckett and Mark Hill. From 1969 to 1972 there were no additions to the flora, but from 1973 to 1977 new species were found almost annually and included some of the Wicken calcifuges. The eight species discovered in 1977, the highest total in the entire period, came from various sites and have no single explanation. This year of plenty was followed by a decade, 1978-1987, in which no more than one species was discovered in any one year and only 5 in total. The drought broke in 1988, followed by regular additions in the 1990s when the totals were swollen by the returning epiphytes. An increased amount of fieldwork from 2000 onwards has resulted in annual additions, and already the total for the 2000s is as good as that for any decade since the 1960s.

This brief history shows that the variations in the rate of recording reflects changes in the intensity of fieldwork in the county, the presence at various periods of skilled bryologists with particular interests, variations in the actual flora of the county, with 'pulses' of additions as suites of species colonise newly available habitats or respond to changing ecological conditions, and presumably a certain random element in the timing of rare events such as the discovery of a new species.

Was the county list "adequately complete" in 1956?

In summing up the state of recording of the flora in 1956, Michael Proctor suggested that, despite an uneven coverage of the county with many more records from southern Cambridgeshire than from "the bryologically rather uninviting areas of flat arable Fenland north of Ely", the records "probably give an adequately complete picture of the flora of the county as a whole". At first reading he may seem to have given an unwise hostage to fortune, considering the 43% increase in recorded species since then. However, a detailed examination of the new records shows that the situation is not as simple as this. At a very rough guess, I estimate that only 40 of the additional species were taxa known to British bryologists in 1956, present in the county before 1956 but overlooked by those who contributed records for Proctor's Flora, and many of these would have been rare. A further 20 are taxa that may well have been present

but were not understood until further taxonomic work took place in the following decades. The remaining 40 may well have invaded the county since that date. This suggests that the county list was indeed “adequately complete” by the taxonomic standards of 1956.

It seems appropriate to conclude this celebratory account with Michael Proctor’s own words, made when reviewing the 1983 *Checklist* of Cambridgeshire bryophytes and vascular plants (Proctor 1984):

“It seems to me that v.c. 29 is beginning to show us a county flora as the dynamic entity we know it must be, and to show that even considering our long-established native species, not all change is loss. It probably shows too that we can never expect to know the flora of an area finally or completely, and probably we should rejoice that this is so”.

References

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Table 1. Number of taxa known from Cambridgeshire (v.c. 29) to Proctor (1956) and those added in the period up to the end of 2005. All numbers refer to taxa currently recognised, with species before the '+' sign followed by additional subspecies and varieties.

	Liverworts	Mosses	Total
Known to Proctor (1956)	31+0	199+4	230+4
Added up to 31.12.2005	18+1	79+2	97+3
Total	49+1	278+6	327+7

Table 2. Additions to the bryophyte flora of Cambridgeshire since 1956, arranged by habitat and native status. Mosses precede liverworts. The date of the first collection is given.

Terrestrial calcifuges, excluding calcifuges arable land and rotting wood: 25 taxa (17 mosses, 8 liverworts)

<i>Campylopus brevipilus</i>	1974	<i>Sphagnum fallax</i>	1975
<i>Dicranella cerviculata</i>	1965	<i>Sphagnum fimbriatum</i>	1963
<i>Hookeria lucens</i>	1963	<i>Sphagnum russowii</i>	2003
<i>Plagiothecium undulatum</i>	1965	<i>Weissia rostellata</i>	1957
<i>Pohlia annotina</i>	1982		
<i>Pohlia lescuriana</i>	1988	<i>Calypogeia arguta</i>	1988
<i>Pohlia lutescens</i>	1977	<i>Calypogeia muelleriana</i>	1973
<i>Pseudephemerum nitidum</i>	1977	<i>Cephaloziella divaricata</i>	1957
<i>Pseudotaxiphyllum elegans</i>	1973	<i>Diplrophyllum albicans</i>	1988
<i>Racomitrium ericoides</i>	1961	<i>Fossombronia wondraczekii</i>	1988
<i>Racomitrium heterostichum</i>	1961	<i>Lophozia excisa</i>	1968
<i>Racomitrium lanuginosum</i>	1961	<i>Pellia neesiana</i>	2002
<i>Rhytidiadelphus loreus</i>	1974	<i>Riccardia multifida</i>	1959

Epiphytes: 17 taxa (16 mosses, 1 liverwort)

<i>Bryum laevifilum</i>	1952	<i>Rhynchostegiella litorea</i>	1960
<i>Hypnum andoi</i>	1997	<i>Sanionia uncinata</i>	2004
<i>Orthotrichum pulchellum</i>	1990	<i>Syntrichia virescens</i>	1965
<i>Orthotrichum stramineum</i>	1994	<i>Ulota bruchii</i>	1984
<i>Orthotrichum striatum</i>	1995	<i>Ulota phyllantha</i>	1986
<i>Orthotrichum tenellum</i>	2000	<i>Zygodon conoideus</i>	1991
<i>Plagiothecium laetum</i>	1991	<i>Zygodon rupestris</i>	2005
<i>Platygyrium repens</i>	1977		
<i>Pylaisia polyantha</i>	2004	<i>Frullania tamarisci</i>	2003

Arable land and other disturbed ground: 15 taxa (13 mosses, 2 liverworts)

<i>Bryum gemmiferum</i>	1956	<i>Dicranella staphylina</i>	1960
<i>Bryum gemmilucens</i>	1968	<i>Ditrichum cylindricum</i>	1960
<i>Bryum klinggraeffii</i>	1956	<i>Ephemerum serratum</i> var. <i>minutissimum</i>	1957
<i>Bryum rubens</i>	1834	<i>Weissia longifolia</i> var. <i>longifolia</i>	1952

<i>Bryum ruderae</i>	1957	<i>Weissia squarrosa</i>	1991
<i>Bryum subapiculatum</i>	1960		
<i>Bryum violaceum</i>	1960	<i>Riccia sorocarpa</i>	1960
<i>Dicranella schreberiana</i>	1959	<i>Riccia subbifurca</i>	1959

Chalk grassland or disturbed chalk: 9 taxa (7 mosses, 2 liverworts)

<i>Aloina brevirostris</i>	1966	<i>Seligeria donniana</i>	2005
<i>Brachythecium populeum</i>	1960	<i>Tortella inflexa</i>	1961
<i>Bryum torquescens</i>	1958		
<i>Didymodon acutus</i>	1956	<i>Leiocolea badensis</i>	1966
<i>Pottiopsis caespitosa</i>	1962	<i>Lophozia perssonii</i>	1966

Rotting wood: 7 taxa (3 mosses, 4 liverworts)

<i>Brachythecium salebrosum</i>	1958	<i>Cephalozia connivens</i>	1966
<i>Campylopus fragilis</i>	1977	<i>Cephalozia lunulifolia</i>	2005
<i>Dicranum tauricum</i>	1977	<i>Lepidozia reptans</i>	1965
		<i>Nowellia curvifolia</i>	1962

Other habitats (including one species for which habitat was not recorded): 19 taxa (18 mosses, 1 liverwort)

<i>Amblystegium humile</i>	1968	<i>Henediella heimii</i>	1977
<i>Bryum algovicum</i> var. <i>rutheanum</i>	2001	<i>Hygrohypnum luridum</i> var. <i>luridum</i>	1978
<i>Bryum creberrimum</i>	1959	<i>Hylocomium brevirostre</i>	1974
<i>Bryum donianum</i>	2004	<i>Plagiomnium ellipticum</i>	1953
<i>Bryum pallescens</i>	2000	<i>Plagiothecium ruthei</i>	1956
<i>Bryum tenuisetum</i>	2003	<i>Rhynchostegiella curviseta</i>	1985
<i>Cinclidotus fontinaloides</i>	1957	<i>Rhynchostegiella teneriffae</i>	1995
<i>Grimmia lisae</i>	1993	<i>Tortula acaulon</i> var. <i>pilifera</i>	1977
<i>Gyroweisia tenuis</i>	1956		
<i>Hedwigia stellata</i>	2002	<i>Marchantia polymorpha</i> subsp. <i>polymorpha</i>	1967

Introductions: 8 taxa (7 mosses, 1 liverwort). Species believed to be introduced to Britain are marked with an asterisk.

<i>Campylopus introflexus</i> *	1965	<i>Neckera crispa</i>	1955
<i>Didymodon umbrosus</i> *	1965	<i>Scorpiurium circinatum</i>	1961
<i>Grimmia trichophylla</i>	1992		
<i>Henediella macrophylla</i> *	2003	<i>Riccia rhenana</i> *	1959
<i>Henediella stanfordensis</i> *	1977		

