THE BRYOPHYTES OF CORNWALL AND THE ISLES OF SCILLY

by David T. Holyoak

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Geraldine Holyoak is thanked for much encouragement, assistance and forbearance during all the years since 1993 when this project has dominated our household.
INTRODUCTION

Scope and aims

This Flora attempts to give a comprehensive account of bryophytes (mosses, liverworts and hornworts) in Cornwall and the Isles of Scilly. Its predecessor, A Bryophyte Flora of Cornwall by Jean A. Paton (1969a), was a model study combining detailed fieldwork carried out by its author throughout the 1960s with critical reappraisal of almost all significant older herbarium specimens and literature. The present work builds on the good foundations provided by Mrs Paton, presenting results of intensive new field surveys I have carried out during 1993-2010 along with comparisons of the results of these with the data from the 1960s and earlier. The new data have been assembled by mapping in the 2 × 2 km squares of the National Grid (tetrads). To allow detailed comparisons, the older records have been extensively reviewed and these too are assigned to tetrads and mapped.

Coverage and treatment of old records

The species accounts in this Flora assign records to three date-classes: 1791-1949 (Very old), 1950-1992 (Old), and 1993-2010 (Recent). The break at the end of 1949 corresponds to the treatment of date-classes for the national bryophyte Atlas (Hill et al. 1991-1994). The 1950-1992 date-class covers the large majority of Mrs Paton's extensive fieldwork in Cornwall which began in earnest in 1960, and also the period over which she most actively checked and assembled records made by other bryologists visiting Cornwall. The latest period corresponds to my own fieldwork, which began soon after we moved to Cornwall in 1993 and largely ended after we moved to Portugal in 2009; my records here were therefore all made after publication of the first national bryophyte Atlas.

The reader is referred to Paton (1969a: 680-684) for an historical survey of bryology and bryologists in Cornwall. The earliest known records of bryophytes in Cornwall result from a few liverworts collected by E. Forster in 1791 (in BM), while the earliest moss specimens were collected by J.S. Tozer between 1820 and 1830 (in RAMM). The first systematic publications on Cornish bryophytes (Curnow 1843, Greenwood 1844, 1846) were followed during later decades of the nineteenth century by considerable bryological activity, especially by W. Curnow and J. Ralfs based in Penzance, with contributions elsewhere mainly by F. Brent, E.M. Holmes and R.V. Tellam (see Bibliography). Nevertheless, by the end of the nineteenth century the neighbourhood of Penzance and much of the Land’s End Peninsula were the only districts in Cornwall that had been really well explored for bryophytes. Detailed studies on the Lizard peninsula and around St Ives only began in earnest with W.E. Nicholson's skilled work from about 1916 onwards. Many other regions remained poorly studied throughout the first half of the twentieth century, although F. Rilstone worked first in the Fowey-Perranporth-Looe region then between Newquay and Redruth. However, much of Bodmin Moor and large areas elsewhere did not receive much bryological study until Mrs Paton covered all 10-km squares (hectads) of Cornwall and the Isles of Scilly during the 1960s.

Only limited use can be made of the nineteenth century bryophyte records and indeed all the pre-1950 records for comparisons with modern data. This is partly because of the patchy geographical coverage of the old records, but also because they were based on taxonomic treatments of species that have since often changed radically, and errors of identification
were also common. Hence it is only those old records supported by voucher specimens that were used by Paton (1969a) and in the national bryophyte Atlas (Hill et al. 1991-1994). This sceptical tradition is maintained here. The *Flora* by Paton (1969a) was a condensed version of a much longer 'Typescript Flora' that gave fuller details of old records. The latter typescript has been used as a starting point in assembling old records for the present work, followed by searches for additional records using the full database of Cornish and Scilly records used for the national Atlas (43720 records in all: kindly made available from the Biological Records Centre, Wallingford [BRC]), and other literature. These sources mainly listed records of rare or uncommon species, along with the first records for species in each vice-county, and a selection of records for commoner species. All of the records have been reappraised for the present study, so that known errors and a small proportion of apparently dubious records have been removed; the original specimens have also been loaned for checking of numerous identifications which seemed doubtful. The preponderance of records of rare and notable species in the pre-1950 data remains, such that really common species such as *Kindbergia praelonga* or *Rhynchostegium confertum* are badly under-represented. However, little useful purpose would be served by spending many weeks checking the old herbarium material for the common species, since many of their recorded localities are vague and the geographical coverage is anyway very patchy.

Recording of bryophytes using squares of the National Grid began in the early 1960s. Localities for records from before then have been assigned to tetrads and included in the present study only when: (a) the place name given is reasonably unambiguous, (b) the place can be confidently assigned to a single tetrad, or at any event to one of no more than four adjacent tetrads, (c) there is no reason to believe that the collector used place names in a careless manner. The *County of Cornwall Reference of Place Names* (prepared for use by the Fire Brigade, reprinted 1970) was valuable both in locating place names and spotting those that are ambiguous. Records from 'The Lizard' or 'Land's End' have not been used because it is often clear that the whole of each peninsula might have been involved. For similar reasons, Tellam's records of 31 species labelled 'St Minver' have all been ignored since the list includes coastal and dune species some of which must have been collected 4 km or more from St Minver (e.g. *Schistidium maritimum*, and a specimen of *Trichostomum crispulum* shamelessly recorded as from 'St Minver Sands'). Where a grid intersection passes through a named place the records were always assigned to the same tetrad unless a good reason exists to place them elsewhere. Thus 'Penzance' records were assigned to SW43Q, 'Truro' to SW84H (but, e.g., 'coast near Penzance' was assigned to SW42U). In the end though, it must be appreciated that while some Very old records had the localities pinpointed (e.g. 'Clodgy Moor' or 'Trengwainton Carn') others (such as the oft-repeated 'near Penzance') are rather vague. Hence no significance can usually be attached to the presence of Very old records in tetrads adjacent to the modern records rather than in exactly the same places.

Recording by Mrs Paton was organised from its outset to cover the 10-km squares (hectads) of the National Grid, partly for use in the Cornish *Flora*, but also as a contribution to recording for the national *Atlas*. Fortunately her records were kept with much greater detail than the minimum needed for recording species in each hectad, such that separate species lists were kept on field recording sheets for every locality, and each locality was marked on the 1:63360 map sheet. For the present study all ca 38000 records were assigned to tetrads and copied onto standard recording sheets (one for each tetrad), using current nomenclature. In cases of doubt, the marked map and other information recorded were usually sufficient to
place records unambiguously within one tetrad, or at most two adjoining tetrads. In several cases of uncertainty Mrs Paton remembered where the plants were recorded, so in the end only a few records were disregarded because they could not be assigned to a tetrad. Only a synthesis of these data was passed to BRC for the national Atlas (and thence incorporated into the BRC database), only a summary list of hectads was published by Paton (1969a) [and only this summary was then incorporated into the ERICA database of the former Cornish Biological Records Unit] and the data for only the richer localities was synthesised by N.G. Hodgetts and A.E. Newton in the unpublished *Bryophyte Site Register for Cornwall* [BSRC] (Nature Conservancy Council, 1987). Hence the original data from Mrs Paton was always used for her records and not the BRC, ERICA or BSRC versions of it, all of which are incomplete and all of which also contain a small proportion of errors of transcription.

**Recording since 1993**

My own recording of bryophytes began soon after moving to Cornwall in July 1993 and has been carried out with breaks of no more than about two months at any one time up to late 2006, then intermittently until 1st April 2010. During 1993-1995 bryophytes increasingly replaced vascular plants as the focus of my recording activities in Cornwall, but until 1995 only mosses were recorded and these only in West Cornwall (vice-county 1).

Encouragement and good tuition from Mrs Paton led to recording of liverworts alongside the mosses from late 1995 onwards and occasional forays into East Cornwall (vc2) became more regular from about 1998. Long trips away from home to carry out survey work in Ireland and elsewhere from 1999-2009 reduced the amount of time available for fieldwork in Cornwall, but around 50 tetrads were surveyed in most years mainly during the winter months.

Increasing experience of bryophytes in Cornwall and elsewhere has made my field recording more efficient. This has partly been due to increased knowledge of where to seek particular species, but also to an understanding of which species can be safely identified in the field and which need microscopical checking. Odd looking plants of almost all species and many of those from unusual habitats have regularly been checked microscopically and compared with herbarium material. In addition, all material I have recorded for certain genera has been checked microscopically (*Andreaea, Anthoceros, Cephalozia* except *C. bicuspidata*, *Cephaloziella, Cynodontium, Drepanoclados* and allied genera, *Ephemera*, most *Fossombronia, Gymnostomum, Gyroweisia, Heterocladium, Jungermannia, Kurzia, Leiocolea, Lejeunea, Leptobarbula*, most *Marsupella, Palustriella, Philonotis*, small *Plagiochila, Pleuridium, Radula, Rhabdoweisia, Riccardia*, many *Scapania, Schistidium, Sematophyllum, Solenostoma* except some *S. gracillimum, Weissia, Zygodon*).

Much material of many other genera has also been checked microscopically although certain taxa are safely identified with a hand-lens (*Atrichum, Brachytheciastrum, Brachythecium, Bryum, Campyliadelphus, Campylium, Campylopus*, *Cratoneuron, Dichodontium, Dicranella, Dicranum, Didymodon, Ditrichum, Entosthodon, Eurhynchium, Fissidens, Fontinalis, Grimmia, Hedwigia, Hygrohypnum, Hypnum, Isothecium, Leucobryum, Orthotrichum, Oxyrhynchium, Plagiommium, Plagiothecium, Pohlia, Polytrichastrum, Polytrichum, Racomitrium, Rhynchostegiella, Rhynchostegium, Sciauro-
Certain habitats have been more thoroughly searched than others. Surveys of bryophytes on former metalliferous mine sites carried out mainly for English Nature (Holyoak 2000) have led to particularly thorough investigation of this habitat, while detailed studies for Plantlife on Dendrocrpyhea lamyana, Petalophyllum ralfsii and Lejeunea mandonii, and for E.N. on Jamesoniella undulifolia and Marsupella profunda have resulted in good coverage, respectively, of the banks of the River Tamar, dune-slacks, crags of serpentinite, mires and china-clay spoil. Nevertheless, efforts have been made to cover all bryophyte habitats at all times of the year. Except for coastal tetrads containing little land, a minimum of two hours intensive fieldwork was normal in each tetrad and double this in the richest ones.

At least one specimen and more often several specimens of every species I have recorded in Cornwall or Scilly has been kept in my herbarium (DTH). Some duplicate material has already been donated to NMW. Some duplicates from the Isles of Scilly have also been given to the Isles of Scilly Museum (Hugh Town: IOS). Voucher specimens for new vice-county records resulting from my fieldwork have been checked by the British Bryological Society Recorder of Hepatics or Recorder of Mosses and these specimens are lodged in BBSUK. Mrs Paton's extensive herbarium with much important Cornish material is now housed mainly at E (with some material also at BBSUK, IOS, OXF).

**Presentation of data**

This study covers all of Cornwall and the Isles of Scilly. West Cornwall and Scilly comprise vice-county 1, East Cornwall is vice-county 2. A small area of modern Cornwall (South Wheatley and North Petherwin to Yeolmbridge) is in vice-county 4 (North Devon) but included in the present study as it is almost surrounded to north and south by land in vc 2. The vice-county boundaries are described in detail by Dandy (1969), his account being reproduced with helpful maps in Atkinson et al. (2000).

An attempt was made to record the bryophytes of all (approximately 1072) tetrads in Cornwall and Scilly separately, however little land they contain. The practice of adding data from coastal squares with very little land to those of the closest square with more land has long since been abandoned by biological recorders, but some older bryophyte data (for hectads) that were treated in this way have been reinstated in the correct squares.

The bulk of the present Flora consists of a Text file giving a systematic list of all the species of hornworts, liverworts and mosses, with accompanying Maps (in a separate folder) showing the distribution by tetrads of each species. Records from 1791-1949, 1950-1992 and 1993-2010 are superimposed on the same map, allowing detailed assessment of changes in the status of species. Text for each species gives the national status, the earliest records in vc1 and vc2, more or less detailed notes on habitats and other aspects of ecology of the species and a summary of both vegetative and sexual reproduction in the county. In addition notes may be given on synonyms, any identification or taxonomic problems, the pattern of distribution in Cornwall compared to that in Britain as a whole and evidence of changes in status.
Photographs (in a separate folder) illustrate a selection of characteristic species and their habitats. 616 images taken by the author were mainly photographed with a small digital camera (Nikon Coolpix 995 or 4500). In addition there are five photos from Dr D. Callaghan (Cephalozia integerrima, Conardia compacta, Riccia bifurca, Telaranea europaea, Tortula wilsonii) and three from Dr S.R. Edwards (Douinia ovata and two of Cyclodictyon laetevirens). Photos taken in Cornwall or the Isles of Scilly have the letter C as a suffix to the file number.

Paton (1969a) gives an introduction from a bryological viewpoint to the geography, geology, soils and climates of Cornwall and the Isles of Scilly, followed by short accounts of the characteristic bryophytes of certain habitats and their role in the vegetation. French, Murphy & Atkinson (1999) give fuller accounts of the region from a botanical viewpoint in the introduction to their Flora of Cornwall.
NOTES ON SPECIES

Introduction and abbreviations


The heading for each taxon contains the following information (†Threat categories are based on the revised list by Hodgetts 2011, replacing those in the *British Red Data Book* by Church *et al.* 2001).

- **ALIEN** Thought to be an introduced species in British Isles
- **CR** Critically Endangered †
- **EN** Endangered †
- **LS** Locally Scarce (taxa recorded post-1950 from four or fewer sites in Cornwall or Isles of Scilly, but which are not **NR** or **NS**)
- **NR** Nationally Rare (recorded post-1950 in 1–15 hectads in Britain, mainly following list by Preston 2010, with data on infraspecific taxa from other sources)
- **NS** Nationally Scarce (recorded post-1950 in 16–100 hectads in Britain, following list by Preston 2006 with additions by Preston 2010: 33, i.e. excluding recent additions to British list and most infraspecific taxa)
- **S** Recorded in Isles of Scilly (see Paton & Holyoak 2005)
  - **s. l.** *sensu lato*, i.e. aggregate species (comprising two or more taxa)
  - **s. str.** *sensu stricto*
- **S8** On Schedule 8 of Wildlife & Countryside Act 1981
- **VU** Vulnerable †
  - **1** Recorded in mainland vc1 [excludes Isles of Scilly]
  - **2** Recorded in vc2
  - **vc1** West Cornwall and Isles of Scilly (vice-county 1)
  - **vc2** East Cornwall (vice-county 2)
  - [ ] Pre-1950 records only
  - { } Recorded only as weed of horticulture

Each species account gives information in the following sequence:

**SYNONYMS:** see note above.

**FLORISTIC ELEMENT:** A note summarises the European distribution as a whole, coded as a Biogeographic 'element' (cited from Hill *et al.* 2007, which is based largely on the detailed account by Hill & Preston 1998), e.g. 'Temperate Oceanic' or 'Mediterranean-Atlantic European'.

**FIRST RECORDS:** (marked*) for vice-county *1 or 2, or updated records (for taxa unrecorded for fifty or more years, marked +1 or +2.
HABITATS: All data refer strictly to author's observations in Cornwall and the Isles of Scilly [C&S], unless otherwise noted. Available data are briefly summarised for rare species. For those that are commoner, information is given on the following topics: growth form (i.e. tufts, turfs, cushions, mats, wefts: adopting terminology of Hill et al. 2007), substrate types, water relations, preferences for insolated or shaded sites; main kinds of habitats occupied; any records of unusual habitats. In many cases where a diversity of habitats has been recorded the field notes are merely listed. This avoids rather glib summaries stating, e.g., 'wet places, shaded or unshaded, acidic or basic', when the bryophyte involved is nevertheless much less common than such a description might imply. Although generalised descriptions of habitat parameters are shorter and easier to understand than lists from field data, they can be seriously misleading when a taxon is later found to consist of several cryptic species each having different ecological preferences, as is proving to be the case with some of our bryophytes now molecular data are becoming available (e.g. *Aneura pinguis* s. l.).

ASSOCIATES: All data refer strictly to the author's observations in C&S, unless otherwise noted. Associated plants (especially bryophytes) are noted, the lists often being first of 'Common associates' then of 'other associates'. Associates were defined as plants growing in immediate contact (i.e. normally touching the species in question, not merely species present 'nearby'). For relatively common bryophytes the lists are intended only to be indicative of the usual or commoner associates, not comprehensive. Scientific or English names of vascular plants mainly follow Stace (2010), with authors given only for those not included in his *Flora*. Generally, English names are used for familiar trees and shrubs, scientific names for the remainder of the flora.

OCCURRENCE OF VEGETATIVE PROPAGULES: All data refer strictly to author's observations in C&S, unless otherwise noted. Occurrence of bulbils, gemmae, tubers, deciduous leaves or other propagules is briefly noted.

OCCURRENCE OF SPOROPHYTES: All data refer strictly to author's observations in C&S, unless otherwise noted. Sexuality (dioicus, autoicus, synoicus, paroicus, etc.) is sometimes noted based on Hill et al. (2007) or a reference that is cited. c.fr. = with sporophytes (even very immature or very old). Only four categories are used for frequency of occurrence of sporophytes: Common (present on 10-100% of occurrences of taxon), Frequent (on 1-10%), Occasional (on 0.1-1 %), Rare (on <0.1 %). Generalisations like these are only attempted where taxon itself has reasonably large number of records. Additional details are given for rare taxa or where sporophytes were seen <5 times in total. Normally records of capsules in each month (1 = January, 12 = December) are summarised as Immature, Dehiscing or Dehisced; exceptional or unusual records and those based on very few capsules are given in square brackets. For cleistocarpous capsules of some mosses occurrence of perianths is recorded in similar way to capsules. Months are summarised as, e.g. 3-6, only when there are records for all intervening months (thus, 3-6 = March, April, May and June).
Additional information on some species may consider:

NOTES ON TAXONOMY AND IDENTIFICATION: Given mainly where changes in taxonomy have affected distributional data, e.g. newly described or newly recognised taxa, or those notorious for being misidentified or where the characters used for identification have changed over the years.

SUMMARY OF RANGE AND STATUS: A brief summary of the range in Britain and Ireland ('B.I.') may be given, mainly based on Hill, Preston & Smith (1991-1994) and Hill et al. (2008); references to literature are only given for sources additional to these. Comments on the range in Cornwall and the Isles of Scilly (C&S) are sometimes given and intended mainly to amplify or explain the data shown on the tetrad map. Where relevant, 'Status' then considers evidence of changed abundance or range in C&S since the 1960s (sometimes mentioning a numerical Change index: see the final chapter); brief references to changes elsewhere in B.I. are also added where appropriate.

ABBREVIATIONS USED IN ACCOUNTS OF TAXA

BBS       British Bryological Society
B.I.      Great Britain and Ireland
BRC      Biological Records Centre, Wallingford
Bull.    Bulletin of the British Bryological Society
C&S      Cornwall and Isles of Scilly
CC      Census Catalogue of BBS
cfr    with sporophytes
comm.  communicated by [initials of person]
conf.  Determination confirmed by [initials of person]
cper    with perianths
CWT    Cornwall Wildlife Trust
det.  Determined by [initials of person]
Exc.  Excursion [Field Meeting]
HWST    high-water spring tide
J. Bryol.  Journal of Bryology
JNCC  Joint Nature Conservation Committee
leg.  Collected by [initials of person]
NVC  National Vegetation Classification (see Rodwell 1991a-2000)
pen.  peninsula
R.  River
redet.  reidentified
s. l.  sensu lato, i.e. aggregate species (comprising two or more taxa)
s. str.  sensu stricto (cf. s. l.)
Scilly  Isles of Scilly
SEM  scanning electron microscope
syn.  synonym
Trans.  Transactions of the British Bryological Society
t.s.  transverse section
vc1  Vice County 1 (West Cornwall, including Scilly)
vc2  Vice County 2 (East Cornwall)
µm  micron (0.001 mm)
1-12 Months, when discussing capsules (see above)  
= Correct name of taxon  
* First record in **vc1, vc2**  
+ Updated record in **vc1** or **vc2** [where published and none recorded for > 50 years]

**Abbreviations (initials) of persons; with earliest and latest dates of records entered; dates are lacking for persons not known to have collected significant specimens in Cornwall who are listed as referees, etc.; 'active' means active in Cornwall or Scilly):**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Name</th>
<th>Dates</th>
</tr>
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<tbody>
<tr>
<td>ACC</td>
<td>A.C. Crundwell† (1923-2000; active 1962-1977)</td>
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<tr>
<td>ACS</td>
<td>Alex C. Smith [of Diss, Norfolk]</td>
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<td>AF</td>
<td>Miss A. Fry (active 1910)</td>
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<td>AG</td>
<td>A. Greenwood† (active 1843-1852)</td>
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<td>AJES</td>
<td>A.J.E. Smith (active 1959-1962)</td>
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<tr>
<td>AL</td>
<td>A. Ley† (pre 1900)</td>
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<tr>
<td>AS</td>
<td>A. Sutton (active 1922)</td>
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<tr>
<td>AW</td>
<td>A. Wilson</td>
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<tr>
<td>BE</td>
<td>B. Edwards (active 1997)</td>
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<td>BS</td>
<td>Miss B. Saunders (active 1961)</td>
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<tr>
<td>BT</td>
<td>Miss B. Tonkin (active 1998-2008)</td>
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<td>BW</td>
<td>Ms B. Wheeler (active 2001)</td>
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<td>CAJ</td>
<td>Rev. C.A. Johns† (active 1838-ca 1860)</td>
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<td>CCT</td>
<td>C.C. Townsend (active 1957-2000)</td>
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<td>CEL</td>
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<td>CHB</td>
<td>Rev. C.H. Binstead† (1862-1941; active 1926)</td>
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<td>CJN</td>
<td>Ms C.J. Neil (active 1998)</td>
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<td>CPH</td>
<td>C.P. Hurst† (active 1916-1933)</td>
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<td>Mrs Christine S. Rieser (active 2000)</td>
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<td>DAJ</td>
<td>D.A. Jones†</td>
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<td>DAN</td>
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<td>DC</td>
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<td>DEC</td>
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**Of Herbaria (in bold type):**

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HORNWORTS (ANTHOCEROTOPHYTA)

1.1 *Anthoceros punctatus* L.  


Habitat notes from Cornwall and the Isles of Scilly are as follows. Damp soil in arable fields (mainly cereal stubble, also once in horticulture), where following associates noted: *Ceratodon purpureus, Dicranella staphyлина, Didymodon insulanus, Ephemerum minutissimum, Epipterygium tozeri, Phaeoceros laevis, Pleuridium acuminatum, Riccia sorocarpa, Tortula truncata*, less often with *Anthoceros agrestis*. Damp acid soil of wet, little-used tracks at edge of heathland, unshaded, sometimes plentiful. Damp soil on tracks in Grey Willow carr and woodland, but only partly or lightly shaded (with *Phaeoceros laevis, Riccia subbifurca*). Twice on patches on soil of low hummocks created by cattle trampling in marshy pasture, in open or lightly shaded by trees (near *Pseudophemerum nitidum*). On patches of mainly bare soil in damp pastures (with *Fossombronia pusilla, Phaeoceros laevis*). Steep mainly bare soil of river bank at edge of pasture (with *Fossombronia cf. pusilla*). On partly bare soil dug from small ditch in cliff-top flush. Colonist on damp clay of bank beside working china clay quarry, partly bare areas on china clay spoil, near *Aneura pinguis, Pleuridium acuminatum*, entirely or almost unshaded. Soil near ruined walls, sheltered but unshaded. Soil near path on unshaded slope above coastal inlet. Vertical soil of pathside banks beside wet track, near stream and woodland edge, almost unshaded. Steep soil at road edge, almost unshaded. Soil exposed in wet grassland at roadside. Steep soil of lightly shaded bank above stream (with *Dicranella rufescens, Fossombronia pusilla, Lunularia cruciata, Nardia scalaris, Pellia epiphylla, Phaeoceros laevis, Pohlia annotina*). Single small patch on firm clay high in inundation zone beside reservoir, unshaded.

Antheridia seen: 4, 6, 10-12. Commonly c.fr.: immature 1, 3-6, 12, dehiscing 6.

1.2 *Anthoceros agrestis* Paton  


Only material in which mature antheridia have been examined is included here. Most of the old records are referable to 1.1.

Three DTH records on soil in fields of cereal and flax stubbles (near *Bryum rubens, Dicranella schreberiana, Dicranella staphyлина, Trichodon cylindricus, Ephemerum minutissimum, Fossombronia pusilla, Fossombronia wondrackezii, Riccia glauca, Riccia subbifurca, Tortula truncata*).

Antheridia seen: 2, 9, 10. Often (?) c.fr.: spores immature 9, mature 9.


+2: Shaded pathside bank, 130 ft alt., cemetery east of Morval Church, N. of E. Looe, SX260567, 17 July 2008, JAP 8284.

Habitat notes from Cornwall and the Isles of Scilly are as follows. Colonist on damp often clayey soil on ground recently made bare, and on damp track edges, banks near canal, beside track and beside a path, unshaded or lightly or partly shaded e.g. by woodland or scrub (near *Atrichum tenellum, Dicranella heteromalla, Fossombronia pusilla, Pleuridium subulatum, Pseudophemerum nitidum, Riccia subbifurca*). Damp soil in gardens, unshaded to lightly or part shaded. In damp stubble fields, fallow arable, flax stubble (once in horticulture) (with *Anthoceros punctatus, Barbula convoluta, Bryum dichotomum, Bryum rubens, Dicranella schreberiana, Dicranella staphyliana, Didymodon insulanus, Trichodon cylindricus, Entosthodon fascicularis, Ephemerum minutissimum, Fossombronia pusilla, Tortula truncata, Poa annua, Veronica persica*). Mainly bare patches of soil in damp pastures and grass leys (with *Anthoceros punctatus, Brachythecium mildeanum, Brachythecium rutabulum, Philonotis caespitosa, Fossombronia pusilla*). Near-vertical damp clayey soil of bank under Sycamore trees at edge of pasture. Steep damp soil of lightly shaded bank above stream (with *Anthoceros punctatus, Dicranella heteromalla, Fossombronia pusilla, Lunularia cruciata, Nardia scalaris, Pellia epiphylla, Pohlia annotina*). Bare disturbed soil patch on laneside bank, part shaded. Colonist on bare patches amongst damp china clay spoil. Abundant on clayey spoil-banks among low grasses and in bare patches at edge of china-clay quarry. Few records of sparse patches on mud exposed in inundation zones beside reservoirs, with sparse low vegetation, unshaded (with *Trichodon cylindricus*).

Antheridia seen 1, 3-7, 10-12; capsules immature 1-7, 11; dehiscing 5, 6.


Recorded only from this single site in Cornwall, in Nov. and Dec. 1971. It was not refound by a party of bryologists led by JAP during the BBS Excursion in April 2000.
LIVERWORTS (MARCHANTIOPHYTA)

1/1  *Haplomitrium hookeri* (Sm.) Nees  
Boreal-montane European element.  

*1*: 'Formerly in Chy-an-hal Moor' [*sic* = Chyenhal Moor], 1842 and 1884, WC (BM)  
+1: Damp acid sand, hollow near Abbey Pool, Tresco (SV8914), 1967, JAP 3634 (E) (Paton  
1968c: 621, MS.).

A single 1967 record from Scilly. Otherwise known only by 1842-1844 records from two  
localities in West Penwith, where Curnow (1882) reported that it had been overgrown. The  
site beside Abbey Pool on Tresco had become unsuitable for the species by 2002 (JAP pers.  
comm.), so the species may now be extinct in C&S.

2.1  *Blasia pusilla* L.  
Boreo-temperate Circumpolar element.  

*1*: Chyenhal Moor, Newlyn, 1840, WC (OXF) (Paton 1969a: 693).  
*2*: Roadside, Bodmin Moor near North Hill (SX261762), Aug. 1956, HLKW (Castell 1957:  
323, Paton 1969a: 693).

Habitat notes from Cornwall are as follows. Damp, partly bare clay surfaces in and near  
china clay quarries, including sites at edges of pools (where subject to periodic inundation;  
sometimes plentiful at mica dam edges), also ditch edges and on damp tracks in china-clay  
district, fully open or sheltered but almost unshaded (associates include *Lophozia incisa*  
*Nardia scalaris, Pohlia annotina, Pohlia filum*). Damp clayey track, unshaded, on Goss  
Moor (near *Atrichum tenellum*). Small patch on soil on steep side of granitic boulder just  
above water-level of stream, slightly shaded. Damp unshaded soil of path through heathy  
area at edge of area of copper-mine spoil (Porkellis Moor).

Always (?) with gemmae. Frequently (?) c.fr.: capsules: immature 3, dehiscing 3, dehisced  
3.

3.1  *Sphaerocarpos michelii* Bellardi  
Mediterranean-Atlantic Oceanic element.  

*1*: Sandy soil in sheltered bulb-field, lying fallow, The Garrison, St Mary's, Mar. 1950,  

Mature spores are necessary for species identification in this genus. Hence many records  
from the Isles of Scilly cannot be identified specifically because capsules are lacking or  
immature. There is a single mainland record of an unidentified *Sphaerocarpos* sp., found in  
a field near Penzance by HLKW (assigned to SW43Q).

Frequent on bulb fields in Isles of Scilly, although less common there than *S. texanus*.  
Grows mainly on damp loamy soil with sparse vegetation among bulb crops, at field edges,  
and less often along nearby paths or tracks. Associates commonly include *Riccia cavernosa,*
Riccia sorocarpa, Sphaerocarpos texanus and various low mosses such as Bryum dichotomum, Bryum rubens, Kindbergia praelonga and Tortula truncata.

Capsules frequent; immature 4, dehiscing 4. (Unidentified Sphaerocarpos spp. also seen with well-formed involucres in 10-11).

3.2 **Sphaerocarpos texanus** Austin

Mediterranean-Atlantic Oceanic element.


Common in bulb fields in Scilly, with very similar habitats, ecology and associates to the preceding species.

Capsules frequent; immature 4, dehiscing 4, 12.

4.1 **Lunularia cruciata** (L.) Dumort. ex Lindb.

Mediterranean-Atlantic Suboceanic element.


Habitat notes from C&S are as follows. Common on soil just above water of streams, ditches, river banks (also a canal bank and lake bank), in flood-zone and a little above it, almost unshaded to rather heavily shaded by deciduous trees. Often on silted rocks in and at edges of streams. Soil on banks and slopes near streams and well away from them, e.g. on field edges under trees, on quarried slope under trees, laneside and trackside banks, in old quarries, in churchyards, cemeteries, in sheltered places in gardens, in shelter under scrub on slope above sea-cliff, floor of damp Grey Willow carr, on damp soil on flushed sea-cliff. Associates include Anthoceros punctatus, Conocephalum conicum s. str., Dicranella rafescens, Didymodon insulanus, Didymodon tophaceus, Oxyrrhynchium hians, Kindbergia praelonga, Fissidens bryoides var. bryoides, Fossombronia pusilla, Homalia trichomanoides, Nardia scalaris, Pellia endiviifolia, Pellia epiphylla, Phaeoceros laevis, Pohlia annotina, Thamnobryum alopecurum.

Also on soil on tops, ledges and at bases of walls, low on 'hedges', and in crevices of masonry, but generally in humid and sheltered or partly shaded places, e.g. about old mill, on and inside ruins, near ruined buildings on old mine spoil (with Barbula convoluta), in moss carpet on open area of old copper-mine spoil, on soil well shaded under overhanging concrete of ruin of mine building, on bank in cemetery, on old decayed mortar in partly shaded wall, on a gravelly lay-by. Locally plentiful on unshaded sandy soil over old mine-spoil in and beside trackways in sand-dunes at Upton Towans and near Godrevy (occasionally mixed with Petalophyllum ralfsii). Large patches on vertical masonry of side of mill race in spray from 'waterfall'; growing 2-3 cm out from substrate here, in contrast to usual almost flat mats. Twice seen as patches on thin film of clay and old concrete of walls of ruins; lightly to moderately shaded. Patch on vertical stone at base of wall. Thin soil low on wall, part shaded. Soil on area of old china clay spoil, but closely associated with small patch of calcareous masonry debris and not in acidic areas around; unshaded. Partly bare,
part shaded, horizontal soil under Grey Willows on old mining ground (with *Oxyrrhynchium hians*, *Oxyrrhynchium pumilum*).

All but very young plants nearly always with gemmae. Not seen c.fr.

5.1 *Marchantia polymorpha* L., subsp. undet. (additional records only)  
Boreo-temperate Circumpolar element.

First vice-county records for species as a whole:


Long (1995a) revised British records of each of the three subspp. now recognised (for details of which see Paton 1999: 572). See below for records of each of subspp.

5.1.a *Marchantia polymorpha* L. subsp. *polymorpha*  
Boreo-temperate European element.


Habitat notes on two recent records from Cornwall are as follows. Small patch with *Lophocolea bidentata* on unshaded edge of small pond in garden of Nicholas De Sausmarez at Point, vc1. Single record with subsp. *ruderalis* on plant pots in tunnel at Trewithen Nursery near Probus (SW94D), 9 Nov. 1999 (coll. & det. JAP, voucher in DTH).

5.1.b *Marchantia polymorpha* L. subsp. *ruderalis* Bischl. & Boisselier  
Boreo-temperate Circumpolar element.


Several DTH records are from plant pots and other containers in nurseries and garden centres, both inside greenhouses and in sheltered places outdoors. One record of small bit in arable field (game-bird food was being grown at field margin). Recorded by JAP on burnt heathland on Goonhilly Downs (SW61Z, SW71E).

[The record of *M. polymorpha var. alpestris* from flower bed, Duchy Woodlands, Penlyne Nursery, N. of Lostwithiel, vc2, 1980, JAP (BBSUK) (Corley 1981: 17) is no longer accepted as the taxon currently known as *M. polymorpha* subsp. *montivagans* Bischl. & Boisselier].
7.1 Reboulia hemisphaerica (L.) Raddi
Southern-temperate Circumpolar element.


Above Kynance Cove on thin soil in crack in serpentinite crag on slope of valley side, slightly shaded.

C.fr.: 7 (in DTH).

9.1* Conocephalum conicum (L.) Dumort. s. l.
Boreo-temperate Circumpolar element.

*1: Mount's Bay, 1842, WC (NMW) (Paton 1969a: 690).

Divided into two British species based on study by Szweykowski et al. (2005), but Conocephalum salebrosum Szweyk. et al. has not been recorded in C&S. Records from 2005 onwards are divided between Conocephalum conicum s. str. and C. salebrosum (see below).

Commonly forming extensive pure patches that tend to exclude other plants, sometimes covering several square metres. Habitat notes from Cornwall are as follows. Usually on soil of stream and river banks, mainly within or near flood-zone, and commonly on steep surfaces and where partly shaded, e.g. in woodland, groves of trees or Grey Willow carrs. Also on rocks (vertical, inclined or horizontal: granitic, serpentinite, slaty) and masonry of banks and horizontal soil near water-level. Once on clayey soil of lake edge (The Loe). Associates include Epipterygium tozeri, Lunularia cruciata, Pellia endiviifolia, Pellia epiphylla, Pohlia melanodon, Thamnobryum alopecurum, less often Dumortiera hirsuta.

Also recorded deep inside sea cave on rock dripping with water and in waterfall on N.-facing slate sea-cliff. On firm sometimes horizontal soil and old fern tussocks in unshaded and tree-shaded flushes, and in part shaded sites sheltered beneath overhanging boulders on, above, and under N.-facing sea-cliffs. Occasionally more extensive on damp soil in woodland, e.g. on flushed slopes. In deep shady hollows inside ruined mine buildings, on wet slaty rocks in old quarries inside deciduous woodland. Damp old masonry shaded inside old lime kiln near Cotehele Bridge. Steep damp bank just N. of Poundstock church.

Occasionally c.fr.: receptacles immature 1, 3, 4, dehisced 3.

9.1 Conocephalum conicum (L.) Dumort. s. str.
Temperate European element.

As noted above, this is the only one of the two segregate species that has been recorded in Cornwall (C. salebrosum appears to occur mainly in limestone districts of the British Isles).

Habitat notes with recent records from Cornwall are as follows. From soil and rocks on stream and river banks (up to 0.5 m or occasionally higher above summer water level),
lightly to moderately shaded in deciduous woodland or by few trees (over serpentinite on Lizard peninsula). Also on banks of R. Tamar within its inundation-zone. On steep flushed head under overhang near base of N.-facing sea-cliff at Porthmeor Cove. On slaty rock of low sea-cliff shaded by trees beside Helford River, where flushed in wet weather but very dry at times. Small patch on wood of decaying log lying in stream. Once extending onto calcareous masonry of shaded bridge over stream. Very large patches, up to 10 m across, on granitic rocks and damp soil along large stretch of disused railway cutting, in light to heavy shade, similarly abundant on calcareous slaty rock in disused slate quarry part-shaded by woodland (with *Cratoneuron filicinum*, *Fissidens adianthoides*, *Pellia endiviifolia*, *Thamnobryum alopecurum*). Sometimes extending onto soil in flushed areas of wet woodland or Grey Willow carr. Associates recorded: *Lunularia cruciata*, *Pellia endiviifolia*, *Pellia epiphylla*, *Plagiomnium undulatum*, *Platyhypnidium riparioides*.

One record c.fr.: receptacles newly dehisced 4 (Gwills).


Grows on unshaded or almost unshaded mud exposed during summer to autumn at edge of Drift Reservoir. Sometimes plentiful; mainly lacking close associates other than algae, although very sparse *Aphanorrhegma patens* sometimes nearby, and some plants growing near *Littorella uniflora* or at base of *Scirpus tabernaemontani*.

Only identified with mature spores: spores lacking 6, immature 9, mature 9, 10.


Widespread in Isles of Scilly. First recorded from mainland of vc1 in coastal car park at Marazion in 2005 (DAP & CDP in Hill 2005: 44). Discovered in 2002 on a car-park in vc2; otherwise known in British Isles only from single record in Scotland.

Many records from Isles of Scilly and both mainland records have been confirmed by microscopic study of spores, although the species is only likely to be confused with *Riccia cavernosa* (which differs in habitat, seasonal timing of growth and spore maturation, and at least slightly in typical coloration of the thalli).

Common to abundant in bulbfields in the Isles of Scilly, with sparser records there extending along paths and track edges, even onto paths on cliff tops and coastal heaths, to which it appears to be distributed on footwear. Mainly grows on partly bare, unshaded to
lightly shaded, damp, loamy soil but extends onto drier and wetter sites and persists when shaded by crops and hedgerows. Associates often include *Riccia sorocarpa*, *Sphaerocarpus micheli*, *Sphaerocarpus texanus*, such low mosses as *Bryum dichotomum*, *Bryum rubens*, *Kindbergia praelonga* and *Tortula truncata*, and various low herbs and grasses.

The only mainland records are from coastal car parks, on sandy soil at Porthluney Cove (vc2, SW94Q) where discovered in early 2002, and Marazion (vc1, SW53A) where discovered in March 2005 (latter near to *Crassula tillaea*) (Hill 2005: 44).

The thalli grow from autumn to spring; spores common: mature 3, 4.

10.3 *Riccia huebeneriana* Lindenb.  
Temperate European element.


The only Cornish records were from a pool (SS2910) near Lower Tamar Lake in 1968 and Oct. 1972 (JAP pers. comm.). The management of the pool for the past decade or more has ensured that low water levels exposing mud can no longer occur there.

10.5 *Riccia rhenana* Lorb. ex Müll.Frib.  
Temperate European element.


Known from a single locality in Cornwall. It was recorded there again in Aug. 1995 (SW647374, floating on water and at mud of edge of small pond in woodland; DTH 95-270, 95-271, *DTH*) and was still present on another small pool nearby in 1998 (*DTH*).

10.7 *Riccia sorocarpa* Bisch.  
Wide-temperate Eurosiberian element.


Habitat notes from C&S are as follows. Compressed soil of partly bare areas on paths, on or beside old tracks, track edges and in old quarries inland (including areas of old copper mine spoil, among serpentinite rocks on hillside, on heath, beside ruined building in old granite quarry) and often on slopes above sea-cliffs (where often near rocks, sometimes in low carpets of other bryophytes), on woodland track; unshaded or lightly shaded; associates include *Acaulon muticum*, *Archidium alternifolium*, *Barbula convoluta*, *Bryum argenteum*, *Bryum dichotomum*, *Ceratodon purpureus*, *Fossombronia 'husnotii'*, *Fossombronia incurva*, *Lophozia excisa*, *Philonotis fontana*, *Riccia glauca*, *Riccia subbifurca*, *Tortula truncata*, *Agrostis tenuis*. Small amount on soil on ledge of slaty rock on coastal slope. In small
quantity on unshaded mud exposed in inundation zone beside Argal Reservoir (with *Aphanorrhegma patens*, *Bryum klinggraeffii*, *Pseudephememum nitidum*, *Riccia subbifurca*).

Often also on exposed soil in fields (arable fallow and cereal, flax and maize stubble; bulbfields and other horticulture; grass ley), near *Barbula convoluta*, *Bryum rubens*, *Dicranella schreberiana*, *Dicranella staphylina*, *Trichodon cylindricus*, *Entosthodon fascicularis*, *Ephemenum minutissimum*, *Epiptrygium tozeri*, *Riccia glauca*, *Riccia subbifurca*, *Tortula truncata*, along with herbs such as *Cerastium glomeratum*, *Lamium purpureum*, *Stellaria media*, *Veronica persica*. In Isles of Scilly often with *Riccia crystallina*, *Sphaerocarpus michelii*, *Sphaerocarpus texanus* and herbaceous weeds such as *Oxalis pes-caprae*.

Commonly cfr; spores mature 2, 3, 10, 12.

10.8 *Riccia nigrella* DC.  
Mediterranean-Atlantic Oceanic element.


Most British records are from Lizard pen. in vc1.

10.9 *Riccia glauca* L.  
Southern-temperate Circumpolar element.

*1*: Newlyn Cliffs [SW42], 1862, WC (O XF) (Holmes 1869, Paton 1969a: 691).  

Habitat notes from C&S are as follows. Damp or free-draining soil in arable fields, unshaded to lightly shaded by herbs (cauliflowers, cereal stubble, flax stubble, maize stubble, daffodils and other horticulture, fallow) (near *Barbula convoluta*, *Bryum dichotomum*, *Bryum rubens*, *Dicranella schreberiana*, *Dicranella staphylina*, *Trichodon cylindricus*, *Ephemenum minutissimum*, *Epiptrygium tozeri*, *Phaeoceros laevis*, *Riccia sorocarpa*, *Riccia subbifurca*, *Tortula truncata*, rarely *Anthoceros agrestis*, *Fossombronia wondraczekii*, *Riccia crozalsii*). Compressed soil on or at edges of unshaded paths above sea-cliffs (near *Riccia sorocarpa*, *Riccia subbifurca*). Damp partly bare soil of old tracks, in open to slightly or partly shaded (with *Anthoceros punctatus*, *Archidium alternifolium*, *Dicranella staphylina*, *Ephemenum minutissimum*, *Ephemenum serratum*, *Fossombronia pusilla*, *Phaeoceros laevis*, *Pseudephememum nitidum*, *Riccia sorocarpa*, *Riccia subbifurca*, *Tortula truncata*). Sandy soil in caravan park near coast.

Commonly c.fr.: spores immature 9, mature 2, 9, recently dehisced 9.


*2: Damp clay on edge of pool, Retew near Fraddon [SW95], 1962, JAP (BBSUK) (Paton 1969a: 691, as *R. warnstorffii*). [Record published as *R. warnstorffii* from track, Rocky Valley, Tintagel, JAP & JA, in Paton 1961: 150, is based on *R. crozalsii*, fide Paton 1969a: 691].

British records were revised by Paton (1990b) who showed that older records of *R. warnstorffii* belong here. It is now one of the commonest *Riccia* spp. in Cornwall and occasional in Isles of Scilly. *R. subbifurca* may have increased in the past two decades (change index +127%) but it seems more likely to have been under-recorded in the past, presumably because it was often overlooked as *Riccia glauca*.

Habitat notes from C&S are as follows. On damp soil of old track through woodland, partly or slightly shaded (with *Anthoceros punctatus*, *Phaeoceros laevis*, *Riccia glauca*, *Riccia sorocarpa*). On compressed soil of bare areas on and beside paths on sea-cliffs and slopes above them (over granitic, slate and serpentinite rocks); unshaded; with *Archidium alternifolium*, *Bryum dichotomum*, *Fossombronia husnotii*, *Pleuridium acuminatum*, *Riccia sorocarpa*, *Scleropodium touretii*, *Trichostomum brachydontium*, *Weissia* spp., *Sedum anglicum*; rarely *Weissia longifolia* var. *longifolia*. On rather loose mainly bare soil of ant-hill on slope above sea-cliff, unshaded. On partly bare patches of soil in old serpentinite quarry above sea-cliff, in trampled places and on banks, unshaded. Compressed, partly bare soil on little-used path at edge of heathland near coast (over serpentinite), unshaded.

Kynance Cliff: plentiful in patches/rosettes on damp partly bare soil of small hollow on top of serpentinite sea-cliffs (with *Archidium alternifolium*, *Trichostomum brachydontium*, locally *Riccia beyrichiana*); path on slaty sea-cliff slope. Bit on soil of bare areas in pastures and near edge of grass-ley (with *Bryum rubens*, bit *Riccia sorocarpa*). Damp soil at edge of cauliflower field, unshaded (with *Dicranella staphylina*, *Riccia glauca*, *Tortula truncata*). Soil in flax, fallow, daffodil (and other horticultural) and cereal stubble fields (near *Barbula convoluta*, *Bryum rubens*, *Dicranella schreberiana*, *Dicranella staphylina*, *Trichodon cylindricus*, *Ephemerum minitissimum*, *Phaeoceros laevis*, *Riccia glauca*, *Riccia sorocarpa*, *Tortula truncata*, rarely *Anthoceros agrestis*, *Fossombronia wondraczekii*, *Riccia crozalsii*; in Isles of Scilly with *Riccia crystallina*, *Sphorocarpos* spp.). Soil in arable (fallow) field (near *Dicranella staphylina*, *Trichodon cylindricus*, *Riccia sorocarpa*, *Tortula truncata*). Colonist on bare recently disturbed soil in unshaded clayey hollow (with *Phaeoceros laevis*, *Pleuridium subulatum*). Soil exposed on stream bank. Partly bare soil of old cattle-trodden tracks, unshaded (with *Trichodon cylindricus*, *Ephemerum serratum*, *Ephemerum sessile*, *Pseudephemerum nitidum*, *Riccia glauca*, *Riccia sorocarpa*, *Tortula truncata*). Usually unshaded or lightly shaded, one record on thin soil over gabbro rock partly shaded by Grey Willow scrub on Lowland Point (with *Bryum bornholmense*, *Bryum rubens*, *Ephemerum serratum* s. l., *Fossombronia husnotii*, *Riccia beyrichiana*). Sparsely on unshaded mud exposed in inundation zones beside Argal and Stithians Reservoirs (with *Bryum klinggraeffii*, *Dicranella staphylina*, *Leptobryum pyriforme*, *Riccia sorocarpa*).
Spores mature: immature 9, mature 2, 3, 7, 9, recently dehisced 9.

10.11 *Riccia crozalsii* Levier
Mediterranean-Atlantic Oceanic element.


Most British records are from Cornwall. However, most of the records in Isles of Scilly appear to be errors for *Riccia subbifurca*.

Habitat notes from C&S are as follows. Kynance Farm: on small patches of mainly bare soil at edge of old track with exposed serpentinite rocks, at base of rocky slope, unshaded (4 June 1997: in good condition following wet weather in preceding weeks). Chynhalls Point: on partly bare, compressed soil on path on coastal headland, unshaded, with *Archidium alternifolium*. On unshaded, compressed soil of old track on slope above coast, with *Archidium alternifolium, Fossombronia ‘husnotii’, Fossombronia maritima*. On Tresco on unshaded soil of trackway in edge of daffodil field (near *Dicranella staphylina, Riccia subbifurca, Tortula truncata*).

Mainly grows from autumn to spring, but at least one record of well-grown plant in late July after several weeks of wet weather.

Commonly c.fr.: spores immature 2, ripe 2.

10.12 *Riccia bifurca* Hoffm.
Southern-temperate European element.


Older records of this species are rejected because it was often misidentified and there are no specimens (Paton 1980). These include: Penzance, Curnow (Pearson 1902); ground near the monument, Carbis Bay and water wheel of tin working near Trecrom, 1923, and E. of Housel Bay Hotel, 1916 (all WEN diary); near the Headland Hotel, Coverack, WEN (Nicholson 1938) (cf. Paton 1969a: 691, MS.: 9).

Seen in 2004 near Traboe Cross, in two unshaded open places on heathland, associated with *Riccia beyrichiana*. One site in small damp hollow among rocks was becoming shaded by a Gorse bush. Another site was on open surface of old track. Habitats are at risk as tracks are now disused and Gorse bushes spread. Near Kynance found in 2006 on muddy open ground beside a track edge.

Spores present: 9.
10.13 *Riccia beyrichiana* Hampe ex Lehm. Boreo-temperate Suboceanic element. NS 12


Habitat notes from Cornwall are as follows. Compressed, partly bare soil on little-used paths, path edges and damp hollows on cliff-tops and at edge of heathland near coast (over serpentinite), unshaded (sometimes with *Riccia subbifurca*). Inland on Lizard heathland on thin unshaded soil over quarried serpentinite rocks (with *Archidium alternifolium, Cephaloziella dentata, Entosthodon obtusus, Fossombronia 'husnotii', Cladonia* sp.). Thin soil over slaty rock at unshaded edge of pathway above coastal inlet. Usually unshaded or lightly shaded, one record (of it persisting ?) on thin soil over gabbro rock partly shaded by Grey Willow scrub on Lowland Point (with *Bryum bornholmense, Bryum rubens, Ephemerum serratum s. l., Fossombronia 'husnotii', Riccia subbifurca*).

Spores often present.

[Riccia michelii* Raddi var. ciliaris* Levier – Reported from Cornwall (vc1 and vc2, by Pearson 1902), but the records were treated as doubtful by Nicholson (in Macvicar 1926) and Wilson (1930). Paton (1969a: 690) was unable to trace any specimens and Paton (1980: 4) recommended that the species should be removed completely from the British list].

[Riccia ciliata Hoffm. – Listed for W. Cornwall (vc1) by Ingham (1913), but the record was treated as doubtful by Paton (1965c, 1969: 690). Mrs Paton later (1980: 4-5) established that the Cornish record is based on a minute specimen (Quarry field near Penzance, 1861, WC, (E)) that has the appearance of being a small portion probably detached from a larger gathering. Furthermore, the specimen is actually of *R. canescens* Steph., a species of very dry habitats that is uncommon in Europe and unlikely to occur near Penzance, so the provenance of this specimen is perhaps most likely to have become muddled in Curnow's herbarium. Unfortunately the description and illustration in Macvicar (1926) appear to have been based on this specimen. As pointed out by Paton (1980: 5), the unsatisfactory data preclude inclusion of *R. ciliata* or *R. canescens* on the British list].

12.1 *Targionia hypophylla* L. Mediterranean-Atlantic Oceanic element. NS 2

*2: Near Bodmin, 1844, JR (MANCH) (Paton 1969a: 690). This record is much older than the one listed as new for vc2 by Paton (1963: 482).

The only other record is from SX36F (on rocky lane cutting N. of Tideford, JAP (Paton 1963: 482, 1969a: 690)).
13.1 *Dumortiera hirsuta* (Sw.) Nees  
Southern-temperate Oceanic element.  

NR:VU 12


Habitat notes from recent Cornish records are as follows. Trelowarren Mill: within 0-20 cm above usual water level of stream in shade of deciduous woodland in sheltered valley, mainly on slaty rocks (horizontal or inclined, locally vertical) with small amounts spreading onto adjacent hard soil of steep bank; forming small and larger patches, up to 70 x 150 cm in extent; grows close to *Chiloscyphus polyanthos, Pellia endiviifolia, Conocephalum conicum s. str., Fissidens rivularis*. Below St Nectan's Glen: bank of stream (fide FJR). Lesnewth Valley: on horizontal to sloping slaty rocks low on banks of streams and small rivers, within flood-zone and shaded by edge of deciduous woodlands; associates include *Conocephalum conicum, Fissidens taxifolius var. taxifolius, Thamnobryum alopecurum.*


14.1 *Pellia epiphylla* (L.) Corda  
Boreo-temperate Circumpolar element.  

[S]12

*2:* Rough Tor, 1907, RWS (TRU) (Paton 1969a: 692).

Habitat notes from Cornwall are as follows. On horizontal to sloping or vertical acidic soil (mineral or humic) or soft or crumbling rocks, on path edges, laneside banks, base of 'hedges', flushes, ditch-sides, stream and river banks, in old quarries, entrances to mine adits, in china-clay pits, on old china clay spoil heaps, on mine-spoil, often in light to moderate shade, e.g. in woodland (deciduous and conifer), groves of trees, Grey Willow carrs, less often rather heavily shaded; also in open where sheltered or on N.-facing slopes. On wet peat/sphagnum debris in open mire (near *Pellia neesiana*). Vertical acid soil of path-side banks, part shaded (with *Calypogeia fissa, Calypogeia arguta*). Acid soil on steep sheltered banks above N.-facing sea-cliff. Low bank at edge of flush above sea-cliff. Peaty humus or peaty banks in mires, where ground-cover open and grazed/trampled, or on ditch sides. Side of old fern tussock in wet Grey Willow-carr. Thin soil low on old wall in deciduous woodland. Other associates include *Anthoceros punctatus, Conocephalum conicum s. str., Dicranella heteromalla, Dicranella rufescens, Kindbergia praelonga, Solenostoma gracillumum, Lunularia cruciata, Mnium hornum, Nardia scalaris, Phaeoceros laevis, Plagiomnium undulatum, Pohlia annotina, Rhizomnium punctatum.*

Commonly c.fr.: capsules immature 1-4, 9-12; dehiscing 2-4 (5); dehisced 3, 4.
14.2 *Pellia neesiana* (Gottsche) Limpr.
Southern-temperate Oceanic element.


Under-recorded in past because male plants not identified (at least up to March 1999) and female plants only recorded when perianths present.

Habitat notes from C&S are as follows. On peaty substrate in areas of mires open due to cattle or horse-grazing and trampling. Unshaded acidic flushes (near *Philonotis fontana*, *Chrysosplenium oppositifolium*); edges of small streams in mires, slightly to moderately shaded by Grey Willows and in well-grown Grey Willow carr. Associates include *Aneura pinguis*, *Brachythecium rivulare*, *Calliergonella cuspidata*, *Hookeria lucens*, *Plagiothecium nemorale*, *Plagiothecium succulentum*. Wet soil at edges of small stream in Grey Willow carr; soil shaded on floor of wet Grey Willow carr. On firm soil of low wet bank in flush above sea-cliff. On water of ruined wall of china clay dry, trickling with water and shaded by Grey Willows (near *Pellia endiviifolia*). Flushes on slopes of old china clay spoil, in or beside recently abandoned quarries and spoil-heaps, unshaded or partly under *Juncus effusus* [male plants] (with *Aneura pinguis*, *Brachythecium rivulare*, *Philonotis fontana*). Edge of pool in china-clay spoil. Damp soil of cattle-trodden marshy pasture near stream, slightly shaded by deciduous trees. Base of pathside bank near stream, part shaded deciduous trees.

Damp edge of track, part shaded by edge of conifer plantation.


14.3 *Pellia endiviifolia* (Dicks.) Dumort. 
Southern-temperate Circumpolar element.

*1*: Newlyn Cliff, 1840, WC (OXF) (Paton 1969a: 693).

Doubtless under-recorded since non-fertile plants were often seen but placed as this species only when showing numerous fine branches. Paton (1999: 529) noted that dark green but non-fertile *Pellia* on basic substrates can normally be safely identified as this species, but in Cornwall it is often unclear whether the substrate really is basic.

Habitat notes from Cornwall are as follows. On rocks or firm soil (clay, loam, slightly basic to circumneutral) from horizontal to inclined, close above water level in ditches, streams and rivers or higher in flood-zone, commonly in shade of deciduous woodland, groves of trees or Grey Willows, less often unshaded, e.g. in open above sea-cliffs; often forming pure patches (associates may include *Kindbergia praelonga*, *Fissidens bryoides* var. *bryoides*, *Conocephalum conicum*, *Lunularia cruciata*; rarely *Leiocolea turbinata*). On soil on or near masonry of walls, in mill-race, lightly to moderately shaded. Common on thin clay film or wet soil over and amongst old vertical concrete or mortared stone walls e.g. of ruins, especially at wall bases, lightly shaded to moderately shaded. On steep damp slaty rock of crags near stream, in shaded road cutting and old quarries in deciduous woodland.
flushed soil of banks and on slopes above N.-facing sea-cliffs (with *Aneura pinguis*, *Riccardia chamedryfolia*). On unshaded granite of flush on exposed sea-cliff (with *Bryum pseudotriquetrum, Oxyrrhynchium speciosum*). Clayey soil of low bank at lake edge. With low mosses in unshaded, calcareous flush on sandy ground above sea-cliff (with *Didymodon tophaceus*). In edge of flush above stream bank in deciduous woodland. On open, flushed, calcareous sand of floor of sandpit in dunes (with *Aneura pinguis, Bryum pseudotriquetrum, Calliergonella cuspidata, Cratoneuron filicinum, Drepanoclados aduncus, Petalophyllum ralfsii*). Other associates recorded include *Cratoneuron filicinum, Thamnobryum alopecurum*; rarely *Dumortiera hirsuta*). 

Often c.per. (7, 10, 12). Occasionally c.fr. (3 DTH records in Cornwall): capsules immature 2, 3, dehiscing 4, dehisced 3.

15.1 *Petalophyllum ralfsii* (Wilson) Nees & Gottsche NS S8 1 Mediterranean-Atlantic Oceanic element.


Although this species is named in honour of John Ralfs, who was resident at Penzance for many years, his type specimen came from Aberfraw in Wales (Marquand 1891: 237). The authorship of this name has been revised to follow Stotler *et al.* (2002).

Known for many years from the two main areas of sand-dunes on the north coast of vc1, which still support strong populations. Indeed, populations in the Upton Towans to Godrevy region appear to have greatly increased since about 1995. It has not been refound in several other areas for which there are old records.

At Gear Sands and Upton Towans mainly on damp calcareous sand in hollows of fixed dunes and dune grassland, including natural dune-slacks, hollows resulting from past disturbance, hollows along paths and the floor of a disused sand pit. Occurs on blown sand on cliff-top at Gwithian Towans, including sandy sites over old mine-spoil. At Upton Towans also locally growing over slag and spoil of metalliferous mines at landward edge of dunes, growing in thin soil or among lawns of acrocarpous mosses. One colony there also in moss carpet a few cm thick growing over extensive horizontal mortare-brickwork of ruin. All sites are unshaded and have very short vegetation, mainly kept low by intense rabbit grazing, often accompanied by trampling on pathways. See Holyoak (1998, 1999, 2000) for detailed population studies and lists of associated plants.


Some of its sites near the landward edge of Upton Towans and at Gwithian Towans are on pathways that were surfaced with metalliferous mine-spoil during the 1939-45 war, with only a thin layer of compressed blown-sand now covering the mine-spoil. In places it grows there with *Hymenostylum recurvirostrum*, suggesting tolerance of Cu in the substrate. Chemical analyses of its substrates show that it can tolerate high levels not only of Cu, but also of Pb and Zn, and indeed presence of all three of these metals at high concentrations. All substrates investigated were basic.

| Analyses of substrates from localities in Cornwall (metal concentrations given as µg/g dry weight): |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| LOCALITY (N samples) Cu Pb Zn pH Source |
16.1 *Fossombronia foveolata* Lindb.  
Boreo-temperate European element.


*Atlas* (1: 270) shows a record in Scilly (81c/d) that is of unknown provenance and apparently erroneous (JAP pers. comm., Feb. 1997).

Grows as scattered small plants (erect or shortly creeping). Recorded on unshaded firm soil and sediment with sparse low vegetation at top edge of inundation-zone of reservoir, with *Archidium alternifolium, Calliergonella cuspidata, Cephaloziella divaricata, Fossombronia incurva*.

Only recorded c.fr.: capsules immature 10, dehiscing 10, dehisced 10.

16.2 *Fossombronia angulosa* (Dicks.) Raddi  
Mediterranean-Atlantic Oceanic element.


Forms substantial pure patches; perennial. Habitat notes from Cornwall are as follows.

Steep, wet soil of flushed banks and thin wet soil over flushed slate or granitic rocks on and above sea-cliffs, N.- to E.-facing but unshaded (near *Fissidens osmundoides, Pellia endiviifolia, Pellia epiphylla, Rhizomnium punctatum, Riccardia chamedryfolia*). Soil part shaded in crevice high on S.-facing serpentine sea-cliff. Damp N.-facing bank in pasture above cliffs, partly shaded by herbs (with *Entosthodon obtusus*). Rather low on sea-cliff, on steep wet soil of low banks and base of old *Molinia caerulea* tussock in flush. Extending onto damp unshaded edge of track above sea-cliffs.

Commonly c.fr. Capsules immature 1, 3, 12; dehisced 5.

16.3 *Fossombronia caespitiformis* De Not. ex Rabenh.  
(syn. *F. husnottii* Corb., *F. husnotii* var. *anglica* W.E.Nicholson). Mediterranean-Atlantic Oceanic element. ‡ Preston (2006: 27) listed both *F. caespitiformis* and *F. husnottii* separately as NS; it is unclear whether the combined taxon retains this status.


Hill *et al.* (2008: 141) noted that *F. caespitiformis sensu lato* has been extended to include *F. caespitiformis* subsp. *multispira* (Schiffn.) J.R.Bray & Cargill (Stotler *et al.* 2003). *F. husnottii* (including its var. *anglica* W.E.Nicholson) is treated as a synonym of subsp.
multispira by R. E. Stotler and B. J. Crandall-Stotler (http://bryophytes.plant.siu.edu/fossombronia.html). Although Hill et al. (loc. cit.) commented that it was not then clear whether all British plants of \textit{F. caespitiformis} belong to subsp. multispira, this is true of small numbers of Cornish (see Map) and other British Isles specimens studied by JAP (pers. comm.). Unfortunately, it cannot be assumed that all \textit{Fossombronia} with colourless rhizoids determined in the past as \textit{F. husnotii} correspond to \textit{F. caespitiformis} subsp. multispira, since atypical colourless rhizoids have occasionally been recorded in other species of the genus, including \textit{F. wondraczekii}. Hence, records of \textit{F. 'husnotii'} where spores and elaters were not (or were probably not) checked are mapped and discussed separately here. \textit{F. caespitiformis} (subsp. undet.) with purple rhizoids is also mapped separately.

Habitat notes from Cornwall for \textit{F. caespitiformis} (subsp. undet.) with purple rhizoids are as follows. Three records from arable fields, including a new grass-ley and two stubble fields (one of them a wheat stubble on reddish loam soil, pH 6.2, fide CDP). Compressed soil of path in cemetery, part-shaded by young conifers. Damp soil of bank beside wet track, almost unshaded. Associates recorded: \textit{Aloina aloides}, \textit{Bryum dichotomum}, \textit{Dicranella staphylina}, \textit{Dicranella varia}, \textit{Trichodon cylindricus}, \textit{Epipitygium tozeri}, \textit{Leptodictyum riparium}, \textit{Tortula truncata}, \textit{Trichostomum brachydontium}. The taxon was only recorded c.fr. with ripe spores; capsules immature: 3, 10, ripe: 1-4, dehisced 10.

\textit{F. 'husnotii'} was recorded from vc1 and vc2 before \textit{F. caespitiformis} (subsp. undet.) with purple rhizoids was recorded, as follows:


Surprisingly for a liverwort that is common on coasts of the Cornish mainland, \textit{F. 'husnotii'} appears to be absent from the Isles of Scilly.

Habitat notes for \textit{F. 'husnotii'} in Cornwall are as follows. Sometimes locally abundant on thin, often compressed soil at cliff edges and on old trackways and edges of paths high on cliffs and above sea-cliffs, unshaded (with \textit{Archidium alternifolium}, \textit{Bryum dichotomum}, \textit{Lophozia excisa}, \textit{Lophozia ventricosa}, \textit{Pleurochaete squarrosa}, \textit{Riccia sorocarpa}, \textit{Riccia subbifurca}, \textit{Trichostomum brachydontium}, \textit{Weissia} spp., sometimes \textit{Fossombronia maritima}, \textit{Riccia crozalsii}). Partly bare patches of soil on little used pathway at edge of heathland (over serpentinite), near coast. On partly bare, compressed, thin, humic loam soil of pathways high on serpentinite sea-cliffs, unshaded. On gravelly and wet clayey tracks across or beside heathland several km inland (with \textit{Archidium alternifolium}, \textit{Fossombronia pusilla}) and inland on unshaded thin soil over quarried serpentinite on Lizard heaths (with \textit{Archidium alternifolium}, \textit{Cephalozia dentata}, \textit{Entosthodon obtusus}, \textit{Riccia beyrichiana}, \textit{Cladonia} sp.). Usually unshaded or only lightly shaded, but (persisting ?) on soil over gabbro partly shaded by Grey Willow scrub at Lowland Point (with \textit{Bryum bornholmense}, \textit{Bryum rubens}, \textit{Ephemenum serratum s. l.}, \textit{Riccia beyrichiana}, \textit{Riccia subbifurca}). A record from several kilometres inland on flat unshaded area of old metalliferous mine-spoil (with \textit{Cephalozia divaricata}, \textit{Lophozia excisa}, \textit{Pohlia annotina}, \textit{Scapania compacta}, \textit{Scapania irrigua}). \textit{F. 'husnotii'} is commonly recorded c.fr.: capsules immature 1, 2, 4, 11, 12; dehiscing 1, 2, 4, 11, 12; dehisced 4.

Earliest vice-county records for *F. pusilla* s. l.:
*1*: Chyenhal Moor, Newlyn, 1840, WC (NMW) (Paton 1969a: 694).

Identifiable only when mature spores are present, like most Cornish species of the genus (exceptions are *F. angulosa, F. incurva* and usually *F. husnotii*). It must therefore have been somewhat under-recorded, despite efforts to find mature or dehisced capsules when *Fossombronia* spp. were encountered and, when this failed, to collect plants with immature capsules and grow these on indoors.

Habitat notes from C&S are as follows. Damp or wet soil along old tracks, part shaded (e.g. at woodland edge) or rather open (with *Archidium alternifolium, Dicranella varia, Dicranella rufescens, Dicranella staphylina, Ephemerum serratum, Fossombronia husnotii, Tortula truncata*). Compressed soil on unshaded path above sea-cliffs. Colonist on partly bare soil of disturbed ground and recently made (or disturbed) banks, unshaded (with *Phaeoceros laevis, Pleuridium subulatum, Riccia subbifurca*). Steep soil of hedgebank at edge of arable field. Damp clay soil on vertical bank at edge of pasture, part shaded by Sycamore trees (good patches). Steep soil of earthy river bank at edge of pasture (with *Anthoceros punctatus, Lunularia cruciata*). Damp clayey soil on trackside, roadside and streamside banks, slightly to partly shaded (with *Dicranella varia, Lunularia cruciata, Pellia epiphylla, Pohlia annotina, Pohlia melanodon*; associates recorded more rarely include *Anthoceros punctatus, Bryum sauteri, Dicranella rufescens, Fissidens exilis, Phaeoceros laevis*). Bit on china clay spoil. Damp mainly bare sand of heathy ground near stream and mine-spoil. Damp soil in arable fields (mainly cereal stubble fields, also new grass-ley and flax stubble) (near *Barbula convoluta, Bryum rubens, Dicranella schreberiana, Dicranella staphylina, Trichodon cylindricus, Ephemerum minutissimum, Oxyrrhynchium hians, Phaeoceros laevis, Tortula truncata*). Damp partly bare soil patches in pastures and on bank at edge of pasture, unshaded or slightly shaded (with *Phaeoceros laevis*). Damp soil in bulb-fields on Isles of Scilly (where apparently replaced by *Fossombronia maritima* on coastal heaths and cliff tops). Damp soil in stubble field. On firm unshaded mud with sparse low vegetation in upper part of inundation-zone beside Stithians Reservoir and Siblyback Lake.

Only identified c.fr.(with mature spores, or when grown-on). Capsules: immature 1-12; dehiscing 1-7, 9-12, recently dehisced 1-5, 9, 10, 12.


*2*: Soil on cliff top near path, above S. side of Rocky Valley, between Boscastle and Tintagel, SX08, 2000, JAP (BBSUK) (Blackstock 2001: 36).
See Paton (1973a) for description and Paton (1994) for elevation to species rank.

Although detailed microscopic study of mature spores is usually necessary to identify this species, well-grown plants lacking spores can be identified if they combine purple rhizoids and a thick stem (although care needs to be taken to avoid confusion with *Fossombronia angulosa*).

Habitat notes from C&S are as follows. On Isles of Scilly on coastal heaths, cliff tops, coastal slopes and in short vegetation on acidic sand in a dune slack (Tresco), often on partly bare trampled ground beside paths. Sometimes forms large populations in partly bare damp peaty hollows in coastal *Calluna vulgaris* heaths. Recorded growing close to *Fossombronia incurva*. A single atypical record from partly shaded loamy soil in a garden ca 1 km inland near Rocky Hill on St Mary's. On mainland on compressed, partly bare, unshaded soil of track above sea-cliffs, with *Archidium alternifolium*, *Fossombronia husnotii*, *Lophozia excisa*, *Riccia crozalsii*. Also soil exposed on unshaded bank beside coastal inlet.

Only identified c.fr. (with mature spores, or when grown-on). Capsules: immature 4, dehiscing 4.

16.6 *Fossombronia wondraczekii* (Corda) Lindb. 12
Temperate European element.


Habitat notes from Cornwall are as follows. Compacted soil among stones of unshaded turning area on track near coast. Compacted acid soil of bare patches on unshaded path in cemetery (with *Archidium alternifolium*, *Bryum capillare*, *Lophozia bicrenata*). Compressed soil of edges and central parts of earthy, clayey and gravelly tracks, close to edges of Grey Willow carr or woodland and in open or slightly shaded (associates include *Archidium alternifolium*, *Phaeceros laevis*, *Scapania irrigua*, rarely *Atrichum tenellum*, *Ephemerum sessile*, *Pleuridium subulatum*, *Pohlia lutescens*). Acid soil with bare patches on disturbed ground near china clay quarries; unshaded (with *Ceratodon purpureus*, *Pleuridium subulatum*, low grasses). Lightly shaded damp clay on path among *Calluna vulgaris* in old china-clay 'dry', with *Archidium alternifolium*, *Ephemerum serratum*, *Gymnocolea inflata*, *Solenostoma gracillimum*. Unshaded soil in old granite quarry. Firm clay, firm soil or damp peaty mud exposed in inundation zones on unshaded edges of reservoirs (near *Dicranella rufescens*, *Ephemerum serratum*, *Pohlia camptotrichela*). Damp soil of low hummock in acidic flush (with *Philonotis caespitosa*). Four times in arable (stubble) fields, one of these loam, pH 6.2 (with *Anthoceros agrestis*, *Riccia glauca*, *Riccia subdivurca*, *Trichodon cylindricus*, *Ephemerum minutissimum*, *Tortula truncata*).

Only recorded with mature spores (often ripened indoors): capsules immature 3, 4, 6, 7, 9-12; dehiscing 2, 4, 6-12, dehisced 3, 10-12.

*[Fossombronia loitlesbergeri* – report from vc1 (Nicholson 1925) was rejected as doubtful by Paton 1969a: 694].

16.8 *Fossombronia incurva* Lindb.  
Temperate Suboceanic element.  

**NS S12**

*1*: Sandy path, Great Bay, St Martin's, Isles of Scilly, 1977, ACC *(BBSUK)* (Corley 1978: 13).

*2*: China clay track across marsh, Goss Moor N. of St Dennis, 1972, JAP *(BBSUK)* (Paton 1973b: 504).

Under-recorded in the past partly because of the rather small size of the often sparsely scattered plants but also because identification relied on presence of mature spores, which are often not present in this dioicous species. However, Paton (1999: 522) noted that when small and erect the plants are often distinctive in the field and that identification of male plants can also be based on the presence of large antheridia (body 180-320 µm wide) with long stalks (120-470 µm). Use of these characters has led to more frequent records over the past few years.

Habitat notes from C&S are as follows. Three records on damp open almost flat areas of china-clay spoil, including surfaces of a track; among low mosses, with *Nardia scalaris*. One record with low carpet of *Cephaloziella* on almost unshaded metalliferous mine-spoil. Two records on partly bare disturbed soil of unshaded ground near old quarry; with *Cephaloziella hampeana, Riccia sorocarpa*. On unshaded compressed soil of pathway along disused track (near *Philonotis fontana, Riccia subbifurca*). On unshaded partly bare damp soil of open patches in acidic grassland (with *Cephaloziella hampeana, Ceratodon purpureus*). On Isles of Scilly frequent on cliff tops, coastal heaths and acid sand of dunes, growing mainly in partly bare trampled places at edges of paths. One record from upper edge of inundation-zone beside reservoir, on firm soil with sparse low vegetation (with *Archidium alternifolium, Calliergonella cuspidata, Cephaloziella divaricata, Fossombronia foveolata*).

Although the small erect and unbranched plants of *F. incurva* have a characteristic appearance even when non-fertile, the species has only been recorded c.fr. or with mature perianths or mature antheridia (which are distinct in their large size). Capsules frequent, immature 2-4, dehiscing 2-4, 8, 12.
17.2 *Moerckia flotoviana* (Nees) Schiffn. (syn. *M. hibernica* auct. non (Hook.) Gottsche).


Apparently long extinct in Cornwall, where also recorded in the nineteenth century between Loggans Mill and Treeve, Phillack, and destroyed by drainage (Curnow 1882, Paton 1969a: 693).


First vice-county records of '*M. fruticulosa* s. l.:'


First vice-county records of *M. violacea*:


Recognition of *M. violacea* (as *M. fruticulosa* auct.) and *M. consanguinea* (as *M. temperata*) as separate species in Britain dates from the revision by Paton (1977a: 441). Older records of 'M. fruticulosa' are placed as the s. l. unless specimens have been revised recently. Considerable care is needed in field identification of these species, since young gemmiferous branches of *M. consanguinea* and those from which most of the gemmae have been dislodged by rain can resemble gemmiferous branches of *M. violacea*.

Normally grows as epiphyte, forming patches on trunks and branches. Recorded commonly on Elder, Gorse, Grey Willow, Hazel and Sycamore; also on Alder (1 record), Apple (1 record), Beech (1 record, Bodmin Moor), Blackthorn (9 records, 4 of them near coasts), Bramble (1 record, on dead stem), Buddleja (1 record), *Cotoneaster integri folius* (2 records), elm (1 record), oak (1 record, shore of The Loe lake), *Picea abies* (dead twigs: one record), *Pinus contorta* (1 record), Rhododendron (1 record), Silver Birch (1 record, inland near stream, with rich epiphyte flora), Wild Cherry, Wild Privet. Apparently less common than *M. consanguinea* on acidic, nutrient-poor bark, but there is much overlap in phorophytes and they commonly grow intermixed.


Also recorded as abundant over surfaces of numerous serpentinite boulders low in inundation-zone of large part-shaded stream at Poltesco, forming large pure patches. Single
record of small amount on large granitic boulder at edge of pasture, lightly shaded by *Urtica dioica* (same boulder had *Cryphaea heteromalla, Orthotrichum affine, Orthotrichum tenellum, Ulota phyllantha*, etc.). Several records on granitic blocks or boulders close above water-level in streams. Patch on shaded slaty rock.

Mainly identified c. gemmae, which normally present (although sometimes sparse after heavy rainfall). Not seen c.fr. in Cornwall.

20.2 *Metzgeria consanguinea* Schiffn.  


See notes on preceding species.

Other habitat notes from Cornwall are as follows. Several records from scrub on slopes above sea-cliffs (on Blackthorn) and on streamside in valley near exposed coast on Grey Willow. Several strong patches on vertical and steep parts of granitic boulders part shaded by Grey Willow scrub, in hollow on old china clay spoil heap. Patch on granitic boulder under edge of woodland (base of china clay spoil bank); on shaded granitic boulders near river edge. Several patches seen on granitic rock of tors. Unusual records include one of it growing in plenty on old cast-iron of pipe under trees near river; once growing epiphytically on stems of old *Polytrichastrum formosum* plants on a laneside bank.

Only identified c. gemmae, which common. Not seen c.fr.

20.3 *Metzgeria furcata* (L.) Dumort.  
(syn. *M. furcata var. ulvula* Nees). Boreo-temperate European element.


Grows as almost flat patches, often extensive, or mixed with other bryophytes. Habitat notes from C&S are as follows. Often common as epiphyte on bark of trunks and branches of Alder, Ash, Beech, Elder, elms, Grey Willow, Hazel, hybrid poplars, Rhododendron, Sessile Oak, Sycamore; single records from *Chamaecyparis lawsoniana*, stem of cultivated Cherry, *Cortaderia, Cupressus macrocarpa*, Gorse, Ivy, *Prunus laurocerasus*, Sitka Spruce, Sweet Chestnut, Wild Cherry, Wild Privet. Associates include *Cololejeunea minutissima, Frullania dilatata, Hypnum andoi, Hypnum cupressiforme var. resupinatum, Lejeunea*
lamacerina, Metzgeria violacea, Microjeunea ulicina, Ulota phyllantha, Ulota bruchii, Ulota crispa. In unshaded, part shaded and rather heavily shaded sites, on isolated trees, in groves or in woodland or scrub, sometimes on slopes above sea-cliffs. Extends down into flood-zone beside R. Tamar (with Leskea polycarpa, Orthotrichum sprucei).

Often plentiful on rock, as pure patches or intermixed with other bryophytes, on serpentine, granite and slate rocks of crags, old quarries, walls and in 'hedges', in open (including exposed sites above sea-cliffs) and lightly to moderately shaded, on vertical, overhung or sloping surfaces. On steep or vertical granitic rocks of 'hedges' (partly amongst mosses), similarly on walls around old mill race, lightly shaded. Shaded rock of wall. Granitic boulders beside streams, often but not always shaded, extending down into flood-zone. Associates on rock or masonry include Lejeunea lamacerina, Rhynchostegium confertum. On firm soil at top of low bank of mine-spoil in dune grassland (on lip of steep part of bank, in small opening amongst low grasses). Patch on steep, firm soil on 'hedges', soil near gravestone in churchyard. On slopes above exposed sea-cliffs, growing over steep firm soil or on or with mosses, often forming an intermixed mat. On serpentine, gabbro and granitic rocks and their edges and in crevices high on sea-cliffs, sometimes in exposed sites (once with Frullania microphylla var. microphylla). On cast-iron of old pipe under trees near river.

Occasionally with gemmae. Plants with narrow gemmiferous branches (formerly separated as 'var. ulvula') are frequent on the Isles of Scilly, but connected to the typical form by intermediates.

Frequently c.fr.: immature 1-4, 10-12; dehiscing 10, dehisced 4, 10-12.

20.4 Metzgeria conjugata Lindb.
Boreo-temperate European element.


Probably somewhat overlooked. Habitat notes from Cornwall are as follows. Damp vertical concrete of low bridge over stream, well shaded by deciduous trees. Serpentine rock close to unshaded stream in coastal valley. Serpentine rock on stream bank, well shaded inside deciduous woodland. Granitic rock at edge of river, lightly shaded by deciduous woodland. Seen once c.fr.: capsules immature 9, dehiscing 9.

21.1 Aneura pinguis (L.) Dumort. s. l.
(syn. Riccardia pinguis (L.) Gray). [A. pinguis s. l. is a Wide-boreal Circumpolar element.]


Recent molecular studies show that this taxon comprises a complex of cryptic species in Britain, with few morphological differences (D. G. Long pers. comm.).
Very large *Aneura* with thalli up to 10 mm wide from a shaded, flushed streambank near Lesnewth (DTH) raised hopes that *A. maxima* (Schiffn.) Steph. was at hand, but detailed study by JAP reidentified it as a large form of *A. pinguis*. Similarly large plants have also been seen on flushed ground with *Chrysosemnium oppositifolium* inside a Grey Willow carr near Trekeivesteps. Very large plants with long wide thalli were found a number of times in flushes in woodland (e.g. DTH 07-477), but although as large as *A. maxima* they do not show its other characters.

The wide range of habitat types occupied by this taxon may reflect occurrence of more than one morphologically cryptic species (see above). In Cornwall it occurs in at least three contrasting habitat types: (a) strongly acidic, peaty and unshaded; (b) mildly acidic, on mineral soils, often well shaded; (c) basic and unshaded.

Detailed habitat notes from Cornwall are as follows. On damp peaty or humic partly bare surfaces on heaths, on sphagna, mineral soils and damp humic litter in mires, stream edges and flushes above sea-cliffs (with *Calliergonella cuspidata*, *Calypogeia fissa*, *Straminergon stramineum*, *Cephalozia bicuspidad*, *Kurzia pauciflora*, *Pellia endivifolia*, *Riccardia chamedryfolia*, *Riccardia multifida*, *Sphagnum capillifolium*, *Sphagnum denticulatum*; *Anagallis tenella*, *Drosera rotundifolia*, *Narthecium ossifragum*). On damp soil of partly bare patches along old tracks in heathland; bit in damp hollow on track in old mining ground, part shaded. Unusual record of small patches on open soil of heap amongst mine-spoil. Colonist on damp clay e.g. of flushed areas, of china clay quarry slopes, banks above working quarries and on spoil heaps, track edges, almost unshaded or partly shaded (with *Anthoceros punctatus*, *Pellia neesiana*, *Philonotis fontana*). Damp sand at edges of mica dams. On wet peaty humus of flush on slope above N.-facing sea-cliff, unshaded. With low mosses on unshaded, calcareous sandy substrate of flush on slope above sea-cliff (with *Cratoneuron filicinum*, *Didymodon tophaceus*). On open, flushed, calcareous sand of floor of sandpit in dunes (with *Bryum pseudotriquetrum*, *Calliergonella cuspidata*, *Cratoneuron filicinum*, *Drepanocladas aduncus*, *Pellia endivifolia*, *Petalophyllum ralfsii*). Frequent in flushes and edges of small streams in deciduous woodland and Grey Willow carrs, growing on old fern bases, fern and other plant litter and intermixed with mosses, or on thin soil over wet rock, once on stream bank (associates include *Calliergonella cuspidata*, *Chiloscyphus polyanthos s. l.*, *Oxystachyum speciosum*, *Pellia neesiana*, *Rhizomnium punctatum*, *Chrysosemnium oppositifolium*). Beneath Grey Willows at upper edge of inundation-zone beside reservoir. On soil of gentle slope in open grove of deciduous trees. On wet clay near base of walls of ruin of china-clay dry, shaded by trees (very large plants). Small patch on partly bare soil on unshaded slope in old mine area, beside road. On wet ground amongst mine-spoil, at base of *Juncus effusus*. Damp soil of old metalliferous mine under edge of scrub (with *Riccardia chamedryfolia*). At normal water level on wet slaty rock in R. Camel with *Hygroamblystegium fluviatile*, partly shaded by trees and frequently inundated.

Commonly c.f.r.: immature 1-3, 5, 12.
21.2 *Aneura mirabilis* (Malmb.) Wickett & Goffinet  
(syn. *Cryptothallus mirabilis* Malmb.). Boreal-montane European element.


This remains the only record from Cornwall.

22.1 *Riccardia multifida* (L.) Gray  
Boreo-temperate Circumpolar element.

*2*: Boscastle, 1910, AF (LDS) (Paton 1969a: 692). This record is older than that given as new for vc2 by Paton (1962: 356).

Habitat notes from Cornwall are as follows. On and among living and decaying sphagna and plant litter in mires and on base of *Molinia caerulea* tussocks. On peaty ditchbanks in mire. In wet flushes and at streamside above sea-cliffs (once with *Riccardia chamedryfolia*). Persisting at edge of mire shaded by Grey Willow carr (with *Rhizommium punctatum, Molinia caerulea*). With other bryophytes on flushed slaty streamside rocks in deciduous woodland. On flushed rock of disused railway cutting, part shaded. On ground partly shaded on wet heath (with *Campylium stellatum, Fissidens adianthoides*). Two records from acid marshy areas on china clay spoil; in marsh developing on floor of china-clay quarry (with *Atrichum undulatum, Campylopus pyriformis, Cephalozia bicuspidata, Gymnocolea inflata, Solenostoma gracillimum, Lophozia incisa, Riccardia latifrons*). Patch in edge of trickle of water under Grey Willows beside ruin of china clay dry. In small quantity on and at edges of damp tracks (with *Pohlia annotina*). Clayey ditchside bank in heathy clearing in spruce plantation (intermixed with *Riccardia latifrons*). Additional associates recorded are *Aneura pinguis, Calliergonella cuspidata, Calypogea fissa, Straminergon stramineum, Campylopus flexuosus, Cephalozia connivens, Kurzia pauciflora, Pseudotaxiphyllum elegans, Sphagnum capillifolium, Sphagnum denticulatum; Anagallis tenella, Drosera rotundifolia, Narthecium ossifragum*.


22.2 *Riccardia chamedryfolia* (With.) Grolle  


Habitat notes from Cornwall are as follows. On clayey, sandy, humic or peaty soil of banks, track-edges and old pathways on heaths and in mires. Unshaded clay soil in trampled area near pool and a reservoir edge, with *Aneura pinguis, Solenostoma gracillimum, Scapania irrigua*. Damp clay soil part shaded on bank near canal. Gear: damp sandy ground of disturbed area by dune slack. Edge of water of small stream in edge of Grey Willow carr in heathland. Edge of water of small stream in flush above S.-facing sea-cliff. Flush on N.-facing sea-cliff (with *Riccardia multifida*). Patches growing over top of extensive turf of
Hymenostylium recurvirostrum at N.-facing base of mortared wall of old mine-building, where apparently copper contaminated. Damp soil among old concrete of ruined wall, part shaded. On decaying mortar and damp concrete of old walls of ruins of china clay dries (almost unshaded to moderately shaded); same, but on wet shaded wall (near Pellia endiviifolia) and on rather dry wall overgrown by low scrub. Thin soil on top of ruined wall of mine boiler house (almost unshaded). On side of block of concrete almost buried in soil on damp unshaded slope below reservoir dam. Partly bare soil of steep slope in small old slate quarry. Thin soil on almost unshaded slope in old quarry near coast (with Cephalozia bicuspidata, Nardia scalaris). On unshaded soil in disused granite quarry, with Bryum dichotomum and Dicranella varia. Wet, sometimes vertical soil of flushed banks and slopes above N.-facing sea-cliffs (with Aneura pinguis, Fossombronia angulosa, Pellia endiviifolia). Twice on wet peaty humus in flushes on slopes above N.-facing sea-cliffs (with Calypogeia fissa). At least two records amongst sphagna in mires or wet heaths (with Aneura pinguis, Calypogeia fissa). In wet areas on quarry floors and flushed areas on slopes of china-clay quarries (with Aneura pinguis, Pellia neesiana, Philonotis fontana). On slaty rocks and stones at water-level in streams and edge of a river, mainly well shaded e.g. in deciduous woodland. On hemic damp sand at edge of mica dam, partly under Juncus effusus (with Blasia pusilla, Riccardia chamedryfolia). Damp soil under edge of scrub on slope of old metalliferous mine (with Aneura pinguis). Among mosses on open flushed calcareous sand of floor of disused sandpit in dunes.

At least occasionally with gemmae on apices of thalli. Frequently (?) c.f.r.: immature 1, 3-5.

22.3 Riccardia incurvata Lindb. NS 12
Boreal-montane European element.


Easily misidentified because 22.2 occurs with top of thallus concave, but that species has epidermal cells narrower than those beneath.

22.4 Riccardia palmata (Hedw.) Carruth. LS 2
Boreal-montane Circumpolar element.


Three records from Cornwall. in Cornwall: one from open acidic mire with sphagna (NVC type M21a, near Dozmary Pool), two from rather degraded overgrazed mires, one of them from peaty side of a hummock; all three sites wet, acidic and unshaded.

Not seen c.f.r. Male at one site (JAP).
22.5 *Riccardia latifrons* (Lindb.) Lindb.
Boreo-temperate Circumpolar element.


Habitat notes from Cornwall are as follows. Several records on peat of low hummocks in oligotrophic mires with *Kurzia pauciflora*, *Odontoschisma sphagni*, unshaded to slightly shaded. In wet runnel in mesotrophic spring-fed mire. Peaty soil of low bank at edge of old track on damp heathland (over serpentinite). On decaying litter of steep side of *Molinia caerulea* tussocks in mire in old china clay workings, with *Calypogeia arguta*, *Calypogeia fissa*, *Calypogeia muellariana*, *Cephalozia connivens*. On damp china clay spoil on bank near working quarry. With other bryophytes in marsh developing on floor of china-clay pit (with *Atrichum undulatum*, *Campylopus pyriformis*, *Cephalozia bicuspidata*, *Gymnocolea inflata*, *Solenostoma gracillimum*, *Lophozia incisa*, *Riccardia multifida*). Clayey ditchside bank in heathy clearing in spruce plantation (intermixed with *Riccardia multifida*). Other associates recorded include *Sphagnum subnitens*.

Recorded c.fr.: immature 2, 3.

23.1 *Porella platyphylla* (L.) Pfeiff.
Boreo-temperate Circumpolar element.

*1*: Near St Issey, 1962, JAP (BBSUK) (Paton 1969a: 705). [Two older reports from vc1 (Lamorna and Morvah, JR, in Curnow 1882) are not supported by specimens; also reported from Lizard district by Curnow 1882 but a specimen (Mullion, 1869, WC (OXF)) is *P. obtusata*; Paton 1969a: 705].

On bark low on tree trunk in open woodland near stream, with *Neckera complanata*. Also among mosses carpeting horizontal top of boulder on 'hedge'; part-shaded by deciduous trees.

Not seen c.fr.

23.2 *Porella cordaeana* (Huebener) Moore
Boreo-temperate European element.


The only other records from Cornwall were from nearby at Bradridge Copse, near R. Tamar, made on the same day (JAP).
23.3 *Porella arboris-vitae* (With.) Grolle


Habitat notes from Cornwall are as follows. On vertical, inclined and sometimes horizontal serpentinite rocks in moderate to rather heavy shade, on outcrops, old quarried rocks, old walls; in light shade on base of outcrop. Locally spreading on to bases of trees. Also unshaded on steep serpentinite rocks on south-facing slope above sea-cliffs. On near vertical and sloping faces of granitic boulders in and near large stream, lightly shaded by Ash trees (some plants extending down into flood-zone), associates include *Isothecium myosuroides* var. *myosuroides*, *Radula complanata s. l.* On bark of large old coppiced Sycamores in sheltered valley. Commonly grows with cover of pleurocarpous mosses including *Kindbergia praelonga*, *Isothecium myosuroides* var. *myosuroides*, *Neckera complana*ta, less often *Pterogonium gracile*, also *Frullania dilatata*, *Radula complanata s. l.*

Not seen c.fr.

23.4 *Porella obtusata* (Taylor) Trevis.
(syn. *P. thuja* auct. non (Dicks.) Lindb.). Southern-temperate Oceanic element.

*1*: Mullion, 1869, WC (OXF) (Paton 1969a: 705).
*2*: Clicker Tor, Menheniot, 1875, WC (NMW) (Paton 1969a: 705).

Mainly on Lizard peninsula on serpentinite rock exposures. Near Pentireglaze (vc2) low on slaty rocks in stone wall, slightly shaded, with *Hypnum cupressiforme* var. *resupinatum*. At Brea Hill (vc2), forming patches covering several square metres on unshaded to lightly shaded, steep and gently sloping slaty rock in sheltered, E.-facing part of old quarry; associated with *Homalothecium sericeum*.

Not seen c.fr.

23.5 *Porella pinnata* L.
Southern-temperate Oceanic element.


At Penberth and E. of Troon: on vertical and inclined surfaces of granitic boulders in stream, from 5 cm below to 20 cm above (late-winter) water-level; unshaded or lightly shaded by saplings (mainly pure patches, some with *Chiloscyphus polyanthos*, or near *Fontinalis antipyretica* var. *antipyretica*; *Sciuro-hypnum plumosum* present higher up on
same rocks). By R. Tamar as pure patches or with other bryophytes on steep or vertical silted bark of bases of trees low in flood-zone of river (on Ash, Sycamore).

Not seen c.fr.

24.1 **Radula complanata** (L.) Dumort.  
Boreo-temperate Circumpolar element.


Habitat notes from C&S are as follows. In patches, usually small. Commonest as epiphyte on bark of varied trees and shrubs, including Ash, Elder, Hazel, Sycamore, Grey Willow; single record on *Cotoneaster integrifolius*. Grows unshaded to moderately shaded, e.g. in groves of deciduous trees; often within flood-zone of rivers. Associates when growing as epiphyte include *Cololejeunea minutissima*, *Cryphaea heteromalla*, *Frullania dilatata*, *Hypnum cupressiforme* var. *resupinatum*, *Metzgeria violacea*, *Metzgeria furcata*, *Metzgeria consanguinea*, *Microlejeunea ulicina*, *Neckera pumila*, *Ulota bruchii*, *Ulota crispa*, *Zygodon conoideus*.

Other record are of a good patch on decorticated wood of damp fence, part shaded. Patch on vertical serpentinite rock in 'hedge' at top of sea-cliff, lightly shaded by grasses. With mosses on gabbro outcrop. With mosses or directly on slaty rocks in open on bank, on partly shaded walls and 'hedge' and on slaty rock in old quarry. On concrete of bridge over stream (with *Zygodon viridissimus*). Spreading onto steep firm soil on steep slaty bank.

Only recorded c.per. (non-fertile plants recorded merely as *R. complanata* s. l., those often abundantly gemmiferous, as are *R. complanata* s. str.). Cper: 1-8, 10-12. Commonly c.fr.: capsules immature 1-5, 8, 10-12; dehiscing 1, 2, 10-12; dehisced 1-5, 8, 10-12.

24.2 **Radula lindenbergiana** Gottsch ex C.Hartm.  


Probably somewhat under-recorded since diligent searching under a dissecting microscope is often needed to locate the inconspicuous inflorescences needed to establish its identity. Apparently non-fertile but gemmiferous *Radula* spp. were often seen on sheltered serpentinite rocks and on shrubs and trees on the Lizard pen. (and e.g. on old walls elsewhere in Cornwall) and these may well be mostly of this species (although *Radula complanata* s. str. occurs on outcrops).

Habitat notes from Cornwall are as follows. Patches on serpentinite rock of S.-facing outcrop, partly shaded by bushes. Slaty rock on S.-facing sea-cliff slope part shaded by trees. On top of old mortared-stone wall, sheltered and lightly shaded (Rostedge, male). On bark low on trunk of Blackthorn bush, in scrub on slope above sea-cliffs. Plentiful on bark
of Sycamore tree well shaded in tall scrub on S.-facing coastal slope. Recorded associates were *Bryoerythrophyllum recurvirostrum*, *Bryum capillare*, *Hypnum cupressiforme* var. *resupinatum*, *Metzgeria furcata*, *Zygodon viridissimus* var. *viridissimus*.

Usually with gemmae: 1, 4, 9, 10. Antheridia seen: 9; archegonia seen: 9, 10. Perianth present: 4.

25.1 *Frullania tamarisci* (L.) Dumort.  

*1*: Kerris Moor, 1869, WC (OXF) (Paton 1969a: 707).


A common epiphyte, on bark of trunks and sometimes branches (or even twigs) in deciduous woodland and woodland edges (on Alder, Ash, Beech, Hazel, Sessile Oak, oak; once on *Cortaderia*), an old orchard, and sometimes scrub or carr of Grey Willows. Associates include *Frullania dilatata*, *Hypnum andoi*, *Isothecium myosuroides* var. *myosuroides*, *Metzgeria furcata*, *Ulota bruchii*, *Ulota crispa*, less often *Lejeunea cavifolia*, *Mnium hornum*.

Other habitat notes are as follows. On serpentinite of S.-facing crag and low serpentinite rocks in quarried areas on Lizard heaths, unshaded. Serpentinite, gabbro, slaty and granitic rocks and firm soil high on sea-cliffs or above them, unshaded, often in very exposed sites and commonly growing over or mixed with mosses. Mainly unshaded, on tops and sides of granitic boulders, e.g. on old walls, tors, block screes below tors, in old quarries and on quarry spoil (often associated with *Isothecium myosuroides* var. *myosuroides*, near *Dicranum scoparium*). On soil on almost unshaded dry end of bank near edge of grove of trees.

Frequently cper: 1, 2, 4, 5, 12. Not seen c.fr.

25.2 *Frullania teneriffae* (F. Weber) Nees  


*2*: Clicker Tor, Menheniot, 1875, WC (NMW) (Paton 1969a: 707). This record is older than that listed as new for vc2 by Paton (1961: 157).

Habitat notes from Cornwall are as follows. W. of Sennen Cove: plenty of patches on inclined granitic rocks on N.-facing slope above coast, mainly where water trickles, unshaded Single record inland on Bodmin Moor (conf. JAP), on steep rocks in hedge beside pastures.

Not seen c.fr.
25.3.a *Frullania microphylla* (Gottsche) Pearson, var. *microphylla* S12
Southern-temperate Hyperoceanic element.


Habitat notes from Cornwall are as follows. On serpentine rock of S.-facing outcrops within a kilometre of coast, unshaded or lightly shaded, growing appressed to vertical or steep rock. Serpentine and slate rock high on exposed sea-cliffs, unshaded and part shaded inside cracks (once with *Cololejeunea minutissima*). Sloping granitic rocks on upper parts of sea-cliffs and on slopes above coast, unshaded to lightly shaded. No records from walls.

One record cper: 11.

25.4 *Frullania fragilifolia* (Taylor) Gottsche et al. S12
Temperate Suboceanic element.


Habitat notes from C&S are as follows. On ledges and rock of S.-facing serpentine outcrop, unshaded. Patches appressed to rock of unshaded and lightly shaded gabbro outcrops and boulders above sea-cliff. On granitic boulder in pasture on slope (near *Hedwigia stellata*, *Racomitrium heterostichum*). There are no records from walls. Unconfirmed record from tree trunk at Ethy (FRo, SD).

Not seen c.fr.

25.5 *Frullania dilatata* (L.) Dumort. S12
Southern-temperate Eurasian element.


Common as epiphyte on bark of trunks and branches of shrubs and trees growing isolated, in groves or in scrub or woodland. Recorded on Alder, Ash, Blackthorn (a locally frequent phorophyte near coast), Grey Willow, Elder, elms, Gorse, Hazel, Sessile Oak, Sycamore; single or few records also from Apple, Broom, *Buddleja*, *Cortaderia*, *Cotoneaster* (tree and low bushes), Garden Privet, Hawthorn, hybrid poplars, *Picea abies* (dead twigs), *Pinus contorta*, Rhododendron, Silver Birch, Sweet Chestnut, White Willow, Wild Cherry, Wild Privet. Associates when epiphyte include *Cololejeunea minutissima*, *Cryphaea heteromalla*, *Frullania tamarisci*, *Hypnum cupressiforme* var. *resupinatum*, *Metzgeria violacea*, *Metzgeria furcata*, *Metzgeria consanguinea*, *Microlejeunea ulicina*, *Neckera pumila*, *Orthotrichum affine*, *Orthotrichum diaphanum*, *Orthotrichum pulchellum*, *Orthotrichum tenellum*, *Radula complanata*, *Ulota bruchii*, *Ulota crispa*, *Ulota phyllantha*, *Syntrichia laevipila*, *Zygodon conoideus*, *Zygodon viridissimus* var. *viridissimus*, rarely *Syntrichia*
papillosa. Also often persisting for some years on fallen branches. Frequently within flood-zone of River Tamar and smaller streams; sometimes in upper part of inundation zone beside reservoirs.

On rock outcrops, cliffs, boulders in quarry spoil and rock in walls and 'hedges', gravestones (including granitic rocks, gabbro, slates and serpentinite, and mortared walls), usually unshaded to partly shaded, sometimes in exposed places e.g. high on sea-cliffs. Associates on rocks include Frullania tamarisci, Grimmia lisae, Hypnum cupressiforme var. resupinatum, Metzgeria furcata; less often Cololejeunea minutissima, Frullania microphylla var. microphylla.

Commonly c.per. (1-12) and frequently/commonly c.fr.: capsules immature 1, 9-11, 12; dehiscing 11, 12; dehisced 1-3, 7, 10-12.

26.1 Jubula hutchinsiae (Hook.) Dumort. LS 12
Southern-temperate Hyperoceanic element.


Habitat notes from Cornwall are as follows. Above Porthmeor Cove (vc1) in one place over about a square metre, on wet, steep to vertical granitic rock of stream bank in small ravine, in permanently shaded crevice under large boulders and just above water of stream; forming a mainly pure patch, but associated at edges with small amounts of Conocephalum conicum s. str., Hyoccomium armoricum, Pellia endiviifolia, Philonotis fontana, Plagiothecium nemorale, Trichostomum brachydontium, Chrysosplenium oppositifolium, juvenile Osmunda, and partly shaded by Angelica sylvestris and Oenanthe crocata. W. of Lesnewth (vc2): on vertical, flushed rock of stream bank inside deciduous woodland. Below Minster Wood: slaty rocks of stream bank shaded by edge of deciduous woodland.

Not seen c.fr.

[27.1 Aphanolejeunea microscopica (Taylor) A.Evans – Listed for vc1 in CC 1905, but no record traced; recorded from rocks near Grade Church, Lizard, 1926, in W.E. Nicholson's diary, but no specimen traced and only Cololejeunea minutissima has been found at this locality: Paton 1969a: 706].

28.3 Cololejeunea minutissima (Sm.) Schiffn. S12
Southern-temperate Hyperoceanic element.

Commonest as epiphyte, on bark of Ash, Beech, Blackthorn, Grey Willow, Elder, elm, Gorse, hybrid poplars, Sycamore. Also recorded three times on Ivy; twice on *Cotoneaster integrifolius*; once each on Broom, Hawthorn, Hazel, Honeysuckle (thick stem, in scrub) and *Prunus laurocerasus*. Associates include most of commoner epiphytes (*Cryphaea heteromalla, Frullania dilatata, Hypnum cupressiforme* var. *resupinatum, Metzgeria violacea, Metzgeria furcata, Metzgeria consanguinea, Orthotrichum affine, Orthotrichum diaphanum, Ulota bruchii, Ulota crispa, Ulota phyllantha, Zygodon conoideus*); also recorded are *Colura calyptrifolia, Neckera humata, Radula complanata*. In woodland and edges, groves, scrub, Grey Willow carr. Single record on bark of Grey Willow that is flooded regularly in upper part of inundation-zone beside reservoir.

Also occurs as small patches on steep or vertical serpentine rock of S.-facing crag, in places overhung by rock above or partly sheltered by bushes. Likewise on gabbro. On sheltered granite of boulders, foot-bridge, grave surround, gravestone, etc. Numerous patches on slaty rocks in vertical N.-facing wall near coast, lightly shaded by trees. Sheltered rock of crags near coast and in crack on rocks at top of exposed sea-cliff (latter with *Frullania microphylla* var. *microphylla*). In Isles of Scilly frequent on granitic rocks, mostly in sheltered places. Small patch intermixed with *Lejeunea cavifolia* on calcareous masonry (Minions).

Usual presence of five-sided perianths (all months) provides useful field character for distinguishing it from *Microlejeunea ulicina* which is never fertile in Cornwall. Commonly c.fr.: immature 1, 3, 4, 6, dehisced 1, 3-5, 8, 9, 11, 12.

29.1 *Colura calyptrifolia* (Hook.) Dumort. 12
Southern-temperate Hyperoceanic element.


The range of this species has undoubtedly expanded in Cornwall over the past few decades. At Phoenix United Mine (SW27R) first recorded in 2005 despite almost annual visits to the site through previous decade, at Lower Bostraze (SW382315) first record in 2006 (site visited annually since 1996). See Bosanquet (2004) for account of recent range increase and habitats in Wales.

Small patches on bark of shrubs. Recent records mainly from Gorse and Grey Willow, once each from Ash and *Cotoneaster integrifolius*. The sites were in and at edges of scrub or Grey Willow-carr, mostly in humid, sheltered locations such as near streams, in old quarries, beneath dam of reservoir, at edge of mire or along track edges in spruce plantations. Small patches are often of this species alone, but other epiphytes recorded nearby are *Cololejeunea minutissima, Frullania dilatata, Hypnum cupressiforme* var. *resupinatum, Metzgeria violacea, Metzgeria consanguinea, Microlejeunea ulicina, Ulota bruchii*; one patch growing on moribund plants of *Ulota bruchii*. Old records were coastal
or at least on low ground but recently (2004) recorded up to 260 m alt. (N. of St Ann's Chapel).

At Crous a Downs (leg. PAG, det. DTH), on tall heathland, most finds on stems of *Erica vagans*, one each on *Erica cinerea* and *Ulex europaeus*.

Most recent records c.per. (1, 2, 6-12). Three records c.fr.: immature 6, recently dehisced 1, 6, 11.

30.1 *Drepanolejeunea hamatifolia* (Hook.) Schiffn. LS 2
Southern-temperate Hyperoceanic element.


Recorded in Cornwall from two localities, the other being Lesnewth Valley (vc2), among bryophytes on Ash trunk in ravine (leg. BE & PAG, 1997).

31.1 *Harpalejeunea molleri* (Steph.) Grolle LS 12


Recorded in Cornwall only from these two localities. Above Kynance Cove (vc1) it grows on serpentine crags high on side of small valley near coast, partly shaded and sheltered by bushes, growing partly on underside of small overhang, partly inside crack.

32.1 *Lejeunea cavifolia* (Ehrh.) Lindb. 12
Boreo-temperate European element.

*1: Kynance Cove, 1960, JAP & AJES (BBSUK) (Paton 1969a: 706). [Old records from both vice-counties were not included by Paton 1969a: 706, doubtless because of difficulties in identifying old specimens lacking descriptions of the oil bodies],

Habitat notes from Cornwall are as follows. On vertical serpentine rock of boulders at base of S.-facing crag, shaded by bushes and Sycamore tree. Patches on masonry of old walls, lightly to moderately shaded e.g. by deciduous trees. Patches on calcareous masonry and on mosses of mortared or concrete walls of bridges where part shaded near streams, in light shade of deciduous trees. Also on concrete just above stream. Brown Willy: granitic rock of tor. On rocks in damp walls part shaded e.g. by scrub or woodland edges. On rocks near stream and a river (granitic), partly to well shaded by deciduous trees. In old Grey Willow carr near stream. With mosses on gabbro boulder, part shaded by scrub. With mosses on firm soil of laneside bank at edge of deciduous woodland. With mosses on granitic rock near river bank in open deciduous grove. On silted bark of trees, Grey Willow and saplings within flood zone of R Tamar and a small river. On bark of fallen branch lying on track in

Commonly c.per. (1-6, 8, 10-12).

32.2  **Lejeunea lamacerina** (Steph.) Schiffn.  


Commonly in patches or mats, often pure, but also intermixed with low-growing pleurocarpous mosses, or other liverworts, or epiphytic on them. Growing on rocks (gabbro, granite, serpentine, slates), damp masonry (stone walls; concrete; mortared stonework of bridge) and on firm soil on banks, or bases of trees or Grey Willows (extending higher on trunks in humid sheltered places), usually in shaded places (often heavily shaded in woodland or Grey Willow carr) or at least where sheltered. Occurs on stream-sides (often within flood zones of rivers, streams or reservoirs, even quite close to water-level), sometimes on boulders in streams, 'hedges' and banks beside lanes, a disused railway cutting, old stone walls, rock outcrops or boulders in woodland, old quarries or rocks trickling with water, inside entrance to mine adit high on sea-cliff. Unshaded on serpentinite and granitic rocks of N.-facing slopes above low sea-cliffs, with mosses. Unusual record of patches on cast-iron of old pipe under trees near river bank.


32.3  **Lejeunea patens** Lindb.  

Southern-temperate Hyperoceanic element.

*2*: Damp shaded rocks by river, Trebartha Estate, 1966, HJBB (BBSUK) (Long 1995b: 39) [previous record (bank in lane to Ellbridge, near St Mellion, Callington, 20/36, 1962, JAP

Many of the records published in Atlas 1: 258 (1991) and previously are known to be based on misidentification of 32.2 (see Long 1995b: 39) and most of those that cannot be rechecked are likely to be misidentifications.

Habitat notes for recent records from Cornwall are as follows. Above Kynance Cove (vc1): on serpentinite boulder amongst crags high on slope of side of small valley near coast; partly shaded; associated with Lejeunea cavifolia. NE. of Warleggan (vc2): on sparse mosses on vertical masonry of ruined walls of mine-buildings, part-shaded. Draynes Wood (vc2): on mortared-granite wall of derelict water-wheel pit (with Eucalypta streptocarpa). De Lank (vc2): growing on Thamnobryum alopecurum in spray-zone of small waterfall of stream in open N.-facing Sessile Oakwood.

Commonly c.per. Not recorded c.fr.

32.7 Lejeunea mandonii (Steph.) Müll.Frib. NR:EN 1
Southern-temperate Hyperoceanic element.


Most British sites are in Cornwall, all the others being in W. Scotland.

Following detailed research carried out for Plantlife during 1997-1998, located at five groups of sites on Lizard pen., with total of 47 patches known, covering total area of ca 0.8 m². All of the sites were closely associated with serpentinite crags and all of the patches were in sheltered locations and partly shaded, with shade from trees at three sites (often Sycamore, but oaks, elms and conifers at some sites), bushes at one (Broom, Blackthorn) and overhanging rocks at one. All of the sites are in stable habitats that have been little disturbed for decades; it avoids exposed coastal sites, inundation zones of streams and places subject to heathland fires, but apparently prefers places with little exposure to wind, rain or much direct sunlight. By 2009 the populations at the richest sites (Bonython Plantation) had declined considerably, due mainly to increased shade from the maturing plantation of Western Red Cedars.

It mainly occurs in rather dry places on somewhat overhanging or overhung faces, with wide variety of aspects (all points of compass). The largest amounts grow epiphytically on low pleurocarpous mosses that are themselves growing on rocks and which are typically rather short and lacking in vigour because of shading and dryness of substrates. Lesser amounts grow on algal films, thin decaying lichens or directly on rock, and in one site on bark of an old Hedera hibernica stem against the rock. The commonest of its close associates include the mosses over which it often grows (Kindbergia praelonga, Isothecium myosuroides var. myosuroides, Thamnobryum alopecurum, less often Hypnum cupressiforme var. resupinatum, Pterogonium gracile). Among the more frequent of its numerous less common associates or near-associates are Homalothecium sericeum, Lejeunea lamacerina, Lejeunea cavifolia (only at Kynance), Marchesinia mackaii, Metzgeria furcata, Neckera complanata, Porella arboris-vitae and Radula complanata s. l. The most frequent of the numerous vascular plant species recorded near to it are Geranium.
robertianum, Hedera hibernica, Lonicera periclymenum, Asplenium scolopendrium, Rubus fruticosus s. l. and Polypodium interjectum.

Not seen c.per. or c.fr. by DTH.

33.1 Marchesinia mackaii (Hook.) Gray
Southern-temperate Oceanic element.


Habitat notes from Cornwall are as follows. On dry, steep serpentinite and gabbro rocks of S.-facing outcrops, almost unshaded or part shaded, mainly on overhanging faces. On shaded serpentinite rocks in deciduous woodland and above wooded stream bank. Large patches low on trunk of substantial Sycamore tree in woodland above bank of stream.

Associates include Hypnum cupressiforme var. resupinatum, Metzgeria furcata, Neckera complanata; but most often forming pure patches appressed to rock on drier more shaded surfaces than those occupied by any of its associates


Care is needed in recording this species in the field, since Cololejeunea minutissima lacking perianths can look very similar.

Common as epiphyte on bark of trunks and branches of Alder, Ash, Blackthorn, Grey Willow, Elder, elms, Gorse (in scrub), Hazel, Sessile Oak, Sycamore; also recorded on Downy Birch, Lawson's Cypress, Pinus contorta, Rhododendron, Wild Cherry. On isolated trees and in groves, woodland, scrub, Grey Willow-carr, sometimes in scrub on sea-cliffs. Very often intermixed with other epiphytic bryophytes or growing on or over them; associates include Frullania dilatata, Metzgeria violacea, Metzgeria furcata, Metzgeria consanguinea, Hypnum andoi, Hypnum cupressiforme var. resupinatum, Ulota bruchii, Ulota crispa, Ulota phyllantha, Zygodon viridissimus var. viridissimus.

One record of it growing on Hylocomium brevirostre, itself an epiphyte on trunk of Grey Willow in open scrub. Single record on Sitka Spruces (growing there with many other epiphyte species). Single record among Hypnum cupressiforme var. resupinatum mat on boulder under deciduous trees. Once on moribund bryophytes over granitic rock on tor.

Female inflorescences recorded: 6, 8, 11, 12. Not seen c.per. and not known male or c.fr.
35.1 *Ptilidium ciliare* (L.) Hampe
Boreal-arctic montane Circumpolar element.


Habitat notes from Cornwall are as follows. Rough Tor and Brown Willy: with other bryophytes on granitic rock and boulders high on mainly unshaded hillsides. Cheesewring Quarry: small amount in moss mat on vertical, S.-facing granitic rock in old quarry. N. of Crow’s Nest: on thin soil among granitic rocks on top of low bank of mine-spoil, with lichens and sparse low *Agrostis*. Minions: stony partly bare soil with short vegetation, unshaded, at top of bank of mine-spoil (with low *Calluna vulgaris*). Harpur’s Downs: thin almost unshaded soil over granitic rocks on top of old 'hedge'. Bodmin Moor S. of Bowithick: with other bryophytes on edges of flat or low granitic boulders in acidic grassland of hillsides.

Not seen c.fr.

36.1 *Blepharostoma trichophyllum* (L.) Dumort.
Boreal-arctic montane Circumpolar element.


All records were from a small area of vc1 in West Penwith. Recorded in 1960s from Hannibal’s Carn (ENE. of Morvah) by JAP but not refound there by DTH on several visits in 1990s.

[Record from Trevelloe Carn, by Ralfs & Greenwood (in Curnow 1882) is referable to *Telaranea europaea*].

37.1 *Trichocolea tomentella* (Ehrh.) Dumort.
Temperate European element.


Grows as mats on permanently wet substrates of soil, over flushed slaty rock and on a rotting log. Recorded in shaded sites in deciduous woodland, on flushed ground, beside streams, on steep damp stream banks and above a river bank. Associates include *Brachythecium rivulare*, *Rhizomnium punctatum* and *Chrysosplenium oppositifolium*.

Not seen c.fr.

40.1 *Bazzania trilobata* (L.) Gray
Temperate Suboceanic element.


A robust liverwort that often grows as large pure patches or partly intermixed with pleurocarpous mosses. Habitat notes from Cornwall are as follows. De Lank, Draynes and Hendergrove Woods (vc2): on ledges and sloping surfaces of granitic rocks, thin soil over rocks and occasionally on rotting wood, partly shaded and shaded inside deciduous woodland above river banks; associates include Plagiochila asplenioïdes, Plagiochila spinulosa and Scapania gracilis. Chapel Rock, Roche: on steep granitic rock near base of tor, on N.-facing slope but unshaded. Rough Tor among large granitic blocks and boulders.

Not seen c.fr.

41.1 Kurzia pauciflora (Dicks.) Grolle (syn. Lepidozia setacea auct. non (G.Weber) Mitt.). Boreo-temperate Suboceanic element.

First vice-county records of Kurzia sp. (most likely of K. pauciflora):

There was formerly a tendency to assume Kurzia spp. were 41.1 on the assumption that the other two spp. are rare. Hence older records of Lepidozia setacea that have not been revised subsequently are placed under a separate 'Kurzia sp. undet.' heading, along with recent gatherings lacking inflorescences.

Records of K. pauciflora from Isles of Scilly given by Paton (1969: 695) are now regarded as unreliable.

Grows as low mats or more often intermixed with other bryophytes. Most records are from mires with sphagna: on low Sphagnum hummocks and on moribund Sphagnum. Also on peaty soil of sides of hummocks or wet peat banks. Once in cushion of Leucobryum glaucum in rather open area of wet heath on Lizard pen. Once on vertical moist peaty surface in flush high above N.-facing sea-cliff. Associates recorded: Calypogeia fissa, Calypogeia muelleriana, Cephalozia bicuspidata, Cephalozia connivens, Cladopodiella fluuits, Lophozia ventricosa, Mylia anomala, Riccardia latifrons, Riccardia multifida, Straminergon stramineum, Dicranella heteromalla, Sphagnum capillifolium, Sphagnum tenellum, Sarmentypnum exannulatum; Anagallis tenella, Drosera rotundifolia, Erica tetralix.

Only recorded when male or female inflorescences seen (except when growing among living sphagna). Once c.fr.: immature 7, 9, 10, near dehiscing 9, 10.


Habitat notes from recent records in C&S are as follows. Nine records from damp or wet peat of hummocks or banks in mires (with sphagna nearby), wet heathland or acidic flushes.
Close associates recorded were *Calypogeia fissa*, *Calypogeia muelleriana*, *Campylopus pyriformis*, *Lophozia ventricosa*, *Mylia anomala*, *Odontoschisma sphagni*, *Drosera rotundifolia*, but once recorded on otherwise bare peat. S. of Georgia (vc1) on near-vertical, moist, humic soil of overhanging lip of bank, heavily shaded by *Rhododendron*. Near De Lank: on part-shaded humic soil of steep N.-facing slope above stream in Sessile Oakwood (with *Tetraphis pellucida*).

Only recorded when male or female inflorescences seen. Not seen c.fr.

41.3 **Kurzia trichoclados** (Müll.Frib.) Grolle


A recent record was on damp peat of unshaded hummock in mire, closely associated with *Cephalozia bicuspidata* and *Lophozia ventricosa*.

Only recorded when inflorescences seen (male for only DTH record). Not seen c.fr.

42.1 **Lepidozia reptans** (L.) Dumort.
Boreo-temperate Circumpolar element.

*1: Try Moor, N. of Penzance, 1881, WC (NMW) (Paton 1969a: 695).
*2: Rough Tor, 1907, RWS (OXF) (Paton 1969a: 695).

Forming mats on acidic substrates, of peaty or humic soil (especially on banks), rotting wood on or near the ground, or steep granitic or slaty rocks, extending onto bark of live trees and shrubs (recorded 1.5 m up on living oak, and at base of *Rhododendron*), usually shaded or partly shaded in woodland, groves of trees, hollows or crevices in N.-facing banks, or in rock fissures or shaded by boulders e.g. on north sides of tors. Often in pure patches, associates include many common acidophiles such as *Dicranum scoparium*, *Diplophyllum albicans*, *Hypnum jutlandicum*, *Mnium hornum* and *Pseudotaxiphyllum elegans*, less often *Calypogeia muelleriana*, *Cephalozia lunulifolia*, *Plagiochila spinulosa*, *Tetraphis pellucida* and *Hymenophyllum tunbrigense*.

Single records also from under *Rhododendron* scrub at edge of old china-clay quarry, from under young trees on slope of old china-clay spoil, and from steep grassland slope above stream with few rocks, where sheltered but almost unshaded.

Occasional (or frequent ?) c.fr.: capsules immature 2, 4, 5; dehiscing 4; dehisced 4, 5.

42.3 **Lepidozia cupressina** (Sw.) Lindenb.
(syn. *L. pinnata* (Hook.) Dumort.). Southern-temperate Hyperoceanic element.

*1: Carn Galver, 1869, WC (NMW) (Paton 1969a: 695).
Forming pure mats or among other bryophytes on steep to horizontal, partly shaded to unshaded, granitic rock outcrops of tors, often on N.-facing rocks or slopes. Devil's Jump (leg. PAG): on vertical rock with other bryophytes.

Not seen c.fr.


*1: Trevelloe Carn [as 'slender form' of *Blepharostoma trichophyllum*], 1879, EDM (OXF) (Paton 1969a: 695, 1969b: 868). [Older reports from Trevelloe Carn (as *Lepidozia setacea*, ca 1852, JR & AG) are not supported by specimens: Paton 1969a: 695].


The only site in Britain. It was first recorded here by Ralfs and Greenwood (ca 1852) as *Lepidozia setacea* and later renamed as a 'slender form' of *Blepharostoma trichophyllum* (Marquand in Curnow 1882). As noted by Paton (1969a: 695), this record predates the first European record of the species by over eighty years (*Rep. 4*, 61, 1938). Treatment of *T. europaea* as a species distinct from *T. nematodes* follows Engel & Smith Merrill (2004).

At Trevelloe Carn it grows on acidic soil and granitic rocks that are steep or vertical and well shaded by *Rhododendron* or *Prunus laurocerasus*, within a plantation of mature Beech trees. The rocks are at the edge of a garden and by April 2006 it appeared that some trees had been removed to extend the garden.

Not seen c.fr.

43.2 *Telaranea murphyae* Paton ALIEN NR:VU S Temperate Oceanic element.


Paton (1999) regarded *T. murphyae* and *T. longii* Paton as distinct species known only from Great Britain where they are 'associated with gardens and may have been imported accidentally from unknown countries of origin'. Grolle & Long (2000) suggested they might represent males and females of a single species. However, a taxonomic monograph by Engel & Smith Merrill (2004) concluded that *T. longii* is a synonym of *T. tetradactyla* (Hook.f. & Tayl.) Hodgs. from New Zealand and possibly elsewhere in the Southern Hemisphere. The origins of *T. murphyae* remain uncertain. Engel & Smith Merrill (*op. cit.* p. 169) commented that 'we cannot match this plant with any Australasian species, nor does it resemble any Neotropical or African species known to us'.

Until 2003 known only on Tresco, where mainly on soil but also spreading over adjacent low rocks and well rotted wood, in humid sheltered sites that are more or less shaded by trees of woodland (plantations) or shrubbery. Extends into Grey Willow carr beside pools,
growing on moist substrates. Recorded in small amounts at two localities on St Mary's in 2003, in a large garden near Rocky Hill and beside a path on Lower Moor.

Not seen c.fr.


One of the commonest and most widespread liverworts in Cornwall. Occurring in a wide range of habitats: on soil, on or among mosses, on ground-litter (dead leaves, twigs, bases of grasses), tree bark (also Grey Willow bark), fallen trunks and branches (including decorticated and decaying wood) or spreading over sheltered rocks (granitic, gabbro, serpentineite, slates) and masonry, in open or shaded. Occurs in wide range of habitats including woodland (deciduous or coniferous), scrub, Grey Willow carr, on laneside banks, shaded 'hedges', banks of ditches, stream banks (sometimes in flood-zone), in flushes, churchyards, on walls, in old quarries, on china-clay spoil, in old mine-spoil areas, colonising disturbed soil, roadside grass verges, slopes and banks high on cliffs and above sea-cliffs where often partly sheltered but sometimes in exposed situations (and then often dwarfed).

Associates include many common mosses (commonly *Brachythecium rutabulum*, *Kindbergia praelonga*, *Eurhynchium striatum*, *Fissidens bryoides* var. *bryoides*, *Rhytidadelphus squarrosus*, *Thamnobryum alopecurum*, *Trichostomum brachydontium*); often with *Lophocolea heterophylla* on rotting wood; other associates recorded include *Brachythecium rivulare*, *Calypogeia fissa*, *Cephalozia bicuspidata*, *Cirriphyllum piliferum*, *Lophocolea bispinosa*, *Nowellia curvifolia*, *Plagiothecium denticulatum* var. *denticulatum*, *Scleropodium touretii*.

Perianths common: 3, 7, 8, 10-12. Frequently c.fr.: immature 1-3, 11; dehiscing 1-4; dehisced 3, 4.


*2*: Unshaded on near-horizontal, gravelly, china-clay spoil of sparsely vegetated bank above quarry, Melbur, NW. of St Austell, SW95, 1998, DTH 98-64 (*BBSUK, DTH*) (Blackstock 1999: 38).

First recorded in Isles of Scilly (in and near Abbey Gardens on Tresco) in 1962 (Paton 1974b, 1999: 392), and present on all five inhabited islands by 1996. A more recent colonist of Cornish mainland, where first recorded in 1997, when it was found to be plentiful over many metres of abandoned trackway near old china clay works at Cold Harbour (vc1). In March 1998 substantial patches were discovered in vc2 over small areas in the St Austell
china-clay district at Melbur and Twin Peaks, but soon afterwards it was found to be locally dominant and much the commonest bryophyte over >10 ha of china clay spoil at Stannon on the western slopes of Bodmin Moor. Small patches were found elsewhere in the St Austell china-clay district in 1999, at Melbur and around High Street, Foxhole. Besides the find at Stannon, several substantial to large patches have now been found at other outlying china-clay pits (1999, SE. of Hawk's Tor; 1999, several places NNE. of St Neot).

Since 1998 also recorded in vc2 at a few localities away from china-clay workings: at Milltown (SX 114681: 1999, one patch at edge of track surfaced with china-clay spoil); edge of track surfaced with china-clay spoil SE. of Trewarmett (2000); in granite quarries (2001, at De Lank and Hantergantick Quarries); on unshaded edge of cliff-top footpath near Bossiney (JAP pers. comm., 2000); near Lockengate (SX0361, on track, 2005).

Colonises bare acidic substrates, forming dense low patches that may become a metre or more across. Widespread on Isles of Scilly by 2003, occurring on variety of humic, acid, often peaty or rocky soils, mainly in open or lightly shaded places, on cliffs, coastal heaths, road sides, in scrub and in groves of trees. Less common in Scilly than Lophocolea semiteres, and preferring somewhat damper sites, although they sometimes occur together.

On mainland, mostly grows on clayey, gritty and gravelly china-clay spoil of banks above working quarries, spoil heaps, about works and depots, and disused tracks and track edges, locally on mica dam edges. Initially colonises mostly sparsely vegetated, unshaded surfaces, but persists at base of grasses and herbs as cover of phanerogams begins to develop, although lost when ground fully shaded with litter layer developing. Less typical habitats: Twin Peaks, vc2: on damp, compressed, sandy soil near unshaded edge of tarmac of road, near china clay quarry. Stannon: bit on china clay spoil in hollows subject to frequent inundation. Near Greensplat in small amount with other bryophytes on old concrete. Rosevear: patch on thin soil on top of mortared-stone wall.

Often in pure patches, but at Stannon and elsewhere also associated with virtually all of the bryophytes and small phanerogams of open acid soils, especially Ceratodon purpureus, Nardia scalaris, Pogonatum urnigerum, but also Archidium alternifolium, Atrichum undulatum, Blasia pusilla, Campylopus pyriformis, Cephalozia bicuspidata, Gymnocolea inflata, Solenostoma graciliforme, Lophocolea bidentata, Lophozia incisa Pohlia annotina, Polytrichum piliferum, Rhytidium rugosum, Scapania compacta, Scapania irrigua, Pseudoscleropodium purum, low grasses (e.g. Holcus lanatus), low herbs (e.g. Sedum anglicum) and young plants of taller phanerogams (e.g. Agrostis sp., Calluna vulgaris, Erica cinerea, Vaccinium myrtillus).

Both sexes occur in Isles of Scilly, where sporophytes are reported (maturing 3-5, 8: Paton 1999: 392). All material checked from mainland of Cornwall has proved to be female only (from St Austell area in tetrads: SW95C, 95D, 95H, 95R, 95S, 95U, 95W, 95X, SX05C, 05H, 05I) as were the Hawk's Tor and St Neot plants (SX 17M, 17V).

Lophocolea bispinosa was presumably introduced to the Isles of Scilly with horticultural plants from the Southern Hemisphere. Its later spread on the mainland may involve a single clone of female plants. The plants are very brittle and they also produce filiform branches, so dispersal by vehicles in the china-clay districts seems likely, especially as many records
are alongside tracks. At least three outlying localities in vc2 are at sites where china-clay spoil has been used to surface tracks.

Recorded on mainland cper: 2, 3, 5; female bracts formed but perianths not yet developed 9, 12.

44.3 *Lophocolea heterophylla* (Schrad.) Dumort.  


Forms patches or mats. Habitat notes from C&S are as follows. Common on rotting wood of decorticated tree stumps and trunks and logs lying above or on or near ground in deciduous and conifer woodlands, or groves of trees, also in Grey Willow scrub. On dead gorse stem on heath. Patch 1.5 m above ground on large living branch of Grey Willow in carr. On low, horizontal, living Alder trunk in wet woodland. Base of trunk of old pine tree, base of trunk of living *Pinus radiata* in plantation. Patches on near-vertical, dry soil high on 'hedges' at top of sea-cliffs, in open on north side of 'hedge' or slightly shaded by grasses. In slight hollow on slope above exposed sea-cliff. Soil, slightly sheltered, of low banks above sea-cliffs. Crevice of rocks at top of sea-cliff. On unshaded rock and soil among rocks on slopes in pastures above coast. Often found on soil on banks and 'hedges' inland (also on thin soil over slaty rock on bank and in quarry) commonly where shaded and often on free-draining substrates, also among roots of wind-thrown tree. Twice on thin soil on old walls. Other habitats include churchyards, laneside banks, ruins of mine buildings, deciduous woodland and groves. Occasionally with mosses and other small liverworts on steep side of serpentine or granitic boulders in shade. Bit with moss and liverwort carpet on moist vertical masonry of old wall. Patch on vertical rock of unshaded boulder close to stream. Associates recorded on soil *Lejeunea lamacerina*, *Lophocolea bidentata*, *Plagiothecium denticulatum* var. *denticulatum*, rarely *Lophocolea fragrans*; on rotting wood sometimes with *Hypnum andoi*, *Hypnum cupressiforme* var. *resupinatum*, *Lophocolea bidentata*, *Pseudotaxiphyllum elegans*, less often with *Nowellia curvifolia*.

Once with many foliar gemmae (Nov: DTH). Commonly c.fr.: recorded c.per. (1-3, 7, 11, 12); capsules immature 1-5, 12; dehiscing 1-3, 5; dehisced 2-5.

44.4 *Lophocolea semiteres* (Lehm.) Mitt.  
(syn. *Chiloscyphus semiteres* (Lehm.) Lindenb. in Gottsche *et al*.). Temperate Suboceanic element.


In our area known mainly from Isles of Scilly, but with single record from vc2 (St Just in Roseland churchyard, 2006, JAP). In Scilly it had become very common and widespread by 2003, occurring mainly on unshaded or lightly shaded acidic substrates, especially peaty paths and track edges on coastal heathland and cliff tops, but also on gravelly paths, among
rocks, in woodland and scrub, at roadsides and in gardens. Also seen several times on well rotted dead wood of stumps. JAP noted in April 2003 that it was growing over Fossombronia and Riccia spp., which were able to hold their own amongst Archidium alternifolium but unable to compete with the L. semiteres that is appearing as a new colonist on clifftop and heathland paths in the Isles of Scilly.

Commonly c.fr.

44.6 Lophocolea fragrans (Moris & De Not.) Gottsche et al. 12  

*1: Coast near St Just, 1884, WC (NMW) (Paton 1969a: 700).

Usually in rather small amounts, commonly as small patches amongst other bryophytes. Habitat notes from Cornwall are as follows. On faces of serpentinite boulders, sometimes in old walls, well shaded by bushes and deciduous saplings; with Kindbergia praelonga and other mosses. Lamorna: among mosses on steep faces of granite boulder and on steep base of Ash trunk, both near stream under Ash trees. Most often near coast, but found far inland near Cadson Bury, on thin soil over steep slaty rock of old quarry shaded by deciduous woodland (with Heterocladium heteropterum var. flaccidum, Lejeunea lamacerina). With Lejeunea lamacerina on bark of large old coppiced Sycamore in sheltered small valley. Steep soil of streambanks, partly shaded by deciduous trees. Steep acidic soil of bank beside track in woodland, part shaded (with Calypogeia fissa, Dicranella heteromalla, Pseudotaxiphyllum elegans).


45.1 Chiloscyphus polyanthos (L.) Dumort. s. str. 12  
(syn. C. polyanthos var. rivularis (Schrad.) Gottsche, Lindenb. & Nees). Boreo-temperate Circumpolar element.


Some of the post-1992 records of non-fertile plants are placed only as 'C. polyanthos s. l.' (plants c.per. were usually assigned to the segregate spp., although the perianth mouth was sometimes so eroded or decayed that determination was not possible; non-fertile plants growing submerged in streams were always placed as 45.1 s. str.).

Usually grows in pure mats or patches. Habitat notes from Cornwall are as follows. On granitic or slaty rocks or soil close to or beneath water level (ranging from shallowly submerged at depths down to 15 cm up to 10 cm above water, occasionally higher) in flushes, trickles, streams and rivers, unshaded to well shaded by deciduous trees of groves or woodlands or Grey Willows in carr; associates include Hygroamblystegium fluviatile.
Fissidens pusillus, Fontinalis antipyretica var. antipyretica, Fontinalis squamosa, Hygrohypnum ochraceum, Leptodictyum riparium, Platyhypnidium riparioides, Scapania undulata, lichens, rarely Lophocolea bidentata, Porella pinnata. On granitic rock in mill race at water level and on flushed granite of side-wall where receiving spray from waterfall; lightly shaded. On damp soil in flush above river bank in deciduous woodland. Among mosses (Calliergonella cuspidata) and Grey Willow-litter in shallow water beneath carr of Grey Willow. Among mosses at water-level of unshaded edge of large oligotrophic pool (old china clay pit). Apparently tolerates considerable eutrophication of stream water, persisting after Fontinalis squamosa and Scapania undulata disappear, often with no aquatic bryophytes associates other than Platyhypnidium riparioides.

Frequently/commonly c.fr.: capsules immature 1, 2, 4, 10, 12, dehiscing 4.

45.2 Chiloscyphus pallescens (Ehrh. ex Hoffm.) Dumort. 12
(syn. Chiloscyphus polyanthos var. pallescens (Ehrh. ex Hoffm.) C.Hartm.). Boreo-temperate Circumpolar element.

*1: Morvah, 1884, WC (MANCH) (Paton 1969a: 701).

See notes on preceding species. Non-fertile plants were only placed as this species when counts of oil-bodies or leaf shapes were decisive (see Paton 1999: 399); otherwise they were placed as C. polyanthos s. l.

Typically forms pure mats or patches. Habitat notes from Cornwall are as follows. On damp soil of bank near stream in shade of Grey Willows. Soil on pathway and a disused track on slope in deciduous woodland (one site in river flood-zone). On low rocks in flush inside deciduous woodland. Three records of pure patches under Grey Willow carr, in areas subject to occasional flooding, on flat loamy soil or ground litter. Plentiful on firm soil and granitic rocks beneath Grey Willow scrub in inundation zones beside Stithians and Argal Reservoirs. Small patch in open flush in area of mires near reservoir edge. Base of Juncus and Molinia caerulea in fen vegetation grown on ungrazed mire. Partly submerged in shallow flowing water near spring in mire (with Sarmentypnum exannulatum).

Commonly c.per. (immature 7, 11, mature 8, 10); capsules immature 1.

48.2 Plagiochila porelloides (Torr. ex Nees) Lindenb. 12
(syn. P. asplenioideus var. asplenioideus auct. non (L.) Dumort.). Boreo-temperate Circumpolar element.


Commonly as pure patches, forming low turfs, but sometimes intermixed with other bryophytes. Habitat notes from Cornwall are as follows. On rocks of tops and sides of old walls and 'hedges' shaded or part shaded by deciduous trees, on horizontal, sloping and vertical surfaces with mosses. Mortared granitic rock of old bridge over small river in
deciduous woodland, patches on vertical faces, in part shaded, humid location. Associates include Kindber gia praelonga, Hypnum cupressiforme var. cupressiforme, Lejeunea lamacerina, Plagiochila asplenioides. Faces of boulders (granitic) in and near rivers and streams (well above water level) and on firm soil with mosses beside streams and in flood zone beside R. Tamar, part shaded or shaded by deciduous trees. With Sciuro-hypnum plumosum, Racomi trium aciculare. Thin soil on slope under trees above river bank. Steep soil and thin soil over rocks in woodland, and on roadside and laneside banks partly to well shaded by deciduous trees (near Kindber gia praelonga, Fissidens bryoides var. bryoides, Lunularia cruciata). Soil on stream banks under deciduous trees. One record with other bryophytes low on ruined of wall of mine building.

Occasionally? c.per. (immature 10). Not seen c.fr.


*1: Carn Gwavas, Newlyn, 1882, WC (NMW) (Paton 1969a: 699-700). This record is much older than that published as new to vc1 by Paton (1962: 360).

Separation from P. porellroides often seems rather arbitrary in practice, based on little more than larger size of P. asplenioides and lack of flagella.

Habitat notes from Cornwall are as follows. Forming patches with moss carpets on steep or vertical granite or slate of crags and boulders or steep soil of banks, in shade of deciduous trees on hillsides (and once in valley bottom), in deciduous woodlands, especially near streams and on shaded 'hedges', old walls and laneside banks; sometimes with Bazzania trilobata, Eurhynchium striatum, Scapania gracilis, Thuidium tamariscinum. In grassland with herbs and other bryophytes on damp soil of steep sheltered bank just N. of Poundstock Church. Locally plentiful on silty loam under trees on top of banks beside R. Tamar. On steep thin soil and damp slaty rocks in shade in disused railway cutting and on roadside or laneside banks (associates include Oxyrrhynchium hians, Kindber gia praelonga, Oxyrrhynchium pumilum, Homalia trichomanoides, Plagiochila porellroides, Thammobryum alopecurum). Shaded bank in churchyard. Among rocks in deep sheltered hollow inside ruin of old mine building (with Homalia trichomanoides). On shaded masonry of old railway bridge, growing among Neckera complanata.

Not seen c.fr.

48.7 Plagiochila spinulosa (Dicks.) Dumort. Southern-temperate Hyperoceanic element.

*2: Rough Tor, 1907, RWS (SLBI) (Paton 1969a: 700).

[Record from vc1 (Near Amalebra, Nancledra, 1923, HHK (NMW), listed by Paton 1969a: 700) deleted because it was misidentified P. killarniensis = P. bifaria (Corley 1981: 19-20)].
**Plagiochila bifaria** [as *P. killarniensis*] was reinstated as a separate species from *P. spinulosa s. str.* following the revision by Paton (1977b). Older records for which specimens have not been revised are placed only as *P. spinulosa s. l.*

Habitat notes from Cornwall are as follows. Patches on vertical granite and steep slate rocks with *Isothecium myosuroides* var. *myosuroides* on crags in shade or part-shade of deciduous trees in valley bottom and on valley side slope. Sometimes forming large patches (> 1 m across) on steep to vertical sides of granitic boulders and granitic or slaty crags in shade of deciduous woodland. Associates include *Dicranum scoparium*, *Diplophyllum albicans*, *Hypnum andoi*, *Isothecium myosuroides* var. *myosuroides*, *Lepidozia reptans*, *Mnium hornum*, *Plagiochila asplenioidea*, less often *Bazzania trilobata*, *Hymenophyllum tunbrigense*. Steep faces of granite boulders in old 'hedges' and walls including at field edge and beside lanes, lightly shaded, N.-facing or open (associates include *Diplophyllum albicans*). NW. side of Little Rough Tor, on vertical granitic rock of damp crevice among boulders on hillside. Unshaded steep to vertical granite of low outcrop, mainly N.-facing, with *Scapania gracilis*.

Deciduous leaves are common and likely to function as propagules. Sporophytes unrecorded (only female plants known in Britain).


See notes on previous species.


48.9 *Plagiochila punctata* Taylor
Southern-temperate Hyperoceanic element.

*2: Kilmar Tor, 1925, FR (BM) (Paton 1969a: 700). This record is older than that published as new to vc2 by Paton (1962: 360).

Habitat notes from Cornwall are as follows. On horizontal sloping or vertical granitic rocks about tors and block screes on hill tops and slopes, in sheltered hollow and in crevices between boulders. On granitic rock in deciduous woodland. One strong patch on low branch in damp deciduous woodland. Soil on heathy slope of sea-cliff (with *Lophozia ventricosa*, *Scapania gracilis*, *Tritomaria quinquedentata*).

Leaves often deciduous. Not seen c.fr.

[48.10 *Plagiochila exigua* Taylor (syn. *P. tridenticulata* auct. non (Dumort.) Dumort.) – Record from vc1 (Carn Galver, 1882, (NMW), and in Curnow 1882 and Castell 1950: 377) rejected by Paton 1969a: 700 because specimen is *P. punctata*].

49.1 *Adelanthus decipiens* (Hook.) Mitt.
Southern-temperate Hyperoceanic element.

*2: At base of steep, almost unshaded, granitic outcrop on heathy slope below tor, just N. of Roche Rock (SW9959), 1999, DTH 99-78 (BBSUK, DTH) (Blackstock 2000: 41).

Recorded only from just N. of Chapel Rock, Roche: in low pure mats and with *Scapania gracilis* on small, steep granitic outcrops on N.-facing heathy slope near base of tor; almost unshaded to partly-shaded by *Calluna vulgaris*. With *Polytrichastrum formosum*, *Scapania gracilis*, and a little *Dicranum scoparium*, beneath *Calluna* and a little *Vaccinium myrtillus*.

Not seen c.fr.

50.1 *Jamesoniella autumnalis* (DC.) Steph.
Boreo-temperate Circumpolar element.


The only record from Cornwall.

50.2 *Jamesoniella undulifolia* (Nees) Müll.Frib.
Boreo-arctic montane European element.

Habitat notes from Cornwall are as follows. Dozmary Pool: in open acidic mire (NVC type M21a), in areas with low Sphagnum capillifolium; other associates, were often plentiful Aulacomnium palustre, Odontoschisma sphagni, Sphagnum papillosum, small amounts of Cephalozia bicuspidata, Cephalozia connivens, Hynum jutlandicum, Lophozia ventricosa, Sphagnum cuspidatum; rather sparse vascular plant cover typically includes Drosera rotundifolia, Erica tetralix, Eriophorum angustifolium and Molinia caerulea. Withey Brook marsh: very small amount in small uns haded area on 5º slope at edge of mire, among Sphagnum capillifolium and Sphagnum papillosum beneath low Calluna vulgaris and Molinia caerulea (other plants present in small amounts were Polytrichum commune, Pleurozia schreberi, Riccardia multifida; Erica tetralix, Eriophorum angustifolium, Juncus squarrosus, Potentilla erecta and Succisa pratensis). NW. edge of Redmoor Marsh: small quantity on unshaded, moist, low, degraded hummock in short vegetation of slightly higher, grazed ground at edge of mire, with Sphagnum capillifolium (partly moribund), Cephalozia connivens, Polytrichum strictum, algae.

Not seen cfr; perianths very immature 9.

52.1 Cephalozia bicuspidata (L.) Dumort. (syn. C. bicuspidata var. lammersiana (Huebener) Breidl.). Boreo-temperate Circumpolar element.


Often in large or small pure patches, but frequently also intermixed with other small bryophytes. Habitat notes from C&S are as follows. On moist, flat and more or less steeply inclined acidic soil (clay, loam) of laneside and other banks, wooded stream- and riversides, beneath exposed tree roots, ditch banks and path edges in deciduous and mixed-conifer woodland, groves of trees, scrub (associates include Calypogeia arguta, Calypogeia fissa, Dicranella heteromalla, Diplophyllum albicans, Solenostoma gracillimum, Lophocolea bidentata, Mnium hornum, Nardia scalaris, Scapania nemorea, rarely Fissidens polyphyllus), similar habitats near stream in wet pastures, almost unshaded to part shaded. Often plentiful on moist clay and other substrates of steep and gently sloping banks in old and newer china clay quarries, unshaded and part shaded. Clayey banks in old quarried area, unshaded (near Pogonatum aloides). Damp slaty rock surface in part-shaded entrance to old mine adit. Walls and banks by old mine shafts. Locally on old copper-mine spoil, e.g. at base of sparse Calluna vulgaris (with Diplophyllum albicans), and in wet area near Juncus effusus. Damp humic soil of steep streambank in old mine area, N.-facing but unshaded. Acid soil of vertical path-side banks, part-shaded only (with Calypogeia fissa, Pellia epiphylla). Soil in crevice of 'hedge'. Soil and damp humus of banks above sea-cliffs and in cliff-top flushes, unshaded to part shaded. On damp sand, peaty or humic banks, decaying tussocks, and among living or moribund sphagna on heaths and in mires (associates recorded include Calypogeia fissa, Calypogeia muelleriana, Cephalozia connivens, Dicranella heteromalla, Mylia anomala, Riccardia chamedryfolia, Riccardia latifrons, Sphagnum subnitens). On decayed Pteridium aquilinum humus on bank above path. Peaty soil on flat path edge on heath. On decaying litter low on Molinia caerulea and other tussocks and low damp earthy banks in mires and acidic flushes (with Calypogeia fissa, Calypogeia arguta, Calypogeia muelleriana, Cephalozia connivens, Diplophyllum albicans, Entosthodon obtusus, Kurzia pauciflora, Kurzia trichoclados, Lophozia ventricosa, Pohlia
annotina, Riccardia latifrons), similar habitats in wet hollows in china clay pits and on china clay spoil heap (with Atrichum undulatum, Campylopus pyriformis, Gymnocolea inflata, Solenostoma gracillimum, Lophozia incisa Riccardia latifrons, Riccardia multifida).


52.3 Cephalozia catenulata (Huebener) Lindb.                           NS   S12
Boreo-temperate European element.


No recent records.

52.4 Cephalozia macrostachya Kaal.                           NS   2
Boreal-montane Suboceanic element.

Paton et al. (1996) show that both var. macrostachya and var. spiniflora (Schiffn.) Müll.Frib. are widespread in Britain, although only the first of these has as yet been recorded in Cornwall. Older records that have not been revised subsequently are listed under the species name only.

52.4.a Cephalozia macrostachya var. macrostachya                           NS   2
Boreal-montane Suboceanic element.


Recorded near Dozmary Pool in open acidic mire with sphagna.

52.5 Cephalozia leucantha Spruce                           12
Boreal-montane Circumpolar element.


Few recent records. Found S. of Sprey Moor on low vertical bank of damp peat in unshaded edge of heavily grazed mire.

Not seen cfr; c.per. 9.
52.6 *Cephalozia lunulifolia* (Dumort.) Dumort. (syn. *C. media* Lindb.). Boreo-temperate Circumpolar element.  
*1*: Morvah, 1880, EDM (*OXF*) (Paton 1969a: 703). This record is older than that given as new for vc1 by Paton (1963: 487).  

Grows as low patches. Habitat notes from C&S are as follows. Most records on steep humic soil or peaty humus of woodland banks, over rocks or on rotting tree-trunks lying on or near the ground in shaded interior of deciduous woodlands (once in a plantation of conifers), often near streams or rivers. Associates recorded include *Cephalozia bicuspidata*, *Lepidozia reptans*, *Lophocolea heterophylla* and *Nowellia curvifolia*. S of Gweek: on steep peaty humus on low slaty cliff at creek edge, lightly shaded by low, open, Sessile Oakwood (associates *Calypogeia fissa*, *Lepidozia reptans*, *Tetraphis pellucida*). Patches on thin humic soil over slaty rocks of crag on slope in deciduous woodland (with *Calypogeia muelleriana*, *Lepidozia reptans*, *Pseudotaxiphyllum elegans*). Damp peaty soil exposed on edges of granitic rocks of tor, unshaded but on N.-facing slope.  

Gemmae abundant on some plants: 4. Cper: 1, 2, 4. Occasional (?) c.fr.: capsules immature 1, 5; dehisced 1, 5.  

52.7 *Cephalozia pleniceps* (Austin) Lindb.  
Boreo-arctic montane Circumpolar element.  

Latest record from SX27 (on *Sphagnum papillosum*, bog on Twelvemen's Moor, 21 Mar. 1972, JAP 7554 (*E*)).  

52.9 *Cephalozia connivens* (Dicks.) Lindb.  
Boreo-temperate European element.  
*2*: Brown Willy, 1918, FR (*BM*) (Paton 1969a: 702-703). This record is older than those given as new for vc2 by Paton (1962: 360 which was erroneous, and 1963: 487).  

Habitat notes from Cornwall are as follows. Numerous records amongst living sphagna and on moribund sphagna, small-sedge debris and damp peat in mires, normally unshaded (but persisting in part-shaded areas when Grey Willow colonises). Associates recorded in mires include *Calypogeia fissa*, *Calypogeia muelleriana*, *Cephalozia bicuspidata*, *Dicranella heteromalla*, *Kurzia pauciflora*, *Lophozia ventricosa*, *Mylia anomala*, *Odontoschisma sphagni*, *Riccardia multifida*, *Sphagnum capillifolium*; *Drosera rotundifolia*, *Erica tetralix*. On decaying litter low on *Molinia* tussocks and on wet peaty debris in mires (with *Calypogeia fissa*, *Calypogeia arguta*, *Calypogeia muelleriana*, *Cephalozia bicuspidata*, *Kurzia pauciflora*, *Riccardia latifrons*). Also damp peat of low bank beside acidic flush (near *Kurzia sylvatica*, *Mylia anomala*, etc.). NW. of Boskednan (vc1): on peaty humus at base of old *Rhododendron* bush, partly shaded, at edge of wet overgrown track through scrub and woodland.
Most often non-fertile; often c.per. (1, 2, 5, 8); occasionally (?) c.fr.: immature 2.

53.1 *Cladopodiella fluitans* (Nees) H.Buch  
Boreal-montane Circumpolar element.


Grows with sphagna in wet areas of acidic, unshaded mires, found growing on low hummocks and in hollows or flat areas on living and moribund *Sphagnum*. Associates recorded include *Straminergon stramineum*, *Calypogeia muelleriana*, *Kurzia pauciflora*, *Sphagnum capillifolium*, *Sphagnum tenellum*, *Sarmentypnum exannulatum*; *Drosera rotundifolia*.

Not seen c.fr.

53.2 *Cladopodiella francisci* (Hook.) H.Buch ex Jörg.  
Boreal-montane European element.


Recent notes on habitat in Cornwall are as follows. On damp, partly bare, acidic soil of heathland on and near old mining areas, in open and at bases of *Calluna* and *Erica*; associates include *Gymnocolea inflata*. Growing from gelatinous mat of algae on sloping soil at edge of path on wet heathland (over gabbro). Damp peat of bank in wet heathland (with *Cephalozia bicuspidata*).

All records were of plants with many foliar gemmae. Not seen c.fr.

55.1 *Nowellia curvifolia* (Dicks.) Mitt.  
Boreo-temperate European element.


Frequently forms extensive low patches which are mainly red-brown, but green where most heavily shaded. On rotting, decorticated trunks (including Beech, oak) lying on or just above floors of deciduous woodland and in wood edges, in sheltered and often damp places such as near streams. Often alone, but associates include *Lophocolea bidentata*, *Lophocolea heterophylla* and *Pseudotaxiphyllum elegans*.

Commonly c.fr.: immature 2, 3.
56.1 *Odontoschisma sphagni* (Dicks.) Dumort. Temperate Suboceanic element.

*1*: Try Moor, N. of Penzance, 1880, EDM (NMW) (Paton 1969a: 703).

Mostly on peaty banks, decaying tussocks (e.g. of *Molinia caerulea* and *Leucobryum glaucum*) and living and moribund sphagna in acidic mires. Grows unshaded to partly shaded. Associates include *Aulacomnium palustre*, *Calypogeia fissa*, *Calypogeia muelleriana*, *Cephalozia connivens*, *Kurzia sylvatica*, *Kurzia pauciflora*, *Lophozia ventricosa*, *Mylia anomala*, *Riccardia latifrons*, *Riccardia multifida*, *Sphagnum capillifolium*, *Sphagnum fallax*, *Sphagnum papillosum*; *Anagallis tenella*, *Drosera rotundifolia*; occasionally *Straminergon stramineum*, *Campylopus pyriformis*, *Dicranum bonjeanii*, *Gymnocolea inflata*, *Pleurozium schreberi*, rarely *Jamesoniella undulifolia*. Also in an acidic flush near sphagna. At Manor Common in *Leucobryum glaucum* hummocks in short acidic grassland on drier slopes well away from mires.

Frequently c.per. in drier sites, e.g. on peaty banks. Seen once c.per. (9), twice c.fr. (few ripe capsules at each of two sites: 4)

56.2 *Odontoschisma denudatum* (Mart.) Dumort. Boreo-temperate European element.


In acidic mires with sphagna nearby, growing on nearly bare peaty soil on low hummocks, normally growing out of gelatinous wet algal films. Also at edge of small mire in wet pasture, growing on vertical, wet peat of low bank. Often in pure patches except for gelatinous algae; associates recorded include *Mylia anomala*, *Odontoschisma sphagni*. Also close to many other plants of acidic mires.


The only recent record was of sparse non-fertile stems in cushion of *Leucobryum glaucum* on rather open area of wet heath (just E. of Predannack Wollas).

Not seen c.fr.
58.3 *Cephaloziella rubella* (Nees) Warnst. – Paton (1964: 717, 1969a: 701) listed voucher specimens from vc1 (Near Gurnard's Head, 1907, WEN (CGE)) and vc2 (Near Sticker, St Austell, 1960, JAP (BBSUK, E, OXF)); in 2001 JAP (pers. comm.) reidentified the vc1 voucher as *C. hampeana* and the vc2 voucher as *C. divaricata* accompanied by an undetermined *Cephaloziella* sp. Several other specimens claimed as *C. rubella* (E, NMW) have been shown to be misidentified, or autoicous (cf. comments in Paton 1999: 143), or the records have been withdrawn by the finders because no specimens were kept. Blackstock (2002: 39) therefore deleted records from the CC for *C. rubella* in both vc1 and vc2.

58.4 *Cephaloziella hampeana* (Nees) Schiffn.

Boreo-temperate European element.


Probably somewhat under-recorded because of difficulty in proving plants are autoicous rather than dioicous.

Habitat notes from C&S are as follows. Several records, sometimes of large patches, on damp soil of partly bare ground in floors of disused granite quarries; unshaded (with *Fossombronia incurva*, *Pogonatum urnigerum*). Compressed soil of damp path in churchyard just north of church, with other very low bryophytes (including *Didymodon insulanus*). On damp tracks, e.g. on heathland, unshaded. Open area of damp soil in acid grassland on old landfill site (with *Ceratodon purpureus*, *Pohlia annotina*). Soil and in cushion of *Campylopus fragilis* on heathy slope of old mining ground near stream and coast, unshaded. With other low bryophytes on unshaded copper mine spoil (with *Bryum donianum*, *Ceratodon purpureus*, *Fissidens dubius*, *Scapania compacta*, *Conocephalum conicum*). Soil on and just below ruined walls of mine buildings, unshaded. Colonist on clay-spoil and crumbling granitic rocks on banks and slopes in and near active and old china-clay quarries (near *Cephaloziella divaricata*, *Nardia scalaris*). Soil and peaty humus on bare soil patches and open areas on banks and flat ground at path edges on slopes above cliffs, unshaded or almost unshaded (with *Archidium alternifolium*, *Diplophyllum alibicans*, *Lophozia ventricosa*). Soil over serpentine in small quarry close to exposed sea-cliff edge, unshaded (with *Trichostomum brachydontium*). Thin soil on bank near stream in wet pasture, part shaded (with *Calypogeia arguta*). On soil of partly bare, unshaded patches in damp acidic grassland (with *Ceratodon purpureus*, *Fossombronia incurva*). Damp soil of low bank in flush above sea-cliff, unshaded, with *Calypogeia fissa*. Unshaded sparsely vegetated bank at top of inundation-zone beside reservoir (with *Archidium alternifolium*, *Bryum dichotomum*). Unshaded peaty soil of small bare patch among patchy low vegetation high in inundation-zone of reservoir. Damp unshaded peat in open part of mire with sphagna.

Often with gemmae: 1, 2, 3, 6, 8-12. Cper: 1-3, 5, 6, 8-12. Frequently (commonly ?) c.fr.: immature 2, 3, 6, 9-11; dehiscing 3, 6, 10; dehisced 6, 9, 10.
58.6 *Cephaloziella divaricata* (Sm.) Schiffn.  

*1*: Madron Moor, 1883, WC (MANCH) (Paton 1969a: 702). This record is older than that listed by Castell (1950: 377) as new to vc1.


Mainly identified when fertile or when non-fertile material showed the characteristic leaf-stance (Paton 1999: 145), hence somewhat under-recorded.

Habitat notes from Cornwall are as follows. Thin soil at edge of old gravelly track on mining ground, unshaded, near *Cephaloziella stellulifera, Ceratodon purpureus*. On sandy mine-spoil, unshaded. On unshaded metalliferous mine spoil (associates include *Campylopus introflexus, Cephaloziella stellulifera, Ceratodon purpureus, Lophozia bicrenata, Pohlia annotina*). Thin soil on granite rocks in old quarries and on their spoil, unshaded and lightly shaded, with *Dictytrichum heteromallum, Nardia scalaris, Pogonatum urnigerum*. Soil and thin soil over serpentinite at edge of heath, unshaded (often with *Archidium alternifolium*). In and around active and old china clay quarries as colonist on clayey banks, slopes and sometimes flat areas with heath vegetation, also on crumbling or hard granitic rocks or thin soil over rocks (often near *Cephaloziella hampeana, Ceratodon purpureus, Marsupella sprucei, Nardia scalaris*), usually unshaded. Soil and thin soil on slope at base of serpentinite crag and edges of paths etc. above serpentinite and slaty sea-cliffs, unshaded (with *Trichostomum brachydontium, Weissia* sp., often intermixed with mosses). Acid soil on banks and slopes on and above sea-cliffs and in unshaded, open areas of coastal heath (close associates sometimes include *Hypnum cupressiforme* var. *lacunosum, Lophozia excisa, Polytrichum juniperinum, Scleropodium tourretii, Tortula viridifolia, Trichostomum brachydontium, Conocephalum conicum*). Small mats on soil on little used old, stony track near gabbro quarry; unshaded; soil on gravelly clearing in conifer wood, almost unshaded.

Minions area and elsewhere: unshaded, thin soil and edges of rocks in areas of copper-mine spoil. Among *Ceratodon purpureus* and *Campylopus introflexus* on unshaded gravelly area of disused railway track (on bridge top). Clayey ditch bank in clearing in conifer plantation. Steep soil of part-shaded trackside bank. Thin soil on ledge of old 'hedge' (with *Scapania compacta*). Soil near rock on open heathland. With *Campylopus flexuosus* on rock on low Cornish hedge. Among *Campylopus flexuosus* on rocks in acid grassland slope. The common *Cephaloziella* on open coastal heath in Isles of Scilly, often on open cliff tops or coastal slopes, growing on peaty soil or mixed with mosses such as *Campylopus introflexus*. Almost unshaded firm sediment at top edge of inundation-zone beside reservoir (with *Calliergonella cuspidata, Fossombronia foveolata, Fossombroria incurva*).

58.7 *Cephaloziella stellulifera* (Spruce) Schiffn. Mediterranean-Atlantic Suboceanic element.


Forming mats, often extensive and pure. Habitat notes from Cornwall are as follows. On thin soil on unshaded spoil of copper mines, on flat ground and on banks, paths, track edges, often in barer patches of heathy areas with sparse *Calluna vulgaris*. Also on ‘soil’ in crevices of walls built from or retaining mine-spoil. On sandy and clayey, unshaded mine-spoil and banks of streams and ditches draining old mine areas. Common associates on old metalliferous mining ground include *Cephaloziella divaricata*, *Ceratodon purpureus*, *Dicranella varia*, *Diplophyllum albicans*, *Gymnocolea inflata*, *Solenostoma gracilimum*, *Pohlia annotina*, *Scapania compacta*, less often *Barbula convoluta*, *Conocephalum conicum*, *Cephaloziella massalongi*, *Cephaloziella nicholsonii*, *Didymodon vinealis*, *Lophozia bicrenata*, *Lophozia excisa*, *Pohlia andalusica*, *Pseudocrossidium hornschuchianum*, *Scopelophila cataractae*; higher plants present close by commonly include *Agrostis tenuis* and *Calluna vulgaris*. Unshaded soil in old mine areas on top of exposed sea-cliff and above stream bank near coast. Clay soil on bank near active china clay quarry. On thin soil over serpentinite rock in small old quarry near exposed sea-cliff edge, unshaded (with *Trichostomum brachydontium*). With other low bryophytes on soil (over slaty and serpentinite rock) on slopes and tops of exposed sea-cliffs, in areas of short vegetation e.g. at path edges (associates *Archidium alternifolium*, *Campylopus introflexus*, *Lophozia excisa*, *Trichostomum brachydontium*). Intermixed in tufts of *Campylopus introflexus* on thin soil at edge of rock in open area on heath. On damp clay or gravelly substrates of tracks on and beside heaths, with *Archidium alternifolium*, *Entosthodon obtusus*.

Commonly with gemmae. Commonly cper: antheridia + archegonia, but no per 11, 12; antheridia and young per in 1, 7, 11, 12; well grown perianths 1-5, 7, 8, [11 old], 12. Frequently c.fr.: immature 1, 3, dehiscing 1, 3, dehisced 1.

Chemical analyses of its substrates show it can tolerate high levels of Cu, Pb and Zn at Cornish localities:

**Analyses of substrates from localities in Cornwall (metal concentrations given as µg/g dry weight):**

<table>
<thead>
<tr>
<th>LOCALITY (N samples)</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
<th>pH</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chyverton, vc1 (6)</td>
<td>452-1120</td>
<td>5464-11025</td>
<td>2304-16166</td>
<td>4.1-6.5</td>
<td>Rouen (2000)</td>
</tr>
<tr>
<td>Dolcoath Road, vc1 (6)</td>
<td>1678-3450</td>
<td>56-90</td>
<td>240-723</td>
<td>5.2-6.8</td>
<td>Rouen (2000)</td>
</tr>
<tr>
<td>W. Bassett, vc1 (4)</td>
<td>1316-3039</td>
<td>35-65</td>
<td>31-78</td>
<td>5.1-5.9</td>
<td>Rouen (2000)</td>
</tr>
</tbody>
</table>

58.8+9 *Cephaloziella massalongi* s. l. Additional records only Boreo-temperate Suboceanic element.

First vice-county records of the s. l.:


*2*: Damp soil among ruins of old copper mine, W. of Caradon Hill, June 1962, JAP (BBSUK) (Paton 1963: 488, 1969a: 702); this specimen was later identified as *C. massalongi* s. str. (see below).
58.8 and 58.9 were not usually separated until the study by Paton (1984), so that only those older specimens revised then or since are allocated to the species. Older records that have not been revised are placed here as the s. l. This residue is mainly of records made by JAP prior to 1983 for which specimens were not kept (or at least not subsequently re-examined), or where the plants either could not be refound or were not looked for again to check which species was involved.

58.8 *Cephaloziella massalongi* (Spruce) Müll.Frib.  
Boreo-temperate Suboceanic element.

** NR:VU  12

*1*: (Paton 1984: 5, Corley 1985: 21). CHECK - which record is voucher ?


As noted above, *C. massalongi* and *C. nicholsonii* were not usually separated until the study by Paton (1984), so that only those older specimens revised then or since are allocated to the species. Older records that have not been revised are placed only as the s. l.

Forming mats, usually pure and often locally dominant, on lithosols, clay banks, thin humic or mineral 'soil' layers on rocks, or directly on rock surfaces. Only in areas about old copper mines and on their spoil, or along streams draining from them, usually where evidently very rich in copper. Occurs on horizontal and sloping surfaces and on steeper substrates e.g. in crevices at base of walls, low on damp walls, on vertical banks of mine-spoil, or on vertical stream and ditch banks and streamside rocks (including sites that flood at times), where unshaded to moderately or rather heavily shaded. Associates commonly include *Cephaloziella nicholsonii*, *Cephaloziella stellulifera*, *Solenostoma gracillimum*, *Pohlia annotina*; less often *Ceratodon purpureus*, *Ditrichum cornubicum*, *Gymnocolea inflata*, *Pohlia andalusica*, *Pohlia nutans* and *Scopelophila cataractae*. Higher plants are usually few and the cover incomplete, but those nearby often include *Agrostis tenuis* and *Calluna vulgaris*.

Gemmae usually abundant. No record of perianths (or of sporophytes).

Chemical analyses of its substrates show it can tolerate high levels of Cu at a Cornish locality, whereas levels of Pb and Zn are not exceptionally high at the site studied. All substrates investigated were acidic.

**Analyses of substrates from localities in Cornwall (metal concentrations given as µg/g dry weight):**

<table>
<thead>
<tr>
<th>LOCALITY (N samples)</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
<th>pH</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gilbert's Coombe, vc1 (4) 2024-3512</td>
<td>82-288</td>
<td>245-485</td>
<td>5.1-5.4</td>
<td>Rouen (2000)</td>
<td></td>
</tr>
</tbody>
</table>

58.9 *Cephaloziella nicholsonii* Douin  

** NS:VU  12


See notes under preceding species. *C. nicholsonii* has most of its localities in Britain and Ireland, with a record from Germany. Most of the British sites are in Cornwall.
Distinction between this species and *C. massalongi* relies mainly on its larger size, most easily assessed from the stem cortical cells, and the larger and often irregularly shaped gemmae (Paton 1999: 152). However, shaded material is often unidentifiable or only rather tentatively identifiable from the large size and frequent irregularity of the gemmae.

Forming mats, mainly pure, often locally dominant. On thin soil and deeper soil or clay in areas of old copper-mine spoil, usually where evidently very copper rich and most plentiful in damp places. Also on walls built from or retaining mine spoil, where it grows mainly on 'soil' in crevices but sometimes spreads over rocks around crevices. On vertical to horizontal substrates. Occurs in open unshaded situations and where very sheltered and partly shaded. Large patches occur on flat open ground near an exposed cliff top at Botallack, but near Minions and elsewhere it grows luxuriantly on sheltered and partly shaded banks of a small stream. It apparently persists for many years when its sites become heavily shaded by encroaching scrub or saplings, although identification becomes difficult if not hopeless with plants growing in shade.

Although differences in habitat preferences from *C. massalongi* have been reported, none appear consistent so that list of associates could mainly serve for both species. Those recorded include *Cephaloziella stellulifera*, *Dicranella varia*, *Pohlia annotina*, *Scopelophila cataractae*. Also overgrowing ground-litter of decaying grasses or mosses on old copper mine spoil, on partly bare stony ground at edge of path near old mines, on steep sandy-silt alluvium of bank near Red River (presumably containing copper). See below for analyses of its substrates at Cornish sites.

Foliar gemmae usually (always?) present, often abundant, especially in shaded plants which often have few leaves, none of them properly formed, but masses of gemmae. Perianths only occasionally present: very immature 2, 12, well grown 1, 4. Capsules not seen.

Chemical analyses of its substrates show it can tolerate high to very high levels of Cu at Cornish localities, whereas levels of Pb and Zn are not exceptionally high at these sites. All substrates investigated were acidic.

### Analyses of substrates from localities in Cornwall (metal concentrations given as µg/g dry weight):

<table>
<thead>
<tr>
<th>LOCALITY (N samples)</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
<th>pH</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Lane, vc1 (2)</td>
<td>161-464</td>
<td>42-139</td>
<td>7-10</td>
<td>6.0</td>
<td>Clements (1996)</td>
</tr>
<tr>
<td>Tuckingmill, vc1 (1)</td>
<td>179</td>
<td>3</td>
<td>20</td>
<td>6.0</td>
<td>Clements (1996)</td>
</tr>
<tr>
<td>Dolcoath Road, vc1 (6)</td>
<td>1678-3450</td>
<td>56-90</td>
<td>240-723</td>
<td>5.2-6.8</td>
<td>Rouen (2000)</td>
</tr>
<tr>
<td>Gilbert's Coombe, vc1 (4)</td>
<td>2024-3512</td>
<td>82-288</td>
<td>245-485</td>
<td>5.1-5.4</td>
<td>Rouen (2000)</td>
</tr>
<tr>
<td>W. Bassett, vc1 (4)</td>
<td>1316-3039</td>
<td>35-65</td>
<td>31-78</td>
<td>5.1-5.9</td>
<td>Rouen (2000)</td>
</tr>
</tbody>
</table>

58.10 *Cephaloziella dentata* (Raddi) Steph. Southern-temperate Suboceanic element.


All British records are from the Lizard pen., where it has apparently been recorded from five different sites. The latest records from two of the sites are from the 1930s, those from another two are from the 1960s, the most recent being in 1968 (JAP); several more recent attempts to refind it there have been unsuccessful (JAP, DTH, RDP).

A lengthy search on 15 Oct. 1998 with JAP in the Ebenezer Triangle, at the best locality for 1960s records, was unsuccessful. The heath was still mostly short, with plenty of 'bare'
looking patches, but these mainly had covering of gelatinous algae. The only *Cephaloziella* seen in 30 minutes of searching was a small amount of *Cephaloziella cf. stellulifera*. JAP recalled much more *Cephaloziella* spp. (*C. hampeana, C. stellulifera*) in 1960s in similar habitats. Possibly Nitrogen pollution from main road nearby has lead to nutrient enrichment of surfaces and loss of small liverworts.

In March 2004 it was newly discovered at a fifth site on the east Lizard pen., W. of Rosuick (DTH, conf. JAP): on unshaded damp soil with sparse low vegetation in hollow among serpentinite rocks on heath (with sparse *Entosthodon obtusus, Cladonia; scanty Fossombronia 'husnotii', F. cf. maritima, Riccia hubeneriana, immature Campylopus*). The *C. dentata* had foliar gemmae (photo), but no perianths.

58.11 *Cephaloziella turneri* (Hook.) Müll.Frib.  
Mediterranean-Atlantic Oceanic element.


Forms small, thin patches or grows as sparse scatter of stems on partly bare substrates.

Habitat notes for localities in Cornwall are as follows. S. of Gweek: on thin soil under overhangs on low slaty cliff at edge of creek, partly shaded at edge of Sessile Oakwood; *Dictichum subulatum* is commonly an associate; some patches being overgrown by ‘slime’ of algae. Mawgan Creek: steep overhanging head of W.-facing low cliff beside creek, part shaded by deciduous woodland edge. Stanbury: partly bare steep soil of laneside bank ca 500 m inland of north coast of vc2. W. of Lamorran: on steep loamy soil of laneside bank partly shaded by trees (with *Calypogeia arguta, Cephalozia bicuspidata, Dicranella heteromalla, Diplophyllum albicans*). Penryn: thin steep soil over slaty rock ca 2 m above H.W.M. on low cliff beside creek, part shaded by mature oak tree. Other associates recorded: *Cephalozia bicuspidata, Epipitygium tozeri, Pogonatum aloides, lichens*.


58.12 *Cephaloziella integerrima* (Lindb.) Warnst.  
Boreal-montane Suboceanic element.


The large majority of post-1950 British records are from Cornwall, including all sites currently known to hold the species. Easily overlooked in the field because it is small even for a *Cephaloziella*, and tends to grow as very short, open turfs as a colonist on small patches of bare substrates, rather than forming the procumbent mats of shoots typical of well-grown (and commonly fertile) material of the congeners that often grow nearby. Under the microscope the angular gemmae provide the first indication of its presence. Of the *Cephaloziella* recorded in similar habitats, only *C. calyculata* has similar gemmae, but that
species is normally much larger in all vegetative parts and lacks any red or brown secondary pigmentation, besides differing in characters of the perianth-mouth and bracts.

Recent records from ca 15 sites in vc1 and four in vc2 are all from old metalliferous mine sites, on mainly rather thin 'soil' over old mine-spoil that is at least sometimes copper-contaminated. Mainly recorded from unshaded places, less often from those lightly shaded (by Calluna vulgaris or by wall and Salix cinerea bushes, also once sheltered but not much shaded by tall Ulex europaeus). Once close to base of large galvanised-iron building. Twice on thin 'soil' in crevices of old walls retaining mine-spoil. Associated species include other small bryophytes of similar open habitats, among them Cephaloziella divaricata, Cephaloziella stellulifera, Ceratodon purpureus, Dicranella varia and Pohlia annotina, with Bryoerythrophyllum ferruginascens, Bryum dichotomum, Bryum pallens, Didymodon tophaceus, Ditrichum cornubicum, Ditrichum lineare and Conocephalum conicum at one site each. The copper-tolerant Cephaloziella massalongi, C. nicholsonii and Pohlia andalusica were also in similar habitats close by at several sites.

Found alone as small pure lawns and in small amounts in low 'turf' of Leptobarbula berica at Okeltor Mine near Calstock, on silty or sandy mine-spoil on top and ledges of low ruined walls at base of bank, an association that implies a calcareous substrate was present, but also present on flat ground nearby with acidophilous associates. Also on thin 'soil' over old concrete at Porkellis Moor, as well as on sandy substrates nearby.

Gemmae present on all gatherings examined and mainly common. Frequently cper, perianths present (but often rather few): 1, 9-11. Occasionally c.fr.: immature 3, dehiscing 3, dehisced 3.

58.13 Cephaloziella calyculata (Durieu & Mont.) Müll.Frib. NR:VU 12
Southern-temperate Oceanic element.


Habitats recorded in Cornwall are as follows. Leswidden: several small patches found over the years on thin unshaded or lightly shaded soil overlying old concrete walls of disused china-clay 'drys'; associates included Cladonia sp., Dicranella varia, Weissia cf. controversa. Crenver Grove: patches on friable soil in crevices of old, partly shaded, mortared stone wall. Crow's Nest: on crumbling loamy, vertical soil under overhang at junction of two stone walls retaining slopes of mine-spoil; partly shaded; no immediate associates, but Cephaloziella massalongi and Dicranella varia growing close by. Gear Sands: sparse stems, on partly bare patches in short calcareous grassland on landward edge of dunes, with Distichium inclinatum, Fissidens sp., Southbya tophacea, close to Tortella flavovirens.

Always? with gemmae. Perianths common (antheridia and archegonia but no perianths in 11, female bract ring growing but no perianths 3); c.fr.: immature/dehiscing 10.

Chemical analyses of its substrate at a mine site in East Cornwall show it tolerates high levels of Cu accompanied by at least moderately high levels of both Pb and Zn. The substrate investigated was circumneutral. At other sites, e.g. Leswidden, it is unlikely that there are high levels of any heavy metal.
Analyses of substrates from locality in Cornwall (metal concentrations given as µg/g dry weight):

<table>
<thead>
<tr>
<th>LOCALITY (N samples)</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
<th>pH</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crow’s Nest, vc2 (1)</td>
<td>2934</td>
<td>587</td>
<td>177</td>
<td>7.0</td>
<td>Walsh (2001)</td>
</tr>
</tbody>
</table>


Habitat notes from C&S are as follows. On lithosols or humic soils, often thin, over old copper mine spoil, where often common and forming pure turfs or mats, especially in unshaded or lightly shaded, damp places, inland and on coasts. Also on 'soil' in crevices of walls built of or retaining mine-spoil. Associates commonly include *Cephaloziella nicholsonii*, *Cephaloziella stellulifera*, *Ceratodon purpureus*, *Diplophyllum albicans*, *Solenostoma gracillimum*, *Lophozia bicrenata*, *Pogonatum aloides*, *Pohlia andalusica*, *Pohlia annotina*, *Pohlia nutans*, *Scapania compacta*, rarely *Cladopodiella francisci*, *Ditrichum plumbicola*; often beneath patchy *Calluna vulgaris*. Moist clay of flat areas and banks in and near old and working china clay quarries, unshaded (with *Atrichum undulatum*, *Campylopus pyriformis*, *Cephalozia bicuspidata*, *Diplophyllum albicans*, *Solenostoma gracillimum*, *Lophozia incisa* *Riccardia latifrons*, *Riccardia multifida*, *Scapania irrigua*). On thin wet clay over horizontal concrete of ruin of china clay dry, unshaded, with *Lophozia ventricosa* and *Scapania irrigua*. Among low bryophytes and on damp peaty soil on hummocks and in open patches of mires and on heathland, sometimes growing from algal sheets (associates include *Campylopus flexuosus*, *Campylopus pyriformis*, *Odontoschisma sphagni*, *Polytrichum commune*, *Sphagnum compactum*). On open coastal heath on Isles of Scilly, growing on damp peaty soil in sparsely vegetated hollows. Wet hollow among *Juncus effusus* tussocks near working china clay quarry, temporarily flooded, unshaded. With other small liverworts as colonist on china clay spoil, including sites near working quarries. Edge of damp clayey track, almost unshaded. Patch on thin soil of crevice in steep retaining wall, part shaded by woodland edge. Slaty rocks high on sea-cliff.


60.3 *Barbilophozia floerkei* (F.Weber & D.Mohr) Loeske Boreal-montane Circumpolar element.


This remains the only locality in Cornwall. It was refound there in 2000, growing among other bryophytes on thin soil among granitic rocks on unshaded slope; associates include *Barbilophozia barbata*.

Not seen c.fr.
60.5 *Barbilophozia attenuata* (Mart.) Loeske  
Boreal-montane Circumpolar element.


Habitat notes from Cornwall are as follows. On steep N.-facing granitic rock of crag, almost unshaded, growing in cushions of *Dicranum scottianum*, with *Lophozia ventricosa*. Roche Rock: on steep surfaces of granitic rocks near base of tor, N.-facing but unshaded or almost unshaded (associates include *Dicranum scottianum*, *Lophozia ventricosa*, *Scapania compacta*, *Scapania gracilis*). Rough Tor: with other bryophytes on granitic boulders on unshaded hillside. Draynes Wood: thin soil over granite of low outcrop beside path in deciduous woodland.

Usually gemmiferous at shoot tips. Not seen c.fr.

60.8 *Barbilophozia barbata* (Schmidel ex Schreb.) Loeske  
Boreal-montane Circumpolar element.


[vc1 records (Gulval, JR, *fide* Curnow 1843; Trevaylor Bottom, JR, in Curnow 1882), both discounted by Paton 1969a: 697 and 1970: 189 because no specimens could be traced].

Rough Tor remains the only locality known in Cornwall. It was refound there in 2000: among other bryophytes on thin soil over unshaded edge of granitic rock on hillslope; associates include *Barbilophozia floerkei*.

Not seen c.fr.

[64.1 *Anastrophyllum minutum* (Schreb.) R.M.Schust. (syn. *Sphenolobus minutus* (Schreb.) Berggr.) – Reported from vc2 (Kilmar Tor, 1917, FR (BM), and in Rilstone 1936 and Castell 1950: 376) was based on misidentified *Barbilophozia attenuata* (Paton 1963: 486, 1969a: 697)].

65.1 *Tritomaria exsectiformis* (Breidl.) Loeske  
Boreo-temperate Circumpolar element.

\*1: Rosewall Hill, St Ives, 1923, HHK (BM) (Paton 1969a: 697).  

Habitat notes from C&S are as follows. Watchtor: on steep to vertical peaty and gritty soil of low banks on N.-facing heathy hillside, including old mine areas, slightly shaded. On thin soil over granitic rocks on Carn Galver, unshaded to part shaded (with *Lophozia*
ventricosa). On Isles of Scilly on peaty soil, unshaded or almost so, on cliff tops, coastal slopes and coastal heath, sometimes among rocks.


65.3  **Tritomaria quinquedentata** (Huds.) H.Buch  
Boreo-arctic montane Circumpolar element.

*2: Among rocks near small stream on heathy cliff-slope, Rusey Cliff, SX19, 2000, SVOL det. JAP (BBSUK, DTH) (Blackstock 2001: 34).

[Several old reports from vc1 (Curnow et al. 1884, Pearson 1902, Holmes 1906) are not supported by specimens: Paton 1969a: 697].

The only confirmed record in Cornwall is from Rusey Cliff, where it grew with other brophytes on soil on a heathy cliff slope among rocks near a small stream; the commonest of the close associates were *Lophozia ventricosa*, *Plagiochila porelloides* and *Scapania gracilis*.

No gemmae seen. Not seen c.fr.

66.2  **Lophozia ventricosa** (Dicks.) Dumort.  


Habitat notes from C&S are as follows. Sides of granitic rocks and boulders, thin and deeper soil (lithosols) among rocks, and on banks in areas of old copper mine spoil; unshaded or lightly shaded (once in small quantity part-shaded in deciduous woodland); associates include *Ceratodon purpureus*, *Dicranum scottianum*, *Didymodon insulanus*, *Gymnocolea inflata*, *Pseudocrossidium hornschuchianum*, *Scapania compacta*, rarely *Barbilophozia attenuata*. Soil on banks about old granite quarry. Colonist on clay and gravelly substrates and granitic boulders of banks around working china clay quarries, quarry floors and on spoil heaps; usually unshaded, sometimes partly shaded. Acid soil on banks, slopes and old tracks and thin soil over granite and slate rocks high on sea-cliffs or above them (sometimes in exposed sites, as small fertile plants). Thin soil over horizontal to vertical surfaces of granitic rocks at tors, and on gravelly or gritty soil among granitic boulders on hilltop, unshaded to part shaded (near *Ceratodon purpureus*, *Dicranum scottianum*, *Polytrichum juniperinum*, *Polytrichum piliferum*, *Scapania gracilis*). A bit part shaded on soil over rock on wooded hillside. Thin often humic soil on horizontal tops or steep or vertical sides of old stone walls and 'hedges', with *Diplophyllum albicans*, *Scapania compacta*. Patch on steep rock in N.-facing wall beside lane. In Isles of Scilly on peaty soil above cliffs and on coastal slopes, or among rocks, often growing among mosses or other liverworts. On damp china clay at unshaded edge of settling tank in works, on thin layer of damp clay over horizontal concrete of ruined works, unshaded (with *Gymnocolea inflata*, *Scapania irrigua*). Damp peat of low bank beside acidic flush. Bodmin Moor: on unshaded peat of low banks in and near mires. On healthy, decaying or moribund sphagna and other vegetation and damp bare
peaty surfaces in mires, in flat areas or at bases of hummocks (associates in mires include *Calypogeia muelleriana*, *Campylopus pyriformis*, *Cephalozia bicuspidata*, *Cephalozia connivens*, *Kurzia pauciflora*, *Kurzia sylvatica*, *Kurzia trichoclados*, *Lophozia incisa* *Mylia anomala*, *Odontoschisma sphagni*, *Sphagnum capillifolium*; *Drosera rotundifolia*).

Usually (perhaps always?) with foliar gemmae, but these sometimes sparse. Often c.per: 4, 11; occasionally c.fr.: capsules immature 1, 10; mature 1, dehisced 10. Abundantly fertile at Portheras, January 1998, over large area

[66.3 *Lophozia longiflora* (Nees) Schiffn. (syn. *L. guttulata* (Lindb.) A.Evans) – Recorded from vc1 and vc2 in error, see *Bull.* 68: 42].

66.5 *Lophozia sudetica* (Nees ex Huebener) Grolle


Habitat notes from Cornwall are as follows. Minions: on thin, often steep soil on top of stone wall between track and pasture, unshaded (with *Diplophyllum albicans*, *Diphyscium foliosum*, *Lophozia ventricosa*, *Scapania compacta*). Minions: thin soil on low unshaded wall around mine-shaft. Crow's Nest: soil in slightly shaded crevice of stone wall, with *Ceratodon purpureus*, *Scapania compacta*, *Cladonia* sp. S. of Bowithick: on thin unshaded acid soil on SW.-facing side of Cornish hedge in moorland, with *Dicranella heteromalla*, *Diplophyllum albicans*.

Normally with foliar gemmae. Not seen c.fr.

66.6 *Lophozia excisa* (Dicks.) Dumort.

Boreo-arctic montane Circumpolar element.


Habitat notes from C&S are as follows. On mosses on vertical granite rock, facing south in old quarry; unshaded (c.per. + few foliar gemmae). Thin acidic soil exposed above granitic boulder on bank. With other low bryophytes on unshaded, part-vegetated copper mine spoil, e.g. on pathways, near top of sea-cliffs and thin soil over masonry of ruined mine building (associates *Archidium alternifolium*, *Cephalozia stellulifera*, *Ceratodon purpureus*, *Solenostoma gracillimum*, *Scapania compacta*). In open areas among heath vegetation in china-clay spoil beside pit. Steep side of granitic rock in old 'hedge'. Thin soil on top of 'hedges' and on a stone wall (with *Diplophyllum albicans*, *Diphyscium foliosum*, *Lophozia sudetica*, *Scapania compacta*). With *Campylopus introflexus* on soil over gravel of unshaded, disused railway track (on bridge). With other low bryophytes on thin compressed soil on exposed soil of grassy slopes, near paths and on old tracks on cliff tops and slope above coast, and on thin soil over slaty rocks on sea-cliff (with *Archidium alternifolium*, *Drosera rotundifolia*, *Mylia anomala*).
Bryum kunzei, Campylopus introflexus, Cephaloziella divaricata, Cephaloziella stellulifera, Fossombronia 'husnotii', Fossombronia maritima, Grimmia lizada, Hypnum cupressiforme var. lacunosum, Riccia crozalsii, Riccia sorocarpa, Scleropodium touretii, Tortula wilsonii, Trichostomum brachydontium; Cladonia sp., Aphanes sp.). On bare patches of sandy soil in slight hollow in sparsely vegetated area of dune-grassland, close to old mine-spoil and patchy Calluna.

Normally with foliar gemmae. Cper: 1, 2, 10, 11. Three records c.fr.: immature 1, 10; dehiscing 1.

66.11 Lophozia incisa (Schrad.) Dumort. S12
Boreal-montane Circumpolar element.


Habitat notes from C&S are as follows. Small plants on soil in flat partly bare area of stony china clay/mine spoil, unshaded (with Diplophyllum albicans, Diplophyllum obtusifolium, Marsupella sprucei). Small patch on steep clay-soil of almost unshaded stream bank. Colonist on damp clay, sand and gritty substrates of unshaded and lightly shaded pool sediments (mica dams), quarry bottoms and banks and slopes in and near old and working china clay quarries (with Atrichum undulatum, Blasia pusilla, Campylopus pyriformis, Cephalozia bicuspidata, Diplophyllum albicans, Gymnocala inflata, Solenostoma gracillimum, Lophozia ventricosa, Nardia scalaris, Riccardia latifrons, Riccardia multifida, Scapania irrigua). On damp peat of low bank beside acidic flush, unshaded. On flat areas e.g. decaying and living sphagna or on hummocks in mires (associates include Lophozia ventricosa, Odontoschisma sphagni, Sphagnum capillifolium). One record on partly bare humic soil over metalliferous mine-spoil, unshaded to part-shaded.


66.13 Lophozia bicrenata (Schmidel ex Hoffm.) Dumort. 12
Boreo-temperate Circumpolar element.


Habitat notes from Cornwall are as follows. Soil in rather bare places on slopes on floor of old quarry. Thin soil on granitic rocks in old quarry, unshaded; with Cephaloziella divaricata, Ditrichum heteromallum. On unshaded (or at most lightly shaded), stony, earthy or sandy metalliferous mine-spoil, or in mats of Cephaloziella stellulifera (also with Cephaloziella divaricata, Cephaloziella nicholsonii, Dicranella heteromalla, Diplophyllum albicans, Gymnocala inflata, Solenostoma gracillimum, Pogonatum aloides, Pohlia nutans, rarely Ditrichum plumbicola beneath open cover of Calluna vulgaris). Clay soil of banks and flat ground near working china clay quarries, unshaded (with Cephaloziella sp.).
Thin clay 'soil' over horizontal concrete of ruin of china-clay dry, unshaded (with *Cephaloziella* sp.). Partly bare soil on bank at edge of clearing in conifer wood, with *Marsupella emarginata* var. *emarginata*, *Nardia scalaris*. Bit on horizontal acid soil in bare patch among *Calluna vulgaris* on heath. Compressed acid soil of partly bare patches on unshaded paths near old mine and in cemetery, (with *Archidium alternifolium*, *Ceratodon purpureus*, *Scapania compacta*). Amongst low mosses or in patchy short turf on soil on exposed cliff slopes and tops (with *Archidium alternifolium*, *Campylopus introflexus*, *Fossombronia* sp., *Polytrichum juniperinum*, *Trichostomum brachydontium*).

Near always (?) with foliar gemmae. Cper: 1, 3, 4, 8, 12. Frequently (or occasionally ?) c.fr.: immature 1, 3, 4, 12; dehisced 1, 3.

**67.1 Diplophyllum albicans** (L.) Dumort.  
Boreo-temperate Suboceanic element.


Often forms extensive patches, commonly of this species alone. Rather uncommon in Isles of Scilly. Habitat notes from C&S are as follows. On acidic rocks (mainly steep faces) and steep acidic soil in old quarries (granite, slate), on banks in woodland (deciduous and conifer), banks beside tracks, lanes and roads, stream banks, bank at edge of reservoir, banks on heaths and in acidic flushes, upper slopes of sea-cliffs, low cliffs beside creeks, groves of trees and other banks, on 'hedges', soil on top of stone walls, boulders beside reservoir and in areas of old copper mine spoil. Commonly in light to moderate shade, but sometimes in open, or sometimes heavily shaded (e.g. on rock in entrance to old mine adit) or trickling with water. Common on old metalliferous mine spoil on flat ground, gentle slopes or steep banks, often as extensive patches, sometimes in places that are apparently copper contaminated, often partly shaded by *Calluna vulgaris* or on N.-facing banks (near *Gymnocolea inflata*). Also common in crevices of walls built of or retaining mine spoil. On old walls, usually slightly to rather heavily shaded, on rock or thin soil (with e.g. *Campylopus flexuosus*, *Dicranum scoparium*, *Lophozia ventricosa*). On clay and stony soil of flat areas and banks, and on sheltered sides of granitic boulders in old china clay quarries and as colonist on banks in and around working quarries and on spoil heaps, often in large patches (with *Cephalozia bicuspidata*, *Gymnocolea inflata*, *Nardia scalaris*). Acidic soil and wet humus on banks and slopes on and above sea-cliffs. Peat and humic soil of banks on heaths and wet heaths, in mires and beside acidic flushes, locally on moribund sphagna (with *Calygoeia arguta*, *Cephalozia bicuspidata*, *Scapania irrigua*). Other associates include *Calygoeia fissa*, *Calygoeia muelleriana*, *Cephaloziella hampeana*, *Didranella heteromalla*, *Entosthodon obtusus*, *Kindbergia praelongia*, *Heterocladium heteropterum* var. *heteropterum*, *Isothecium myosuroides* var. *myosuroides*, *Solenostoma gracillimum*, *Lepidozia reptans*, *Lophozia bicornata*, *Pellia epiphylla*, *Pogonatum aloides*, *Pohlia annotina*, *Pseudotaxiphyllum elegans*, *Scapania compacta*, once each *Ditrichum plum bicola*, *Lophozia sudetica*, *Tetraphis pellucida*.

Foliar gemmae very common. Perianths common: 1-4, 6-12; capsules occasional/frequent: immature 1-4, dehiscing 2, 3; dehisced 2, 3.
67.3 *Diplophyllum obtusifolium* (Hook.) Dumort.  
Boreo-temperate Circumpolar element.


Habitat notes from Cornwall are as follows. On soil in partly bare areas on flat, open china clay/mine spoil, with *Diplophyllum albicans, Lophozia incisa*. On partly shaded, vertical clay of ditch in china-clay spoil, with *Diplophyllum albicans, Nardia scalaris*. Old china-clay spoil on bank, with *Nardia scalaris*.


68.1 *Douinia ovata* (Dicks.) H.Buch  
Temperate Oceanic element.

*2*: Kilmar Tor, 1917, FR (BM) (Paton 1969a: 703).

Habitat notes for recent finds are as follows. Rough Tor: patch on granitic rock high on tor. Carey Tor (ca 280 m alt.): dense patch on vertical N.-facing granitic rock of low crag (tor) high on S.-facing hillslope, with *Diplophyllum albicans*.

Recorded c.fr. Capsules dehisced 12 (plentiful).

69.1 *Scapania compacta* (A.Roth) Dumort.  
Mediterranean-Atlantic Suboceanic element.


Habitat notes from C&S are as follows. Unshaded to lightly shaded, acid soil on path edges, track edges, banks and slopes, thin soil over and among granite rocks and on tops and ledges of walls and 'hedges'; often on rocky hilltops, on coastal heaths or in exposed places on or above sea-cliffs (associates include *Archidium alternifolium, Ceratodon purpureus, Lophozia ventricosa, Nardia scalaris, Polytrichum juniperinum, Polytrichum piliferum, Saccogyna viticulosa, Conocephalum conicum*). On soil of banks about old granite quarries, often common, forming pure patches, associates include *Ceratodon purpureus, Nardia scalaris*, once *Lophocolea bispinosa*. In small quantity on mosses on vertical, S.-facing granite rock in quarry, unshaded. Often on old copper mine spoil and frequently where heavily copper contaminated, forming small or larger pure patches in unshaded spots on horizontal to sloping substrates, inland and on coasts, including tops of exposed sea-cliffs; common associates *Cephaloziella divaricata, Cephaloziella stellulifera, Ceratodon purpureus, Diplophyllum albicans, Gymnocolea inflata, Solenostoma gracillimum, Nardia scalaris, Pohlia annotina*; others recorded are *Archidium alternifolium, Lophozia excisa, Lophozia ventricosa, Saccogyna viticulosa, Scapania nemorea*. Colonist on clay soil of
banks, track edges, mica dam edges, etc. in and around old and working china clay quarries, commonly forming pure patches, unshaded. Thin soil in crevice in old retaining wall, almost unshaded. With *Nardia compressa* on damp granitic rock in Cornish hedge/bank. With other bryophytes on top of large unshaded granitic boulders in river.

Foliar gemmae common. Commonly c.per.: 1, 8-12. Commonly c.fr.: immature 1-3, 11, 12; dehiscing 1, 2; dehisced 1-3.

69.5 *Scapania scandica* (Arnell & H.Buch) Macvicar
Boreal-montane Circumpolar element.


Habitat notes from Cornwall are as follows. Lower Bostraze: on clayey soil of slope above disused china clay quarry, open or partly shaded (with *Nardia scalaris*). Stannon: on gritty soil of near-vertical bank amongst china clay spoil, almost unshaded (with *Lophozia incisa Nardia scalaris*). Rusey: soil high on heathy slope of sea-cliff.

Only seen with foliar gemmae.

69.6 *Scapania curta* (Mart.) Dumort.
Boreal-montane Circumpolar element.

*1*: On soil amongst shrubs, disused tin mine, *ca* 150 m alt., near Bostraze, St Just, SW33, 1998, DGL, DTH & JAP (BBSUK) (Blackstock 2004: 33). [This location is at a disused china-clay pit near Lower Bostraze, not a disused tin mine. An older report from vc1 (Paul near Penzance, 1921, WW (TTN), in Rilstone 1936) is supported only by an undeterminable sterile specimen - Paton 1969a: 704].


These are the only localities at which the species has been recorded in Cornwall.

69.10 *Scapania umbrosa* (Schrad.) Dumort.
Boreal-montane European element.


Uncommon in Cornwall, with only one recent record.
69.11 *Scapania nemorea* (L.) Grolle
Boreo-temperate European element.


Habitat notes from Cornwall are as follows. Mainly pure patches, on nearly flat clay soil of path or track edges and on low granitic rocks, along river banks and near ditches or streams, in open or partly to well shaded by deciduous woodland (associates include *Calypogea fissa*, *Cephalozia bicuspidata*, *Diplophyllum albicans*, *Gymnocolea inflata*, *Solenostoma gracillimum*, *Marsupella emarginata var. emarginata*). Soil or thin soil of flat ground, banks or slopes in areas of old copper mine-spoil, in open or part shaded by *Calluna vulgaris* or trees. Forming patches, sometimes extensive on sandy slopes or soil on flat ground in areas of old copper-mine spoil (with *Scapania compacta*, *Solenostoma gracillimum*). On rather crumbly surface of boulders at woodland edge near stream. On top of boulder near stream, well shaded by trees. On granitic boulders near ruined mine buildings, part shaded by scrub. Amongst sphagna or on bared peat on hummocks in open mires and acidic flushes; on peaty ditch-bank.

Foliar gemmae usually but not always present. Seen cper: 9.

69.12 *Scapania irrigua* (Nees) Nees
Boreo-temperate Circumpolar element.


Habitat notes from C&S are as follows. On thin compressed soil of tracks, edges of paths, on banks, in marshy depressions and other unshaded sites in areas of old copper mine spoil (associates recorded include *Archidium alternifolium*, *Fossombronia wondraczki*, *Gymnocolea inflata*, *Solenostoma gracillimum*, *Pleuridium subulatum*, *Scapania compacta*). Damp tracks in heathy areas, among Grey Willow carrs and in a conifer plantation, in open or partly shaded (associates include *Radiola linoides*, less often *Centunculus minimus*, *Cicendia filiformis*). Soil on bank at woodland edge, slightly shaded. Unshaded damp soil in trampled area near reservoir edge, with *Solenostoma gracillimum*, *Riccardia chamedryfolia*. Colonist on damp clay of sparsely vegetated banks, track edges and flat areas of clay spoil tips and in and around working china clay quarries, unshaded or lightly shaded (with *Nardia scalaris*, less often *Archidium alternifolium*, *Cephaloziella divaricata*, *Pohlia drummondii*). Also damp sand at mica dam edges. Bit on wet clay over horizontal concrete of ruin of china-clay dry, unshaded, with *Gymnocolea inflata* and *Lophozia ventricosa*. Thin soil over rocks in flood zone beside R. Tamar, part shaded. Not rare in open mires with sphagna or on bared peaty surfaces of hummocks in mires (associates recorded *Straminergon stramineum*, *Campylopus flexuosus*).

Commonly with foliar gemmae. Not recorded c.fr.
69.14 **Scapania paludicola** Loeske & Müll.Frib.
Boreal-arctic montane Circumpolar element.


This is the only record from Cornwall. DTH & JAP searched same area unsuccessfully for the species on 5 Oct. 1999, but there is much suitable habitat. JAP (pers. comm., 1999) recalled locality as the NW. part of Dewey Marsh (= ca SX154725) and mentioned that JAP 5539 had remained unidentified in her herbarium for some years after it was collected and that following identification of the specimen she had been unable to refind the plant with a day of searching.

69.15 **Scapania undulata** (L.) Dumort
Boreal-temperate European element.


Habitat notes from C&S are as follows. On rocks (and firm soil, exposed roots, etc.) in and beside quick-flowing soft-water streams and rivers, from close above summer water-level to shallowly submerged (to ca 20 cm depth); often partly shaded to well shaded (e.g. in woods, Grey Willow carrs). Common in a stream with much pollution from old copper mines, where it is the only submerged bryophyte; also in streams in china-clay district prone to heavy clay sedimentation, where again often the only submerged bryophyte; apparently intolerant, however, of eutrophication of streams due to sewage input. On rocks and hard soil in upper part of inundation zones of reservoirs. On vertical granitic and slaty rocks trickling with water, in shade of deciduous woodland. Small amount on firm soil of stream bank ca 20 cm above winter water-level. On wet china clay at unshaded edge of concrete settling tank. In marsh developing on floor of china-clay pit. Strongly toothed form on track edge on china clay spoil (with *Nardia scalaris*). On soil among stones of damp path in woodland and on a damp track near wood edge. Occasionally in open mires and acidic flushes with sphen. Flushed granitic rocks on exposed sea-cliffs (with *Blindia acuta, Solenostoma gracillimum*); flushed slaty rocks in quarry above sheltered riverbank, part shaded by trees. Once shallowly submerged in runnel in mesotrophic mire, with *Solenostoma gracillimum*. Often in pure patches but frequent associates include *Chiloscyphus pallescens, Chiloscyphus polyanthos, Fontinalis squamosa, Hygrohypnum ochraceum, Marsupella emarginata var. emarginata, Racomitrium aciculare, Platyhypnidium riparioides*; others recorded include *Leptodictyum riparium*.

69.16 *Scapania subalpina* (Nees ex Lindenb.) Dumort. Boreo-arctic montane Circumpolar element.


[Listed for vc1 in *CC* 1905, but no record traced by Paton 1969a: 704. A report wrongly attributed to vc2 (Longdowns, Falmouth, May 1936, GHA, in *B.B.S. Rept.* 3: 361 and Castell 1955: 581) is more likely to have been *S. compacta*: Paton 1969a: 704-705].

There are no recent records from Cornwall. However, JAP recorded it from Draynes Wood from the surface of a boulder in the flood-zone of the river and it may still occur there.

[69.17 *Scapania uliginosa* (Sw. ex Lindenb.) Dumort. – Old records from vc1 (Marazion Marsh, 1868, WC (NMW); Curnow 1882) are based on *S. irrigua*: Pearson 1902, Paton 1969a: 704].

69.21 *Scapania gracilis* Lindb. Southern-temperate Hyperoceanic element.


Habitat notes from C&S are as follows. Usually in patches on (often steep) surfaces of granitic rocks, less often on thin soil over and at edges of the rocks, on rocky hilltops, grassy hillsides, in old quarries, on banks of old metalliferous mine spoil and on slope above sea-cliffs, on old walls (especially north sides), most often unshaded, also part to moderately shaded in deciduous woodlands. Locally abundant on soil and ground litter amongst sparse *Calluna vulgaris* on old mine area (with *Hypnum jutlandicum*). One record on rock in area of china clay spoil. A few records on bared peat or among other bryophytes on hummocks in open mires. Also locally on Isles of Scilly on exposed peat of N.-facing banks on coastal heaths. Unusual patch on very well rotted remains of deciduous stump in young woodland near stream, with mosses, part shaded. Sometimes also on acid soil of woodland banks. Other associates include *Diplophyllum albicans*, *Lophozia ventricosa*, *Plagiochila asplenioides*, less often *Barbilophozia attenuata*, *Bazzania trilobata*, *Dicranum scottianum*, *Marsupella emarginata* var. *emarginata*, *Plagiochila spinulosa*.

Usually with foliar gemmae. One record c.fr.: capsules dehisced 4.

70.1 *Mylia taylorii* (Hook.) Gray Boreal-montane Suboceanic element.

*2: Sheltered rocks, granite slope, W. end of Kilmar Tor, Bodmin Moor (SX27), 1971, JAP (BBSUK) (Paton 1972: 133; Paton MS.: 47).

The only record from Cornwall.
70.2 *Mylia anomala* (Hook.) Gray

Boreal-montane Circumpolar element.


On more or less bare peaty surfaces in mires, including tops and sides of hummocks and banks (often growing from gelatinous algal films), on living sphagna, also on vertical damp peat of low bank at edge of acidic flush on open hillside. Normally fully insolated or almost unshaded, sometimes moderately shaded by overhanging banks. Associates include *Calypogeia fissa*, *Calypogeia muelleriana*, *Cephalozia bicuspidata*, *Cephalozia connivens*, *Lophozia ventricosa*, *Odontoschisma sphagni*, *Dicranella heteromalla*, *Sphagnum capillifolium*, *Drosera rotundifolia*; less often *Campylopus pyriformis*, *Kurzia sylvatica*, *Odontoschisma denudatum*.

Normally with plenty of foliar gemmae, but occasionally with none or very few on substantial patches of the plant (which then need careful checking to avoid confusion with *Mylia taylorii*). Cper: 10. Single record c.fr.: one nearly mature sporophyte at Harpur's Downs, 23 Sept 2000 (sporophytes very rare according to Paton 1999).

72.1 *Gongylanthus ericetorum* (Raddi) Nees

Mediterranean-Atlantic Oceanic element.


On Lizard pen. it grows on acid soil over serpentine near rocks and on a little-used path, at unshaded edge of heathland, plentiful in small area with slight flushing. Also on thin soil, partly bare, over serpentine rock on exposed unshaded slope high on sea cliff (with *Trichostomum brachydontium*), and among *T. brachydontium* on thin unshaded soil over serpentine rock in small old quarry above sea-cliff. Malloch (1972) gives fuller ecological notes on the species from the Lizard pen.

Several records from Isles of Scilly were on on acidic unshaded substrates on open coastal heathland and cliff tops; found growing on damp peat exposed in hollow in heathland, on thin compressed stony soil by path on cliff top and among other low plants on thin soil over edge of near-horizontal granitic rocks (near *Ophioglossum lusitanicum*) on heath.

Capsules not seen (unknown in B.I.).

73.1 *Southbya tophacea* (Spruce) Spruce

Mediterranean-Atlantic Oceanic element.

*1: Porth Towan, 1940, EWJ (Paton 1969a: 699). This record of material reidentified by JAP is older than that listed as new for vc1 and for Britain by Paton (1961a, 1961b: 152) [calcareous soil, refuse from mine, Gear, Perranporth, May 1960, JAP].
At Gear Sands it is locally frequent, on vertical, sloping or horizontal surfaces of mainly clayey substrates in an old mining area amongst dune grassland, growing on steep banks, bare patches among grassland and on little-used old paths and tracks; usually associated with *Leiocolea turbinata*, also varied small mosses. A much smaller population at Porthtowan was found on the unshaded base of a bank of sandy soil/mine-spoil above a track on a slope of rocky mine-spoil.

Female bracts seen: 11, 12.

74.1 *Calypogeia fissa* (L.) Raddi
Temperate Suboceanic element.

*S12*

*2: St Breward, 1905, RWS (TRU) (Paton 1969a: 696).*

Grows on acidic soil (mineral, humic or peaty), peat or peaty litter (e.g. on bases of *Molinia caerulea* or fern tussocks), among living and moribund sphagna, thin soil over rocks or occasionally on crumbling rocks; usually shaded, sometimes in heavy shade (e.g. under overhanging banks, or inside entrance to old mine adits), but also occurs in fully insolated sites. Habitats include banks in deciduous and conifer woodlands, swampy woodlands, groves of trees, Grey Willow carr, scrub, old stone quarries, china clay pits and spoil, banks beside roads, paths or tracks, banks on old mine areas, on shaded 'hedges', on stream and ditch banks, on low creek-side cliff, among granitic rocks, inside entrance to old mine adit, peaty banks on heathland, mires, and above sea-cliffs in rock-crevices or on banks and flushes. Associates often include *Calypogeia arguta*, *Cephalozia bicuspidata*, *Diplophyllum albicans*, *Lophocolea bidentata*, *Mnium hornum*, *Pellia epiphylla*, *Pseudotaxiphyllum elegans*, *Sphagnum subnitens*, less frequently *Aneura pinguis*, *Calypogeia muelleriana*, *Calypogeia sphagnicola*, *Cephalozia connivens*, *Cephaloziella hampeana*, *Lophocolea fragrans*, *Odontoschisma sphagni*, *Plagiothecium denticulatum* var. *denticulatum*, *Riccardia chamedryfolia* and *Riccardia latifrons*.

Commonly with gemmae. Two records c.fr.: capsules immature 5, dehiscing 4.

74.2 *Calypogeia muelleriana* (Schiffn.) Müll.Frib.
Boreo-temperate Circumpolar element.

*S12*

*2: Brown Willy, 1918, FR (BM) (Paton 1969a: 696).*

Forms which appear to link this species with *C. fissa* are not rare. These presumably represent variants of both species.

Habitat notes from C&S are as follows. Peat or peaty banks on heathy hillsides, in mires and beside acidic flushes. Amongst sphagna in mires (with *Sphagnum subnitens*). On decaying litter or wet peat low on *Molinia caerulea* and *Sphagnum* tussocks in mires (with *Calypogeia arguta*, *Calypogeia fissa*, *Campylopus pyriformis*, *Cephalozia bicuspidata*, *Cephalozia connivens*, *Dicranella heteromalla*, *Kurzia pauciflora*, *Kurzia sylvatica*, *Lophozia ventricosa*, *Mylia anomala*, *Odontoschisma sphagni*, *Pseudotaxiphyllum elegans*, *Pseudotaxiphyllum elegans*, *Sphagnum subnitens*, *Sphagnum subnitens*, *Aneura pinguis*, *Calypogeia muelleriana*, *Calypogeia sphagnicola*, *Cephalozia connivens*, *Cephalozia bicuspidata*, *Cephalozia bicuspidata*, *Mnium hornum*, *Pellia epiphylla*, *Pseudotaxiphyllum elegans*, *Sphagnum subnitens*, *Lophocolea fragrans*, *Odontoschisma sphagni*, *Plagiothecium denticulatum* var. *denticulatum*, *Riccardia chamedryfolia* and *Riccardia latifrons*. **
**Riccardia latifrons, Sphagnum capillifolium, Sphagnum tenellum; Drosera rotundifolia.** Persisting in part-shaded edge of mire as Grey Willow colonises. Once on damp humus in flush above N.-facing sea-cliff (with *Calypogeia fissa*). On steep, moist acid humus of streamside bank, part shaded only (with *Calypogeia fissa*). Twice in marshy areas on china-clay spoil. On acidic clayey soil of steep laneside bank, part shaded by trees (with *Calypogeia arguta*). Several records on acid humic soil or thin soil over rocks of banks or crags in deciduous woodland, sometimes with *Calypogeia fissa*, but often replaced by *Calypogeia fissa* in the drier woodland habitats. Other associates in this type of habitat: *Cephalozia lunulifolia, Diplophyllum albicans, Lepidozia reptans, Pseudotaxiphyllum elegans, Tetraphis pellucida*. On slope of old china clay spoil under young trees.


Not seen c.fr.

74.6 *Calypogeia sphagnicola* (Arnell & J.Perss.) Müll.Frib. *LS 2*

Boreo-arctic montane Circumpolar element.


[Report from vc1 (among *Sphagna*, Shepherds, near Newlyn East, May 1936, GHA, in Castell 1950: 378) was based on *C. fissa* (Paton 1969a: 696)].

Easily confused with small forms of *C. fissa*; only clearly different material placed as present species.

Habitat notes for two recent records in vc2 re as follows. Red Moor: with *Campylopus flexuosus, Cephalozia bicuspidata, Cephalozia connivens*, on wet peaty substrate in mire (near sphagna). By Dozmary Pool: with low sphagna in open acidic mire, associates included *Calypogeia fissa*.

Not seen c.fr.

74.8 *Calypogeia arguta* Nees & Mont. *S12*

Mediterranean-Atlantic Suboceanic element.


Forms low patches, sometimes extensive, or grows intermixed with other small bryophytes. On circumneutral to acidic soil (often loamy or clayey, or hard and rocky) on banks (characteristically where vertical or under small overhangs) in woodland (deciduous and conifer), groves of trees, scrub, lanesides, low on 'hedges', in old quarries, near old mine shafts, beside streams and ditches, on slopes and flushes on cliffs and above coast, usually at least partly shaded and sometimes in heavy shade beneath overhangs or in entrances to animal burrows. It often forms extensive almost pure patches. Common associates include *Calypogeia fissa, Cephalozia bicuspidata, Dictranella heteromalla, Diplophyllum albicans,*
Kindbergia praelonga, Fissidens bryoides var. bryoides, Mnium hornum, Pogonatum aloides, Pseudotaxiphyllum elegans, occasionally with Cephaloziella turneri, Epipterygium tozeri, Fissidens celticus, Fissidens polyphyllus, Solenostoma gracillimum, Rha fug, Schpen.

Other records from peaty or humic banks and decaying tussocks in heathland, mires and acidic flushes (near or with Calypogeia fissa, Calypogeia muelleriana, Cephalozia bicuspidata, Diplophyllum albicans). On decaying litter low on Molinia caerulea tussocks in mire (with Calypogeia fissa, Calypogeia muelleriana, Cephalozia bicuspidata, Cephalozia connivens, Riccardia latifrons). Acid soil of vertical path-side bank, part-shaded only (with Calypogeia fissa, Cephalozia bicuspidata). Above sea-cliffs on acid soil on banks and in and sheltered rock crevices; a bit very low on exposed sea-cliff on steep soil in small sheltered hollow.

Very commonly with gemmae. Not recorded c.fr.

75.7 Leiocolea badensis (Gottsche) Jörg. (syn. Lophozia badensis (Gottsche) Schiffn.). Boreo-arctic montane Circumpolar element.


No recent records.

75.8 Leiocolea turbinata (Raddi) H.Buch (syn. Lophozia turbinata (Raddi) Steph.). Mediterranean-Atlantic Oceanic element.


Grows as procumbent stems or forming low mats. Habitat notes from Cornwall are as follows. Gwithian Towans: patches on wet calcareous substrate of unshaded, flushed ground on sandy slope above sea-cliff (with Pellia endiviifolia). W of Bodieve: patch on loamy soil of stream bank, lightly shaded by trees. Gwithian: steep sandy soil of bank of small stream at edge of marshy grassland, unshaded and partly shaded (associates Kindbergia praelonga, Fissidens bryoides var. bryoides, Pellia endiviifolia).

Not seen c.fr.


No recent records.

78.2 *Jungermannia pumila* With. 12


Probably somewhat under-recorded as small non-fertile *Jungermannia* seen at several sites were presumably this species.

Habitat notes from Cornwall are as follows. On rocks (with thin silt or soil layer) low in flood-zone of R. Tamar, slightly shaded by edge deciduous woodland. On damp slaty rocks in low wall of ruin in light shade of Hazel coppice near stream. Thin soil film over low granitic rocks part-shaded by deciduous woodland on slope above river.

Only recorded cper: 1, 8. Commonly ? c.fr.: immature 1, 2; dehiscing 2.

79.1 *Nardia compressa* (Hook.) Gray
Boreal-montane Suboceanic element.


[Report from vc1 (Crowan, 1916, RWS, in MEC II, 1917) rejected by Paton 1969a: 698 because no specimen was traced and streams not suitable in this area].

Habitat notes for two recent records are as follows. SW. of Treswiga: on steep damp granitic rock in Cornish hedge/bank beside lane, a sheltered N.-facing site (with a little *Scapania compacta*). Near Rough Tor: on granitic rock trickling with water in unshaded flush; associates included *Sarmentypnum exannulatum*.

Not seen c.fr.

79.2 *Nardia scalaris* Gray
Boreo-temperate European element.

*1*: Buryas Bridge, Penzance, 1842, WC (NMW) (Paton 1969a: 698).

Habitat notes for records in C&S are as follows. Abundant, forming large patches on acid soil of banks and thin soil over granitic rocks in old quarries; associates include *Ceratodon purpureus*, *Diplophyllum albicans*, *Ditrichum heteromallum*, *Pogonatum urnigerum*, *Pohlia annotina*, *Polytrichum juniperinum*, *Scapania compacta*. Frequent and sometimes plentiful on acidic 'soil' or 'lithosols' on areas of old copper mine-spoil, unshaded or sometimes partly shaded; near *Ceratodon purpureus*, *Solenostoma gracillimum*, *Scapania compacta*. Abundant (one of commonest bryophytes), often in pure patches, as colonist on flat and sloping ground on clayey and gritty lithosols and on soft crumbling rock in and around old and working china clay quarries, on mica dam edges and on spoil heaps, where unshaded or
lightly shaded (often with *Cephalozia bicuspidata*, *Ceratodon purpureus*, *Polytrichum juniperinum*, *Pogonatum aloides*, *Pogonatum urnigerum*, *Scapania compacta*, *Scapania irrigua*, less often *Solenostoma gracillimum*, *Lophocolea bispinosa*, *Marsupella profunda*, *Marsupella sprucei*). Plentiful on banks and slopes on and above sea-cliffs, on acidic soil, sometimes in wet places e.g. flushes and thin soil over granite and slate rocks (associates include *Cephalozia bicuspidata*). Several records on Isles of Scilly on low damp N.-facing sea-cliffs of acid sandrock. Peaty or humic substrates of flat ground on heaths or banks on heaths or in mires, often unshaded, sometimes growing from algal mats (with *Odontoschisma sphagni*). Damp tracks in heathy areas and in conifer plantation (with *Solenostoma gracillimum*, *Pohlia annotina*). Damp soil of stream banks, almost unshaded, with *Anthoceros punctatus*, *Dicranella heteromalla*, *Dicranella rufescens*, *Lunularia cruciata*, *Pellia epiphylla*, *Phaeoceros laevis*. In small amount amongst sphagna in open mire. In small amount on steep acid soil of bank beside pasture, partly shaded by deciduous trees (with *Diplophyllum albicans*).


[80.1 *Solenostoma sphaerocarpum* (Hook.) Steph. (syn. *Jungermannia sphaerocarpa* Hook.) – Reported from vc2 (St Breward, 1907, RWS (TRU)) based on misidentification of *Nardia scalaris*: Paton 1969a: 698].

80.3 *Solenostoma gracillimum* (Sm.) R.M.Schust. S12 (syn. *Jungermannia gracillima* Sm., *Solenostoma crenulatum* Mitt.). Boreo-temperate European element.


Notes on habitats in C&S are as follows. Soil of bank beside old track in acid grassland. Clayey or firm gritty soil of banks in woodland edges. Soil on paths, at edges of tracks and on banks at edge of heath, near Grey Willow carrs and in deciduous and conifer woodslands, unshaded to moderately or sometimes rather heavily shaded. Soil of tracks and banks in old quarries, steep banks at track edges, peaty soil and firm sediments of banks and flat ground at pool and reservoir edges (including upper part of inundation-zone). Associates include *Archidium alternifolium*, *Calypogeiia arguta*, *Cephalozia bicuspidata*, *Dicranella heteromalla*, *Dicranella rufescens*, *Diplophyllum albicans*, *Nardia scalaris*, *Riccardia chamedryfolia*, *Scapania irrigua*, rarely *Pogonatum nanum*. Damp, humic or clay soil of low banks or damp old trackways on heaths (often growing from algal mat), of wet peat banks in mires, flushed granitic rocks on sea-cliff (with *Blindia acuta*, *Scapania undulata*) and earthy banks in acidic flushes and beside heathland streams. Once shallowly submerged in runnel in mesotrophic spring-fed mire, with *Scapania undulata*. Damp track in conifer plantation.
Often dominant or forming extensive pure patches on old copper-mine spoil, especially where copper-rich and damp, and there often forming pure mats and locally dominant (unshaded to lightly shaded), inland and on coasts; common associates include *Cephalozia bicuspidata*, *Cephaloziella divaricata*, *Cephaloziella stellulifera*, *Ceratodon purpureus*, *Dicranella varia*, *Diplophyllum albicans*, *Gymnocolea inflata*, *Pohlia annotina*, *Scapania compacta*; less common include *Bryum alpinum*, *Calypogeia arguta*, *Pohlia andalusica*, rarely *Ditrichum plumbicola*); often beneath open cover of phanerogams, especially *Calluna vulgaris*. Also on silty-clay, sandy silt and other substrates on banks of streams draining old mine areas (where it may be abundant and locally dominant), and in crevices of walls built of old mine spoil, unshaded to part shaded. Unshaded soil in areas of old china clay spoil and as colonist on damp clay of banks, track edges, quarry floors, etc., in old china clay quarries and near working quarries (sometimes with *Nardia scalaris*).


80.4 *Solenostoma caespiticium* (Lindenb.) Steph.  


Recorded at single site in Cornwall (earthy mine waste in valley, at old arsenic works, Luckett: JAP), with no records there since 1970.

80.5 *Solenostoma hyalinum* (Lyell) Mitt.  

*1: Trackside, Rocky Valley, Tintagel, Aug. 1960, JAP & JA (BBSUK) (Paton 1961: 152); this record is older than that listed by Paton (1969a: 698) as E. of Perranzabuloe, 1962, JAP. [A much older report from vc1 (Lower Ninnes, 1882, WC (NMW), and in Curnow 1882) was based on misidentification of *Jamesoniella undulifolia* by Paton 1972: 133].


Habitat notes from Cornwall are as follows. On inclined clay of sparsely vegetated bank of spoil near working china clay quarry, unshaded (near *Nardia scalaris*). Damp silty clay of stream banks (draining old mine area), unshaded; several large well-grown patches nearby on damp rotted leaf litter in depressions under deciduous trees, where well shaded. Steep soil of damp N.-facing river bank part shaded by sessile oakwood (with *Hyocomium armoricum*).

One record c.fr.: capsules immature 3 (rather sparse).

[80.7 *Solenostoma obovatum* (Nees) C.Massal. (syn. *Jungermannia obovata* Nees, *Plectocolea obovata* (Nees) Mitt.) – Listed for vc2 by Paton 1963: 484 and 1969a: 698; this record was referred to *J. subelliptica* by Paton 1972: 133].
80.8 *Solenostoma subellipticum* (Lindb. ex Kaal.) R.M.Schust. NS 2

*2: Wet slaty soil in old slate quarry, valley E. of Withiel, near Bodmin (SX0164), 1962, JAP (BBSUK), JAP 4599 det. JV (DTH), JAP 4680a det. JV (E) (Paton 1972:133).

This is the only record from Cornwall.

82.2 *Harpanthus scutatus* (F.Weber & D.Mohr) Spruce LS 2
Boreal-montane European element.


This is the only record from Cornwall.

83.1 *Saccogyna viticulosa* (L.) Dumort. S12
Southern-temperate Oceanic element.


Habitat notes from C&S are as follows. In pure patches or with mosses on steep acidic soil of banks and on granitic or slaty rocks in or at edges of deciduous woodland, on N.-facing hillslopes, on stream and river banks, on old 'hedges, laneside banks and on shaded walls. Associates recorded include *Brachythecium rutabulum*, *Bryum capillare*, *Kindbergia praelonga*, *Fissidens adianthoides*, *Heterocladium heteropterum* var. *heteropterum*, *Isothecium myosuroides* var. *myosuroides*, *Plagiochila spinulosa*, *Trichostomum brachydontium*. On old decorticated wood lying in flush in woodland near stream. Acid soil, damp humus and sloping granitic or slate rocks on banks and slopes on and above sea-cliffs, usually where moist or flushed, unshaded to moderately shaded.

Not seen c.fr.

85.1 *Gymnomitrion concinnatum* (Lightf.) Corda LS 2
Arctic-montane Circumpolar element.


The only Cornish record at High Cliff was from slaty rock high on cliff slope. It was searched for unsuccessfully by TLB, JGD, DGL, DTH and others during BBS Excursion in April 2000.
85.2 Gymnomitron obtusum Lindb.  LS  2
Boreal-montane European element.


This is the only record from Cornwall. It was also seen by JAP who mentioned that it was at ca SX 263723 (pers. comm. 1996). Not refound in 1997 by DTH.

86.1.a Marsupella emarginata (Ehrh.) Dumort. var. emarginata  S12
Boreo-temperate European element.


Habitat notes from Cornwall are as follows. Sides of granitic boulders and sometimes rocks in walls on old metalliferous mine areas, mainly where N.-facing, unshaded or in light shade. Also locally plentiful on unshaded flat areas and slopes of 'lithosols' on old copper mine spoil, in pure patches and with Gymnocolea inflata. On granitic rocks and on firm china clay spoil of banks in and near working quarries (china-clay and granite) and on spoil heaps, unshaded or slightly shaded, small patches or sometimes abundant. Locally plentiful on firm damp sand of unshaded pool edges (mica dams). Granitic boulder of outcrop on hillside, lightly shaded (with Scapania gracilis). Granitic boulders at top edge of inundation-zone beside reservoir, almost unshaded (near Racemitrium aciculare, Scapania undulata). On granitic rocks in sheltered 'hedges', bases of 'hedges', old walls and laneside banks, in open, partly shaded, or moderately shaded inside deciduous woodland. Patches also seen on low granitic boulders in open acid grassland, in a mire and (several times) well above to close above water level in small moorland streams. Granitic boulders in flood-zone of river. On rock and thin overlying soil in old granite quarry. Slaty rocks trickling with water after rain of sheltered laneside bank (near Diplophyllum albicans). Small patches recorded several times on firm soil in woodland: at path edges in deciduous woodland and on part-shaded bank at edge of clearing in conifer wood; with Cephalozia bicuspidata, Diplophyllum albicans, Nardia scalaris. Small patch on rock on path inside deciduous woodland on N.-facing slope, moderately shaded. Other associates recorded include Marsupella profunda, Marsupella sprucei.


86.4 Marsupella funckii (F.Weber & D.Mohr) Dumort.  LS  12
Boreo-temperate Suboceanic element.

*1: Tresawen Moor, S. of Perranzabuloe, 1917, FR (BM) (Paton 1969a: 699). (Vc1 placed in brackets because there has been no satisfactory record since 1917, comm. DTH (Blackstock 2003: 41)).

*2: Track in old slate quarry, Trewarmett, N. of Delabole (SX0686), 1965, JAP 4786 (BBSUK, E) (Paton 1967b: 399, 1969a). [However, species had been collected earlier in vc2 by JAP: with Scapania compacta, earthy bank, cliffs above Rusey Beach, High Cliff, 20/1393, 1964, JAP 4810 (E)].
The only recent record is from Rusey: on soil on heathy cliff slope.

86.5 Marsupella sprucei (Limpr.) Berne 12


Mostly recorded in and near old and working china-clay pits, also a granite quarry. A colonist, occurring in patches on clayey to gravelly substrates on banks and flat ground, unshaded or at most lightly shaded; also on inclined to horizontal surfaces of granitic boulders and other rock, especially where crumbling and soft at surface (with Marsupella profunda, Nardia scalaris, Pogonatum urnigerum, less often Cephaloziella divaricata, Marsupella emarginata var. emarginata).

Two records away from china-clay workings as follows. Small patch on thin gritty soil over sloping granitic rock of large boulder in quarry, almost unshaded, with Cephaloziella divaricata, Ditrichum heteromallum, Nardia scalaris, Pogonatum urnigerum. Single small patch on granitic boulders in mine-spoil on N.-facing hillside, almost unshaded, near Marsupella emarginata var. emarginata.

Commonly cfr; capsules immature 1-3, 11, 12; dehiscing 1, 3, 12; dehisced 3.

86.6 Marsupella profunda Lindb. NR:VU S8 12


All British records are from Cornwall. Holyoak (2010a) gives a summary of steps taken for conservation of the species in Cornwall between 1990 and 2010.

It is a colonist, occurring in patches on clayey to gravelly substrates on banks and flat ground in and around old and working china clay quarries, unshaded or at most lightly shaded; also on inclined to horizontal surfaces of granitic boulders (less often on vertical or overhanging granite), especially where crumbling and soft at surface (nearly always with Marsupella sprucei and Nardia scalaris; other common associates include Cephaloziella divaricata, Pogonatum urnigerum, less often Dicranoweisia cirrata, Marsupella emarginata var. emarginata).
*Marsupella sprucei* occurs at most sites where present species is known and often they are closely intermixed. Overall, it appears that *M. profunda* is relatively commoner in more sheltered, humid places on substrates that are more water-retentive, whereas *M. sprucei* extends on to quicker drying substrates in more exposed places.

Commonly cfr; capsules immature 11, 1-3; dehiscing 1-3; dehisced 3.
MOSSES (BRYOPHYTA)

[1.1 *Sphagnum austinii* Sull. (syn. *S. imbricatum* Hornsch. ex Russow subsp. *austinii* (Sull.) Flatberg) – Paton 1969a: 708 recorded that a letter from Curnow to Holt dated 1883 (*DGS*) states that *S. austinii* and *S. laricinum* (= *S. contortum*) from Stabler and MacAndrew were 'planted in our moors'. There is no evidence that either species survived in Cornwall].

1.3 *Sphagnum papillosum* Lindb. 12
Boreo-temperate European element.

*1*: Tremethick Moor, Penzance, 1876, WC (*CMM*) (Paton 1969a: 708).

Almost all records are from wet, acidic, peaty substrates on open areas of wet heath (including heath on almost flat ground and on flushed side of a small valley) or in oligotrophic mires, where it forms low hummocks or diffuse patches. Common associates include *Sphagnum capillifolium*, *Sphagnum cuspidatum*, *Sphagnum denticulatum*, *Sphagnum fallax*, *Odontoschisma sphagni*, *Erica tetralix*, *Eriophorum angustifolium*, *Molinia caerulea*; less often *Sphagnum fimbriatum*, *Erica ciliaris*, *Narthecium ossifragum*, *Schoenus nigricans*, *Ulex gallii*. Three other records were from open acidic flushes; two in small mires formed in hollows near old china clay pits or spoil tips, with other sphagna.

One record c.fr.: dehisced 9.

1.4.a *Sphagnum palustre* L. var. *palustre* 12
Boreo-temperate Suboceanic element.


Forms patches or more extensive lawns. Habitat notes from Cornwall are as follows. On wet, acidic substrates in open or slightly to moderately shaded places; twice on wet heaths (vc1; once with *Sphagnum fallax*); other records: once at base of tall *Molinia caerulea* tussocks in degenerating mire, twice in young colonising carr of Grey Willow on degenerating mires, four times in old, sometimes rather open, carr of Grey Willow (where perhaps relict of more open conditions; near *Sphagnum fallax*, *Sphagnum subnitens*); flushed stream bank in deciduous woodland, damp N.-facing hillslope at edge of Sessile Oak wood; three times from wet marshes at edges of china-clay workings or spoil heaps (in two of the sites forming large hummocks among *Molinia* tussocks); once from marshy hollow near old mine-spoil and at edge of Grey Willow carr. Several times in open mires among other sphagna, *Juncus* or *Molinia* tussocks, but then usually where some flushing or nutrient or mineral enrichment is apparent, and generally in more mesotrophic habitats than *Sphagnum papillosum*. In vc2, also as colonist of mires on old china-clay areas, e.g. below old china-clay spoil heaps and small wet hollow at edge of working china clay pit. Patches in open grazed mire; acidic flushes on open grassy hillsides and once in flush in pasture, slightly shaded (near *Sphagnum inundatum*). Twice on damp ground of stream banks, in open or slightly shaded (with *Sphagnum inundatum*). Associates recorded in carr include *Sphagnum squarrosum* (once), on degenerating mire with or near *Sphagnum denticulatum*, *Sphagnum fallax*, *Sphagnum subnitens*, much *Molinia caerulea*. Near old china-clay pit
with *Polytrichum commune*, *Sphagnum fimbriatum*, *Juncus effusus*. Unusual record of small plants in plant-pot containing small shrub at Burncoose Nursery; presumably grown from spores in horticultural peat.

Occasionally (?) c.fr.: capsules dehisced 10.

1.4.b Var. *centrale* (C.E.O.Jensen) A.Eddy is regarded as a distinct taxon (as in Daniels & Eddy 1990: 50, Hill *et al.* 2008), but all Cornish records should apparently be referred to var. *palustre*.

1.5 *Sphagnum magellanicum* Brid. LS 2 Boreal-montane Circumpolar element.


Only site in Cornwall is SW. of Bowithick, where it is present in several small patches (totalling less than 1 square metre) in open, oligotrophic mire. Commonest associates are *Sphagnum fallax* and *Sphagnum papillosum*, others present in smaller amounts are *Straminergon stramineum*, *Polytrichum commune*, *Drosera rotundifolia*, *Juncus acutiflorus*, *Menyanthes trifoliata* and *Molinia caerulea*.

Not seen c.fr.

1.6 *Sphagnum squarrosum* Crome 12 Wide-boreal Circumpolar element.


In wet mesotrophic habitats. Habitat notes from Cornwall are as follows. In vc1 at Porkellis Moor in hollows on wet heath partly shaded by Grey Willow, also on earthy roots emergent from shallow pool in carr of Grey Willow on area of old mining ground. In vc2 nine records: in Grey Willow carrs; in unshaded marshy hollows in old china-clay workings; in small mire in hollow partly under Grey Willows at edge of wet heaths; in wet hollow in old china clay spoil heap, slightly to rather heavily shaded by Grey Willow scrub; weak-looking plants in ditch beside track in rather heavy shade of spruce plantation. Associates recorded in Grey Willow carrs are *Polytrichum commune* var. *commune*, *Sphagnum fallax*, *Sphagnum fimbriatum* and *Sphagnum palustre*. In china-clay pit marshes with *Solenostoma gracillimum*, *Scapania undulata*, *Sphagnum denticulatum*, *Juncus effusus*.

Not seen c.fr.
1.8 *Sphagnum fimbriatum* Wilson
Wide-boreal Circumpolar element.

*1:* Penzance, 1882, WC (B) (Paton 1969a: 709).

On wet, acidic but mesotrophic sites, in open or lightly to moderately shaded (by Downy Birch, Gorse or Grey Willow); often forming large patches or sometimes extensive carpets. All six records from vc1 were associated with old mining areas or drainage from metalliferous mine-spoil, in wet heath, hollows with heathy vegetation, among *Juncus effusus* in marshy area, on peaty soil of damp bank, on floor of young birch woodland, alongside stream and beside a small spring. Eight vc2 records were associated with old china-clay workings or other excavations (including very old gravel pits): under or close to edges or young growths of Grey Willow scrub at wet heathland edges or among *Molinia caerulea* tussocks or in mature Grey Willow carr. One vc2 record in shallow water of hollow of old mine working near stream, well shaded inside grove of deciduous trees. Two vc2 records on wet heaths in areas formerly much disturbed by tin-streaming. Associates recorded include *Polytrichum commune* var. *commune*, *Sphagnum denticulatum*, *Sphagnum papillosum*, *Sphagnum squarrosum*, *Juncus effusus*, also bits of *Pseudoscleropodium purum*, *Thuidium tamariscinum*, *Hedera*.

4 records c.fr.: capsules immature 5-7, dehiscing 7, dehisced 1, 4, 7.

[19 *Sphagnum girgensohnii* Russow – Reports from vc1 (Tremethick Moor, 1876, in Ralfs & Curnow MS. 1881; Penzance, in Holmes 1906) not supported by specimens; vc2 report (Hustyn Wood, in Tellam 1888) not supported by specimen, and later gathering (Hustyn Wood, 1895, RVT (TRU)) is misidentified *S. subnitens*: Paton 1969a: 709].

1.11 *Sphagnum quinquesfarium* (Braithw.) Warnst.
Boreal-montane Suboceanic element.

*2:* Near Looe, 1921, FR (EXR) (Paton 1969a: 709). [Earlier record (Helman Tor, 1882, RVT (B), and in Tellam 1888) is misidentified *S. subnitens*: Paton 1969a: 709].

[vc1 records (several specimens from near Penzance, 1884, WC (OXF)) are all *S. capillifolium*: Paton 1969a: 709; vc1 therefore deleted by Crundwell 1970: 195].

Found at Inny Ham on damp bank beside track in deciduous woodland on N.-facing hillside.

Not seen c.fr.

1.13.b *Sphagnum capillifolium* (Ehrh.) Hedw., subsp. *rubellum* (Wilson) M.O.Hill

*2:* Near Helman Tor, 1878, RVT (TRU) (Paton 1969a: 709).
Paton (1969a: 709) tentatively recognised both *S. rubellum* and *S. capillaceum* in Cornwall. Specialists have since recognised only subsp. *rubellum* as occurring here, the range of the rarer subsp. *capillifolium* being predominantly more northern in Britain (Blockeel & Long 1998: 64). However, subsp. *capillifolium* has recently been recorded in S. Devon (Hill et al. 2008) so it may be unsafe to assume it does not occur in Cornwall. In the past these taxa have not usually been recognised by British workers because intermediate forms are apparently common (cf. Hill 1976, Daniels & Eddy 1990: 96-97); research on systematics of the group is continuing (Cronberg 1989). Subspecific identification of specimens from Cornwall has not been attempted during the present study.

In open, acidic and oligotrophic mires and heathy or grassy edges of mires. Associates include *Calypogeia fissa*, *Calypogeia muelleriana*, *Cladopodiella fluitans*, *Hypnum jutlandicum*, *Kurzia pauciflora*, *Mylia anomala*, *Odontoschisma sphagni*, *Rhytidiadelphus loreus*, *Sphagnum cuspidatum*, *Sphagnum denticulatum*, *Sphagnum fallax*, *Sphagnum papillosum*, *Sphagnum tenellum*, *Sarrancina exannulatum*, *Calluna vulgaris*, *Drosera rotundifolia*, *Molinia caerulea*, other grasses. Old hummocks of *Sphagnum capillifolium* form the characteristic habitat of the rare *Jamesoniella undulifolia* (q.v.), as well as one of the habitats of commoner small liverworts such as *Cephalozia connivens*, *Kurzia pauciflora*, *Lophozia ventricosa*, *Mylia anomala*, *Odontoschisma sphagni*. Tends to avoid the wettest areas, or restricted to tops of hummocks there. Also in open acidic flushes on hillsides and wet heathy slopes. Only vc1 record was from extensive, acidic flush on slope above sea-cliff. Several records in flushes and mires among old china-clay workings, e.g. below old china clay spoil tips, and in marsh developing on floor of pit, usually with other sphagna.

Not seen c.fr.

[1.14 *Sphagnum fuscum* (Schimp.) H.Klinggr. – Vc1 reports (Beyond Ding Dong mine and Carn Galver Moor, in Curnow 1884) not supported by specimens: Paton 1969a: 709; vc1 records therefore rejected by Crundwell 1970: 195].


*1*: Tremethick Moor, 1867, WC (PNZ) (Paton 1969a: 709).

One of our commonest sphagna and probably the most tolerant among the common species of somewhat base-enriched groundwater giving mesotrophic conditions. Occurs on wet, more or less acidic, mainly peaty substrates, mostly in open or lightly shaded places, where it typically forms low, pure hummocks. Most records are from wet heaths or mires (where usually associated with flushes and mainly absent from flat areas of open oligotrophic mire); also recorded several times on flushes on and above sea-cliffs, flushes on hillsides inland, from wet heath on flushed valley side-slope, flush in pasture, and in or near old and working china-clay quarries. Associates recorded include *Calypogeia fissa*, *Cephalozia bicuspidata*, *Sphagnum denticulatum*, *Sphagnum inundatum*, *Sphagnum fallax*, *Sphagnum fimbriatum*, *Sphagnum palustre*, *Sphagnum papillosum*, *Carex caryophyllea*, *Erica tetralix*, *Molinia caerulea*, *Ulex gallii*; less often *Aneura pinguis*, *Riccardia chamedryfolia*, *Riccardia latifrons*, *Carex echinata*, *Erica ciliaris*, *Juncus inflexus*, *Schoenus nigricans*. 

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Less typical records from wet ground in carrs of Grey Willow, including well-grown Grey Willow scrub (which had colonised former heaths; near *Sphagnum fallax, Sphagnum palustre*); also at base of tall *Molinia caerulea* tussocks in degenerating mire. With other sphagna in flushes at edge of mire below old china-clay spoil tips.

Commonly c.fr.: capsules dehiscing 6, 7; dehisced 7, 8.

1.17 *Sphagnum molle* Sull.  
Temperate Suboceanic element.


Single record in Cornwall as above. Not refound there recently.

1.19 *Sphagnum compactum* Lam. & DC.  
Boreo-temperate Circumpolar element.


Forms dense lawns and low rounded hummocks (height 5 cm or less). Characteristic of damp acid soils or peaty slopes with very low, closely grazed vegetation. Occurs only in fully insolated sites, on wet heathland (including heaths over serpentinite on Lizard pen.), at edges of mires and in grassland at base of slopes adjoining mires and acidic flushes. It disappears when heathland vegetation is left ungrazed or unburnt, since the resulting tall growth shades its low hummocks. Associates recorded were *Agrostis curtisii, Calluna vulgaris, low Carex spp., Erica tetralix, Juncus effusus, Molinia caerulea* and *Ulex gallii*.

Not seen c.fr.

[1.20 *Sphagnum subsecundum* Nees – Records for vc1 (Curnow 1884, Rilstone 1922) were deleted by Paton 1969a: 708 and Crundwell 1970: 195. However, the vc2 record 'S. subsecundum var. subsecundum' (Redgate, W. of St Cleer, 1924, RWS (OXF)) listed by Paton 1969a: 708 should also be deleted, *fide* J.A. Paton MS. 1986].

1.21 *Sphagnum inundatum* Russow  


The taxonomic treatment of this form has been controversial; it was treated as a distinct species by Blockeel & Long (1998: 65) and Hill (in Smith 2004: 80), as *S. subsecundum* subsp. *inundatum* by Daniels & Eddy (1990: 143; cf. Eddy 1977), but as *S. auriculatum* var. *inundatum* by Hill (1975). Species rank seems undeserved because Cornish material of *inundatum* seems poorly differentiated from *S. auriculatum* in both morphology and
ecology. Furthermore, enzyme data do not support its recognition as a separate species (Krzakowa & Melosik 2000, Brugués et al. 2004: 48).

To the non-specialist on sphagna this taxon appears to be only a rather ill-defined var. of *Sphagnum denticulatum*, with some material apparently linking them, at least in respect of the extent of the fibrillose zone on the stem leaves. However, a population SE. of Roche in wet Grey Willow carr appears to be a mixture of both forms, with *Sphagnum inundatum* possibly on slightly wetter areas. It was also mixed with *S. denticulatum* on very wet heath with shallow water beside pools NE. of Bugle, *S. inundatum* growing there at slightly higher levels than the *S. denticulatum*.

(Pre-1993 records of this var. may include some misidentified *Sphagnum denticulatum*, fide J.A. Paton MS. note dated 1995).

Recorded from variety of wet, acidic sites on peat or peaty substrates, mainly in open or lightly shaded; forms small carpets or low hummocks. Most records are from hollows in wet heaths or in mires (on open ground and on boggy side-slope of valley), with several in wet areas in carr of Grey Willow. Also recorded at edge of heathland pool, base of *Juncus* and *Molinia caerulea* on overgrown mire, in wet hollow among heaps of old mine-spoil (E. of Goonhavern), wet hollows in china clay workings, flush in pasture, in small quantity in extensive flush on slope above sea-cliffs (N.of Morvah), and in shallow water in hollows at base of flushed granitic crag, partly shaded by deciduous woodland (Luxulyan Valley). Common associates include *Sphagnum subnitens*, *Erica tetralix*, *Molinia caerulea*, *Ulex gallii*; frequent associates include *Aulacomnium palustre*, *Straminergon stramineum*, *Sphagnum denticulatum*, *Sphagnum fimбриatum*, *Sarmentypnum exannulatum*, *Erica ciliaris* and *Schoenus nigricans*.

Occasionally [?] c.fr.: capsules dehisced 8.


*2*: Helman Tor, 1882, RVT (TRU) (Paton 1969a: 709).

The most widespread *Sphagnum* and often common, tolerating variety of mesotrophic habitats but local and mainly in pools in the more oligotrophic mires. Characteristic of wet places on heathland with short vegetation, where it is often an early colonist on bare peat following fires or heavy grazing, but where like other sphagna it tends to be excluded as ungrazed or unburnt vegetation becomes tall, persisting longest along tracks or pathways and in other more open areas. Also in a variety of other wet, base-deficient sites including mires (on damp often flushed surfaces or in shallow pools), flushes (including those above and occasionally on sea-cliffs), wet pastures with *Juncus effusus*, wet carrs of Grey Willow, ditches, acidic flushes, trackside ditches, edge of a reservoir and edges of soft-water pools and streams (where often shallowly submerged). Most often in unshaded places, but tolerates moderate shade inside degenerating mire (e.g. at base of tall *Molinia caerulea* tussocks), Grey Willow carrs, deciduous woodlands or conifer plantations. Substrates are
more or less acidic and usually of wet peat or other humic materials, but it will occur among rocks or on mineral soils in more or less permanently wet sites. Several records from in or near old (and not so old) stone and china clay quarries, flushes below china-clay spoil tips and one from hollows among old metalliferous-mine spoil. Found in quantity floating in stream north of Crow’s Nest, with loose Scapania undulata, both evidently washed downstream following heavy rain. Common associates on heathland include Aulacomnium palustre, Calluna vulgaris, Juncus effusus, Molinia caerulea, Ulex gallii; more local associates there or in mires and pools may include Aulacomnium palustre, Straminergon stramineum, Sphagnum palustre, Sphagnum squarrosum, Sphagnum subnitens, Sarmentypnum exannulatum; small Carex spp., Eleogiton fluitans, Erica ciliaris, Eriophorum angustifolium, Hydrocotyle vulgaris, Hypericum elodes, Glyceria spp., Juncus bulbosus, J. effusus, Potentilla palustris and Schoenus nigricans.

Occasionally c.fr.: capsules dehiscing 8.

[1.23 Sphagnum contortum Schultz – Paton (1969a: 708) noted that all available material claimed as this species from vc1 and vc2 is ‘S. subsecundum s. l.’ i.e. S. denticulatum or S. inundatum. She also mentioned that a letter from Curnow to Holt dated 1883 (DGS) states that S. austinii and S. laricinum (= S. contortum) from Stabler and MacAndrew were 'planted in our moors'. There is no evidence that either species survived in Cornwall].

1.25 Sphagnum tenellum (Brid.) Pers. ex Brid. 12
Boreo-temperate Suboceanic element.


Scarce in vc1, where recorded only on open heathland with low vegetation, on moist or wet, acidic peat substrates, but sometimes on drier ground than our other sphagna. At Chykembro Common seen in rather thinly or sparsely vegetated areas on gentle slopes, apparently on recently burnt ground. On several other heaths seen only in nearly flat areas with low herbaceous vegetation. It is presumably lost from heathland areas where lack of grazing or burning results in the vegetation growing tall. In vc2 in short vegetation of grassy edges of mires, in open places in mires along valley bottoms, as minor component on hummocks in some mires, on peaty banks in mires, on wet heath with short vegetation and in open acidic flushes on hillsides. One record in open area of wet heathy vegetation on old china-clay workings. Locally plentiful on wet heathland at Retire Common. Associates recorded include Calypogeia muelleriana, Kurzia pauciflora, Sphagnum capillifolium, Calluna vulgaris, Drosera rotundifolia, Erica tetralix and Molinia caerulea.

Frequent (or common ?) c.fr.: capsules immature 4, 5; dehisced 8.


*2*: Temple Moor, 1881, RVT (B) (Paton 1969a: 708).

Scarce in vc1, where recorded only on wet, acidic heathland. On Woon Gumpus Common seen as colonist on sparsely vegetated areas of wet peat where vegetation had been burnt some years previously; on Chykembro Common it formed low hummocks or carpets in wettest areas on heath; near Carn Galver it was found along a damp, little-used pathway in wet heath and was absent from areas of tall *Molinia caerulea* dominated vegetation nearby. In vc2 often common in wet parts and submerged in pools of mires (associates include *Sphagnum capillifolium*, *Sphagnum fallax*, *Sphagnum papillosum*, small *Carex* spp. and *Eriophorum angustifolium*, but most often locally dominant in shallow depressions); also in flushed areas on hillsides, with other sphagna, low grasses and sedges and patchy *Juncus effusus*, and in small mires or other hollows in wet heath. Several records from wet heathy areas among old china clay workings or adjoining them, including floor of shallow ditch. Associates commonly recorded include *Sphagnum denticulatum*, *Sphagnum papillosum*, *Sarmentypnum exannulatum*; *Calluna vulgaris*, *Erica tetralix*, *Eriophorum angustifolium*, *Molinia caerulea*.

Occasionally (?) c.fr.: capsules immature 6, dehiscing 6, dehisced 6, 8.


[1.29 *Sphagnum pulchrum* ( Lindb. ex Braithw.) Warnst. – Report from vc1 (Penzance, AL, in Horrell 1900) not supported by specimen; reports from vc2 (Near the Cheesewring, 1921, FR (BM); Red Moor, RWS (TRU); and other gatherings) are based on *S. fallax*: Paton 1969a: 708].


*1*: Madron Moor, 1864, WC (PNZ) (Paton 1969a: 708). This record is older than that listed as new for vc1 by Warburg (1962: 365).


*S. fallax* and *S. flexuosum* are treated as distinct species following Daniels & Eddy (1990: 180) and Hill (in Smith 2004; cf. Hill 1977a). *S. fallax* subsp. *isoviitae* is treated as a synonym of *S. fallax* for reasons given by Hill (in Smith 2004: 97).

Only vc1 record (Porkellis Moor) in hollows in wet heath, in one place with *Sphagnum palustre* near Grey Willow bushes. In vc2 recorded in plenty in most valley mires, in open sites over substrates of wet, acid peat, forming lawns or carpets or low hummocks, that are often extensive. Also less extensive in small mires on wet heathland, in acidic flushes or in wet hollows in heavily grazed mires. Associates include *Odontoschisma sphagni*. 
Pleurozium schreberi, Sphagnum capillifolium, Sphagnum denticulatum, Sphagnum papillosum, Calluna vulgaris, Erica tetralix, Juncus acutiflorus, Molinia caerulea, less often Dicranum bonjeanii. Apparently tolerant of slight eutrophication and disturbance in mires. Also in mires or wet heathy areas on old china-clay workings, with other sphagna. Three records of it growing well shaded on flushed ground inside old Grey Willow carrs (where presumably relic from more open conditions; associates Sphagnum palustre, Sphagnum squarrosum, Sphagnum subnitens).

One record c.fr.: dehisced: 9.

1.31 Sphagnum flexuosum Dozy & Molk. LS [2]
(syn. S. recurvum P. Beauv. var. ambylyphyllum (Russow) Warnst.). Boreo-temperate European element.


The only record from Cornwall.

S. flexuosum is treated as a distinct species following Daniels & Eddy (1990: 180; cf. Hill 1977a) and Blockeel & Long (1998). It is known in Cornwall only from Smitham's 1921 gathering from St Cleer. Hill et al. (1992: 48) show a post-1950 record from hectad 20/26, which corresponds to a post-1969 record in the BRC database attributed to JAP, but an error is involved since Mrs Paton (pers. comm., 27 Mar. 2001) has never recorded it in Cornwall.

[1.34 Sphagnum riparium Ångstr. – Report from vc1 (Gurnard's Head, 1883, JR & WC, in Rilstone 1949) is probably based on a specimen leg. WC (OXF) which is S. fallax: Paton 1969a: 708].

2.2.a Andreaea rupestris Hedw. var. rupestris LS [1]
Boreo-arctic montane Circumpolar element.


[Vc2 records (Rough Tor, in Tellam 1888; Gam Bridge, 1871, RVT (B); Gunwen Moor, RVT (CMM); Luxulyan, 1906, RWS (TRU)) are based on misidentified A. rothii: Paton 1969a: 709].

Known in Cornwall only by specimen in BM from 'Helston' noted above. Although the record was accepted as correct by Paton (1969a: 709) and Murray (1988: 71-72), there must be a lingering suspicion that the locality may have been erroneously recorded (or that Helstone in vc2, or Helton near Penrith was involved), especially since the close vicinity of Helston has hardly any suitable rock exposures.
2.6 Andreaea rothii F.Weber & D.Mohr

The revision by Murray (1988) recognised two subspp. within A. rothii. Older records of subspp. and vars. under the same names were based on partly different criteria and may not be entirely equivalent. Murray (op. cit.: 54) admitted that there is a 'small amount of material with features in all ways intermediate', but this appears to underestimate the frequency of intermediate specimens. Indeed, Paton (1969a: 709) did not record these forms separately because they appear to intergrade, and my own experience is that intermediate specimens are so common in Cornwall as to render distinction between them troublesome and apparently of little value. Many plants seem to have leaf characters of subsp. falcata but only low papillae on the inner perichaetial bracts. Intermediates are also frequent in Devon (M. Pool, pers. comm.) and elsewhere in Britain (T. L. Blockeel in litt.). Only occasional attempts have been made to record the subspp. separately during the present study, resulting in a paucity of mapped records at subspp. level.

The species as a whole grows on unshaded granitic rocks, on horizontal, sloping and vertical surfaces, including boulders in old walls.

Commonly c.fr.: capsules immature 4, 9-11, dehisced 4, 7.

2.6.a Andreaea rothii F.Weber & D.Mohr subsp. rothii

Boreo-temperate Suboceanic element.

+2: On steep, exposed face of boulder of granitic rock, Rough Tor, Bodmin Moor, SX18, 1993, DTH 93-149A (DTH) (Blockeel 1999: 11).

Only records from Murray (1988) and subsequently are listed for this subsp.

Forms small patches, usually pure, occasionally larger or intermixed with other epiliths (especially Racemitrium heterostichum and lichens). Grows on unshaded, mainly sloping (often gently inclined) surfaces of granitic rocks (large boulders, blocks, outcrops) on hillsides, in acid grassland, in areas of old rocky mine spoil, in and near disused quarries.

Commonly c.fr.: capsules immature 2, 3, 5, 10; dehiscing 3; dehisced 3, 5.

2.6.b Andreaea rothii subsp. falcata (Schimp.) Lindb.

Boreo-temperate European element.


See notes above regarding recognition of subspp. and the frequency of intermediate specimens in Cornwall. Only records from Murray (1988) and subsequently are listed for this subsp.

Grows on unshaded, sloping surfaces of granitic rocks on hillsides, in heaths, about tors or in pastures, and on a heathy slope in area of old mine-spoil. Closer associates include Grimmia trichophylla, Hedwigia stellata, Racomitrium heterostichum.

Commonly c.fr.: capsules immature 2, 10, 12; dehisced 5, 7.

[4.1 *Atrichum crispum* (James) Sull. – A record from vc1 (on soil on shady bank by stream, Bonython Plantation, Lizard Peninsula, 1967, MFVC & JSP (BBSUK)) listed by Crundwell 1968: 630 and Paton 1969a: 710 is based on misidentified immature plants of *A. undulatum* (det. DTH, in Rothero 2010: 64)].

4.2 *Atrichum tenellum* (Röhl.) Bruch & Schimp. NS 12
Boreo-temperate Circumpolar element.


Easily confused with some immature plants of *Atrichum undulatum* that lack transverse undulation on the leaves, although the present species tends to have wider leaves. It also differs in other leaf characters (Smith 2004). Apparently also differs in frequent presence of tubers on rhizoids, although these have not been confirmed in British material, despite several quick searches of Cornish specimens.

Small patches or forming low turfs. Habitat notes from Cornwall are as follows. Near Porkellis Moor: as apparent colonist on almost bare gritty soil on gravel of fairly recently dug-out edge of small stream in marshy pasture; unshaded; two years later site with much more cover of grasses and herbs and species not seen in brief search. S. of Temple: small patches on wet mineral soil of low mounds in mire below china-clay spoil, unshaded. Stithians Reservoir, Colliford Lake and Siblyback Lake: on firm sediment or hard soil of banks or flat ground exposed high in inundation zone beside reservoirs, unshaded or partly shaded by Grey Willow scrub. Crowdy Reservoir: on unshaded peaty mud exposed close to normal shore-line (with *Dicranella rufescens, Pohlia camptotrichela*). Goss Moor: on unshaded or almost unshaded damp clayey soil of track and its edges (surfaced with china-clay spoil) in open disturbed areas among wet heaths, rush pastures and Grey Willow carrs (with *Bryum bornholmense, Dicranella heteromalla, Ditrichum heteromallum, Fossombronia incurva, Solenostoma gracillum, Phaeoceros laevis*). Fowey Valley: patches on sandy sediment of steep bank beside river, almost unshaded.

One recent record c.fr.: capsules immature 11 (Goss Moor).

*2*: Withiel, 1867, RVT (B) (Paton 1969a: 710).

Var. *gracilisetum* Besch. is a rare plant with no modern British records and none of any age from SW. England (Hill *et al.* 2008). Fertile plants of that var. should be distinctive because of the yellowish (not reddish) seta and straight or slightly curved (not curved) capsules, but plants without sporophytes are reported to differ only in the paroicous (rather than usually autoicous) sexuality (Smith 2004: 136) so they would normally be overlooked. Nevertheless, since fertile plants of *var. undulatum* are common in Cornwall it is probably a safe assumption that all or nearly all of our records can be referred to this taxon.

Grows as patches which may extend to form low lawns. On soil, typically more or less acidic and clayey or loamy, e.g. in short grassland (such as on or near graves or on banks, e.g. in churchyards or cemeteries), woodland (deciduous and conifer, e.g. on banks, path-sides, or colonising soil among roots of wind-thrown Beeches), groves of trees, Grey Willow carrs, scrub, on hedge-banks, in gardens, in quarries, on old mine-areas (but only where not heavily copper-contaminated), on banks or flat ground in and around working china-clay quarries, on roadside banks and river and stream banks. Occurs in full sunlight and in moderate to fairly heavy shade. Apparently avoids both very dry and very wet sites. Occurs above cliffs, but not in sites exposed to much salt spray. Associates often include *Brachythecium rutabulum*, *Kindbergia praelonga*, *Mnium hornum*. Many others recorded include *Campylopus pyriformis*, *Cephalozia bicuspidata*, *Gymnocolea gracillimum*, *Lophozia incisa*, *Pohlia camptotrichela*, *Riccardia latifrons*, *Riccardia multifida*. Less typical sites seen on drying mud of small stream in wet heath (Ventongimps); soil or old mortar in crevices of mortared-stone wall; on soil in plant-pots in nursery (Burncoose); on soil in sheltered bulb-field near coast (Mousehole); young plants on soil in arable (cereal stubble) field.

Commonly c.fr.: capsules immature 1, 2 (3), 7-12; dehiscing 1-3 (4), 11, 12; dehisced 1-9 [10], 11.

5.1 *Oligotrichum hercynicum* (Hedw.) Lam. & DC. Boreo-arctic montane Circumpolar element.

*2*: Lane near St Cleer, 1918, RWS (TRU) (Paton 1969a: 710).

A local colonist forming small mainly pure patches on mainly bare, damp to rather dry, acid substrates that may be clayey, gritty or stoney and horizontal to steeply sloping. Once on vertical face of a crumbling granitic boulder. Commonly unshaded, but also seen partly shaded by Grey Willows and on steep, N.-facing banks. Found most often in and near recently abandoned and working parts of china clay quarries and beside the adjoining tracks and spoil heaps, and on edges of mica dams, especially on sandy or gritty substrates and
sometimes where flushed with water and on banks and flat areas of old copper-mine spoil on Bodmin Moor. Associates include _Nardia scalaris, Pohlia annotina_.

Sporophytes never recorded in Cornwall.

6.1 _Pogonatum nanum_ (Hedw.) P.Beauv. (syn. _Polytrichum nanum_ Hedw.). Temperate European element.

*2: Dunmere Wood, Bodmin, 1880, RVT (B) (Paton 1969a: 710).

Only recorded with well-grown capsules, since non-fertile plants cannot reliably be distinguished from those of the much commoner _Pogonatum aloides_.

Generally uncommon despite there being plenty of apparently suitable habitats. Colonist on bare or partly bare acidic soils (loamy, gravelly or stony) of flat ground and banks, fully insolated or partly shaded (by bushes or saplings). Recorded in and near old quarries, on mine-spoil, on china-clay spoil (once), on roadside and pathside banks, on slopes above sea-cliffs and beside path in acidic grassland. Associates recorded include _Dicranella heteromalla, Solenostoma gracillimum, Pogonatum aloides_.

Commonly c.fr.: capsules immature 1, 10; dehiscing 1, 5; dehisced 3, 4, 7.

6.2 _Pogonatum aloides_ (Hedw.) P.Beauv. (syn. _Polytrichum aloides_ Hedw.). Boreo-temperate European element.

*2: Bodmin, 1887, RVT (B) (Paton 1969a: 710).

Only recorded with well-grown capsules since non-fertile plants are not reliably separable from the rarer _Pogonatum nanum_. Non-fertile (single-sex) colonies are frequent, so species is presumably somewhat under-recorded. DTH records all discriminated between the common 'var. _aloides_' and the rarer var. _minimum_ covered in the following account. A few recent records by other bryologists did not identify the plants varietally; these are mapped as typical var. _aloides_ since var. _minimum_ is much rarer and also sufficiently distinctive to attract attention.

A colonist of bare acidic soil, characteristically on steep or vertical loam or clay on banks, where it often forms extensive pure patches, but also on flat ground at times, occasionally on peaty or gravelly substrates. Commonly grows in sheltered sites or partly shaded by woodland (deciduous or conifer), but also in fully insolated sites. Non-fertile plants presumed to be this species sometimes occur in heavy shade, e.g. under Beeches. In addition to typical sites on banks in or near woods and banks beside lanes, tracks, paths, streams and a reservoir, and above sea-cliffs, recorded on soil among roots of wind-thrown trees, low on earthy 'hedges', on flat ground of partly bare path-sides and track-sides, in quarries and on their spoil (granitic and china clay). Less typical sites include banks and flat areas of copper-mine spoil, soil in crevices of walls, a low cliff above tidal creek, low on sea-cliffs (non-fertile plants), steep peaty banks near mire, and on thin soil over granite rock of boulders in quarry. Frequently in pure patches; associates often include _Calypogeia arguta_,

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Calypogeia fissa, Dicranella heteromalla, Diplophyllum albicans; fewer records with Atrichum tenellum, Cephaloziella sp., Dicranella crispa, Dicranella rufescens, Ditrichum heteromallum, Gymnocolea inflata, Lophozia bicornata.

Commonly c.fr.: capsules immature 1-3, 6-12; dehiscing 1-3 [4, 5]; dehisced 1-8 (10 old).

A specimen in DTH has very tall setae (02-319).

All of above records are of typical plants (var. aloides). The following records are referable to 'var. minimum' as described by Smith (1978: 97) which is of uncertain status.

**Pogonatum aloides var. minimum (Crome) Mol.**

Blockeel & Long (1998: 69) treated P. aloides var. minimum (Crome) Mol. as a synonym of P. aloides, perhaps following the monograph by Hyvönen (1989). However, records from Cornwall are treated separately here because it may represent the interspecific hybrid P. aloides × P. nanum (cf. Timm 1927, Koppe 1964, Wijk 1956). The circumstantial evidence for some Cornish plants being this hybrid seems quite strong, in that both P. aloides and P. nanum are sometimes present at the same sites, and the var. minimum has intermediate morphology. However, it is puzzling that spores of the var. minimum all appear to be the same size as in typical P. aloides, with no hint of larger spores (as in P. nanum) or abortive or variable spores (as might perhaps be expected in a hybrid). Possibly var. minimum is indeed the hybrid but has spores of the same size as in typical P. aloides because of strong maternal effects. Cornish var. minimum also seem very variable, although this might be attributable to appearance of F2 plants or even to back-crossing with the parental species.

Records of 'Var. minimum' are as follows:


Only recorded with well-grown capsules since non-fertile plants are not reliably separable from P. nanum or P. aloides var. aloides. This form was probably overlooked in past, or ignored as merely small P. aloides var. aloides. Cornish var. minimum ranges from plants intermediate with var. aloides to rare, tiny plants recalling Tortula truncata (DTH). Identification as the var. has only been recorded when several plants together have setae <10 mm.

Mainly found in small amounts, as colonist on mainly bare acidic soils in sites similar to those of var. aloides, which very often accompanies it in larger amounts. Recorded in old china-clay quarries, on earthy mine-spoil, in granitic quarry-spoil, on hedge-bank, steep soil on part shaded 'hedges' at edge of pastures, beside a woodland track and at woodland edges, mainly on banks that are commonly N.-facing, but once on flat ground. Other recorded associates are Nardia scalaris and Pogonatum nanum (once).

Commonly c.fr.: capsules immature 1, 10; dehiscing 3; dehisced 3, 5, 7.

*1*: Chyenhal Moor, Newlyn, 1864, WC (PNZ) (Paton 1969a: 710).
*2*: Near the R. Tamar opposite Morwell (Drakewalls), 1835, JR (TRU) (Paton 1969a: 710).

Colonist, sometimes plentiful, on bare or partly bare, usually rather dry, acidic, nutrient-poor soils (clayey, gritty or gravelly in texture), on horizontal to steeply inclined surfaces, usually in open, but persisting where lightly shaded by bushes or saplings or moderately shaded in woodland. Also in thin soil on top of or in crevices of granitic or slate rocks, occasionally on soil on ruined walls or 'hedges', on gravel tracks and car parks, on old metalliferous mine-spoil, and on clay or crumbling surfaces of rocks in china-clay districts. Found among rocks, in old and newer granite and china-clay quarries (often abundant on china clay spoil), on and beside tracks, on earthy or gravelly banks, heaps of acid soil, in clearings, on and beside tracks, at edges of woodlands; a few records from upper parts of reservoir inundation-zones. Common associates include *Ceratodon purpureus*, *Nardia scalaris*, *Polytrichum juniperinum* and *Polytrichum piliferum*; others recorded include *Cephaloziella hampeana*, *Lophocolea bispinosa*, *Pogonatum aloides*, *Scapania compacta*, plus low acidophilous phanerogams including *Holcus lanatus* and *Sedum anglicum*. Only occasionally on metalliferous mine-spoil and then not on copper-contaminated ground.

Frequent to common c.fr. Capsules immature 1-3, 5-6, 8, 10-12; dehiscing 2-4, dehisced 2, 3, 5, 6, 11.


[Vc1 record (Chyandour, in Holmes 1906) not supported by specimen so rejected by Paton 1969a: 710 and treated as dubious by Crundwell 1970: 196; *Atlas* 2 gives SW95 and SX06; these are not mentioned by Paton 1969a and MS. and may be errors].

The only recent record is from SX18K: Rough Tor, N. side near top, 17 Apr. 2000, NGH and RAF during BBS Excursion (conf. DTH).

7.2 *Polytrichastrum longisetum* (Sw. ex Brid.) G.L.Sm. (syn. *Polytrichum longisetum* Sw. ex Brid., *Polytrichum aurantiacum* Hoppe ex Brid.). Boreo-temperate Circumpolar element.


[Modern records in vC1 are only of its occurrence as a horticultural weed (see Holyoak 1995a): SW662421, weed on peaty soil of plant pots left in open, Trevenson Moor Garden]
Centre, NW. of Pool, 18-19 June 1994, DTH 94-306, 94-308, c.fr. (DTH); the plant pots were part of a consignment imported months earlier from the Netherlands. On some pots it formed a carpet 2 cm tall, on others it grew amongst cover of *Campylopus introflexus*.

[vc2 record (Redgate, St Cleer, undated, FR (TRU), and in Rilstone 1918) is based on misidentified *Polytrichastrum formosum*: Paton 1969a: 711; vc2 therefore deleted by Crundwell 1970: 196].

As noted by Paton (1969a: 711) the comment by Rilstone (1919) that *P. aurantiacum* takes the place of *P. formosum* in West Cornwall implies that he misunderstood the species, especially since all his material is *P. formosum*.

Capsules seen in plants at garden centre (other plants non-fertile): dehiscing 6.

7.3 *Polytrichastrum formosum* (Hedw.) G.L.Sm. (syn. *Polytrichum formosum* Hedw.). Boreo-temperate Circumpolar element.


Habitat notes from C&S are as follows. Typically forms patches or lawns on well drained, acidic soils (humic or mineral) in open sites, partly shaded, or sometimes more heavily shaded in deciduous woodland or edges of conifer plantations. Typical sites are on banks and slopes in or at edges of woodland or groves, and among rocks (of varied acidic lithologies; sometimes in crevices or on thin soil over rock), on stream and riverbanks, laneside banks, on tops or sides of 'hedges' and in or near old quarries. Also recorded locally on heathland, on heathy short-grassland, or rocky areas of old copper mine spoil, sometimes on china clay spoil or track edges or slopes near quarries; on old graves in churchyards, on wide wall tops and on track of disused railway. Apparently avoids really exposed places on sea-cliffs, but present locally on more sheltered cliff tops, etc. Atypical records include finds on wet ground inside carr of Grey Willow (where it would have been taken for non-fertile *Polytrichum commune* if not checked microscopically), on hummock in acidic mire and on damp heavily shaded wall of a ruined china-clay dry. Commonly in pure patches, other plants growing intermixed or close by often include *Dicranum scoparium*, *Kindberga praelonga*, *Polytrichum juniperinum*, grasses, sometimes adjoining *Polytrichum commune* at edge of wet hollows. *Metzgeria consanguinea* once recorded growing as epiphyte on old stems of this species. Unusual record of small patch growing as epiphyte 1.5 m above ground on horizontal bough of Grey Willow in carr.

Frequently c.fr.: capsules immature 1-5, 7, 11, 12; dehiscing 7; dehisced [old: 1-2], 7-12.


*1*: Madron Moor, 1867, WC (PNZ) (Paton 1969a: 711).

*2*: Glynn valley, E. of Bodmin, before 1907, RVT (B) (Paton 1969a: 711).

On the basis of isozyme evidence, var. *perigoniale* was reported to be indistinguishable genetically from *P. commune* var. *commune* (Derda & Wyatt 1990, Wyatt & Derda 1997:
leading to speculation that characters used to distinguish varieties in *P. commune* are merely phenotypic responses. Similarly, var. *humile* seemed likely to have little or no genetic basis. However, DNA sequence data (Bijlsma et al. 2000, Van der Velde & Bijlsma 2000, N. Bell unpublished) and culture experiments (Schriebl 1991) have led to a reappraisal and two European species are recognised by Hyvonen & Bell in Hill *et al.* (2006: 203). The latter authors use the name *P. uliginosum* (Wallr.) Schriebl for the familiar tall plant of bogs and marshes, reserving *P. commune s. str.* (including var. *perigoniale*) for a shorter plant occurring in drier habitats, up to 5 cm tall, with the end cells of the costal lamellae flat or weakly and unevenly grooved. Hill *et al.* (2008) do not adopt these names 'pending a more thorough revision of the taxonomy of *Polytrichum* ' and their treatment as var. *commune* and var. *perigoniale* is followed here, although var. *humile* is retained for reasons discussed below.

A few recent records do not name the variety. These are mapped as var. *commune* since it is by far the commonest taxon and the small rarer forms would be likely to attract attention.

Habitat notes from Cornwall for var. *commune* are as follows. Characteristically forming patches or tall turfs on wet, acidic substrates in mires, flushes or on wet heaths, often with sphagna. Commonly in open, but also partly to rather heavily shaded by Grey Willow carrs, young birch woodland or edges of conifer plantations (probably persisting from former more open conditions). Occasionally in flushes on slopes above sea-cliffs. Recorded associates include *Sphagnum denticulatum*, *Sphagnum fallax*, *Sphagnum fimbriatum*, *Sphagnum palustre*, *Sphagnum papillosum*, *Sphagnum squarrosum*, *Sphagnum subnitens*; sometimes amongst *Juncus acutiflorus*, *J. effusus* or *Molinia caerulea*. Others recorded include *Carex rostrata*, *Erica tetralix*, *Hedera* and *Ulex gallii*. Once seen adjoining *Polytrichastrum formosum* at edge of wet hollow.

Also recorded in various drier habitats where often less tall, non-fertile, and not infrequently distinguishable from *Polytrichastrum formosum* only by checking microscopic characters. Examples include on steep, unshaded slopes among rocks near tors, on rather dry grassy slope in old granite quarry, on banks and stream- and river-sides in open areas in deciduous woodland and under Grey Willows, flushed laneside bank, and on rather dry soil near rocks in deciduous woodland. Often found as a colonist on disturbed, wet or damp, acidic ground, such as path and track edges and around old quarries. Records of such colonists include bits on clay banks etc. in and near working china clay quarries and on spoil heaps, larger patches on flushed ground below old china-clay spoil heaps and on floor of old pit, bits at edges of mica dams, and hollows in old metalliferous mining ground, especially in wet hollows or where flushed. Atypical records are of it being locally plentiful on sediments (sandy, gravelly and humic) of open, wave-washed edge of a reservoir, in places submerged by shallow water for parts of each year (a few records also from inundation-zone edges of other reservoirs); on peaty soil of plant-pots in several places at Burncoose Nursery.

Frequently c.fr.: capsules immature 3-7; dehisced 8-10.
8.1.b *Polytrichum commune* var. *perigoniale* (Michx.) Hampe 2
Boreo-temperate Circumpolar element.

*2: In patchy low grassland on china clay spoil tip, 190 m alt., NE. of Scarcewater, SW92135501, 2008, DTH 08-68 *(BBSUK)* (Rothero 2010: 64). [Previously reported for vc2 (Roche, Halgavor Moor and Bodmin, in Tellam 1888) but specimens lacking; a specimen seen (Rough Tor Moor, 1891, RVT *(B)*) is misidentified var. *commune* according to Paton 1969a: 711. Hence it was deleted from *CC* by Crundwell 1970: 196].

See taxonomic notes under var. *commune* (above) and under var. *humile* (below).

Recent records of var. *perigoniale* are from unshaded, open, damp to rather dry, acidic soil on china-clay spoil, on flat ground, beside a track and bank beside ditch.

Capsules common; immature 8, dehisced 8.

8.1.b(?) *Polytrichum commune* var. *humile* Sw. 1

*1: Wet heath, Goonhavern Moor, near Perranporth, 1965, JAP *(BBSUK)* (Crundwell 1968: 631, Paton 1969a: 711). [Vc2 record from Roche in Tellam (1888) is dismissed by Paton 1969a: 711 because no specimen was located].

Although this var. was recognised as a separate taxon by Smith (1978: 93-94) and Blockeel & Long (1998: 69), it was not recognised by Hill *et al.* (2008: 66, 145), following Hyvonen & Bell in Hill *et al.* (2006). However, no detailed analysis of the reasons for merging them has been published and, contrary to the treatment in Hill *et al.* (2008), the name *humile* would have priority over that of *perigoniale* if they are regarded as synonyms. *P. c.* var. *humile* is therefore retained as a separate taxon here pending further information.

The only recent record attributed to var. *humile* is from S. of Georgia (vc1): on partly bare clayey and rocky soil near base of ‘hill’of quarry spoil, unshaded [accompanied by plants thought at the time to be intermediate with var. *commune*; DTH]. Capsules were present: immature 4.

A non-fertile gathering of small plants of *P. commune* from drier than usual, disturbed habitat are referable to this variety or possibly var. *perigoniale*; they have apical cells of lamellae variously rounded to grooved when viewed in section (in small quantity on gravelly soil in heathy area by path above old quarry, Carn Marth; DTH).

8.2 *Polytrichum piliferum* Hedw. S12
Wide-boreal Circumpolar element.


Habitat notes from C&S are as follows. Mainly on well drained, acidic soil, on heathland, tops of ‘hedges’, old mine-spoil, about quarries, or thin soil over rocks. Although frequently
a colonist of bare substrates, such as on soil of banks and slopes above working china clay quarries and on their spoil heaps, where it may be common, it mainly grows in habitats that have been stable for several years. It is usually intolerant of much shading, but recorded from a track in a spruce plantation. Its preferences appear to be much like those of the commoner Polytrichum juniperinum, and it often occurs close to that species, but it is typically a shorter plant and hence unable to grow with such tall competitors as that species sometimes tolerates. Recorded from partly bare areas close to edges of exposed sea-cliffs, and on 'hedges' and other sites close to exposed coasts, so evidently tolerates salt spray, although not typical of such places. One record from upper part of inundation-zone beside reservoir. Single record of patch on exposed acidic soil of bank at edge of mesotrophic pasture, but much less frequent than P. juniperinum as colonist of temporary and less acidic habitats. Associates include Ceratodon purpureus, Hypnum juniperinum, Marsupella sprucei, Cladonia spp., Ornithopus perpusillus.

Frequently or commonly c.fr.: capsules immature 1-6, 11, 12; dehiscing 8; dehisced [1-3: old], 8-11.

8.3 Polytrichum juniperinum Hedw.  S12
Wide-boreal Circumpolar element.

*2: Roche, 1879, RVT (B) (Paton 1969a: 711).

Habitat notes from C&S are as follows. Commonest on well drained, acidic soil (stony, sandy, gravelly or humic), such as in barer patches on heathland or acid grassland, on tops or sides of 'hedges', on old copper mine-spoil, about old quarries and their spoil heaps (granite, china clay, serpentine, slate), on disused tracks or track edges, thin soil overlying rocks, on wall tops and on graves. Unlike Polytrichastrum formosum, it usually appears intolerant of more than light shading, although recorded on slopes in open deciduous woodlands, on tracks in conifer plantations, in clearings or on banks at woodland edges, and a few times in small quantity on banks under mature deciduous trees. Although a colonist of bare substrates such as those in and around quarries and their spoil heaps, it generally requires surfaces that have been stable for several years, and is later lost as taller phanerogams invade. Frequent on cliff tops (serpentine, granite, slates) and coastal slopes, sometimes in very exposed situations on headlands, so evidently tolerant of salt-spray. One record of small patches in upper part of inundation-zone of a reservoir. Absent from calcareous dunes, but in Isles of Scilly often on acidic dune sand. Two records of small amounts in sites that appeared base-rich (thin soil on old mortared wall, thin soil over exposed serpentine) were presumably on leached substrates. Less typical sites include colonising old tarmac on bridge on minor road and on a disused track, a cemetery path and the edge of a lane, as weed on soil of plant pots in nursery, on soil in garden, colonising edge of short grassland of old lawn, on gravel beside sewage farm and on track of disused railway. Recorded associates include Cephaloziella divaricata, Hypnum cupressiforme var. lacunosum, Pogonatum urnigerum, Polytrichum piliferum, Scleropodium touretii, Conocephalum conicum, many low herbs e.g. Aphanes, low Calluna vulgaris. Less often e.g. Tortula viridifolia.

A form with a short hyaline tip to leaf point was found twice in coastal sites (SW. of Lamorna Cove; on St Martin's).
Frequently or commonly c.fr.: capsules immature 1-6, 8-12; dehiscing 6-9; dehisced [1-4: old], 8-11.


*2: E. of Tiptree Hall, Temple, 1964, JAP (BBSUK) (Paton 1969a: 711). [Listed for Bodmin and St Breock by Tellam 1888, but specimens (Bodmin, undated, RVT (BM); Halgavor Moor, 1879, RVT (B)) are *Polytrichum commune* or (Bodmin, 1879, RVT (BM)) *Polytrichastrum formosum*: Paton 1969a: 711].

Grows mainly in patches that colonise decaying hummocks of *Sphagnum capillifolium* and *Leucobryum glaucum* at open wet acid mire edges, often persisting to form pure cover on tall firm hummocks. Found once in hollow near sphagna on wet heathland and once also persisting at base of large *Leucobryum glaucum* hummock in open acidic flush on heavily grazed hillside. Frequent associates are *Leucobryum glaucum, Sphagnum capillifolium, Sphagnum papillosum, Calluna vulgaris, Erica tetralix, Molinia caerulea, Potentilla erecta.*

 Apparently only three records c.fr. in Cornwall (single patch seen with sporophytes W. of Little Care Hill, vc2: capsules immature 10, dehisced (old) 10; mire E. of Fox Tor, vc2: old dehisced capsules 12; one hummock with numerous capsules on mire SW. of Fox Tor, capsules immature and old/dehisced 4).


*2: Chapel Rock, Roche, before 1907, RVT (B) (Paton 1969a: 732).

Habitat notes from Cornwall are as follows. Humic soil of banks, thin soil over rocks and on wood of rotting stumps, trunks and large branches lying on ground in open deciduous woodland (including larch, and Sessile Oakwoods, often on shaded or N.-facing slopes (associates include *Calypogeia muelleriana, Cephalozia lunulifolia, Diplphyllum albicans, Kurzia sylvatica, Lepidozia reptans, Pseudotaxiphyllum elegans*). Near Gweek: on vertical humic soil and low cushions of moribund *Leucobryum*, on upper part of low cliff, *ca* 1.5-2.5 m above HWST level of estuary, partly shaded by Sessile Oak woodland on slope above (associates include *Calypogeia fissa, Cephalozia lunulifolia, Lepidozia reptans*). Kennall Vale: on thin humic layer and with low mosses on vertical granitic rock heavily shaded in deciduous woodland; also on rotting wood of fallen, decorticated tree stump in wet area near old mills. Roche Rock: thin soil and among other bryophytes on granitic boulders and outcrops at base of tor, N.-facing but otherwise unshaded to well shaded. Rusey: heathy slope high above sea-cliff. Rotting wood of fallen tree trunk (with *Lophocolea heterophylla, Orthodontium lineare*). Clay of steep laneside bank, shaded by trees (with *Calypogeia arguta, Calypogeia muelleriana*).

Gemmae always (?) present. Occasionally c.fr. (only four records by DTH, all in vc2): capsules immature 12, 2; dehisced 5, 12.
12.1 *Diphyscium foliosum* (Hedw.) D.Mohr

*2*: Helman Tor, 1879, RVT (B) (Paton 1969a: 711).

Habitat notes from Cornwall are as follows. Thin soil under small overhang on N.-facing rock wall in old granite quarry. Slaty rock and thin soil in old quarries in deciduous woodland, sometimes where flushed in wet weather. Steep rather dry soil on steep faces or under overhangs of 'hedges', laneside banks and a quarried bank, in fully insolated S.-facing sites and well shaded in deciduous woodland (with *Calypogeia fissa*, *Pseudotaxiphyllum elegans*). Thin soil of old 'hedges' e.g. beside lanes, on thin vertical soil or in crevices, slightly shaded to almost or wholly unshaded. Thin soil on top of laneside stone wall, unshaded (with *Diplophyllum albicans*, *Lophozia ventricosa*, *Lophozia sudetica*, *Scapania compacta*). Inside deciduous woodlands on steep soil on trackside bank and on soil among rocks near river. Firm horizontal soil on top of low 'hedge' beside track in deciduous woodland, with *Sciuro-hypnum plumosum*.

Perichaetial leaves well developed: 1, 12. Occasionally c.fr.: capsules immature 4, [12 tiny capsule], dehisced 10.

14.1 *Encalypta streptocarpa* Hedw.
Boreo-temperate Eurasian element.

*2*: Hill Head, St Lawrence near Bodmin, 1891, RVT (B) (Paton 1969a: 719).

Only recent vc1 records are from Gear Sands: several patches on soil of fixed sand-dunes near their landward edge, in almost bare areas with very short vegetation. Surrounding vegetation is of NVC type CG, so sand is doubtless calcareous there. In vc2: several records on decayed mortar and thin soil of tops, sides and near bases of old, mortared walls of ruins, especially of mine buildings and old china-clay dries, where evidently calcareous. Also on old horizontal concrete. Usually unshaded or almost so, but moderately shaded by trees near Golitha Falls. Close associates include other small acrocarps, especially *Barbula convoluta*, *Didymodon rigidulus*, *Pseudocrossidium revolutum*; also single records of *Gymnostomum viridulum*, *Lejeunea patens*.

One record c.fr.: capsules immature 10 (numerous capsules on single patch, N. of Minions, seta short to fully lengthened).

14.4 *Encalypta vulgaris* Hedw.
Temperate Circumpolar element.

Seen recently only at Gear Sands, where locally frequent in small area: on thin stony and sandy soil on top and sides of low banks of mine-spoil around old mine-shaft; unshaded; in places with sparse to complete cover of very low grasses, herbs and mosses.

Only seen c.fr.: capsules immature 2, 12.

15.1 **Funaria hygrometrica** Hedw.
Wide-temperate Circumpolar element.

*2: Bodmin, 1888, RVT (B) (Paton 1969a: 731).

Grows as scattered plants or forms low turfs. Habitat notes from C&S are as follows. An ephemeral colonist that may occur almost anywhere that bare soil is exposed, disappearing when taller vegetation shades the soil. Recorded in arable fields (where usually uncommon, but occasionally abundant, with finds in fields of cereal stubble, flax, maize stubble, set-aside and a grass-ley), gardens, on plant pots (often common in gardens, nurseries, garden centres, and their glasshouses), disturbed areas in grassland, soil heaps, graves, path and track sides, roadsides, unsurfaced car parks, 'hard-standing' areas in caravan park, disturbed places on banks, a sand pit, stable dunes, sea-cliff slopes, mine-spoil, china-clay pits and their spoil, stone quarries, chinks in walls, top of a 'hedge', dredgings from ditches, dried mud of pool edge, and clearings in heathland, scrub and woodlands. Occurs on soils of varied textures (gravel, sandy, loamy, clayey, humic), from moderately acidic to basic, rather dry to moderately wet, but preferring nutrient-rich substrates that are unshaded or only lightly to moderately shaded. Sometimes grows on thin soil e.g. on rock in ruined wall and over old concrete, and several records of it in tiny crevices of granite boulders or rocks, e.g. among china clay spoil.

As elsewhere (Southorn 1976, 1977, Brown 1982: 430), *F. hygrometrica* is common on old bonfire sites, where it is characteristically the first plant colonist and often forms dense pure turfs; it is sometimes abundant also on heathland the year after a fire. Other records from nutrient-enriched places include abundant patches near Nanquidno on ground where leaking bags of silage had stood, but it is also frequent on substrates with much lower nutrient levels. Apparently sometimes tolerates elevated levels of copper in substrates overlying mine-spoil or slag. Unusual records on rotting wood in hollow of top of post (a few plants) and on decaying woollen socks dumped in shady Grey Willow-carr near road (plentiful, cfr).

Associates often recorded include *Barbula convoluta, Barbula unguiculata, Bryum argenteum, Bryum dichotomum, Bryum rubens, Ceratodon purpureus, Dicranella staphylina, Trichodon cylindricus, Pleuridium acuminatum, Riccia sorocarpa, Phascum cuspidatum, Tortula truncata* and vascular plants including *Montia fontana, Sinapis arvensis, Urtica urens*; in horticultural contexts sometimes with *Leptobryum pyriforme, Marchantia polymorpha* subsp. *ruderalis*; less often with many other bryophytes of partly bare soil including *Didymodon umbrosus, Ditrichum lineare* (on copper-mine spoil), *Entosthodon obtusus*.
*F. hygrometrica* was not recorded when non-fertile because of risk of confusion with other *Funariaceae*. Since all but young plants apparently bear sporophytes it is very commonly seen cfr; capsules immature 1-7, 9-12; dehiscing 6, 7, [8]; dehisced 1-12.

16.1+2 *Entosthodon muhlenbergii* (Turner) Fife or *E. pulchellus* (H.Philib.) Brugués (syn. *Funaria muhlenbergii* Turner or *Funaria pulchella* H.Philib.).

First record of *F. muhlenbergii* s. l.:

*2*: St Minver, [SW97T], 1878, RVT (BM) (Paton 1969a: 731).

Records from before the study by Crundwell & Nyholm (1974) did not separate these species so they are mapped here only as the s. l. Note that Tellam's 'St Minver' records appear to originate from a radius of ca 5 km around the village of that name. The other two records are from SW98Q (Port Quin, 1891, Tellam: Tellam 1892 (B), JAP typescript Flora p. 210) and SX08A ('Port Gaverne, 1971', JAP, noted as *F. pulchella* in JAP typescript Flora p. 210).


The only Cornish record. Sought by DTH at Bossiney Haven but not refound.

16.3 *Entosthodon attenuatus* (Dicks.) Bryhn (syn. *Funaria attenuata* (Dicks.) Lindb.). Mediterranean-Atlantic Oceanic element.


*2*: Trehane near Probus, undated [but pre-1866], ES (TRU) (Paton 1969a: 731).

Habitat notes from Cornwall are as follows. Grows as scattered plants, small patches or low turfs of small extent. Occurs on partly bare, persistently damp soil (loamy, clayey or humic, less often thin soil over rocks; of mildly acidic to circumneutral reaction; in places that are commonly somewhat sheltered or N.-facing but otherwise mostly unshaded to lightly or partly shaded, less often well shaded e.g. by grasses and herbs, only occasionally by trees). Sometimes apparently a colonist where bare soil is temporarily exposed, but *E. attenuatus* more typically grows in places where bare substrates persist for years on steep banks. It is commonest on and near sea-cliffs, especially on moist steep banks beside flushes and where small streams reach the coast, but recorded also on soil exposed in steep grassland on a cliff and among rocks in a coastal quarry. Three records inland were from steep earth or clay banks (in heathland, a laneside and beside a churchyard path).

Distinct from other *Funariaceae* in the bright purple (cerise) colour of the rhizoids, but almost always recorded c.fr. Capsules immature 4-6; dehiscing 2, 3, 5, 6, 9; dehisced 2-6, 9, 12.
16.4 *Entosthodon fascicularis* (Hedw.) Müll.Hal.  
(syn. *Funaria fascicularis* (Hedw.) Lindb.). Temperate European element.  

*S12*  

*1*: Penzance, 1844, AG (PNZ) (Paton 1969a: 731).  

Unidentifiable immature plants likely to be this species have been seen repeatedly in arable fields in winter. Since it cannot be distinguished from *Physcomitrium pyriforme* until the calyptra (great care needed!) or operculum are well developed (During 1973, Smith 1978: 344) there can be little doubt that it has been under-recorded to a significant extent.  

Grows mainly in small rather dense to open patches, less often as scattered plants, or forming low turfs of small extent. A colonist of bare soil (clayey, loamy or gritty; of mildly acidic to circumneutral reaction; avoiding both dry and really wet substrates; unshaded or less often partly shaded). Most records are from soil of arable fields (cereal stubble, cabbages, bulb-field edge and an old bulb field), others from soil patches exposed in a pasture and a re-sown grass-ley. Single records also from steep bank of small stream above sea-cliffs, a bank near old mine-spoil and dumped soil near quarries. Associates recorded were *Barbula convoluta*, *Bryum dichotomum*, *Bryum rubens*, *Bryum violaceum*, *Trichodon cylindricus*, *Dicranella schreberiana*, *Dicrillanella staphylina*, *Oxyrrhynchium hians*, *Fossombronia pusilla*, *Funaria hygrometrica*, *Phaeoceros laevis*, *Physcomitrium pyriforme*, *Pseudophemerum nitidum*, *Riccia sorocarpa*, *Riccia subbifurca*, *Sphaerocarpos sp.*, *Phascum cuspidatum*, *Tortula truncata*, and herbs (including *Cerastium glomeratum*, *Lamium purpureum*, *Stellaria media*, *Veronica persica*).  

Only recorded with well-grown capsules, but almost all but very young plants evidently bear sporophytes. Capsules immature 2-4, 7; dehiscing 3, 4.  

16.5 *Entosthodon obtusus* (Hedw.) Lindb.  

*S12*  

*1*: Chyenhal near Newlyn, 1844, AG (PNZ) (Paton 1969a: 731).  

Occurs as scattered plants, or where plentiful forming rather open low turfs. Habitat notes from C&S are as follows. Grows on damp often water-retentive soils (of clayey, loam, humic or peaty textures, often on thin soil over granitic, slaty or serpentinite rocks; substrates often ± acidic, sometimes circumneutral; mostly in open or on N.-facing banks, less often partly shaded e.g. by grasses or Grey Willows, or in rock crevices, rarely in heavier shade). Commonest on and above sea-cliffs where most sites are on steep banks (e.g. beside streams or flushes) or on flushed grassland slopes. Also frequent up to several kilometres inland on heathland of the Lizard pen. (in acidic flushes, on almost flat ground and banks at edges of paths and old tracks, on partly bare areas in wet heath, in old quarries). There are few other records inland, including one on disturbed soil of unshaded bank near a reservoir (on Bodmin Moor), a bank within an ancient earthwork (St Piran’s Round near Rose), and ditch banks of a heathy clearing in spruce plantations. Unusual records were on soil of an unshaded wall-top (inland on the Lizard pen.) and of a few stems c.fr. almost overgrown by *Fissidens bryoides* var. *bryoides* on soil of low bank shaded inside a grove of tall deciduous trees near coast. Associates recorded are *Archidium*


alternifolium, Bryum rubens, Calypogeia arguta, Calypogeia fissa, Cephalozia bicuspidata, Ephemerum serratum, Diplophyllum albicans, Solenostoma gracillimum, Pohlia annotina, rarely Cephalozia dentata, Fossombronia 'husnotii', Riccia beyrichiana, Cladonia sp.

Because of the risk of confusion with other Funariaceae, only recorded when capsules are present. However, almost all but young plants appear to bear capsules. Capsules immature 1-7, 9, 11, 12; dehiscing [1], 3, 5-8 [11]; dehisced 3-8 [11 old].

17.1  **Physcomitrium pyriforme** (Hedw.) Bruch & Schimp.  
Temperate Circumpolar element.

*2: Withiel, 1878, RVT (B) (Paton 1969a: 731).

Usually occurs in small patches (low turfs), less often as scattered plants. Habitat notes from C&S are as follows. A colonist of damp or wet soil or drying mud (silty, clayey or humic; mildly acidic to circumneutral; most often in the open, but tolerating moderate to rather heavy shade at times, e.g. under Grey Willows and at woodland edges). Records are from soil or mud exposed in Juncus marshes, marshy grassland (often where poached by stock), a fen, a flush in a pasture, high on sea-cliff slopes (e.g. by path side), at edges of streams and pools (including stream banks and dredged mud left on them), on recently disturbed ground such as at roadsides, and occasionally from damp to wet parts of arable fields (including stubbles, and a bulb-field on Tresco), rarely inside Grey Willow-carr or rather heavily shaded by Grey Willows and trees near edge of small river. Often occurs on otherwise bare mud; associates recorded were Pseudephemerum nitidum, grasses, Juncus effusus and herbs.

Doubtless somewhat under-recorded because it is distinguishable from Entosthodon fascicularis (q.v.) only when well-grown capsules are present, although almost all but young plants of *P. pyriforme* appear to bear capsules. Capsules immature 3-6 [8, 10]; dehiscing 6, 7; dehisced 8, 10.

18.1  **Aphanorrhegma patens** (Hedw.) Lindb.  
(syn. Aphanorrhegma patens auct., Physcomitrella patens (Hedw.) Bruch & Schimp.).  
Temperate Eurosiberian element.


Occurs as scattered plants, in small patches, or where commoner forms low turfs. The plants grow quickly and mature within a few months from late spring to autumn, on drying mud or damp soil (silty, clayey or loamy; mildly acidic to circumneutral; wet to damp, rarely rather dry; unshaded, less often lightly or part shaded). Large populations occur in the inundation zones beside reservoirs (Argal, College, Drift and Stithians Reservoirs, Upper Tamar Lake), the plants evidently reappearing from a persistent spore-bank in the substrate in those years when water levels are low. Sparingly scattered small populations (sometimes a single isolated plant) have also been recorded from damp soil or mud in various other places that are wet in winter but dry in summer: several times in ruts, hollows or larger ephemeral pools along old
tracks, twice in cattle-poached ground near a gateway into pastures (at one site most plants were on steeply inclined edges of the hoof-prints), ruts in damp edge of a stubble field, on partly shaded banks near the Bude Canal and beside a damp lane, and once a rather dry bank in a small woodland clearing.

On reservoir mud *A. patens* often lacks close associates, but it was frequently also recorded with *Pseudephemerum nitidum*, less often *Bryum klinggraeffii*, *Trichodon cylindricus*, *Leptobryum pyriforme*, *Pohlia annotina*, *Riccia sorocarpa*, *Littorella uniflora*. Associates recorded with small populations on damp tracks etc. were *Dicranella staphylina*, *Pseudephemerum nitidum*, *Gnaphalium uliginosum*, *Juncus bufonius*, *Agrostis stolonifera* and various other herbs and grasses.

Usually c.fr. except when plants immature; capsules immature 6-11; dehiscing [8], 9-11.

19.1 *Discelium nudum* (Dicks.) Brid.  
Boreal-montane Circumpolar element.


Recorded only from the china clay district, with four records made by JAP 1968-1983; one recent record made by JGD.

20.1 *Coscinodon cribrosus* (Hedw.) Spruce  
Boreo-temperate Circumpolar element.


[Report from vc1 (Near Kynance, WEN diary) not supported by specimen: Paton 1969a: 728].

Forms small dense cushions that may expand to produce low patches and low lawns. Restricted to unshaded shaly and slaty Carboniferous rocks of outcrops and boulders on cliffs along north coast of vc2 from Rusey northwards, growing on horizontal to steeply sloping surfaces. Found once growing on very thin silt overlying horizontal shale rock in middle of cliff-top path. Usually lacks close associates.

Commonly c.fr.: capsules immature 4, 11; dehisced 11.

21.1 *Schistidium maritimum* (Sm. ex R.Scott) Bruch & Schimp.  
(syn. *Grimmia maritima* Sm. ex R.Scott). Boreo-temperate Oceanic element.


Grows as cushions or tufts that sometimes increase or merge to form larger patches. Restricted to the coast and its immediate vicinity, where it occurs in small crevices and on
small ledges (on horizontal to vertical surfaces) of hard rocks (including granitic, greenstone, serpentinite, shale and slaty lithologies), in unshaded or sometimes lightly shaded places. Mainly restricted to sea-cliffs, occurring at foot of sheltered cliffs but reaching tops of tall exposed cliffs with a few records also from quarried and other rocks (including rocks in old 'hedges') above cliff tops. Also occurring 'inland' along tidal Helford River and beside estuary of R. Camel and other sheltered coastal inlets, within a few metres above HWST level.

*S. maritimum* sometimes shows a preference for sites on cliffs with permanent trickles or flushes of freshwater, or at least those where rainwater drainage is concentrated. Found once on rocks in flood-zone along a small stream up to ca 100 m inland (Gew Graze on Lizard). Often common, especially on N.-facing or flushed cliffs, but unaccountably absent from some apparently suitable places. Usually lacks closely associated bryophytes, occurring in lower zone on sea-cliffs than any other moss, although lichens such as *Ramalina* spp. are often close by and *Tortella flavovirens* may be in contact with it or closely adjacent. A single atypical record from thin soil overlying shaly rock above sea-cliff, growing with *Weissia* sp.

Commonly cfr; capsules immature 1-4, 10-12; dehiscing [1], 2-4; dehisced 2-4 [12 old].


For notes on identification and taxonomy see Orange (1995).

Small patches and open mats, trailing somewhat when tall. Habitat notes from Cornwall are as follows. S. of Pantersbridge: on (slaty?) boulders close to water-level of small river. Near Retire: on unshaded granitic block close above water of small stream. Banks of R Tamar, on slaty boulders and rocks close above summer water-level (flooded in winter). Grows in open or partly shaded by deciduous trees. Also once on silted, vertical trunk of tree in flood-zone at edge of river. Most often in pure patches, but sometimes associated with *Cinclidotus fontinaloides*, *Schistidium apocarpum* s. str.

Commonly c.fr.: immature 1-3, 10; dehiscing 2 (5 few), dehisced 3, 5.


S. apocarpum s. l. here refers to the taxon treated as *S. apocarpum* var. *apocarpum* by Smith (1978: 309), Corley & Hill (1981: 86) and Hill et al. (1992: 338). Blom (1996) revised this and allied taxa in Scandinavia and recognised several additional species which also occur in Britain. Studies of Cornish specimens has revealed only *S. crassipilum* and *S. apocarpum s. str.* (Smith 2000: 48-49, Rothero 2004b, pers. obs.). Allocation of first records for each vice-county mainly follows the paper by Rothero (2004b), much older material has also been reidentified as both segregate species.

Distinction between *S. apocarpum s. str.* and *S. crassipilum* is sometimes difficult even with good material. Although the mainly quadratic exothecial cells of *S. apocarpum s. str.* are sometimes obviously different to the mainly elongate rectangular cells in *S. crassipilum*, many plants have patches of both quadratic and elongate cells in different parts of the same capsule, so that it sometimes seems rather arbitrary deciding which type predominates. However, spore size is mainly larger in *S. apocarpum s. str.* (11-15(19) µm) than in *S. crassipilum* ((8)9-11(12) µm) and Blom (1996: 39-40) describes several other differences.

*S. l.* commonly recorded as c.fr.: capsules immature 1-3, (4), 7, 10-12; dehiscing 2-5; dehisced [1, 2: old] 3-5, 7, 8, 10, 11.

21.5 **Schistidium apocarpum** (Hedw.) Bruch & Schimp. *s. str.* (syn. *Grimmia apocarpa* Hedw.). Boreo-temperate Eurosiberian element.


Grows in tufts or small patches. Habitat notes from Cornwall are as follows. Mainly restricted to hard basic rocks and masonry in unshaded or partly shaded sites. In Cornwall, *S. apocarpum s. str.* may occur mainly in more humid locations than many of those tolerated by the commoner *S. crassipilum*. Several of its records are from rocks in and beside streams and rivers, including the flood-zone beside the R. Tamar, others were of large populations on masonry on and below reservoir dams and on concrete beside standing water. Mortared-stonework low on church wall. On horizontal concrete at edge of water on structure in china clay works, unshaded. On rocks (serpentinite ?) emergent from large stream in deciduous woodland, 0.3-0.6 m above water-level. On boulder (gabbro ?) in short grassland at edge of heath. On unshaded granitic blocks beside walls of ruined mine structures. Unusual record of strong patch c.fr. on bark of exposed root of large old Ash tree in slope in pasture. Several records from banks of R. Tamar were on silted, vertical or steep bark of trunks of tree in flood-zone at edge of river, slightly shaded (seen near to *Schistidium rivulare*). Also on unshaded slaty rocks in river flood zone (with *Schistidium rivulare*). Associates recorded include *Bryum capillare*, *Didymodon rigidulus*, *Grimmia pulvinata*, *Tortula muralis*.

Plants confirmed as *S. apocarpum s. str.*: capsules immature 1-3, 10, 11; dehiscing 2, 3; dehisced 2-5 [10, 11 old].
21.16  **Schistidium crassipilum** H.H.Blom

(syn. *S. apocarpum* auct. *pro parte* non (Hedw.) Bruch & Schimp.). Southern-temperate European element.

*1*: On old concrete wall, Upton Towans, SW54, 1997, DTH, det. AJES (Rothero 2004b: 5).

*2*: On the dam wall, Crowdy Reservoir, SW18 [sic = SX18], 2000, CCT 00/160 (BBSUK) (Rothero 2001: 41).

A large majority of Cornish material of the 'S. apocarpum s. l.' checked since 1997 appears to be *S. crassipilum*.

Grows in tufts or compact patches. Habitat notes from C&S are as follows. A basiphile, almost restricted to hard mainly calcareous masonry and rocks (commonest on horizontal to gently inclined surfaces, but also on those that are vertical), in unshaded or partly shaded sites (occasionally moderately shaded, e.g. in deciduous woodland), that vary from dry to periodically inundated (sometimes within flood-zone of streams or rivers). Most records are from old concrete and other masonry, with a few from natural substrates. The many artificial sites recorded were on old mortared-stone walls (e.g. beside roads, of bridges, a church, mine-building ruins, reservoir dams); blocks of old masonry; on old (and sometimes less old) concrete structures (including walls, bridges, pipes, fence posts, cattle trough, grave surrounds, path edge, mine structures, old airfield runway), concrete blocks and loose debris; a slate roof; also on roofs and fragments of asbestos-cement sheet. Fewer records from rock were from serpentinite outcrops and blocks; granitic and gabbro blocks and boulders on ground and occasionally in 'hedges'; granitic rock forming part of mortared walls; slaty and granitic boulders (in streams) and on slate and shale in old quarries. An unusual record (of *S. l.* species; NW. of Reskadinnick) of few loosely rooted stems on sparsely vegetated horizontal sand on old mining ground. Associates frequently recorded are *Bryum capillare, Bryum radiculosum, Didymodon luridus, Didymodon rigidulus, Grimmia pulvinata, Orthotrichum anomalum, Rhynchostegium confertum, Tortula muralis* (common); fewer records with *Sciuro-hypnum plumosum, Didymodon tophaceus, Grimmia orbicularis, Grimmia trichophylla, Orthotrichum affine, Orthotrichum cupulatum, Schistidium apocarpum*.

Commonly c.fr. (and only recorded when capsules present). Capsules immature 1-3 (4), 10-12; dehiscing 2-5; dehisced [1, 2: old] 2-8 [9-11 old].

22.2  **Grimmia crinita** Brid.

Mediterranean-Atlantic Suboceanic element.


The single find in Cornwall is the only British record for more than a century. One small patch grew with a little *Didymodon rigidulus* and *Tortula muralis*; there was more of these nearby and also *Grimmia pulvinata, Schistidium crassipilum*. Despite searches, no more was found nearby and none was refound on subsequent visits. The species may well have been a natural colonist, from wind-blown spores.
Only seen c.fr.: capsules immature (well grown) 2.

22.3 *Grimmia laevigata* (Brid.) Brid.  
Southern-temperate Circumpolar element.


The only modern record is from Pentire Point East (vc1), where locally plentiful on unshaded, acidic, slaty rocks on coastal headland; forming patches on flat surfaces or growing in small crevices, where rock near-horizontal to fairly steeply inclined; *G. lisae* occurs with it in some places.

Not seen c.fr.

22.16 *Grimmia pulvinata* (Hedw.) Sm.  


Recorded as 'var. pulvinata' frequently when the operculum was checked. A few capsules seen were only rostellate rather than rostrate but no material clearly referable to 'var. africana' has been seen.

Forms neat cushions which may extend or coalesce to create larger patches. Habitat notes from C&S are as follows. A basophile of hard dry masonry or rocks, often growing on firm open surfaces or in crevices and on small ledges, on horizontal, inclined or vertical aspects, typically in unshaded or lightly shaded sites (sometimes moderately shaded beneath trees). Commonest on calcareous man-made substrates (mortar and adjacent stonework or bricks, old and modern concrete, asbestos-cement sheets; once on old tarmac) such as on walls, ruined walls, fragments of old masonry, gravestones and grave surrounds, and varied structures including bridges, modern reservoir dams, ruins of old mine-building, concrete fence-post tops and church walls. On natural rock, frequent only on blocks, boulders and outcrops of serpentinite. Occasionally also on blocks and boulders of gabbro, granitic rocks (in open and e.g. in 'hedges') and slaty rocks (at exposures above sea-cliffs, in 'hedges', and in old quarries and road-cuttings), especially on coasts where salt-spray or blown sand presumably supply extra bases, but sometimes far inland where presumably it is on rocks with higher than usual base-content. Common associates are *Bryum radiculosum, Didymodon luridus, Didymodon rigidulus, Orthotrichum anomalum, Schistidium apocarpum, Schistidium crassipilum, Tortula muralis, Zygodon viridissimus* var. *viridissimus*, scarcer ones include *Bryum dichotomum, Syntrichia laevipila, Tortula atrovirens, Tortula cuneifolia*. The usually more acidophilous *Grimmia lisae* often occurs with *G. pulvinata* on serpentinite and slate cliffs and both that species (e.g. at Sennen Cove) and *Grimmia trichophylla* occasionally occur with or near it on granitic rocks and masonry. *G. pulvinata* is evidently a good colonist, presumably from wind-blown spores, to judge
from records on isolated habitats such as concrete gate-posts or a small concrete block isolated amongst acidic mine-spoil.

Commonly c.f.r.; capsules immature 1-5 (6, 7), 10-12; dehiscing 3-7 [8]; dehisced [old 1-5], 5-12.

22.17 *Grimmia orbicularis* Bruch ex Wilson

Mediterranean-Atlantic Suboceanic element.


Six recent records, as follows: (1) E. of Cold Harbour: in substantial patches on horizontal concrete of top of wide old wall of ruined china clay works; unshaded; with *Grimmia pulvinata, Schistidium apocarpum* and *Orthotrichum anomalum*. (2) Leswidden: on steep and vertical old concrete walls of ruins of china clay works; sites S.-facing, unshaded or almost so; often associated with *Grimmia pulvinata*. Numerous cushions here in 2004, along many metres of wall, also several larger patches up to 17 x 13 cm. (3) Great Work: small amounts on small ledge of vertical, S.-facing, concrete wall of old mine building, unshaded (near *Bryum radiculosum, Schistidium crassipilum, Tortula muralis*). (4) Treviscoe: unshaded top and steep sides of old concrete walls of disused china clay dry (no close associates, species nearby were *Tortula muralis, Grimmia pulvinata, Schistidium crassipilum*). (5) SW. of Roche: unshaded top of mortared-stone wall beside road. (6) De Lank Quarry: patch on concrete of ledge low on N.-facing wall of shed (near *Schistidium crassipilum*).

Commonly c.fr.: capsules immature 2-4, 12; dehiscing 2-4, dehisced 4. In April 2003 the population at Leswidden had many fewer capsules than the accompanying *G. pulvinata* and most of those had been damaged, apparently partly eaten (by molluscs or insects?).

[22.19 *Grimmia funalis* (Schwägr.) Bruch & Schimp. – Vc1 record (Tolcarne, Newlyn, 1844, AG, PNZ) discounted by Paton (1969a: 729) because the specimen is misidentified *G. trichophylla* s.l.]

22.20-23 *Grimmia trichophylla* Grev. s. l.

(syn. *G. decipiens* var. *robusta* sensu Paton 1969a: 729 non Braithw.).


*G. lisae* was treated as a distinct species from *G. trichophylla* by Greven (1995) and Muñoz & Pando (2000), but characters allowing its separation from several similar species remained unclear until the paper by Maier (2002). Since then specimens from Cornwall have been revised and treated as *G. lisae* or *G. trichophylla* s. str. (see below); a third species of the group, the calciphile *G. dissimulata* E.Maier, is known elsewhere in southern England but has not yet been found in Cornwall.
Forms cushions and small patches that may extend or coalesce to form larger patches or low lawns. Notes on the habitats of the s. l. species in C&S are as follows (each species is also treated separately below). Grows mainly on hard dry rocks, including base-poor types (granitic, shale, slaty, gabbro, greenstone) and serpentinite, on open surfaces, small ledges and in crevices, on horizontal to steeply inclined surfaces. Occurs on boulders, blocks, natural outcrops, walls (including those of churches), rocks in 'hedges' and quarries, and on gravestones, most often in unshaded or lightly shaded places or part shaded e.g. by bushes or in open woodland, but more rarely well shaded inside deciduous woodland or groves. Sometimes common on upper cliff slopes and cliff tops, so evidently tolerant of salt spray. A few records also from within regularly flooded zones beside rivers, a reservoir and a pool.

*G. trichophylla* s. l. sometimes grows on granitic rocks within or capping mortared or concrete walls, but usually not directly on the calcareous substrates. Several such records from granite parapets of bridges over R. Inny and R. Tamar are in regions otherwise unsuited to the species. Single record of several small patches (checked microscopically) from sloping concrete on grave, close to *Didymodon luridus* and *Tortula muralis*, so surely on a basic substrate there, as also on old concrete beside steps on exposed coastal slope. Despite rarity of capsules it often colonises isolated patches of suitable rock away from the natural outcrops of granite, especially old granite (or less often slaty) gateposts, gravestones, masonry debris, rocks in walls and stonework of larger bridges. An unusual record of substantial patches of low plants on old tarmac of edges of path in churchyard.

Associates often include *Bryum capillare*, *Dicranoweisia cirrata*, *Hedwigia stellata*, *Hypnum cupressiforme* var. *resupinatum*, *Racomitrium heterostichum*, lichens; also *Sciuromhypnum plumosum* in a river flood-zone. Common alongside the mainly more basiphilous *G. pulvinata* (q.v.) on serpentinite, but mostly replaces that species on granitic rocks, except at a few coastal localities where they occur together. *G. trichophylla* s. l. entirely replaces *G. pulvinata* on gabbro at Lowland Point.

Single record c.fr. by DTH: capsules immature 11 (few, patch on boulder partly sheltered by scrub).

22.20 *Grimmia trichophylla* Grev. s. str.  


*2*: Rock, St Cleer, 1920, RWS (NMW 76.66.4120), conf. DTH 2004.

See notes above. These are the earliest specimens confirmed as *G. trichophylla* s. str. using characters given by Maier (2004). Information on the segregate is based on specimens identified or reidentified since 2003 and field records from 2004 onwards:

Notes on habitats in C&S are as follows. Records almost entirely from inland sites (exception, poor material apparently of this sp., leg. JAP det. DTH, on Tresco). Horizontal to steeply inclined surfaces of granitic boulders and outcrops; granite gate posts (almost unshaded and lightly shaded); top of stone wall. Granitic boulder in unshaded 'hedge' in moorland. Granitic rock of tops of mortared walls including those of bridges. Associates
include *Andreaea rothii*, *Racomitrium heterostichum*, less often *Bryum dichotomum*, *Grimmia pulvinata*. On mortared bridge top also near calcicoles such as *Didymodon rigidulus*, *Schistidium crassipilum*, *Tortula muralis*.

One old record cfr, 15 Aug. 1961 leg. JAP (E and DTH), with mature undehisced and dehiscing capsules.

22.21 *Grimmia lisae* De Not. NS\(^\ddagger\) S12
(syn. *G. retracta* Stirt., *G. subsquarrosa* Wilson, *G. trichophylla* var. *subsquarrosa* (Wilson) A.J.E.Sm.). Southern-temperate European element. \(^\ddagger\)Although listed as NS by Preston (2006: 29) this species is probably under-recorded nationally.

*1*: Kynance Cove, 1882, EMH (NMW 22.187d.373), det. DTH 2004. This is the earliest specimen confirmed as *G. lisae* using characters given by Maier (2004).


See notes above. Information is based on specimens identified or reidentified since 2003.

Grows as compact cushions, which sometimes grow or coalesce to form patches. Habitat notes from C&S are as follows. Records are mainly from coastal slopes and hillsides (within 500 m of sea), but single collections made far inland at ca 305 m alt. on Bodmin Moor (*DTH 07-474*) and at ca 55 m alt. on Treheunsey Bridge (*DTH 07-476*). Occurs mainly on low rocks (exposures and boulders) of granitic, serpentinite and slate lithologies, on horizontal and sloping surfaces or in small crevices, where unshaded or lightly shaded. One gathering was from a boulder just above water-level in a stream. One record from unshaded serpentinite in old quarry on heathland inland in Lizard pen. (W. of Rosuick). One record from stone on top of wall of bridge over small river, slightly shaded. One record of plenty on old tarmac of churchyard path. Associates recorded include *Frullania dilatata*, *Grimmia pulvinata*; also near or touching many bryophytes that grow on thin soil among rocks, e.g. *Archidium alternifolium*, *Lophozia excisa*, *Scleropodium touretii*, *Trichostomum brachydontium* and rarely *Bryum kunzei*, *Hypnum cupressiforme* var. *lacunosum*, *Tortula wilsonii*; also touching *Cladonia* sp., low herbs e.g. *Aphanes* sp. and grasses.

Not seen c.fr.

[**Grimmia austrofunalis** auct. non Müll.Hal. (syn. *G. britannica* A.J.E.Sm., *G. trichophylla* var. *robusta* (Fergusson) A.J.E.Sm.) – The only specimen reported from Cornwall (boulders on cliffs, Sennen Cove, vc1, 1967, TL (*BBSUK* C.2001.019.359), Crundwell 1969: 883) was reidentified as typical *G. trichophylla*, det. DTH, conf. AJES (Rothero 2000: 52) but should now be placed as *G. lisae* along with other 'G. trichophylla s. l.' from that locality (redet. J. Muñoz 1998, DTH 2004). Greven (1997) regarded *G. britannica* (syn. *G. trichophylla* var. *robusta*) as a synonym of the Southern Hemisphere species *G. austrofunalis*, and this treatment was followed by Blockeel & Long (1998: 104) and Greven (2003: 68). However, J. Muñoz (in Muñoz & Pando 2000: 21 and in Smith 2004: 451) has found that all specimens from Europe placed as this taxon belong either to *G. trichophylla*]
or *G. longirostris* Hook. and that *G. austrofunalis* does not occur in the Northern Hemisphere.

22.24  **Grimmia hartmanii** Schimp.

Boreal-montane European element.


Known in Cornwall only by three recent records from vc2. Habitat notes on the other two of these are follows. Draynes Wood (SX26J), in mainly small patches with other low bryophytes on sloping surfaces of low granitic rocks and boulders in deciduous woodland on S.-facing hillside above river. Minster Church (SX19A), growing in patches on granite low on south wall of church, sheltered and slightly shaded; some patches in contact with *Tortella nitida*.

Foliar gemmae seen (2-3) but sparse. Not seen c.fr.

22.25  **Grimmia decipiens** (Schultz) Lindb.

Mediterranean-Atlantic Suboceanic element.

*1*: Road from Penzance to Lamorna Cove, 1830, JST (RAMM) (Paton 1969a: 729).


Apparently in long-term decline. Grows in patches that tend to disintegrate when removed from rock. Single recent record (N. of Troon, vc1), of patch 7 cm across on unshaded surface of large granitic boulder just north of ruin of mine engine house (no associates).

Only recent record c.fr.: capsules immature 4.

22.27  **Grimmia ramondii** (Lam. & DC.) Margad.


*2*: De Lank, Camelford, 1886, HND (BM) (Paton 1969a: 729) (probably the same record listed as Brown Willy, 1886, HND, by Tellam (1888).

[An old record from vc1 (Holmes 1906) was deleted by Paton 1969a: 729, Crundwell 1970: 202].


Possibly now extinct (or overlooked?).

[23.1  **Racomitrium ellipticum** (Turner) Bruch & Schimp. – Formerly listed for vc2 but the only specimen traced (Brown Willy, 1907, RWS, TRU) is misidentified *R. fasciculare* (Paton 1969a: 730)].
23.2 *Racomitrium aciculare* (Hedw.) Brid.
Boreo-temperate Suboceanic element.


Grows in tufts or small to rather large patches. Habitat notes from Cornwall are as follows. Usually the most hygrophilous of our *Racomitrium* spp. Most plentiful beside streams, small rivers and reservoirs, growing above normal water-levels but within flood-zones (typically 0.1-2.0 m above summer water-level), but also and mainly in small amounts away from water in mostly very humid places. Mainly grows on hard acidic rocks (granitic and slaty; once apparently on gabbro; on horizontal to sloping or vertical surfaces), e.g. on tops of boulders in and beside streams and on streamside outcrops, walls or bridges. Also away from water-courses on boulders, walls, or on horizontal damp or wet rocks of tracks; in and beside woodland or groves of trees, by roadsides, in old quarries, low on a rocky hillside, in a cemetery, and on a 'hedge'. Grows unshaded, part shaded or sometimes moderately shaded by trees. Unusual records on slate roof of a building and, in moderate amount, on damp old tarmac of track partly shaded by trees. Plentiful on cast-iron of old pipe above river bank, lightly shaded by trees. Associates often include *Sciuro-hypnum plumosum*, *Hyocomium armoricum*, *Thamnobryum alopecurum*, sometimes *Isothecium holtii*, *Plagiochila porelloides*.

Frequently/commonly c.fr; capsules immature 2, 4, 5, 8, 10-12; dehiscing 4, 5; dehisced 3, 5.

23.3 *Racomitrium aquaticum* (Brid. ex Schrad.) Brid.
Temperate Suboceanic element.

*2*: Helman Tor, 1880, RVT (OXF) (Paton 1969a: 730).

Grows in patches that are often pure and rather extensive. Recorded only from granitic rocks, commonly in places that are flushed with trickles of water at least after rain, and on gently sloping, steep, or vertical surfaces. Records are from rocks about tors (often N.-facing, once S.-facing), rocky slopes above a river, a mossy boulder on old mine-spoil and in an old quarry. Found in open and wooded areas, unshaded to part shaded.

One record c.fr.: capsules dehiscing 4.

23.4 *Racomitrium fasciculare* (Hedw.) Brid.
Boreo-temperate European element.

*2*: Near Fowey, 1888, RVT (B) (Paton 1969a: 730).

Habitat notes from Cornwall are as follows. Vc1 record on inclined surface of granitic boulder, slightly shaded by elm tree. Vc2 records: On granitic rocks in old quarry. Sloping granitic rocks of unshaded boulders in old mine area, such as around ruins of buildings and walls, usually fully insolated; associates include *Racomitrium heterostichum*. On sloping surface of firm and crumbling granitic boulders in and near china clay quarries and several
times on tops of ridges on firm clay spoil, unshaded to sheltered and slightly shaded. Numerous patches as colonist on unshaded flat damp sandy sediment at edge of mica dam. On granitic boulders at edges of reservoirs and below reservoir dam; unshaded. On granitic rock of unshaded wall top.

Four records c.fr. from three localities (vc2): capsules immature 2, 3, 10, 12; dehiscing 2, 3; dehisced 3.

23.6-8  *Racomitrium heterostichum* (Hedw.) Brid. *s. l.*

Taxonomy of this group was elucidated by Frisvoll (1988) and Blockeel (1991). Only *R. heterostichum s. str.* has been recorded in Cornwall, despite routinely checking leaf-sections and other characters of most plants recorded since 1993 on the assumption that *R. affine* (Schleich. ex F.Weber & D.Mohr) Lindb. (which is known in Devon) and perhaps *R. sudeticum* (Funck) Bruch & Schimp. 'should' also occur. Nevertheless, although Porley & Hodgetts (2005: 409) appear to imply that *R. affine* occurs on Bodmin Moor it has not been recorded in Cornwall. Records from before the revision by Blockeel (1991) are treated here as the *R. heterostichum s. l.* (unless old specimens were revised), along with more recent records which have not been carefully checked for the other segregate species.

Some Cornish plants show the characters of *R. heterostichum* fo. *obtusum*, which was regarded as a distinct species by Frisvoll. Large plants of *R. heterostichum* from an old flooded quarry on Carn Marth, with a broad nerve and blunt leaves, were superficially similar to *R. aquaticum*, but their leaf-cells lacked all trace of papillae.

23.8  *Racomitrium heterostichum* (Hedw.) Brid.  


First vice county records of the *s. l.* species (see below):

*2: Helman Tor, 1891, RVT (B) (Paton 1969a: 730).

First vice-county records of *R. heterostichum s. str.*:


See notes above. Taxonomy of this group was elucidated by Frisvoll (1988). British specimens were revised by Blockeel (1991), who found that *R. obtusum* appears to be no more than a muticous form of *R. heterostichum* which probably does not merit treatment as a separate species.

Grows in tufts or forms small to rather large patches. Habitat notes from C&S are as follows. Confined to hard rock surfaces (granitic, gabbro, slates), typically on horizontal to inclined surfaces or arising from small crevices, more rarely from a very thin layer of overlying soil or a bryophyte mat. Recorded from natural outcrops and boulders (e.g. on hillsides, heathland, reservoir edges including upper part of inundation-zone), quarried rocks, areas of old quarry- and mine-spoil, old and rather recent china-clay spoil, rocks in
'hedges', walls, and rock of gravestones and grave surrounds. Grows in fully insolated sites and lightly shaded at wood edges, less often partly shaded, e.g. in open deciduous woodlands. Normally restricted to rock substrates, but a single record on firm gritty china clay waste on unshaded bank at quarry edge. Often common in areas with much exposed granite, but much scarcer elsewhere. Most of the records furthest from the granite districts are on old walls, gravestones, or isolated boulders, in some cases perhaps a result of the moss having been transported by man attached to a boulder. Often grows with Grimmia trichophylla and lichens; other frequent associates include Andreaea rothii, Dicranoweisia cirrata, Hedwigia stellata, Racemitrium fasciculare, less often Ptychomitrium polyphyllum, Racemitrium lanuginosum.

Frequently cfr; capsules immature 1-5, 9-12; dehiscing 3, 5; dehisced 3-5, 7-9, 11.

23.10  *Racomitrium lanuginosum* (Hedw.) Brid.  12
Boreo-arctic montane Circumpolar element.

*1*: St Enoder, 1861, ES (TRU) (Paton 1969a: 730).
*2*: Helman Tor, 1890, RVT (B) (Paton 1969a: 730).

Forms patches or mats, sometimes wefts. Habitat notes from Cornwall are as follows. Occurs on a variety of acidic substrates that may be rather wet to free-draining, but mainly peat or humic soils, lithosols and granitic rocks (where often growing directly on rock or in tiny crevices). Rather patchy in its occurrence and sometimes locally plentiful, mostly in granitic regions, in heathland, mires or among rocks (boulders, outcrops, walls, on 'hedges'). Generally grows unshaded, so that in heathland where vegetation is tall it is restricted to barer patches or rocks, but it often colonises burnt heathland soils. Locally abundant on heavily grazed areas at edges of some mires and occurs with sphagna on hummocks within some mires. Colonises heathy ground over old metalliferous mine-spoil and sometimes an early colonist of china-clay quarries and their spoil. A single record of small patches on sloping granite of buttress 2.5 m above ground on NE. corner of church. Unusual record of small amount growing on old roofing felt dumped amongst mine-spoil. Associates recorded on ground include various sphagna, *Calluna vulgaris, Carex binervis, Erica tetralix*; on rock *Racomitrium heterostichum*.

One DTH record cfr.; capsules immature 12. There are a few older records of capsules (3, 6: Paton 1969: 730).

23.11  *Racomitrium ericoides* (Brid.) Brid.  12

First vice-county records of *R. canescens s. l.*
*2*: Nanstallon Downs, Bodmin, 1892, RVT (B) (Paton 1969a: 730).

First vice-county records of *R. ericoides*:
The taxonomy of the *R. canescens* s. *l.* [23/11-13] was revised by Frisvoll (1983); Hill (1984a) revised the British vice-county records. Older records that have not been revised recently are listed as the *s. l.*

Forms patches or low to almost tall turfs. Habitat notes from Cornwall are as follows. Normally on acidic, mainly sandy or gravelly soil, commonly on compressed soil on less disturbed parts of paths and tracks and often on damp ground. Recorded on heathland, in and near old quarries, in old metalliferous mine areas and in china-clay pits and among their spoil. Grows in open or only slightly shaded. Normally grows on soil rather than rock, but recorded once on thin soil overlying quarried slaty rock and a few times growing directly on rock of surfaces of granitic boulders in areas of china-clay spoil. Sometimes locally dominant and forming substantial patches. Associates recorded include *Archidiium alternifolium*, *Campylopus introflexus*, *Calliergonella lindbergii*, *Philonotis fontana*, *Pleurozium schreberi*, *Pohlia annotina*, *Pohlia drummondii* and short grasses and herbs.

Not seen c.fr. in recent years (Paton 1969: 730 notes 'rarely c.fr' for *R. canescens* in Cornwall, which would refer to the present species).

23.12 *Racomitrium elongatum* Ehrh. ex Frisvoll

Boreo-temperate Suboceanic element.


The only record from Cornwall. Not re-found by DTH on a visit to the site.

24.1 *Ptychomitrium polyphyllum* (Dicks. ex Sw.) Bruch & Schimp.

Southern-temperate Oceanic element.


*2*: Grogley Down, W. of Bodmin, before 1907, RVT (B) (Paton 1969a: 740).

Usually forms small, pure cushions or patches. Habitat notes from C&S are as follows. Mainly on hard dry acidic rocks (usually granitic or slaty, once shale), growing on open surfaces or in small crevices. Recorded most often from man-made sites in old quarries, quarry spoil, boulders among old mine-spoil, old walls (including bridge walls, a reservoir dam and north wall of church), masonry debris, graves, granite fence-posts, in ‘hedges’, and a road cutting. The few natural sites recorded include low on sheltered sea-cliff and a granite boulder in the flood-zone beside a small river. It is often but not always found in sheltered places, and tends to avoid exposed hill tops, but usually grows unshaded or lightly shaded (occasionally part-shaded, e.g. by woodland edge or buildings, rarely in heavy shade e.g. in wooded old quarry). Although typical of acidic rocks, it apparently tolerates some base. Patches found on rock in mortared walls were all or mainly on acidic parts of the substrates, but four scattered records of it (well-grown and fertile at three of the sites) on old concrete suggest tolerance of a basic substrate, especially as one of these was close to *Didymodon rigidulus* and *Tortula muralis*.

Commonly c.fr.; capsules immature 1-5, 10-12; dehiscing 2-6 [7]; dehisced 4, 5, 7, 8, 10-12.
26.1 *Blindia acuta* (Hedw.) Bruch & Schimp.  
Boreo-arctic montane Circumpolar element.


Mainly in wet, flushed places on and above granitic sea-cliffs of Land's End Peninsula, both N.-facing and S.-facing, on firm sloping rocks, crumbling rocks, thin soil over rock and gritty soil in edge of a stream. Commonly almost or quite unshaded, but also in small quantity on underside of overhanging rock with trickling water, and occurring in quantity quite low on N.-facing sea-cliffs. Commonly lacks closely associated bryophytes, although others occurring nearby may include *Didymodon tophaceus*, *Solenostoma gracillimum*, *Scapania undulata* and occasionally *Dicranella palustris* and *Philonotis rigida*. Atypical record at Carwinion of small amount of weak, straggling plants growing close to edge of shallow water on granitic rock of 'bowl' in ornamental gardens

Not seen c.fr.

27.1 *Brachydontium trichodes* (F. Weber) Milde  
Temperate Suboceanic element.


Two recent records from vc2 as follows: NW. of Warleggans, on steep side of granite boulder, almost unshaded in low open oak woodland on slope above small river, with *Marsupella emarginata* var. *emarginata*; Baal Pit, Carclaze, on unshaded surfaces of crumbling granitic boulder at foot of slope in disused china-clay pit.

Only recorded c.fr.: immature 2, dehisced 4.

29.1 *Archidium alternifolium* (Hedw.) Mitt.  
Southern-temperate European element.


Habitat notes from C&S are as follows. Characteristic of soil on trampled coastal headlands, cliff-slopes and sea-cliffs, cliff-top paths and other partly bare, unshaded coastal sites, where it is often locally dominant and forms sparse patches or low carpets, or occurs in short, open turf, often where trampled. It occurs commonly on compressed acidic soils but also on firm substrates that are not trampled and where some base is present. Water stands temporarily in puddles at many of its sites; indeed, it is frequent on and above exposed sea-cliffs in places where there must be considerable input of salt-spray, and it often occurs in hollows where salt-spray will be concentrated e.g. by rocks, or where there is a trickle of
fresh water. *Bryum dichotomum* is its most consistent associate in these habitats; other common associates include *Campylopus introflexus*, *Ceratodon purpureus*, *Kindbergia praelonga*, *Tortella flavovirens* and *Cladonia* sp.; less common are e.g. *Bryum kunzei*, *Cephaloziella divaricata*, *Cephaloziella hampeana*, *Cephaloziella stellulifera*, *Ephemerum serratum*, *Fossombronia* spp. (especially *Fossombronia 'husnotii'*, *Grimmia lisae*, *Hypnum cupressiforme* var. *lacunosum*, *Lophozia excisa*, *Pohlia annotina*, *Riccia sorocarpa*, *Scapania compacta*, *Scleropodium touretii*, *Tortula canescens*, *Tortula viridifolia*, *Tortula wilsonii*, *Trichostomum brachydontium* and *Weissia* spp.; also various low herbs, e.g. *Aphanes*, and grasses.

Less common inland, but locally frequent to abundant on partly bare, often compacted, acidic soil (humic, silty or gravelly) of paths or tracks and other partly bare patches on heaths or more rarely on bare patches in acid grasslands, usually where wet or damp and often but not always in slight hollows where water stands, mainly in unshaded places. Also on paths or tracks and on open flat mine-spoil in old copper-mining areas, and about old granite and china clay quarries. Associates at typical sites inland may include *Bryum dichotomum*, *Bryum bornholmense*, *Dicranella varia*, *Entosthodon obtusus*, *Fossombronia 'husnotii'*, *Fossombronia pusilla*, *Fossombronia wondraczekii*, *Calliergonella lindbergii*, *Solenostoma gracillimum*, *Pleuridium subulatum*, *Pohlia annotina*, *Riccia sorocarpa*, *Scapania irrigua*, *Tortula truncata*, *Radiola linoides*, and such rarities of trackways on the Lizard heaths as *Ephemerum sessile*, *Fossombronia 'husnotii'*, *Riccia beyrichiana*, *Cicendia filiformis* and *Juncus pygmaeus*. On and near Bodmin Moor recorded with *Campylopus subulatus*, *Philonotis fontana*, *Pohlia drummondii*, *Scapania irrigua*, *Centunculus minusimus* and *Radiola linoides*. Sometimes found forming a dense carpet with stems 3-5 cm tall on bottoms of temporary or seasonal pools, e.g. in pool in conifer plantation (growing near *Littorella uniflora*) and in area of old china clay spoil; another record on damp track edge on spoil near china clay works. Less typical records are from gravelly car-parking area in village, gravel track in young conifer plantation, on acidic soil at edges of tarmac and concrete roads beside china clay quarries, and in damp hollows with sparse vegetation on flat areas of china clay spoil. Also recorded on firm sediments in inundation zones beside several reservoirs, sometimes in quantity (where associates include *Calliergonella cuspidata*, *Campylopus introflexus*, *Cephaloziella divaricata*, *Ceratodon purpureus*, *Dicranella rufescens*, *Fossombronia foveolata*, *Fossombronia incurva*) and on trampled ground at pool edges.

Frequently c.fr.: capsules immature 1-4, 9-12; nearly mature 1, 2, 4-6. Spores are apparently liberated only when capsule decays, by which time leafy gametophyte may be moribund.

30.1 **Fissidens viridulus** (Sw.) Wahlenb.  

First vice-county records of *F. viridulus* s. l.:  

First vice-county records of *F. viridulus* s. str.:  

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**S12**
*1: Earthy bank at back of shore, Watermill Cove, St Mary's, Isles of Scilly, 1984, JAP & DGL (BBSUK) (Hill 1985: 23). [*F. viridulus s. str. was previously listed as confirmed for vc1 by Corley 1980: 207, but without any details].

*2: F. viridulus s. str. listed as confirmed for vc2 by Corley (1980: 207), but without any details.

See notes under several species below for comments on taxonomic delimitation of *F. viridulus*.

Grows as scattered plants or forms open patches or lawns. Habitat records from C&S are as follows. A colonist of bare or partly bare soil, often where clayey or loamy and moist at least in winter, but avoiding very wet or very dry sites. Apparently prefers less acidic soils than those tolerated by *F. bryoides* var. *bryoides*, typically occurring on circumneutral to mildly basic substrates. Commonly on banks such as beside lanes, by ditches and streams, in pastures and at field edges, inside woodland, Grey Willow-carr and groves of trees, on and above sea-cliffs, also on disturbed soil of soil heaps, soil exposed by wind-thrown trees, in gardens, field gateways, churchyards and a cemetery, on 'edges', beside a path, and among mine-spoil. Once near edge of arable field (cereal stubble). Often partly shaded, but recorded from fully insolated sites and also from places heavily shaded by scrub or trees or in holes in banks. On Isles of Scilly recorded several times on steep soft sandstone (of Pleistocene raised-beach deposits) well inside shallow caves low on sea-cliffs, often with *F. crispus*, or as non-fertile plants that are hard to place as either of these species. Also on low shale cliffs 1.5-2.0 m above HWST level of estuarine creeks. Atypical records elsewhere from thin silt over dead wood of horizontal tree trunk lying over stream, on crumbling vertical concrete of old weir, on hard 'soil' exposed by falling water-level of reservoir, on vertical face of old house-brick, with other low mosses on old brickwork, on very thin 'soil' over vertical rock in shade near stream. Associates include many small mosses that colonise circum-neutral soils, e.g. *Didymodon insulanus*, *Funaria hygrometrica*, *Pohlia melanodon*, *Pseudephemerum nitidum*, *Tortula truncata*; occasionally *Bryum sauteri*, *Pleuridium subulatum*.

Commonly c.fr. [not recorded without well-grown capsules]: capsules immature 1-4 [5], 7, 10-12; dehiscing 1-8, 11, 12; dehisced 2-5, 7.

30.2 *Fissidens crispus* Mont. NS S12


*2: Garden hedge, Bodmin, no date, RVT (DBN) (Corley 1980: 206).

Not distinguished from closely allied species in Britain until the study by Corley (1980). Distinguished from *F. viridulus* only on basis of smaller, more bulging cells of leaf lamina, but patches or local populations often show intermediate characters. Indeed, variation in both cell size and mamillosity appears to be continuous, so taxonomic status of *F. crispus* may be questionable. Although *F. crispus* appears to be more closely confined to coastal sites in Cornwall than *F. viridulus*, cultivation experiments are desirable to assess whether its characters have a genetic basis.
Scattered stems or lawns. Habitat notes from C&S are as follows. Usually on steep to vertical surfaces of open soil that may be loamy, sandy or stony, in dry to damp places. Unshaded or more often slightly or partly shaded (often by scrub or trees), sometimes rather heavily shaded. Mostly recorded from banks and 'hedges' near the coast, often near cliff tops. Also on low cliff beside a creek, banks near a small stream close to coast and a ditchbank. Once on thin soil over steep slaty rock in old quarry well inland and shaded by deciduous woodland. Associates recorded include *Lejeunea lamacerina*. On St Martin's (Isles of Scilly) found inside several shallow caves low on sea-cliffs, on vertical to horizontal or overhanging steep soft sandstone (of Pleistocene raised-beach deposits), in sites that are permanently shaded and rather humid. Plants also occur here and in similar habitats elsewhere in Scilly that appear to be intermediate between this species and *F. viridulus*, along with those that seem rather arbitrarily placed as *F. crispus* because they have cells < 8 µm in upper parts of most leaves.

Commonly c.fr. [not recorded without well-grown capsules]: capsules immature 1, 2, 4, 12; dehiscing 1-4, 6, 12.

30.3 *Fissidens pusillus* (Wilson) Milde *s.* *str.*


Not consistently distinguished from allied spp. in Britain until the study by Corley (1980), when it was recorded for vc1 and vc2, so that older records are accepted only when specimens have been revised subsequently. Nevertheless, *F. pusillus* is often difficult to separate from *F. viridulus*, the shape of the leaf apex appearing to be an unstable character. Indeed, the habitat appears more distinctive than the morphology, so that populations of plants occur that are recognisable as *F. pusillus* only or mainly by the habitat (rocks in and near water), suggesting that recognition of two taxa may have little value. *F. pusillus* can also be very similar to diminutive plants of *F. bryoides* var. *caespitans* and *F. crassipes* and it occasionally grows intermixed with those species. Plants showing all characters of *F. pusillus* *s.* *str.* except that the capsules were all somewhat inclined were found SW. of Treswigg and SW. of Rosecraddoc Manor (DTH 07-473). See also notes below under *F. bryoides* var. *caespitans*.

Grows as scattered plants or low open lawns. Habitat notes from Cornwall are as follows. On horizontal, inclined and vertical surfaces of stones and rocks (including granitic and slaty lithologies), mainly from shallowly submerged to within ca 15 cm above water-level of streams. Normally in places that are lightly to moderately shaded by banks, scrub or trees, including streams in woodlands. Associates include *Hygroamblystegium flaviatile*, *Chiloscyphus polyanthos*, *Platyhypnidium riparioides*. On granitic boulders in inundation zones at edge of Argal Reservoir and Siblyback Lake (Reservoir), unshaded to lightly
shaded, often with *F. bryoides* var. *caespitans* (q.v.). One record from higher above water-level on flat rock near a sluice at Clowance (vc1).

Commonly c.fr. [not recorded without well-grown capsules]: capsules immature 2, 7, 10, 11; dehiscing 1, 7-11, dehisced 10.

30.5 *Fissidens incurvus* Starke ex Röhl.
Mediterranean-Atlantic Suboceanic element.


Old records from 1860s might have been errors for 30.6.b, which was not described until 1876 and not named at species rank until 1885.

Readily identified by its inclined capsule, but otherwise seems very close to *F. viridulus* and perhaps only a recurrent form of that species. However, it may occur more consistently on basic substrates than does *F. viridulus*.

Grows as scattered plants or low lawns. Habitat notes from C&S are as follows. On open rather basic to mildly acidic loamy or clayey soil (occasionally thin soil over slaty rock) that may be horizontal, sloping or vertical and rather dry to damp. Grows in unshaded or partly shaded places, less often moderately shaded e.g. under trees. Records are from soil exposed in pastures (e.g. on steep banks), trackside and laneside banks, bank beneath hedgerow beside canal, stream banks, banks near coast and beside a lake, old quarries, a churchyard and disused railway cuttings. Single finds also on thin soil on top of stone wall and on a bank of old mine-spoil. Associates recorded include *Bryum rubens*, *Bryum ruderale*, *Dicranella rufescens*, *Epiptrerygium tozeri*, *Fissidens exilis*, *Fissidens bryoides* var. *bryoides*, *Fissidens taxifolius* var. *taxifolius*, *Fissidens viridulus*, *Microbryum davallianum*, *Microbryum rectum*, *Weissia* sp.

Commonly c.fr. [not recorded without well-grown capsules]: capsules immature 1, 3, 4, 6, 10-12; dehiscing 1-7, 10, 11; dehisced 3-7.

30.6.a *Fissidens bryoides* Hedw. var. *bryoides* S12
Temperate Circumpolar element.


Small plants are easily misidentified as *F. viridulus*, since stunted *F. bryoides* var. *bryoides* may lack male buds in the leaf axils on all but a small minority of plants. *F. bryoides* var. *bryoides* can also be difficult to separate from small forms of *F. bryoides* var. *caespitans* (q.v.) with which it is apparently connected by intermediates. However, *F. bryoides* var. *bryoides* is more widespread in Cornwall and often commoner than both of these.

Scattered plants or forming lawns. Habitat notes from C&S are as follows. Normally on neutral to moderately acidic mineral soils, on horizontal, sloping or vertical surfaces that are rather dry to moist, but not permanently wet. Commonest in light to moderate shade, but
sometimes fully insolated and frequently also growing (non-fertile) in deep shade in
crevices and under overhangs on banks. Common in woodlands, groves of trees (deciduous
and conifers) and scrub, on laneside banks, stream banks, on 'hedges' and on and above sea-
cliffs, but also recorded from bare patches or banks in pastures, a damp cattle-trodden track,
Grey Willow scrub, cemeteries, churchyards, old quarries, old mine spoil, a bank beside a
reservoir, and banks or spoil heaps of china clay near quarries. Commonly on thin soil over
rocks and occasionally in moist rock crevices, but not usually growing directly on rock
although occasionally seen on soft rock surfaces in sheltered places. Frequent associates
include *Calypogeia arguta*, *Calypogeia fissa*, *Kindbergia praelonga*, *Fissidens taxifolius*
var. *taxifolius*, *Lophocolea bidentata*, *Mnium hornum*, *Plagiothecium nemorale*,
*Plagiothecium suculentum*, *Rhizomnium punctatum*, *Conocephalum conicum*; others
recorded include *Bryum sauteri*, *Trichodon cylindricus*, *Epipterygium tozeri*,
*Oxyrrhynchium hians*, *Oxyrrhynchium pumilum*, *Fissidens exilis*, *Pleuridium acuminatum*,
*Tortula truncata*.

Commonly c.fr. [recorded mainly when evident that capsules are erect]; capsules immature
1-3 [4 few], 6, 9-12; dehiscing 1-4 [5-9], 10-12; dehisced 1-10 [11 old].

30.6.b  *Fissidens bryoides* var. *caespitans* Schimp.  

*1*: Newlyn Cliff, 1861, WC (OXF) (Paton 1969a: 712-713). The Holotype was from
Newlyn Cliff.

in Tellam 1892) not supported by specimen: Paton 1969a: 712-713].

The recent recognition that this taxon commonly has brown rhizoids in Cornwall (Holyoak
& Whitehouse 1998) suggests that it was under-recorded in the past, when only the
somewhat scarcer plants with red rhizoids were placed here (cf. Smith 1978: 194). Plants
with brown rhizoids are likely to be mistaken for *F. bryoides* var. *bryoides*, since that taxon
can also have multistratose leaf borders, but var. *caespitans* has inclined capsules and larger
spores (many >16 µm), and it is commonly taller. However, some plants are undoubtedly
intermediate and this probably justifies their treatment as varieties rather than species..

Some plants from Siblyback Lake resemble *F. pusillus* in their small size but have
antheridia on dwarf axillary branches and inclined capsules; since larger *F. bryoides* var.
*caespitans* is present close by these are interpreted as dwarf plants of the latter taxon.

It usually forming pure patches or lawns, but occurs also as scattered stems. Habitat notes
from C&S are as follows. The usual substrates are thin soil over rock or it grows directly on
rock surfaces (slaty, granitic), often also on firm soil, several times seen on concrete and
other masonry and occasionally on exposed tree roots e.g. of Alder; most often on steep or
vertical surfaces but also on horizontal ones. It grows in damp or wet places and mostly
close to water-level of streams (within 0-35 cm, so commonly within the flood-zone;
sometimes where shallowly submerged even in summer), but also on flushed rocks away
from streams or rivers, such as on sea-cliffs, on a hill top, in a disused railway cutting and in
old quarries, and in upper part of inundation zones beside reservoirs. It usually grows partly
to moderately shaded, typically by trees, Grey Willow scrub or banks, but is sometimes
fully insolated, or rather heavily shaded. Twice seen on moist loamy soil near graves in
churchyards, once on damp soil under elms (where occasionally flooded) and several times on damp humic soil under Alder or Grey Willow carrs. More atypical records are from the wet clayey surface of wall of ruin of china clay ‘dry’, in shaded interior of old mine adit high on a sea-cliff and on flushed rocks well inside a large sea-cave. Associates recorded include Fissidens adianthoides, Mnium hornum, Plagiothecium nemorale, Rhizomnium punctatum, Platyhypnidium riparioides, less often Fissidens polyphyllus, Heterocladium heteropterum var. heteropterum, Heterocladium wulfsbergii, Trichostomum tenutrostre.

Commonly c.fr. (although non-fertile when submerged all year): capsules immature 1-6, 9-12; dehiscing 1-6 [7], [9], 11, 12; dehisced 1, 4, 5, 7, 8.

30.7 Fissidens rivularis (Spruce) Schimp. Mediterranean-Atlantic Oceanic element.


A rather rare moss that is usually clearly distinct from congeners in its greatly thickened leaf border, but a few gatherings seem to form a link with F. bryoides var. caespitans. Grows as lawns or scattered plants. Habitat notes from Cornwall are as follows. On rocks (slaty or granitic), occasionally masonry (of bridge) or firm soil, on vertical to horizontal substrates. Occurs shallowly submerged to just above water-level (up to ca 12 cm above water; within flood-zone) of clean streams, the sites being shaded or partly shaded, mainly by deciduous woodland. One site is in small stream on exposed coastal slope. Close associates are often lacking, but can include Chiloscyphus polyanthos, Dumortiera hirsuta; Fissidens bryoides var. caespitans grows close to it at some sites.

Capsules apparently frequent: immature 4, 10, dehisced 3, 5.

30.8 Fissidens monguillonii Thér. Southern-temperate Oceanic element.

*2: On firm earth on bank of river, R. Tamar just N. of Greystone Bridge, SX38, 2000, DTH 00-70 and 00-71 (BBSUK, DTH) (Rothero 2001: 39).

At edge of River Tamar near Greystone Bridge and near Luckett it grew as small patches on firm earth at edge of river and on thin soil over low boulders or other low rocks, partly shaded, close above summer water-level, deeply flooded in winter. Also beside stream not far from R. Tamar, near Penscombe, on vertical clay of steep bank of stream ca 5-15 cm above water-level, slightly shaded by deciduous trees.

One record c.fr.: capsules immature 5.
30.9  *Fissidens crassipes* Wilson ex Bruch & Schimp.  Southern-temperate European element.


Rather rare in Cornwall. Grows as low lawns or scattered stems. Habitat notes from Cornwall are as follows. At Ponsanooth: on slaty rocks just above water-level of river, partly shaded by trees and a viaduct. SE. of Badger’s Cross: on block of old concrete, part-shaded inside ruins of concrete cattle trough at edge of field bordered by woodland. Near Kilkhampton: on firm soil just above water-level of stream, well shaded by deciduous trees. Near Higher Tolcarne: on slaty rock close above water level of small, somewhat polluted river (near *Chiloscyphus polyanthos*, *Platyhypnidium riparioides*). Near Boskennal Mill: on granitic rocks at and just above water-level of large stream (within inundation-zone), part-shaded by deciduous trees.

Four of five records were c.fr.: capsules immature 1 [6 a single capsule], 8; dehiscing 8; dehisced 8.

30.11  *Fissidens exilis* Hedw.  Temperate European element.


*2*: Bodieve near Wadebridge, 1878, RVT (B) (Paton 1969a: 713).

Grows as scattered plants, less often as a low lawn, its presence often not being detected until other small bryophytes are examined with hand lens or dissecting microscope. Habitat notes from Cornwall are as follows. On soil (dry to damp, silty or loamy, circumneutral to mildly acidic), on horizontal, sloping or vertical surfaces. Most sites are shaded or partly shaded, mainly by trees or scrub, but once on open but N.-facing bank. Most finds have been in open woodland or on woodland tracks, edges or in clearings, with others in Grey Willow carr, on laneside banks, on top of ‘hedge’, on slope above sea-cliff, between boulders of stile in ‘hedge’ between fields, on bank between pastures and in a cemetery. Associates recorded include *Bryum ruderale*, *Bryum sauteri*, *Dicranella rufescens*, *Epipterygium tozeri*, *Oxyrrhynchium hians*, *Kindbergia praelonga*, *Fissidens bryoides* var. *bryoides* (frequent), *Fissidens incurvus*, *Fissidens taxifolius* var. *taxifolius*, *Fossombronia pusilla* and *Conocephalum conicum*.

Commonly c.fr. [only recorded with capsules]: immature 1, 9-12; dehiscing 2-4, dehisced 5, 6.
30.12  **Fissidens celticus** Paton  
Temperate Oceanic element.


Grows as scattered stems or sparse open lawns; unlike most congeners it never forms closed lawns or tufts. Habitat notes from Cornwall are as follows. Often intermixed with other small bryophytes, on mainly bare to partly bare soil (circumneutral to moderately acidic, loamy or clayey), usually on inclined to vertical surfaces that are free-draining and often somewhat eroded. Grows in sheltered and often humid situations, in light to moderate shade (of deciduous trees or less often conifers or *Rhododendron*). Mostly found on banks in deciduous woodland, often on woodland stream, trackside (including wheel ruts in conifer plantation) or river banks, also laneside banks, less often on flat horizontal soil of woodland tracks. Frequently on nearly bare soil at edge of badgers' pathways down banks. Associates recorded include *Calypogeia arguta, Dicranella heteromalla, Diplophyllum albicans, Epipterygium tozeri, Fissidens bryoides var. bryoides, Pohlia lutescens, Pseudotaxiphyllum elegans*. A few plants found once on small patch of mainly bare soil in pasture on hillslope not far from woodland edge (with *Withoceros punctatus*).

Only female plants known, so sporophytes unknown. It is uncertain how this species disperses.

30.13  **Fissidens curvatus** Hornsch.  


At Talland Bay it grew as scattered plants on steep often rather thin, partly bare soil over slaty rock of bank above coastal path at edge of pasture, unshaded (with *Weissia* sp.). Only record c.fr.: capsules immature 1, dehiscing 1, dehisced 1 (at Talland Bay most capsules sometimes either aborted or eaten off).

30.14  **Fissidens osmundoides** Hedw.  
Boreo-arctic montane Circumpolar element.

*2: Tregawn, Withiel, 1871, RVT (B) (Paton 1969a: 713).
Grows in small patches (e.g. in crevices) or as larger patches (low lawns). DTH records from vc1 only from N.-facing sea-cliffs of Land’s End peninsula, as follows. Pendeen Watch: low on vertical wet rock on lower part of sea-cliff slope at edge of flushed area; sheltered and partly shaded by grasses and herbs. Near Porthmoina Cove: on firm soil and thin soil over rock in flushed areas. NW. of Morvah: in flushes with trickling water, both in open (on N.-facing slope) and inside sheltered crevices. Vc2 record inland by RJM 1960 (conf. DTH 2001): rocks by waterfall, St Nectan’s Kieve. DTH record on thin soil at Rocky Valley: over steep flushed slate rock on E.-facing bank above stream near coast, almost unshaded, with *Fossombronia angulosa*.

Not seen c.fr.

30.15.a *Fissidens taxifolius* Hedw. var. *taxifolius*  
Southern-temperate European element.

*2:* Near Croan, Egloshayle, 1888, RVT (B) (Paton 1969a: 713).

Typically forms rather dense lawns or patches. Habitat notes from C&S are as follows. Usually on dry to damp mineral soil (often clayey or loamy) with at least moderate base content, on horizontal or sloping, less often vertical surfaces (occasionally on thin soil over rocks or on old walls). Typically grows where partly shaded or sheltered, but also occasional in fully insolated sites or in heavy shade. Often common in deciduous woodland (especially on slopes or banks), groves of trees, under scrub (including Grey Willow carr), on banks e.g. beside lanes, beside ditches, and on stream and river banks (commonly occurring in zone that is flooded briefly each year) and in churchyards (including records in short grassland in sheltered and partly shaded places). Recorded also from a conifer plantation, roadsides, on 'hedges', hedgebanks and above sea-cliffs, in cemeteries, on garden soil, and (as young plants) from bare soil patches in damp unimproved pasture. Frequent associates include *Oxyrrhynchium hians*, *Kindbergia praelonga*, *Oxyrrhynchium pumilum*, *Fissidens bryoides* var. *bryoides*, *Mnium hornum*.

Atypical records from damp soil in flushes above sea-cliff, on stone at water-level in stream, on old concrete near streams, soil inside ruins of old mine engine-house, and on a soil heap and a spoil bank on old mining ground.

Single record of plant with rhizoidal tubers in arable (stubble) field, DTH 05-88, March 2005. Occasionally (frequently ?) c.fr.: capsules immature 1-3, 10-12; dehiscing 1-6; dehisced 3-5, 8, [10 old].

[30.15.b *Fissidens taxifolius* cf. var. *pallidicaulis* (Mitt.) Corb. (syn. *F. taxifolius* subsp. *pallidicaulis* (Mitt.) P.de la Varde). Southern-temperate Oceanic element. Cornish material (DTH) from SX08Z and SX 19F is intermediate between 30.15.a and 30.15.b]
30.16 **Fissidens dubius** P.Beauv. (syn. **Fissidens cristatus** Wilson ex Mitt.). Temperate European element.


A few gatherings appear absolutely intermediate between *F. dubius* and *F. adiantoides*, e.g. from fixed sand-dunes at Gwithian Towans, but most *F. dubius* are readily separable on smaller leaf-cell size and presence of bistratose areas in upper part of leaf.

Forms patches or lawns. Although not especially common over much of Cornwall, this species occurs in a curiously varied range of habitats:

(1) Frequent on calcareous sand or sandy soil in short turf of dune grassland on fixed dunes, extending onto similar blown-sand areas on hillslopes (e.g. above dunes) and light sandy soils blown onto cliffs. Associates include *Barbula* and *Didymodon* spp., *Homalothecium lutescens*.

(2) On soil or thin soil over rocks, e.g. on partly shaded or shaded banks and among rocks near streams and rivers and in quarries (in open or in woodland), amongst unshaded short turf on slope in old serpentinite quarry above sea-cliffs, on heathy areas above serpentinite cliffs and quarried slate/shale cliffs, tops of 'hedges' inland and near cliff tops and on thin soil over old concrete.

(3) Directly on rock (serpentinite, slaty, less often granitic), old concrete or mortar of mortared walls (e.g. of viaducts, bridges and wall of mill-leat), on horizontal to vertical surfaces, where at least some base is probably present. Occurs on both wet (flushed) and rather dry rocks and concrete, in open and unshaded to rather heavily shaded and sheltered places. The records include boulders near outcrops, rocks on and above sea-cliffs, a disused railway cutting, quarries and a stony path.

(4) Five records of patches on tree bark: in some quantity 1-2 m above ground on old oak in deciduous woodland (W. of Lerryn); single patch low on large oak tree near stream in edge of deciduous woodland (near Callestick); low on old Ash trees, once part-shaded in woodland near stream, once near coast; patch on silted bark of tree low in flood-zone beside R. Tamar.

Infrequent (11) records c.fr. (but at least 3 of them with capsules abundant): capsules immature 1, 2, 11, 12; dehiscing 1, 2, 3*; dehisced 1, 3, 5, 6, 9 [* = plants apparently intermediate with 30.17].

30.17 **Fissidens adiantoides** Hedw. Boreo-temperate Circumpolar element.


See note above regarding occurrence of plants intermediate between this species and *F. dubius*. Like the latter species, *F. adiantoides* occurs on varied substrates in a wide range
of habitats, most of them at least slightly basic. Although there is considerable overlap in their preferences, *F. adiantoides* often occurs on wetter substrates than those with *F. dubius*, notably in wet heathland. Its records can be divided into the following groups of substrate/habitat types:

(1) Frequent on calcareous sandy soil of fixed dunes and in dune-slacks; usually unshaded.

(2) Occasional on soil on cliff-slopes. Also found once on thin soil over slaty rock close to a small waterfall where partly shaded by deciduous woodland. Once on soil at base of concrete wall.

(3) Directly on rocks (slaty, granitic, serpentinite) and old concrete or wall-mortar, often near water and frequently where surfaces are running with water or receiving spray from waterfalls (the plants then sometimes very large). Sites may be unshaded to rather heavily shaded (e.g. under trees, in old quarries, in old railway cutting and at entrance to mine adit).

(4) In short to rather long vegetation of wet heaths and other marshy places, especially over serpentinite on Lizard pen. It may grow almost unshaded or heavily shaded at bases of tall tussocks of *Molinia caerulea* and *Schoenus nigricans*. Also in similar habitats in flushes on sea-cliffs and once seen growing as extensive lawns on thin film of moist clay under *Calluna vulgaris* on floors of old china-clay settling tanks.

Associates recorded include *Bryum pseudotriquetrum* var. *pseudotriquetrum*, *Conocephalum conicum* s. str., *Cratoneuron filicinum*, *Eucladium verticillatum*, *Pellia endiviifolia*, *Saccogyna viticulosa*, *Thamnobryum alopecurum*, *Trichostomum brachydontium*.

Frequently (or commonly) c.fr.: capsules immature 1, 2, 8, 10-12; dehiscing 11, 1-4; dehisced 3-6.

30.18  *Fissidens serrulatus* Brid.  
Mediterranean-Atlantic Oceanic element.


All Cornish records are from a single site by the stream NE. of Castle Horneck, W. of Penzance. At this locality it grew in patches on overhanging, compact soil of stream-bank, 20-120 cm above fast-flowing water in shade of Beech trees. Some of the plants are above the height of all but exceptional flooding. Although growth of this species on soil was mentioned by Smith (1978 p. 204) the *Atlas* (2 p. 203) refers to it only as growing on alluvial sand and gravel and rocks, 'below flood-level'.

Not seen c.fr. [all British plants reported to be male: Smith 2004: 258].


Habitat notes from Cornwall are as follows. Usually in patches (often pure) on granitic rock and firm soil of stream or river banks from just above water-level to ca 1.5 m above it, preferring steeply inclined, vertical and slightly overhanging surfaces and sheltered humid hollows, nearly all sites being partly to well shaded by trees (often in or at edges of old woodland) and some are heavily shaded in holes. At Mousehole small plants grow on near-vertical granitic rock, with trickling water, in shade well inside a sea cave; *Cyclodictyon laetevirens* and *Conocephalum conicum* grow nearby. In Hendergrove Wood also in damp sheltered hollows among shaded granitic rocks on hillside far above stream inside deciduous woodland (sometimes near *Hymenophyllum wilsonii*). At Dozmary Pool it grows submerged on rocks in shallow water at edge of lake (leg. RJM, in DTH). Unusual record from above Clapper Bridge (SX171) of three strong patches (largest 30 cm) on vertical concrete of enclosed sluice near river, just above water level and rather heavily shaded. Another atypical record of small but established patch on part-shaded soil of steep bank in woodland many metres above R. Camel. Associates recorded: *Calypogeia arguta*, *Cephalozia bicuspidata*, *Fissidens bryoides* var. *caespitans*, *Heterocladium heteropterum* var. *heteropterum*, *Mniu hornum*, *Rhizomnium punctatum*, *Trichostomum tenuirostre*.


Known in Cornwall only by four recent records from rocks submerged in the River Tamar. The species is likely to occur more widely along the Tamar since three of the finds resulted from prolonged searches for Pearl Mussels *Margaritifera margaritifera* carried out by wading to search the river bed in summer when water levels were low using 'glass-bottomed buckets'.

Grows as more or less dense patches or more extensive low (1-3 cm) lawns up to ca 30 cm in diameter. Recorded only from the horizontal or sloping upper surfaces of slaty rocks (bedrock, cobbles and boulders) permanently submerged in water that is slow- to quick-flowing and 5-30 cm deep at times of low summer water-levels. The largest populations grew partly shaded by edges of deciduous woodland, but others were in the open. It mainly grows in pure patches, but sometimes mixed with sparse *Fontinalis squamosa*; *Fontinalis antipyretica* var. *antipyretica* and lichens sometimes also occur close by. The species is thought to tolerate water that is somewhat polluted (C. D. Preston & A. J. E. Smith in Hill *et al*. 1992: 205) so that it may have colonised the Tamar or at least increased there as a result of eutrophication of the river resulting from sewage inputs and agricultural runoff.

Not seen c.fr. [capsules are unknown in British Is.].
31.1 *Pleuridium acuminatum* Lindb.  
Temperate European element.

*2*: Tregawn, Withiel, 1879, RVT (B) (Paton 1969a: 714).

Grows as scattered stems (often among other mosses) or forms small dense patches. Habitat notes from C&S are as follows. On exposed soil (gravelly, loamy or clayey), usually acidic, in grassland, arable fields (four records in stubbles, once each at edge of cereal field, in horticulture and a grass-ley, but apparently not common in arable land), on old tracks, floors of quarries, on and above cliffs, on banks (including stream and laneside banks) or 'hedges', in woodland clearings on disturbed soil, on graves, or on soil-heaps. Often unshaded, or shaded only by grasses and herbs, but sometimes among other mosses on banks, slopes or in crevices of 'hedges' where partly shaded by trees. Usually not in wet places. Associates noted include *Bryum dichotomum*, *Bryum rubens*, *Bryum sauteri*, *Bryum subapiculatum*, *Cephalozia bicuspidata*, *Ceratodon purpureus*, *Dicranella staphylina*, *Ditrichum heteromallum*, *Trichodon cylindricus*, *Kindbergia praelonga*, *Fissidens bryoides* var. *bryoides*, *Fissidens pusilla*, *Phaeoceros laevis*, *Pogonatum aloides*, *Pohlia lutescens*, *Pseudophemerum nitidum*, *Riccia subbifurca*, *Scleropodium touretii*, *Tortula truncata*, *Trichostomum brachydontium*, *Sedum anglicum*; more rarely *Anthoceros punctatus*, *Bryum bornholmense*, *Epipterygium tozeri*, *Pleuridium subulatum*, *Riccia sorocarpa*, *Weissia longifolia* var. *longifolia*.

Less usual sites: on steeply sloping, gravelly, acidic soil of ditch-side at edge of heath; soil on old, metal-contaminated mine-spoil (several records, but mostly in small amounts); on banks and flat areas of china clay spoil; on track in old china-clay works (Georgia); on unshaded soil on top of low wall of ruin (Botallack).

Commonly c.fr. [almost all records are of plants with capsules]; capsules immature 1-5, 10-12; 'dehiscing' [see below] 1-8 [9]; 'dehisced' 3 [5]. Capsules full of mature spores become detached from drying plants, whence they commonly disperse intact. Spores may also sometimes be liberated as capsules decay on plants that remain or become wet.

31.2 *Pleuridium subulatum* (Hedw.) Rabenh.  
Temperate Circumpolar element.


Habitat notes from C&S are as follows. Soil on unshaded slopes e.g. banks above paths, at coast, in churchyard and a cemetery, on open disturbed ground, tracks at woodland edge (associates recorded include *Bryum rubens*, *Bryum sauteri*, *Didymodon insulanus*, *Epiphterygium tozeri*, *Pleuridium acuminatum*, *Phascum cuspidatum*, *Tortula truncata*, *Weissia brachycarpa* var. *obliqua*). Colonist on damp clay, disturbed clayey soil and recently dumped soil of soil heaps, banks and flat ground near working china clay quarries; sites partly bare and fully insolated or almost unshaded (with *Ceratodon purpureus*, *Dicranella schreberiana*, *Dicranella staphylina*, *Trichodon cylindricus*, *Fossombronia*...
pusilla, Fossombronia wondraczkii, Phaeoceros laevis, Riccia subbifurca, Phascum cuspidatum var. piliferum, Tortula truncata, short grasses). Damp peaty soil of trackways on heathland and at edge of heath (with Archidium alternifolium, Fossombronia wondraczkii, Scapania irrigua). Unshaded sediment at upper edge of inundation-zone at Cargenwen Reservoir (with Archidium alternifolium). Soil on damp old track (surfaced mainly with cinders). Five records from arable fields (cereal stubbles, weedy fallows) (with Bryum dichotomum, Bryum rubens, Trichodon cylindricus, Fissidens viridulus, Pseudohemerum nitidum, Tortula truncata). Locally plentiful on firm unshaded sediments among sparse low vegetation in inundation zone beside Stithians Reservoir and Upper Tamar Lake (with Dicranella schreberiana), also recorded in same habitat at Cargenwen Reservoir.

Mainly but not always recorded c.fr. (identifiable without fruit, at least when perichaetial bracts developed and male 'buds' seen): Capsules very small 1, 11, 12; immature 1-4, dehiscing (whole capsule loose or breaking away) 3, 10. Comments on capsule dispersal made under previous species apparently also apply here.

32.1 Pseudohemerum nitidum (Hedw.) Loeske
Temperate European element.

*S12

*2: Near Roche, 1879, RVT (B) (Paton 1969a: 715).

Grows as scattered plants or in colonies forming rather open low turfs. Habitat notes from C&S are as follows. On exposed soil or mud, usually where moist, somewhat acidic and clayey, silty, loamy or humic. Recorded in grassland, marshy pastures, flushes and other marshy places, arable fields (including stubble, maize, brassicas, damp bulbfields, set-aside), on banks, soil heaps, on woodland tracks and in clearings, wood-edges, beside water (margins of pools, a lake, a reservoir, ditch-edges, stream-edges, river banks), sides of paths and tracks, damp field gateways, in cliff-top flush. Locally abundant on sediment of inundation zones at several reservoirs. On clay and gritty soil of bed of old, flooded china-clay quarry exposed by low water-level (Cold Harbour); disturbed soil on path in old mine-spoil (one plant), earthy slope of old mine-spoil, soil dumped on top of 'hedge'. Once on thin soil on bark of felled saplings in pile of wood. Often in open, but tolerates considerable shade (e.g. on track in conifer plantation; under old Grey Willow-carr). Associates recorded include Bryum rubens, Dicranella rufescens, Dicranella schreberiana, Dicranella staphylina, Trichodon cylindricus, Physcomitrium pyriforme, Pleuridium acuminatum, Pleuridium subulatum, Pohlia annotina, Pohlia camptotrichela, Pohlia melanodon, Tortula truncata, less often Anthoceros punctatus, Aphanorrhegma patens, Bryum klinggraeffii, Bryum sauteri, Ephemerum minutissimum, Ephemerum serratum, Epipterygium tozeri, Fissidens viridulus, Leptobryum pyriforme, Pleuridium subulatum, Pohlia lutescens.

Commonly c.fr. [only recorded with capsules]: capsules immature 1-7, 9-12; 'dehiscing' [i.e. with ripe spores] 1, 2, 4-12. Capsules perhaps disperse whole, or rot on plants (as in Pleuridium acuminatum q.v.).


Habitat notes from C&S are as follows. A colonist of more or less bare soil (clay, silt or loam) that is neutral to moderately acidic, disappearing when larger plants shade the surface heavily. Most frequently occurs intermixed with other small mosses, but forms low pure lawns at times. Habitats commonly recorded include soil heaps and other disturbed soil, bare patches in pastures, gardens, arable fields (fallow, barley, wheat, cereal stubbles, bulbs and other flowers, flax and *Brassica* fields, set-aside, grass-leys), soil on roadsides, banks, paths or old tracks, damp field gateways and drying mud in and near ditches. Also recorded from soil in churchyards and cemeteries, in crevice of old 'hedge', on soil dumped on 'hedge', amongst mine-spoil, on stream banks and in woodland clearings, and on drying sediments beside pools and reservoirs (including sites that remain flooded in some years). Mainly in unshaded sites, but sometimes partly to well shaded by bushes or trees (e.g. on ride in conifer plantation), or in rather heavy shade beneath crops or herbaceous weeds. Associates commonly include *Barbula convoluta*, *Barbula unguiculata*, *Bryum argenteum*, *Bryum dichotomum*, *Bryum rubens*, *Ceratodon purpureus*, *Dicranella staphylina*, *Riccia sorocarpa*, *Phascum cuspidatum*, *Tortula truncata*; others recorded include *Anthoceros punctatus*, *Aphanorrhegma patens*, *Bryum klinggraeffii*, *Bryum violaceum*, *Dicranella schreberiana*, *Dicranella varia*, *Entosthodon fascicularis*, *Ephemerum minutissimum*, *Ephemerum serratum*, *Epipitygium tozeri*, *Fossombronia incurva*, *Fossombronia pusilla*, *Leptobryum pyriforme*, *Leptodictyum riparium*, *Microbryum rectum*, *Phaeoceros laevis*, *Pohlia annotina*, *Pohlia camptotrichela*, *Pohlia drummondii*, *Pohlia lutescens*, *Pseudophemerum nitidum*, *Riccia glauca*, *Riccia sorocarpa* and *Riccia subbifurca*. Often also with herbaceous weeds such as *Cerastium glomeratum*, *Lamium purpureum*, *Stellaria media*, *Veronica persica*. Unusual records: growing with *Ceratodon purpureus* on decaying fabric lying on soil of old mine area (also on soil nearby); on thin soil on bark of felled saplings in wood pile. Usually with rhizoidal tubers. Not seen c.fr. [Atlas states capsules rare; no Cornish record of sporophytes; seen with archegonia and perichaetial lvs: 10, 11].

34.1 *Ditrichium pusillum* (Hedw.) Hampe

Boreo-temperate Circumpolar element.

*2*: Open china-clay spoil, with sparse low vegetation, near flooded pit, ca 235 m alt., Park china clay Pit, SE. of Whitebarrow Downs, ca SX197704, 10 Aug. 2007, DTH 07-122 (BBSUK, DTH) (Rothero 2008: 53).

The only Cornish record; grew closely associated with carpet of low bryophytes comprising *Ceratodon purpureus*, *Ditrichium heteromallum*, *Lophocolea bispinosa*, *Pohlia annotina*.

Only record involved plants with rhizoidal tubers and many with capsules: capsules immature (green or turning brownish) 8.
34.2 *Ditrichum cornubicum* Paton


Other habitat notes from Cornwall are as follows. At Minions in Oct.-Dec. 1997: forming lawns up to 5 cm across on patches of partly bare soil among sparse *Agrostis purpurea* and *Pohlia annotina*. Elsewhere, several patches on mainly bare stony soil of ridge formed where ditch recently dug in mine spoil; unshaded; with little *Trichodon cylindricus* and *Pohlia annotina*. At Crow's Nest in Nov. 1997: on earthy, near-vertical mine-spoil exposed in bank facing west, almost unshaded; near to *Pohlia annotina*, also *Cephaloziella massalongi* and bit of *Scopelophila cataractae* close by. Also on thin soil over mine-spoil on edges of tracks and on ditch clearance debris. NE. of Crow's Nest, Jan. 1998: on thin silty soil (near vertical) among boulders at steep base of S.-facing bank of mine-spoil, unshaded (associates include *Bryum pallens*). Also at Crow's Nest, small amounts with other low bryophytes in earthy crevices in stone walls. Elsewhere at Minions and Crow's Nest associates often include *Ceratodon purpureus*.

Chemical analyses of its substrates at sites in East Cornwall show it consistently tolerates high to very high levels of Cu, whereas levels of Pb and Zn were low to rather high. All substrates investigated were acidic.

### Analyses of substrates from locality in Cornwall (metal concentrations given as µg/g dry weight):

<table>
<thead>
<tr>
<th>LOCALITY (N samples)</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
<th>pH</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minions, vc2 (5)</td>
<td>151-1400</td>
<td>13-49</td>
<td>13-41</td>
<td>5.5-5.8</td>
<td>Holyoak <em>et al.</em> (2000)</td>
</tr>
<tr>
<td><em>(Minions, vc2 (4)</em></td>
<td>1428-1800</td>
<td>78-401</td>
<td>78-172</td>
<td>5.2-5.4</td>
<td>Walsh (2001)</td>
</tr>
<tr>
<td>Crow's Nest, vc2 (4)</td>
<td>1676-3220</td>
<td>32-597</td>
<td>112-368</td>
<td>5.3-6.0</td>
<td>Walsh (2001)</td>
</tr>
</tbody>
</table>

*Tubers always present. Only male plants known, so capsules unknown.*

34.3 *Ditrichum lineare* (Sw.) Lindb.

Boreal-montane European element.


Known in Cornwall only from two old copper-mine areas in vc2, where it was first collected in 1997 by DTH. The plants are small, rather featureless, with leaves that are unusually wide with strongly recurved margins. They were not identified until several years after they were first found.
A single large patch of ca 450 cm² was present at Minions in 1998, but this declined progressively and became fragmented, so that only 3 cm² remained in total in January 2002 and it disappeared soon afterwards, to reappear briefly for a short time later. It grew on an area of almost horizontal blackish metalliferous ore that includes much granular slag-like material and is mainly bare of vegetation, although a little Funaria hygrometrica and Cephaloziella stellulifera is present near to the D. lineare and the latter species spread over and amongst it from 1998 to 2002, perhaps as a result of eutrophication from sheep dung.

Small amounts of D. lineare were discovered in earthy crevices of a steep retaining wall at Crow's Nest in 1998, when its population totalled ca 10 cm², but this had declined to 6 cm² by March 2000. It disappeared soon afterwards because the wall was used for climbing practice that eroded soil from the crevices. Small amounts of Ditrichum cornubicum and Cephaloziella massalongi grew with it.

Chemical analyses of the substrate show it tolerates very high levels of Cu at the Minions locality, accompanied by moderately high levels of Pb and Zn. The substrate there is acidic.

<table>
<thead>
<tr>
<th>LOCALITY (N samples)</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
<th>pH</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minions, vc2 (2)</td>
<td>6746-7242</td>
<td>50-238</td>
<td>223-410</td>
<td>5.6</td>
<td>Walsh (2000).</td>
</tr>
</tbody>
</table>

A few tubers have been found on Cornish material. Only male plants have been recorded in Cornwall (DTH). Capsules are unknown in Cornwall. Elsewhere in British Isles mainly female plants known (R.D. Porley in Hill et al. 1992: 96), although both sexes and capsules recently found in south Wales (S.D.S. Bosanquet, pers. comm.).

34.4 *Ditrichum plumbicola* Crundw. NS 1
Temperate Oceanic element.


A tiny moss that is easily overlooked, growing as scattered very low erect stems or small patches, occasionally forming very low lawns. Known only from small area W. of Chyverton House: in at least four spots on damp, horizontal, silty-clay alluvium on and near banks of small stream in old quarried and mined area and for ca 100 m downstream of it. Also in at least three spots on 'lithosol' of mine/quarry spoil on slopes of old quarry and banks near old quarry track. Generally in sparsely vegetated sites, which vary from unshaded to lightly shaded by colonising Gorse bushes. Sometimes in small almost pure patches on alluvium, but on lithosols and some alluvial sites generally mixed with low bryophyte associates that were listed as Cephaloziella sp., Dicranella heteromalla, Dicranella varia, Diplodiphyllum albicans, Gymnocolea inflata, Solenostoma gracillimum, Lophozia bicornata, Pogonatum aloides. Sometimes also close to moribund Agrostis tenuis.

*Ditrichum plumbicola* is associated with lead at its Cornish site, as is reported to be the case at all of its other British localities (Hill et al. 1992: 97). The Chyverton district was formerly noted for its lead mines. Barton (1963: 49) wrote of the 'once important Chiverton lead-mining district, centred about a mile west of Zelah. No less than eight separate mines included the word Chiverton in their names, most of them brief ventures that came into
being in the 1860's in a wave of local speculation consequent upon the richness of West Chiverton. The prosperity of this mine however was never equalled by its namesakes, most of which had only a few years life.'

Chemical analyses of its substrates show it tolerates not only high levels of Pb at its Cornish locality, but also rather high levels of Cu and high to very high levels of Zn, some samples showing simultaneously high levels of all three metals. All the substrates investigated were acidic.

**Analyses of substrates from locality in Cornwall (metal concentrations given as µg/g dry weight):**

<table>
<thead>
<tr>
<th>LOCALITY (N samples)</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
<th>pH</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chyverton, vc1 (6)</td>
<td>452-1121</td>
<td>5464-11026</td>
<td>2304-16166</td>
<td>4.1-6.5</td>
<td>Rouen (2000)</td>
</tr>
</tbody>
</table>

Apparently reproducing by stems breaking off as these are very fragile. No tubers or gametocia seen. According to R.D. Porley (in Hill *et al.* 1992: 97) gametangia and sporophytes are entirely unknown in this species.

34.5 *Ditrichum heteromallum* (Hedw.) E.Britton

**Boreo-temperate European element.**


*2*: Longcoombe Lane, Polperro, 1924, FR (BM) (Paton 1969a: 714).

On acidic soil (humic, clayey, gritty or gravelly), china-clay spoil, thin soil over and among rocks and on crumbling surfaces of granitic rocks, where unshaded to moderately shaded. Most records are from flat rocky ground, banks, slopes or ditch sides in old or working granite and china clay quarries, or areas of quarry spoil, but also found on a pathside bank in open oak woodland, on low banks beside tracks (e.g. through Grey Willow carrs), on steep banks beside streams and on mineral or peaty substrates of ditch-banks in mires. *Nardia scalaris* and *Pogonatum aloides* are frequent associates; others noted less regularly are *Atrichum tenellum*, *Dicranella heteromalla*, *Dicranella subulata*, *Diplophyllum albicans*, *Oligotrichum hercynicum* and *Pleuridium acuminatum*.

Commonly c.fr.: capsules immature 2, 3, 5-7, 9-11; dehisced 2-6, 9, 10.

34.7 *Ditrichum subulatum* Hampe

**Mediterranean-Atlantic Oceanic element.**


Habitat notes from Cornwall are as follows. Mostly recorded growing in small patches (low lawns or scattered plants) on shale or head on low cliffs beside coastal creeks, where it usually grows in slightly to well shaded places under small or larger overhangs (and often also shaded by trees), commonly where there is a trickle of water, and often on thin accumulations of 'soil' (that may be vertical, inclined or horizontal). It often grows down to within about 1.5 m above HWST level. *Cephalozia turneri* is a regular and close associate in this type of habitat. Near Perranarworthal found on thin soil on sloping ledges of slaty rock of quarried bank above busy road, the site now being rather heavily shaded by
trees and bushes. Other associates recorded: *Ceratodon purpureus, Hypnum cupressiforme var. resupinatum*, alga, lichen.

Commonly c.fr.: capsules immature 4; dehiscing 4; dehisced 4, 5, 7, 12.

[34.8 *D. flexicaule* (Schwägr.) Hampe s. str. – Listed for vc1 in revision by Smith (1993: 52) [and by Blockeel 1994: 36], on basis of specimen [Sand dunes, Perranporth, 1932, 'B.M.' = FEM, BBSUK] later reidentified by DTH as *D. gracile* (Blockeel 1996: 44)].


*1*: Connor Downs, 1862, WC (PNZ) (Paton 1969a: 715): presumably this species not *D. flexicaule*.

*2*: Rock near St Minver, 1871, RVT (CGE) (Paton 1969a: 715): presumably this species not *D. flexicaule*.

Frisvoll (1985) recognised 34.9 as a distinct species from 34.8; Smith (1993) revised British herbarium material. Only 34.9 has been recorded for Cornwall (see note above); since 34.8 might yet be found, older records from prior to revision by Smith (1993) are placed as the s. l. unless specimens have been revised recently.

Mainly or exclusively a calciphile of coastal sites. Locally plentiful on substrates of calcareous sand in fixed dunes and dune-grassland, in areas with very short and open turf or herb and moss cover, often forming extensive patches. At edges of paths in longer grassland on dunes. Mainly in unshaded places, but persisting locally under edges of bushes that have colonised dune grassland. Also growing over calcareous blown sand on open grassy hillsides near dunes. Associates commonly include *Barbula convoluta, Bryum* spp., *Pleurochaete squarrosa, Tortella flavovirens, Trichostomum crispulum* and various small grasses and herbs (e.g. *Aphanes, Cerastium*), also occasionally *Didymodon acutus*.

Less typical records: At landward edges of Upton Towans on thin sand layers (5 mm or more) overlying old concrete, and colonising silty and clayey substrates near concrete works at edge of dunes; at Gear Sands, extending locally onto banks of soil on calcareous mine-spoil among stable dunes. Only record away from dunes or blown sand was NE. of Cape Cornwall, in small quantity on soil of slope close to coast and to old mines.

Not seen c.fr. [Smith 1993: 46 was unable to confirm any British records of this sp. with capsules].


*1*: On vertical mortared stone wall above edge of road, shaded by bush of *Prunus laurocerasus* and edge of woodland, Trevarno, SW63, 1995, DTH 95-66 (BBSUK, DTH) (Blockeel 1996: 45).

Single vc1 record at Trevarno, where several substantial patches on old mortar of roadside wall, growing on vertical surfaces where wall is rather heavily shaded by trees and bushes. Single vc2 record from near Minions, where in 2007 two patches persisted close together (measuring 18 x 9 and 12 x 5 cm) on thin steep to vertical soil of E.-facing remnant of low wall beside a ruined mine building, where almost unshaded. Patches are mainly pure, but one was partly mixed with *Eucalypta* *streptocarpa*; other plants closely adjacent were mainly low *Festuca rubra*, also *Plagiommium undulatum*, *Aspleniun trichomanes* subsp. *quadrivalens*, *Viola riviniana*.

Frequently c.fr. (only identified from plants with mature spores): capsules immature 3, 7, 10; dehisced 3, 7.

36.2 *Distichium inclinatum* (Hedw.) Bruch & Schimp. NS 1 Boreo-arctic montane Circumpolar element.


Two sites in Cornwall. At Gear Sands, where locally plentiful and extending over *ca* 50 m, on partly bare sandy patches occurring as gaps in very short dune grassland (NVC type closest to CG1e, with damp, low turf of herbs, grasses and mosses; patches of *Calluna vulgaris* are present nearby). This area probably receives slight flushing from old copper-mine spoil upslope. *D. inclinatum* often forms pure, small, low patches in these partly bare, base-rich areas, where its low-growing associates include *Cephalozella* spp., *Ditrichum gracile*, *Fissidens dubius*, *Leiocolea turbina* and *Southbya tophacea*. At Pool found as *ca* 7 small patches all within 0.5 m radius, on soil among small granitic rocks on open disturbed ground near disused mine, with sparse low grasses (mainly *Agrostis capillaris*) and herbs.

Frequently c.fr. at Gear Sands but only seen non-fertile at Pool (secure identification can only be based on plants with mature spores): capsules immature 4, 12.

37.1 *Ceratodon purpureus* (Hedw.) Brid. S12 Wide-boreal Circumpolar element.

*1*: Trevaylor, Penzance, 1844, AG (PNZ) (Greenwood 1844, Paton 1969a: 715).

Common and often forming extensive patches on dry or intermittently dry, acidic mineral or peaty soils, especially on open humic, sandy, rocky or gravelly ground, less often in damp places (but occasionally even in marshes). Mainly absent from base-rich substrates such as the calcareous sand of many duneland areas, but occurs on acidic dunes in Isles of Scilly. Often common in eutrophicated sites such as on tracks frequented by sheep or near dung-mounds of rabbits on heathland. Commonest in unshaded places, but also frequent in light shade and sometimes occurring in small amounts in moderately heavy shade in woodland. Occurs in wide range of habitat types, e.g. on and beside paths and tracks, on banks and slopes, in barer patches of heathland or grasslands, woodland rides and clearings, among rocks, in quarries, on metalliferous mine-spoil, china clay waste, tops and slopes of sea-
cliffs, tops of 'hedges', soil on walls, and colonising soil heaps, roadsides, graves, gardens, plant pots and (mainly in small amounts) arable land (seen in stubble, bulb and other horticultural fields, but mostly rather uncommon in arable fields), on rocks in flood-zones of rivers and reservoir edges exposed as water-level falls.

A very wide range of associates includes almost all bryophytes and small phanerogams of dry acidic to circumneutral ground that is not heavily shaded, the following being among the more frequent: *Barbula convoluta*, *Barbula unguiculata*, *Bryum argenteum*, *Bryum dichotomum*, *Bryum capillare*, *Bryum rubens*, *Bryum subapiculatum*, *Campylopus introflexus*, *Didymodon insulanus*, *Trichodon cylindricus*, *Nardia scalaris*, *Pleuridium acuminatum*, *Pohlia annotina*, *Polytrichum juniperinum*, *Pseudocrossidium hornschuchianum*, *Tortula truncata*, *Cladonia spp.*; on damper acidic soil with *Cephaloziella hampeana*, *Fossombronia incurva*; on the coast often with *Archidium alternifolium*, also recorded with *Acaulon muticum*, *Anthoceros punctatus*, *Bryum dichotomum*, *Epiptrygium tozeri*, *Riccia sorocarpa*, *Scleropodium touretii*; on copper-mine spoil its associates often include *Cephaloziella stellulifera*, *Dicranella varia*, *Gymnocolea inflata*, *Solenostoma gracillimum* and *Scapania compacta*, but although often near *Cephaloziella massalongi* and *Cephaloziella nicholsonii*, it does not occur directly on the most heavily copper-contaminated substrates; on wood of old fence with *Dicranoweisia cirrata*.

Common on thin soil over rocks, but not infrequent also on mainly soft or crumbling surfaces of acidic rock where little or no soil has accumulated, including slaty rocks, granitic boulders and crevices of serpentinite on open heathland. Occurs locally over old concrete, usually among other mosses, and mainly avoids direct contact with basic substrates. Also recorded on 'soil' accumulated in guttering of house-roof and on thin sandy soil over logs of footbridge. Frequent also as colonist of old tarmac on paths and in centre and at edges of lanes, which may be virtually its only substrate in some base-rich districts.

Frequently recorded in small amounts on unshaded decorticated wood, both natural (e.g. on tree trunk in open, on old stump) and artificial (e.g. rotting and burnt timbers lying on old mine-spoil, old fences, gates and posts, moist rotting timbers of old shed, in crevice of wooden 'sleepers' of disused railway); sometimes associated with *Dicranoweisia cirrata* when on wood. Unusual as epiphyte in Cornwall, but single records on horizontal Grey Willow trunk near ground in edge of carr and on fallen dead Sycamore branch. Occasional records also from artificial substrates, including rotting vinyl of discarded car seat and an old, rotting carpet. Once on a small old bone lying in quarry.

Commonly c.fr.: capsules immature 1-6 [7 one, 8 few abortive], 10-12; dehiscing 5-7 (generally well synchronised); dehisced 6-12 (1 old).

39.1 *Bruchia vogesiaca* Nestl. ex Schwägr.  


The only British record of a species regarded as Endangered in the *Red Data Book of European Bryophytes* (Schumacker & Martiny 1995: 77). A few plants grew scattered in
two small areas on steep damp soil (humic and sandy) forming low banks at edge of river (Holyoak 2007 & unpublished). Site is unshaded, <1 m above (low) summer water level. Associated with *Atrichum tenellum*, *Dicranella rufescens*, *Solenostoma gracillimum*, *Pohlia campototrichela*, immature *Pellia epiphylla*; similar habitat close by also has *Calypogeia arguta*, *Cephalozia bicuspidata*, *Fissidens cf. bryoides* var. *caespitans*, *Philonotis* sp., *Pseudophemerum nitidum*. Phanerogams within <1m were: *Agrostis capillaris*, *Danthonia decumbens*, *Euphrasia nemorosa*, *Juncus bulbosus*, *Plantago lanceolata*, *Potentilla erecta*, *Prunella vulgaris*, *Wahlenbergia hederacea*.

In Portugal it also grows on open soil, in sites subjected to grazing and trampling by cattle, with 'an intermittent rivulet flowing through acid grassland on peaty soil' (Sérgio *et al.* 1998).

Only specimen (collected 13 July 2006) has 4 good, near mature capsules (photos).

41.2 *Amphidium mougeotii* (Schimp.) Schimp. 12
Boreal-montane Circumpolar element.

*2*: Dunmere, Bodmin, 1880, RVT (B) (Paton 1969a: 740).

Records from Scilly in *Atlas* (3: 177) are all errors.

Habitat notes from Cornwall are as follows. E. of St Agnes: cushions on vertical and near-vertical, wet, slaty rock at entrance to disused mine-adit, fairly heavily shaded by rock overhang and bushes. Rocky Valley: cushions on steep slaty rock above stream, part-shaded.

Not seen c.fr.

42.1 *Rhabdoweisia fugax* (Hedw.) Bruch & Schimp. 12
Boreal-montane European element.

*1*: On thin soil inside cracks of granitic rock in old quarry, partly shaded, Carfury, SW43, 1994, DTH 94-381 ([BBSUK, DTH](https://doi.org/10.5516/bbsuk/dth94-381)) (Blockeel 1996: 45). [Old records from vc1 (near Hayle and Newquay, in Stackhouse 1865) not supported by specimens: Paton 1969a: 716].

Grows as small to deep cushions, sometimes forming larger patches, often pure. Only vc1 record: Carfury, on thin soil partly shaded inside cracks of granitic rock of old quarry. Rocky Valley (vc2): locally plentiful on thin soil over slate rock, in slightly to rather heavily shaded crevices and beneath overhangs of crags on E.-facing slopes of valley side and above coastal inlet.

All records c.fr.: capsules immature 8, dehiscing 3, dehisced 4.
42.2 *Rhabdoweisia crispata* (Dicks.) Lindb. (syn. *R. denticulata* (Brid.) Bruch & Schimp.). Boreal-montane Suboceanic element.

*1*: On thin soil on granite beneath boulder on N.-facing slope, N. end of Carn Galver, SW43, 2000, DTH 00-56 (*BBSUK, DTH*) (Rothero 2001: 39).

*2*: Helman Tor, 1879, RVT (B) (Paton 1969a: 716).

In vc1 (Carn Galver): thin partly bare horizontal humic soil on shaded granitic rock beneath boulder in block scree on N.-facing slope; with sparse *Dicranella heteromalla, Pohlia nutans*. In vc2 (Cheesewring): patch on thin soil on sloping surface of granite boulder, shaded by another boulder, at base of N.-facing wall of old granite quarry.

Sporophytes recorded for one of the two finds (plentiful, Cheesewring, DTH): capsules dehiscing 10.


43.1 *Cynodontium bruntonii* (Sm.) Bruch & Schimp. (syn. *Oreoweisia bruntonii* (Sm.) Milde). Temperate European element.


*2*: Helman Tor, 1879, RVT (B) (Paton 1969a: 716).

Carn Kenidjack (vc1): few cushions on small ledge of granitic crag (part of tor on hill top), partly shaded by small overhang. Rusey, etc.: surfaces and shallow crevices of slaty rocks high on sea-cliff. Rough Tor and Brown Willy: shallow crevices of granitic rocks about tors.

Sporophytes common (?): capsules immature 4, 10; dehisced 10.


*1*: Mousehole Cave, 1888, RVT (B) (Paton 1969a: 717).

*2*: Trewarmett, 1958, TL (Paton 1969a: 717). [Older record (Camel R., in Tellam 1888) said not to be supported by specimen (Paton 1969a: 717) but there may be one at OXF, see below].

Most Cornish material of *D. pellucidum s. l.* and *s. str.* and *D. flavescens* needs to be revised on the basis of the gametophyte characters described by Werner (2002). There are no records of sporophytes in Cornwall, and it was assumed for many years prior to publication of Werner's study that non-fertile plants could not be reliably separated (e.g. Corley & Hill 1981: 136, Newton in Hill *et al.* 1992: 132). Consequently, all records prior to the paper by Werner (2002) are placed as *D. pellucidum s. l.* unless specimens have subsequently been revised. Nevertheless, identifications using different gametophyte characters described by Werner sometimes appear to contradict each other, so the last word may not have been written on determination of non-fertile material or indeed on whether two species are worthy of recognition. Patricia M. Eckel (in *Flora of North America* 27: 384, 2007) treats
flavescens as a synonym of *D. pellucidum*. In Cornwall there does not appear to be any evidence of ecological differences between the two taxa.

Grows in small patches (low lawns). Notes on habitats of the *s. l.* species were recorded as follows. On rock part-shaded on slope above track at edge of deciduous woodland. Thin silt on boulders and a slaty outcrop in flood-zone beside R. Tamar, in open and lightly shaded by deciduous trees. Locally plentiful on thin soil over old concrete of runway edges of disused airfield on Davidstow Moor, with associates including *Bryverythrophyllum recurvirostrum, Bryum argenteum, Bryum dichotomum, Didymodon nicholsonii*. Minster Church: on damp vertical masonry on north wall of church and large plants forming lawns on flat horizontal top of mortared wall south of church. Thin damp soil of crevices in path at woodland edge, part shaded. See also records under two segregate spp. below.

Not seen c.fr.

45.1 *Dichodontium pellucidum* (Hedw.) Schimp. *s. str.*  2
Boreo-arctic montane Circumpolar element.

The following specimen was revised using the characters described by Werner (2002):

*2*: On slaty rocks *ca* 0.5 m above water of stream, partly shaded in deciduous woodland, Peter's Wood near Boscastle, SX113908, 3 Sep. 1996, DTH 96-404 (*DTH*).

Only this specimen has been redetermined as *D. pellucidum s. str.* as yet.

Several older specimens need to be reexamined, especially two records listed for vc2 by Paton (1969a: 717) (Camel R., Dunmere Wood, 1879, RVT (*OXF*); stream near Trussel Bridge, S. of Liskeard, JAP), which Corley & Hill (1981) excluded along with others of plants lacking capsules.

Not seen c.fr.

45.2 *Dichodontium flavescens* (Dicks.) Lindb.  12
(syn. *D. pellucidum var. flavescens* (Dicks.) Kindb.). Boreal-montane European element.


These are the only records from Cornwall confirmed using the gametophytic characters described by Werner (2002), although the reliability of these is questioned above. Perhaps overlooked in the past on the assumption that only fertile plants could be identified (see notes under *D. pellucidum s. l.* above).

In vc1 at Porthmeor on vertical to horizontal granitic rocks and gritty soil low on N.-facing sea-cliff (where otherwise unshaded) and in 'ravine' formed by stream just inland of the
cliffs (where sheltered and partly shaded). In vc2 patch on soil among rocks at base of flushed, unshaded, E.-facing bank near river, below damp basic slaty rocks.

A specimen from 'Beside road outside Redruth', 3 April 1959, leg. L.B.C. Trotter (NMW 64.555.959) is probably this species but it has not been mapped because the locality seems rather vague and the plants are atypical (leaves only weakly toothed, leaf margin strongly recurved, lamina smooth).

Not seen c.fr.

45.3 *Dichodontium palustre* (Dicks.) M.Stech
(syn. *Dicranella palustris* (Dicks.) Crundw., *Dicranella squarrosa* (Starke) Schimp.). Boreal-montane European element.


Grows as low lawns or forming low cushions or patches among other bryophytes. In vc1 in two sites in flushes on N.-facing granitic sea-cliffs, also along banks of a stream just inland of the cliffs. Growing on wet, unshaded humic soils.

Not seen c.fr.

46.1 *Dicranoweisia cirrata* (Hedw.) Lindb.
Temperate European element.

*2*: Gunwen Moor, Bodmin, 1891, RVT (B) (Paton 1969a: 717).

Grows mostly as patches and cushions on steep to horizontal surfaces of granitic or gabbro rock, mainly where unshaded (occasionally in moderate shade). Less often on slate or firm shale lithologies, once on old tarmac. Occurs on tors and other outcrops, boulders, rocks in old walls and 'hedges', old quarries and their spoil heaps, rocky mine-spoil, and occasionally on sheltered slopes of sea-cliffs, masonry debris and grave-stones. Infrequently recorded as epiphyte in Cornwall, with two recent records on old Gorse stems, one on Hawthorn, one on Grey Willow branch, one on rotted branches beside a pool. Nine other records from decorticated wood (including a fence, fence post, ancient window frame in building, an old field gate, structural wood of river bridge and on burnt tree-trunk lying in field). Not usually much intermixed with other species, but closer associates often include *Grimmia trichophylla*, *Hedwigia stellata*, *Racomitrium heterostichum*. Single record of large patches on old tarmac of cemetery path, near *Ceratodon purpureus* and on wood of fence with same species.

Commonly c.fr.: capsules immature 1-3, 10-12; dehiscing 1-4, [5], 12; dehisced 2-7-10.
46.2 *Dicranoweisia crispsula* (Hedw.) Milde – Vc2 records rejected by Paton 1969a: 717 as due to confusion with *D. cirrata* ('very common' according to Stackhouse 1865) or misidentification of *Dicranum scottianum* (Roche Rock, 1870, RVT (B), and in Tellam 1892).

49.1 *Glyphomitrium daviesii* (Dicks.) Brid.  
Southern-temperate Oceanic element.

*2*: Near Trehane, W. of Probus, 1861, ES (TRU) (Paton 1969a: 740, where it is listed in parentheses because there are no recent records).

This is the only record from Cornwall.

50.1 *Schistostega pennata* (Hedw.) F.Weber & D.Mohr  
Boreal-temperate Suboceanic element.


Occurs as glistening golden-green protonemata ('Goblin's Gold'), as small patches or sometimes covering tens of square centimetres, giving rise in most sites to scattered leafy stems that may form sparse low turfs. A few finds of protonemata without gametophores have not been recorded as distributional records of the species (e.g. in deep, dark crevice low on a sea-cliff W. of Wine Cove, St Martin's) as there may be slight doubt that some alga or other protonemata could be confused.

Grows on overhanging, vertical, steep, or horizontal, friable loamy or silty to rather humic or hard or rocky, ± acidic soils in rather dry sites beneath overhangs of banks or exposed tree roots. It grows in places that are sheltered and often rather humid, but where it receives little or no rainfall or water dripping from above. Most sites are on roadside or laneside banks, usually where partly shaded by trees and often well shaded by e.g. wood edges or actually within woods, but there are a few records from open places including sea-cliffs, a few from hollows in old 'hedges', small old quarries and two from high on well shaded stream banks.

A single large patch was recorded on overhanging soil at the base of a wind-thrown Beech tree on a steep stream bank in woodland, but there are no other records from wind-thrown tree bases (its usual habitat in C. Russia: Ignatov & Ignatova 2001). One record inside entrance to animal burrow (rabbit?) inside wood edge.

H.J.B. Birks (in Hill et al. 1994: 50) stated that 'associates are rare' but this is untrue in Cornwall. Frequent or common associates here are *Calypogeia arguta* and *Pseudotaxiphyllum elegans*, weak plants of *Dicranella heteromalla*, *Kindbergia praelonga*, *Fissidens bryoides* var. *bryoides*, *Mnium hornum* and *Pogonatum aloides*, with a few records of *Epipterygium tozeri*.

Occasionally c.fr. Capsules: immature 2, 4, dehiscing 4-6, dehisced 8.
Lye (1972) reviewed distribution and ecology of *S. pennata*. Edwards (1978) suggested the protonemal gemmae of this species may be dispersed by mites or flies. Ignatov & Ignatova (2001) gave other information on its biology, including the suggestion that its sticky spores are dispersed by various animals.

52.1 *Dicranella schreberiana* (Hedw.) Dixon (syn. *D. schreberana* auct.). Boreo-temperate Circumpolar element.

*1*: Lamorna, 1922, JBD (Hb JBD) (Paton 1969a: 715).

The character given in Smith's (2006) *Flora* for separation from *Trichodon cylindricus* is unreliable: this species may also have teeth all around subula, but its leaf apex is wider than in that species.

Habitat notes from Cornwall are as follows. A colonist of disturbed soil (loamy, silty, clayey or gritty) that varies from mildly acidic to basic, in sites that are damp to rather dry. Although usually in sites that are unshaded or lightly shaded, it sometimes tolerates considerable shade. Typical habitats include arable fields (cereals and their stubble, flax, brassicas, flowers, beans, grass-leys), gardens, partly bare patches in grasslands or marshes, soil heaps, banks and slopes, roadside verges and lay-bys, woodland rides, woodland edges and clearings, stream and river banks, churchyards, on and beside tracks, edge of gravel car park, mud dredged from ditches, and dried mud of pools and reservoirs. Occasionally also on old mine-spoil, and recorded on unshaded bank on coast and on slope of sea-cliff where partly shaded by bushes. On sediment exposed in inundation zone beside Upper Tamar Lake. Common associates include other mosses that colonise bare soil, especially *Barbula convoluta*, *Barbula unguiculata*, *Bryum dichotomum*, *Bryum rubens*, *Dicranella staphylina*, *Dicranella varia*, *Trichodon cylindricus*, *Fossombronia pusilla*, *Phaeoceros laevis*, *Pohlia melanodon*, *Riccia glauca*, *Riccia sorocarpa*, *Riccia subbifurca*, *Phascum cuspidatum* and *Tortula truncata*, less often *Anthoceros agrestis*, *Bryum dichotomum*, *Pleuridium subulatum*.

Rhizoidal tubers probably common/regular, but not often checked. Occasionally/frequently c.fr. (seven records): capsules immature 3, 8, 9, 11; dehiscing 3, 11; dehisced 1, 3.

52.3 *Dicranella crispa* (Hedw.) Schimp. Boreo-arctic montane Circumpolar element.

*1*: Newlyn Cliff, 1862, WC (PNZ) (Paton 1969a: 716). This record is much earlier than one given as new for vc1 by Warburg (1964: 724).

The only recent record is of plants without capsules, so the identification may not be completely certain (steep partly bare clay soil of S.-facing bank near stream in area of grassland and flushes, Cardinham Downs, SX105696 (SX16E), 12 Nov. 2000, DTH 00-822); few closely adjacent patches, up to 10 cm across or mixed with other low mosses: *Dicranella heteromalla*, *Dicranella rufescens*, *Pogonatum aloides*).
Not seen c.fr. Archegonia present 11 (on DTH 00-822).

52.4 *Dicranella subulata* (Hedw.) Schimp.
Boreo-arctic montane Circumpolar element.


Easily overlooked among other small Dicranales with narrow leaves. When lacking capsules perhaps inseparable from *Ditrichum heteromallum* with which it often grows, so probably under-recorded. When capsules are present it is distinct in the rostrate lid and peristome type.

Grows on partly bare banks, track edges and flat ground with substrates of clay or gravelly clay near old and working china clay quarries, almost or quite unshaded; often in wet or damp places. Also a bit intermixed with *Ditrichum heteromallum* on soft crumbling granite on vertical face of large boulder inside working china clay quarry.

Commonly (frequently ?) c.fr.: Capsules immature 3, dehiscing 3, dehisced 3.

52.5 *Dicranella varia* (Hedw.) Schimp.


*2*: Trebetherick, St Minver, 1879, RVT (B) (Paton 1969a: 715).

Habitat notes from C&S are as follows. Occurs mainly on mineral soils (sandy, loamy, silty or clayey) in wide range of situations, on substrates varying from basic to acidic and growing mainly in open but sometimes where moderately shaded (e.g. on woodland rides or in crevices of old walls). As a colonist of disturbed soil in arable fields (cereals and their stubbles, flax, brassicas, where frequent but not often abundant), gardens, soil heaps, churchyards, quarries, sea-cliffs, on stream, river, pond and other banks, ditch sides, and bare patches in pastures and other grasslands, roadsides, and on and beside tracks and paths. Fewer records from dune-grassland (in entrance to rabbit burrow), dune slacks, dried mud of pool and in reservoir inundation- zones. Often abundant and forming large pure stands on clayey, silty or sandy lithosols on old copper-mine spoil and on banks of streams draining old mine areas, where it evidently withstands significant copper concentrations. Occurs locally as colonist on apparently acidic clay of banks around working china clay quarries and on open disturbed ground in granite quarries. Frequently also in evidently basic places on old or decaying mortar of walls, thin soil over old concrete, in crevices of concrete. Among a long list of associates, species frequently recorded include *Barbula convoluta*, *Barbula unguiculata*, *Bryum argenteum*, *Bryum dichotomum*, *Bryum rubens*, *Bryum radiculosum*, *Didymodon fallax*, *Didymodon ferruginascens*, *Didymodon insulanus*, *Didymodon tophaceus*, *Pleuridium acuminatum*, *Pohlia annotina*, *Phascum cuspidatum*; less common associates include *Aloina aloides*, *Cephaloziella stellulifera*, *Dicranella schreberiana*, *Dicranella staphylina*, *Pohlia andalusica*, *Pohlia melanodon*, *Riccardia chamedryfolia*. Inexplicably rare in Scilly, where only record is from plant pot in garden.
Two gatherings made of unusual form with purple rhizoids (DTH 94-233, 97-244); another of a form with blunt leaves having strongly recurved margins (DTH 95-499).

Rhizoidal tubers occur, but frequency unknown. Frequently c.fr.: capsules immature 1-3, 10-12; dehiscing 1-3; dehisced 2-5, 7.

**[Dicranella howei]** Renauld & Cardot. A widespread species in S. Europe that has not been formally accepted for the British list. Two unconfirmed records have been made in vc2, the best material being from SE. of Seaton, SX3075/5419, unshaded thin soil among scree of slaty rock about half-way up sea-cliff with patchy vegetation, ca 20 m alt., 4 May 2005, DTH 05-95. It grew as patches (low lawns) up to ca 15 cm across or intermixed with other low mosses in some quantity on sea-cliff slopes SE. of Seaton and in small amount on soil of a laneside bank near Hessenford. At the former locality it occurred on unshaded, thin, free-draining soil among scree of slaty rock at about half- to three-quarters height on the cliff slope. There were numerous moss patches associated with D. howei, mainly of *Barbula unguiculata, Bryum capillare, Bryum dichotomum, Didymodon fallax, Conocephalum conicum*; abundant patches of *Centranthus ruber* occur over much of this part of the cliff and other associated phanerogams include *Daucus carota, Festuca rubra, Lotus corniculatus* and *Teucrium scorodonia*. Bushes of *Buddleja davidii* have begun to colonise the upper part of the cliff and these may pose a threat to *D. howei* if they increase; there are also a few patches of *Ulex europaeus* and one of *Cortaderia selloana*. Not seen c.fr. Howard A. Crum treated *D. howei* as a form of *D. varia* (*Flora of North America* 27: 389, 2007), perhaps correctly.]

52.6 *Dicranella staphylina* H.Whitehouse

Temperate European element.

*S12* Scattered plants, often among other low mosses, or small patches. Habitat notes from C&S are as follows. Common as colonist of disturbed mineral soil, typically on mesic loamy, clay or silty, neutral to somewhat acidic soil and growing unshaded to lightly shaded (occasionally in heavier shade under herbs, trees or scrub or along tracks in plantations). One of the commonest mosses in arable fields (cereals and their stubble, maize stubble, flax, brassicas, bulbs and other horticulture, beans, grass-leys, game-bird food crop, fallow land) both inland and close to cliff edges; also on partly bare soil patches in grasslands, at base of laneside banks, on roadsides, around field gateways, on soil heaps, in gardens, churchyards, on stream banks, dredgings from ditches, graves, on or beside paths and tracks, and on exposed sediment beside reservoirs. A few records also from mine-spoil, 'hard-standing' in caravan park, edge of gravel car park, on 'hedges' and on soil in old cattle-grazed Grey Willow-carr. Common or frequent associates include *Barbula convoluta, Barbula unguiculata, Bryum dichotomum, Bryum rubens, Dicranella schreberiana, Trichodon cylindricus, Pseudephemerum nitidum, Riccia sorocarpa, Phascum cuspidatum, Tortula*
truncata; others recorded less often include Anthoceros agrestis, Bryum dichotomum, Bryum klinggraeffii, Bryum violaceum, Didymodon tomatulosus, Entosthodon fascicularis, Ephemerum serratum, Epipertynium tozeri, Fossombronia caespitiformis, Fossombronia pusilla, Funaria hygrometrica, Leptobryum pyriforme, Leptodictyum riparium, Microbryum rectum, Pohlia wahlenbergii var. wahlenbergii, Riccia crozalsii, Riccia glauca, Riccia subbifurca. Usually also with herbaceous weeds on arable soil, e.g. Cerastium glomeratum, Lamium purpureum, Stellaria media, Veronica persica. Found once on thin soil on bark of felled saplings in wood pile.

Rhizoidal tubers probably always present. Not seen c.fr. Female plants with perichaetal bracts: 3, 10. [Atlas 2: 141 noted that most plants in Britain are female, with males seen in Yorkshire; sporophytes unknown in Britain but recorded in Luxembourg].

52.7 *Dicranella rufescens* (Dicks.) Schimp. 12

Boreo-temperate Circumpolar element.

*1: Chyenhal Moor, Newlyn, 1862, WC (PNZ) (Paton 1969a: 716).
*2: Withiel, 1871, RVT (B) (Paton 1969a: 716).

Habitat notes from Cornwall are as follows. Colonist of acidic soil in mainly damp places, often on clayey substrates, but also on gravelly, sandy, humic or peat surfaces. Commonly unshaded or lightly shaded, but also quite well shaded at times, e.g. in Grey Willow scrub. Recorded from variety of habitats with disturbed or recently exposed soil, including arable fields (stubble), exposed soil on bank in meadow, cattle-trampled area in marshy pasture, stream and river banks, clayey bank beside lake (The Loe), ditch-banks and other banks, tracks in or beside woodland and scrub, soil heaps beside damp woodland track, wood edges and a woodland clearing, china-clay spoil, damp clay overlying concrete steps, and firm soil, peat or sediments exposed by falling water of reservoirs (where it may be abundant). Associates recorded include Anthoceros punctatus, Ceratodon purpureus, Dicranella heteromalla, Trichodon cylindricus, Epipertynium tozeri, Fossombronia pusilla, Lunularia cruciata, Nardia scalaris, Pellia epiphylla, Phaeoceros laevis, Pogonatum aloides, Pohlia annotina, Pseudoephemerum nitidum, Tortula truncata; rarely also Dicranella crispa, Ephemerum serratum, Fossombronia wondraczekii, Pohlia camptotrachela. Found with young plants of Crassula helmsii and Littorella uniflora at reservoir edges and with *Fissidens incurvus* on lake-edge bank.

Rhizoidal tubers seen several times (but not often searched for). Frequently c.fr.: capsules immature 1-3, 8, 10, 11; dehiscing 2, 11, dehisced 1, 3.

52.8 *Dicranella cerviculata* (Hedw.) Schimp. LS [1][2]

Boreo-montane Circumpolar element.


There are no modern records in Cornwall.
52.9 *Dicranella heteromalla* (Hedw.) Schimp.
Boreo-temperate Circumpolar element.

*2: Near Clerkenwater, N. of Bodmin, 1887, RVT (B) (Paton 1969a: 716).

Habitat notes from C&S are as follows. Characteristic of acidic soil (humic and mineral, dry to rather moist) on banks and slopes in woodland. It is most abundant in places where leaf-litter does not accumulate, in which it often forms large, fertile patches (low lawns). Besides sites in woodlands (deciduous and conifer) and wood edges, it occurs in scrub, Grey Willow carrs, beside lanes and on other banks, in old quarries, on 'hedges', on stream banks, and among boulders or rocks of tors. It typically grows at least partly shaded and tolerates heavy shade, e.g. as mainly non-fertile plants under overhanging banks and in deep crevices among rocks. However, smaller amounts occur in a wide range of other habitats, some entirely unshaded, e.g. in cemeteries, churchyards, on mainly bare mine-spoil, on sea-cliffs, and on heathland. A few records of small tufts on rock, e.g. in small shallow crevice in granitic boulder. Associates commonly include *Calypogeia arguta*, *Calypogeia fissa*, *Diplophyllum albicans*, *Kindbergia praelonga*, *Fissidens bryoides* var. *bryoides*, *Solenostoma gracillum*, *Pogonatum aloides*, *Pseudotaxiphyllum elegans*; less often *Atrichum tenellum*, *Bryum bornholmense*, *Dicranella crispa*, *Dicranella rufescens*, *Fissidens celticus*, *Lophocolea fragrans*, *Phaeoceros laevis*, *Pogonatum nanum*, *Pohlia lutescens*.

Single record of small amount on soil near edge of arable field (cereal stubble). Besides its usual soil substrates, recorded as colonist on crumbling granitic rocks and on clay surfaces locally in working china clay quarries and on spoil heaps. Occasionally on moist bared peat in mires, especially on sides of hummocks. Also once on bark at base of oak trunk in grove of trees, and once a bit on well rotted, decorticated wood of fallen log in shade of deciduous woodland. Also once on rotted bark of branch on ground under trees and on a stump with *Campylopus flexuosus*. Non-fertile plants were the only colonist on some parts of very contaminated silt-clay and humic soils beside spring and near stream draining old mine area (W. of Chyverton House).

Commonly c.fr.: capsules immature 1-3, [5 very young], 6-12; dehiscing [8*], [9], 11, 1-4, [5]; dehisced 1-8, 10. (* Dehiscing capsules twice seen in plenty in early Aug., but this unusual).

53.2 *Dicranum bonjeanii* De Not.
Boreo-temperate Circumpolar element.

*2: Halgavor Moor, S. of Bodmin, 1878, RVT (B) (Paton 1969a: 717).

Forms patches or turfs. Uncommon and mainly recorded in open mires or on wet heathland, including in acidic mires with sphagna (with *Sphagnum fallax*, *Sphagnum subnitens*, also *Odontoschisma sphagni*, *Pleurozium schreberi*) and as low hummocks in wet heath with
Schoenus nigricans and Molinia caerulea. Also, in mire below old china-clay spoil heaps, with sphagna. One record in short vegetation on damp slope above sea-cliff (Mullion Cliff).

Not seen c.fr. (sporophytes very rare in British Is., and unrecorded in Cornwall).

53.4 *Dicranum scoparium* Hedw.  
Wide-boreal Circumpolar element.

*2: Helman Tor, 1889, RVT (B) (Paton 1969a: 717).

Habitat notes from C&S are as follows. Growing in small to large patches on varied acidic to neutral substrates. Common on rock (granitic, serpentinite, slates, on horizontal, inclined or vertical surfaces), thin soil over rock, and on soil (mineral, humic, or peat), locally frequent as epiphyte on bark of living trees or large shrubs (usually with other mosses, on e.g. Beech sapling, Grey Willows, Hazel, Sessile Oak), sometimes also on wet peat and tussocks in mires and on dead or rotting wood (five records, including timber of old gates). Commonly both in open sites and in moderately shaded, sheltered places. Frequent or common habitats include deciduous woodland and groves, old Grey Willow carrs, rocks and their crevices (outcrops, boulders, old walls), 'hedges', gravel on gravels, heathland, heathy banks, short acidic grassland, mires, old quarries, metalliferous mine spoil, china clay spoil, disused railway tracks, sea-cliffs including some on exposed coastal headlands. Occurs on acidic sand of dunes in Isles of Scilly. Unusual record of it in plenty on thatch of roof of Friend's Meeting House at Come-to-Good. Frequent associates include *Campylopus introflexus*, *Hypnum andoi*, *Hypnum jutlandicum*, *Hypnum cupressiforme* var. *lacunosum*, *Isothecium myosuroides* var. *myosuroides*, *Mnium hornum*, *Polytrichum commune*, *Polytrichum juniperinum*, *Polytrichum piliferum*, *Pseudoscleropodium purum*, *Thuidium tamariscinum*; frequently also amongst low sphagna in mires. Many others recorded less often include *Campylopus flexuosus*, *Lepidozia reptans*, *Plagiochila spinulosa*, *Hymenophyllum tunbrigense*.

Occasional or frequent c.fr.: capsules immature 1-5, 7-12; dehiscing 1, 3, 12; dehisced 1-5, 7, 9-12.

53.5 *Dicranum majus* Sm.  
Boreal-temperate Circumpolar element.


Often in large, pure patches. Habitat notes from C&S are as follows. More restricted to woods than *D. scoparium*, mostly of deciduous trees, especially Sessile Oak, but including Hazel and Sweet Chestnut coppices and larch plantations. Most woodland records are from acidic soil or ground litter on banks or thin soil on or among rocks, in open places to moderately shaded, sometimes on slopes close to estuaries. Common associates include *Dicranum scoparium*, *Pleurozium schreberi*, *Rhytidiadelphus loreus*, *Rhytidiadelphus triquetrus*, *Thuidium tamariscinum* and *Vaccinium myrtillus*, others that are less common include *Loeskeobryum brevirostre*. Also recorded in open sites on rocky slopes on heathy hillsides, on a partly shaded laneside bank, once at edge of scrub on china-clay spoil, and
near a flush above a N.-facing sea-cliff. More surprisingly, on Isles of Scilly found several times as extensive patches in short Calluna vulgaris heathland, in coastal heaths on peaty soils, once on acidic sand of dunes, and once (St Martin's) in heathland close to shore (just inland of raised boulder beach), unshaded, among low Calluna and Anthoxanthum odoratum.

Five records c.fr.: capsules immature 3, 5, 7, 11.

53.8 Dicranum fuscescens Sm. s. str.
Boreo-arctic montane circumpolar element.


Single DTH record: cushions on steep quarried granitic rock partly shaded by Grey Willow scrub. JAP record (DTH) of deep cushion on vertical granite rock on north side of Kilmar Tor.

Not seen c.fr.: JAP specimen (E) has single capsule, almost mature 3.

53.11 Dicranum scottianum Turner ex R.Scott
Southern-temperate Hyperoceanic element.

*2: Roche Rock, 1870, RVT (B) (Paton 1969a: 717).

Forms deep, rounded cushions on exposed rocks, looser patches on rocks in woodland. Grows mainly on inclined or vertical surfaces and in small crevices of granitic rocks, occasionally on thin soil over rocks. Locally frequent and plentiful in small areas, mainly on open hillsides and slopes near tors; often unshaded or only partly shaded and mainly on N.-facing slopes, but sometimes in shaded crevices and twice found inside deciduous woodlands. Plants intermixed in its cushions or at their edges sometimes include Barbilophozia attenuata, Lophozia ventricosa, Scapania gracilis. A single [unconfirmed] report as epiphyte in Cornwall (Ethy: FR or SD).


55.3 Dicranodontium denudatum (Brid.) E.Britton
Boreal-montane European element.


Known in Cornwall only in Draynes Wood, growing in patches on thin soil among rocks and on humic soil of slope above river bank, with Vaccinium myrtillus, partly shaded by deciduous trees. It has apparently increased at this site since the initial discovery. Because the locality is along a river-bank pathside in a much-visited beauty spot the possibility exists
that it was accidentally introduced here. JAP (pers. comm.) thought it unlikely she would have overlooked it on earlier visits.

Not seen c.fr.

56.2 *Campylopus subulatus* Schimp. ex Milde
Temperate Suboceanic element.


A rather nondescript moss, easily overlooked because immature plants of other *Campylopus* look similar.

Habitat notes from Cornwall are as follows. Red Moor N.R.: unshaded compressed acidic soil on old track in heathy areas and near edges of Grey Willow carrs, with *Archidium alternifolium, Pohlia annotina, Racomitrium ericoides*. Minions area: two localities on thin compressed acidic soil at edges of gravelly tracks in old mine areas, unshaded; associates include *Archidium alternifolium*. Blackpool China Clay Works: open acidic ground near road and buildings in china clay works.

Deciduous shoot tips abundant on large patches at Blackpool China Clay Works, apparently forming propagules. Not seen c.fr.

56.5 *Campylopus fragilis* (Brid.) Bruch & Schimp.
Temperate Suboceanic element.


Habitat notes from C&S are as follows. In compact patches on soil (mineral, humic or peaty, usually acidic) or thin soil over rock. Often common in unshaded sites on or near coasts, but occasional to frequent also inland where it more often occurs in moderately to rather heavily shaded places under trees, as well as in unshaded places. Commonest on sea-cliffs (often in exposed places), coastal slopes, banks, 'hedges' or quarries on and above cliffs and coastal heaths. Records inland from heaths, in old quarries, heathy areas on old mine-spoil, on bank of china-clay spoil, a churchyard bank, on graves, 'hedges', a laneside bank, crag in scrub, in young conifer plantations, banks in mature deciduous woodland and groves of trees (including tall Beeches). Unusual records from old unshaded tree stump in cemetery and on soil of plant pot in nursery garden. Numerous associates, among those that are common are *Campylopus introflexus, Hypnum jutlandicum, Scapania compacta, Weissia controversa*.

Reproduces vegetatively from abundant caducous leaves. Four records c.fr. (in vc1); capsules immature 2, 4, 11; dehisced 10.
56.6 Campylopus pyriformis (Schultz) Brid.  
(syn. C. pyriformis var. azoricus (Mitt.) M.F.V.Corley). Temperate Suboceanic element.

Var. azoricus was not usually distinguished until the study by Corley (1976: 211), which recorded it from vc2; it is maintained as a var. by Blockeel & Long (1998: 80) and Smith (2004: 224) but not by Hill et al. (2008). It is not recognised here because Frahm (1999) regarded it as merely a modification from wet habitats.

Habitat notes from C&S are as follows. Forms patches on acidic soil (often where moist to wet, and humic or peaty), tussocks of Molinia caerulea, bared peat and on decaying wood (mainly rotting stumps, several times recorded on those of pine and Sitka Spruce, but also hardwoods; once on decaying twig of Grey Willow). Most commonly grows in open but also in sites partly shaded by Grey Willow or in open woodland. Occurs on sea-cliffs, in flushes, on coastal and inland heaths, in mires, areas with Juncus effusus, in damp or wet areas among china clay spoil (including floor of a working quarry and marsh forming on floor of old quarry), on old mining ground, among steep rocks in old slate quarry, in open and shaded areas in Grey Willow carrs and in woodland edges and clearings (including conifer plantations). Sometimes becomes plentiful for several years after heathland is burnt. Associates recorded include Atrichum undulatum, Calypogea muelleriana, Campylopus introflexus, Cephalaria bicuspidata, Gymnocolea inflata, Solenostoma gracillimum, Kurzia sylvatica, Lophozia incisa Lophozia ventricosa, Mylia anomala, Odontoschisma sphagni, Polytrichum commune, Riccardia latifrons, Riccardia multifida.

Commonly reproduces vegetatively by caducous leaves (these seen in plenty on fertile as well as sterile stems). Frequently c.fr., capsules immature 1-5, 7, 9-11; dehiscing 3-5, 7; dehisced 2-5, 7, 10.

56.7 Campylopus flexuosus (Hedw.) Brid.  
(syn. Campylopus paradoxus Wilson, C. pyriformis var. fallaciosus (Thér.) M.F.V.Corley, C. flexuosus var. uliginosus Renauld, C. flexuosus var. zonatus (Molendo) Anzi). Temperate Suboceanic element.

Habitat notes from C&S are as follows. Forms patches, mainly on acidic soils, which may be humic or mineral, including thin soil overlying rocks, compacted soil beside paths and uncompacted humic soils. Also on plant litter, varying from Molinia caerulea tussocks to wet peaty substrates and amongst low sphagna in mires, and sometimes growing directly on rock. Few records from old tree stumps in woodland, rotting wood of fallen tree trunk in woodland (with Dicranum scottianum) and roof of a church (Gwinear). Unusual record of small patches growing as epiphyle ca 1.5 m above ground on horizontal bough of Grey Willow in carr. Grows mainly on coastal and dry and wet inland heaths, in acidic mires, on and among granitic boulders and rock outcrops, in old granite quarries and on their spoil, and often on 'hedges'. Occurs mainly in open, unshaded or lightly shaded places and sometimes increases on heathland a few years after fires. Frequent also in areas of old
copper-mine spoil, found once on a heathy slope of old china clay spoil and once on floor of old china-clay pit. Single record from gravel beside sewage farm. Recorded several times part-shaded inside or in edges of deciduous groves and conifer woodland and also several times inside shady deciduous woodland. Associates include a range of common acidophiles, e.g. *Campylopus pyriformis*, *Cephaloziella divaricata*, *Dicranella heteromalla*, *Dicranum scottianum*, *Gymnocolea inflata*, *Odontoschisma sphagni*, *Sphagnum* spp., and such vascular plants as *Calluna vulgaris*, *Juncus effusus* and *Molinia caerulea*. Among less common species, noted with *Straminergon stramineum*, *Sarmentypnum exannulatum*.

Occasionally/frequently c.fr.: capsules immature 1-4, 7, 9-12; dehiscing 7; dehisced 5, 8, 10.

56.10.a *Campylopus atrovirens* De Not. var. *atrovirens* Temperate Hyperoceanic element.

*1*: Alwyn Common, St Buryan near Land's End, 1884, WC (BM) (Paton 1969a). [Earlier reports (Tremethick Moor, 1865, WC (PNZ), and in Curnow 1865; Ding Dong Moor, 1884, EDM (BM, E), and in Braithwaite 1887-1905) were based on misidentified *C. brevipilus*: Paton 1969a: 718].

*2*: Bodmin, 1878, RVT (B) (Paton 1969a: 718).

Grows as small to large, often almost pure patches. Occurs locally on unshaded damp ground close to edges of mires and on wet heathland, especially where vegetation is very closely grazed. Locally abundant in this habitat on heavily grazed parts of Crowdy Marsh, often close to *Racomitrium lanuginosum*.

Not seen c.fr.

56.11 *Campylopus pilifer* Brid. (syn. *Campylopus polytrichoides* De Not.). Southern-temperate Oceanic element.


Forms compact patches on surfaces of granitic and slaty rocks, thin soil overlying rock and deeper soil (sometimes sandy) in places that dry in summer. Only found in unshaded or slightly shaded sites, mainly on and above sea-cliffs, also on boulders in quarry waste near the coast. There are usually no close associates, although *Campylopus introflexus* sometimes grows with it on thin soil as well as on its own nearby on deeper soil. *Sedum anglicum* and low *Calluna vulgaris* have also been noted as growing close by.

Not seen c.fr. The species is dioecious and it is rare for both sexes to occur together (Schimper 1864). Male plants were first found in Cornwall (Curnow in Schimper 1876) and may not be known elsewhere in Britain. There are no British records of sporophytes but they are known in Ireland (Hegewald 1973), Spain and Portugal (Giacomini 1955, Richards 1963).
**Campylopus introflexus** (Hedw.) Brid.  
Temperate Suboceanic element. 

**ALIEN** S12


An alien species that became established in Cornwall by 1960 and the Isles of Scilly by 1962 (Tresco, 1962, RJM: Paton 1969a: 718). It was noted as 'local but apparently increasing' through the 1960s (Paton *loc. cit.*) and had become common in all regions with acidic soils by about 1995.

Muticous forms occur frequently, especially with young plants e.g. on damp track edges. They can easily be confused with *C. subulatus*, *C. pyriformis* and other congeners, from which they are best separated by careful study of leaf sections. However, widespread searching among muticous populations during fieldwork often discloses a few plants in which short hair points betray the species identity.

Habitat notes from C&S are as follows. Forms patches or more extensive lawns, mainly on acidic, dry to wet, humic or mineral soils, commonly including thin droughty soil over rocks, but also on bared peat, loose wet litter among *Sphagnum*, hummocks in mires (e.g. on a *Molinia caerulea* tussock). Patches also frequent on well rotted wood (of trunks, logs or stumps, including those of pine, oak and *Tamarix*), not rare also on old timbers of fences or buildings, or on old burnt wood. Rarely on rocks with little or no accumulated soil, e.g. on granite among china-clay spoil, but less typically growing directly on rock than *Campylopus pilifer*. Seen three times in small amounts as epiphyte (1.5 m above ground in hollow where branch had rotted on hedgerow oak; on living horizontal branch of Grey Willow; on bark at base of old pine trunk). Two records on old tarmac at edge of paths (once as large patches), rotting fabric dumped beside track, old roofing felt lying on ground, and on rotting vinyl of wrecked car.

Often abundant in open areas on coastal and inland heaths, such as beside paths and tracks and commonly occurring extensively for a few years on soil exposed by fires. Frequent in many other habitats, including disturbed areas in acid grasslands, banks in open woodland (deciduous and coniferous), woodland clearings, 'hedges', quarry slopes and spoil, partly bare areas on old copper mine-spoil (in open or partly under *Calluna vulgaris* or *Ulex* scrub), china-clay quarries and spoil and almost bare areas above sea-cliffs (including exposed sites that receive much salt spray). Young plants locally abundant on peaty substrates in upper part of inundation-zone beside Colliford Lake (reservoir). Other records from acidic sand dunes (Isles of Scilly), gravel covering graves, soil in gardens, plant pots in nurseries and garden centres, track of disused railway, a church roof, and accumulated 'soil' in guttering of house roof. Commonest in unshaded places, but frequently in light shade.

Frequent associates include many common acidophiles such as *Campylopus fragilis*, *Campylopus pyriformis*, *Cephaloziella divaricata*, *Ceratodon purpureus*, *Dicranella heteromalla*, *Trichostomum brachydontium*, *Sedum anglicum*; many others recorded include *Bryum torquescens*, other *Campylopus* spp., *Cephalozia bicuspidata*, *Dicranum scoparium*, *Hypnum cupressiforme* var. *resupinatum*, *Nardia scalaris*, *Orthodontium lineare*, *Sphagnum*
denticulatum, Aphanes sp. On Isles of Scilly associates often include Lophocolea bispinosa, Lophocolea semiteres.

This alien species now covers large areas on coastal slopes and open parts of coastal and inland heaths, becoming especially conspicuous 1-3 years after fires. It commonly covers so much ground that it must have had a deleterious effect at least locally on other bryophytes occurring in these habitats, such as Campylopus atrovirens, C. brevipilus and C. pilifer. Although widespread, it is much less plentiful on wet ground in mires and in regions with fertile soils it remains a scarce colonist, mainly on decaying wood (and once on gravel beside sewage farm).

Vegetative dispersal apparently common by means of deciduous leaves and fascicles of young leaves. Commonly c.fr.: capsules immature 1-6, 11, 12; dehiscing [1], 5-10; dehisced 1, 3-12.

56.13 Campylopus brevipilus Bruch & Schimp. Temperate Oceanic element.

*S1: Tremethick Moor, Penzance, 1865, WC (PNZ) (Paton 1969a: 718).

Habitat notes from C&S are as follows. Grows mainly on acidic, damp to wet, humic or peaty soils. Apparently intolerant of shading and absent from tall heath vegetation. On heathy cliff slopes, by flushes above cliffs, on coastal heaths, in short areas of wet heathland inland and on hummocks at edges of mires. Close associates often include Campylopus introflexus, Erica spp. Paton (1969: 718) noted that a stunted form occurs amongst turf on dry heathy cliff tops; DTH has seen this in the Isles of Scilly.

Not seen c.fr. [Dioicous; capsules being very rare in British Is.; unrecorded in Cornwall].

57.1 Leucobryum glaucum (Hedw.) Ångstr. Temperate European element.

First vice-county records of the L. glaucum s. l.:
*S1: Madron Moor, 1867, WC (PNZ) (Paton 1969a: 719).

L. glaucum and L. juniperoides were not usually separated in Britain until the study by Crundwell (1972); older records are placed as L. glaucum s. l. unless specimens have been revised subsequently.

Grows in patches that develop into rounded cushions, sometimes forming large hummocks, but these infrequently more than 0.5 m across in Cornwall (although up to 0.8 m tall and 0.6 m in diameter at locality east of Temple in 1999). Habitat notes from C&S are as follows. On acidic humic soil, damp ground-litter, old Molinia caerulea tussocks and other wet peaty surfaces. Grows mainly on wet heathland and in acid mires, but also recorded in drier acidic grassland on Bodmin Moor, on laneside and trackside banks, in a mature Beech wood, and on a slope in open Sessile Oak woodland from where it extended onto vertical soil on low cliff only 1.5 m above HWST level of a sheltered estuarine creek. One record of small
cushions on soil on top of very old ruined walls (Chysauster). Usually unshaded, but also partly shaded in open woodland. Associates include *Leucobryum juniperoides* (in woods), *Polytrichum strictum* (growing on *Leucobryum* hummock), *Campylopus flexuosus*, *Calluna vulgaris*, *Erica spp.*, *Pteridium aquilinum*. Various small liverworts grow in or over its hummocks in mires, especially when they are poorly grown or moribund (including *Kurzia pauciflora*, *Odontoschisma sphagni*). Its hummocks are often occupied by ant nests.


### 57.2 *Leucobryum juniperoides* (Brid.) Müll.Hal. (syn. *L. glaucum* auct. non (Hedw.) Ångstr. *pro parte*). Temperate European element.


See notes above.

Usually pure, flat patches which grow to become domed and eventually rounded cushions up to *ca* 30 cm across. Grows on acidic often humic soil, edges of granitic or slaty rocks and on well-rotted decorticated wood of fallen branches, logs or stumps. Closely associated with deciduous or coniferous woodlands (often Sessile Oakwoods), or at least groves of trees (seen once in young plantation of Beech), growing in light to moderate shade, often on slopes such as steep edges of ditch banks and edges of rocks. Associates include *Leucobryum glaucum*, but it commonly replaces that species in woodland habitats.

Not seen c.fr. [one JAP record from vc2]. See Blackstock (1987) for notes on ecology and sexual reproduction.

### 58.1 *Scopelophila cataractae* (Mitt.) Broth.

Southern-temperate Circumpolar element.


It is a rather inconspicuous and nondescript moss restricted to sites with metalliferous contamination. It was probably overlooked in Cornwall prior to publication of the first British and European record by Corley & Perry (1985). Since the first record in vc1 (Holyoak 1995) it has been found to be widespread but very local in both vc1 and vc2, with more records than from any other part of the British Is., although often occurring in small quantity.

Grows as scattered stems arising from extensive 'felt' of protonemata, sometimes forming patches or more extensive low turfs, or just as often occurs as scattered stems or small
patches arising from mats of *Cephalozia* spp. It is confined to copper-rich substrates in old mining areas, on soil that is typically clayey (also clay-silt, silt, and thin soil in wall crevices), moist, vertical to (less often) horizontal or overhanging, in unshaded and partly shaded places. Its habitats are always on or beside old mining ground and include laneside banks, banks or mounds of old mine-spoil, spoil at edge of an old mine-shaft, streamside banks, sides of old leats and ditches, and a vertical low bank of mine-spoil forming part of a field 'hedge'. Sometimes on mainly bare substrates and normally in places too toxic to support vascular plants, but commonly associated with other copper-tolerant bryophytes, especially *Cephalozia massalongi*, *C. nicholsonii*, *C. stellulifera* and *Pohlia annotina*. Also single records of it growing near to *Ditrichum cornubicum* and *Pohlia nutans*.

A single good patch seen in an unusual situation W. of Chyverton House on decaying humus of base of *Dryopteris* tussock, partly shaded by young birch trees. More substantial patches were present nearby on damp horizontal clay-silt on banks of a small stream draining an old mine area.

This species is well known as a 'copper-moss' that colonises copper-rich substrates on which few other plants can grow (Shaw 1987, Satake *et al*. 1988) and Fletcher (1993) found that in cultivation it is resistant to applications of a strong copper sulphate solution. In Europe it has been found mainly on substrates with a high copper content (Corley & Perry 1985, Sotiaux *et al*. 1987, Schumacker & Brugués 1991) but also where zinc occurs at high concentrations (van Melick 1986).

As shown in the following Table, chemical analyses of its substrates show it tolerates high to extremely high levels of Cu at Cornish localities, whereas levels of Pb and Zn are high to very high at some sites but quite low at others. At Chyverton it tolerates simultaneously high levels of all three metals. All substrates investigated were acidic.

**Analyses of substrates from localities in Cornwall (metal concentrations given as µg/g dry weight):**

<table>
<thead>
<tr>
<th>LOCALITY (N samples)</th>
<th>Cu (µg/g dry weight)</th>
<th>Pb (µg/g dry weight)</th>
<th>Zn (µg/g dry weight)</th>
<th>pH</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Lane, vc1 (2)</td>
<td>161-464</td>
<td>42-139</td>
<td>7-10</td>
<td>6.0 (1996)</td>
<td>Clements</td>
</tr>
<tr>
<td>Tuckington, vc1 (1)</td>
<td>179</td>
<td>3</td>
<td>20</td>
<td>6.0 (1996)</td>
<td>Clements</td>
</tr>
<tr>
<td>Minions, vc2 (2)</td>
<td>13098-15252</td>
<td>26-31</td>
<td>156-245</td>
<td>5.8 (2001)</td>
<td>Walsh</td>
</tr>
</tbody>
</table>

Studies of six European populations by Shaw (1995) found no genetic variation at 15 allozyme loci, whereas North American and many of the Asian populations showed considerable variability. This tends to strengthen suggestions (e.g. in Crundwell 1986) that the species may be a recent introduction to Europe, but the lack of variability might also be due to few European populations having survived Pleistocene glaciations.

Not seen c.fr. in Cornwall or indeed anywhere in Britain or Europe, where only male plants have been reported (antheridia seen in July on Cornish plants). Male and female gametophytes occur in the U.S.A. but never in the same population; both sexes of gametophytes and sporophytes are known over much of its range in Asia and in tropical America (Shaw 1993, 1995). Vegetative spread presumably occurs by dispersal of the
protonemal gemmae, which were noted in Cornish plants as being uniseriate and ca 4 cells long, similar to those described by Arts (1988) and Rumsey & Newton (1989).

59.1 *Eucladium verticillatum* (With.) Bruch & Schimp. [S12]
Southern-temperate European element.

*1: Near St Ives, 1844, AG (PNZ) (Paton 1969a: 726).
*2: Burniere, Bodieve near Wadebridge, RVT (B) (Paton 1969a: 726).

Grows as dense low lawns or deeper tufts, sometimes as large patches. Habitat notes from Cornwall are as follows. A basophile that grows on vertical or steeply inclined firm 'soil' (mostly earthy head deposits), soft rocks (slates, serpentinite, sand-rock) or old masonry (mortar, concrete). It usually grows in lightly to rather heavily shaded places, on surfaces that are flushed or moist, at least in winter. Records from natural sites are from dry and flushed rock low on sea-cliffs, creekside cliffs and low banks beside streams near the coast. More numerous artificial sites are in old quarries, old road and railway cuttings and on old walls (e.g. beside roads, streams and rivers, of mill, of old lime kilns and of ruins of former china-clay works). Often in pure patches; associates recorded were *Conocephalum conicum* s. str., *Cratoneuron filicinum*, *Didymodon tophaceus*, *Fissidens adianthoides*, *Gyroweisia tenuis*, *Pellia endiviifolia*, *Rhyynchostegiella tenella*, *Thamnobryum alopecurum*.

Not seen c.fr. in Cornwall by DTH (although noted as 'rarely c.fr.' in Cornwall by Paton 1969: 726; elsewhere in British Is., capsules 'rather rare, maturing in spring' according to T.L. Blockeel in Hill et al. 1992: 297).

60.1.a *Weissia controversa* Hedw. var. *controversa* S12
Wide-temperate Circumpolar element.

*2: Port Quin, 1890, RVT (B) (Paton 1969a: 727).

This and several allied taxa were only recorded when mature (or almost mature) capsules were examined. Hence it tends to be under-recorded, with only a few records from about July to Dec. (and those based mainly on chance finds of old capsules).

Grows as low lawns or tufts. Habitat notes from C&S are as follows. Commonest on free-draining mineral soil (clayey, silty, sandy, gravelly, or loamy) that is neutral to mildly acidic, including 'head' deposits and thin soil overlying rock, on horizontal, sloping or vertical surfaces. It normally occurs only in sites that have been stable for several years (arable land is not usually colonised). Fertile plants occur in fully insolated to partly shaded places, but non-fertile plants occur in deeper shade (e.g. crevices in banks, under overhanging banks, beneath trees). Commonly recorded from laneside and roadside banks, Cornish hedges, upper parts of sea-cliffs and banks above them, thin soil on old walls, and old quarries (for slates, granite). Fewer records from old copper-mine spoil, china-clay spoil, fixed dunes, blown sand on coastal hillslopes, churchyard banks and on and beside graves. Several records from decayed mortar on tops and sides of walls of ruined mine buildings demonstrate some tolerance of basic substrates, as does a record from very thin soil over 'rotted' concrete of grave. Unusual records of good patch c.fr. on decaying wood of old, partly shaded fence, and large patch forming annulus on decaying rubber of old tyre
lying beneath Ash tree on mine-spoil. Single record from arable (stubble) field in small amount cfr, but several records of sterile Weissia from stubbles perhaps this sp. Associates frequently recorded include Barbula convoluta, Bryum capillare, Bryum sauterii, Fissidens bryoides var. bryoides, Hypnum cupressiforme var. resupinatum, Tortula flavovirens, Tortula viridifolia, Sedum anglicum; rarely Bryum donianum, Cephaloziella divaricata, Cephaloziella hanpeana, Cephaloziella integerrima, Hypnum cupressiforme var. lacunosum, Polytrichum juniperinum, Scleropodium touretii, Tortula canescens, Trichostomum crispulum, Weissia brachycarpa var. obliqua.

Commonly c.fr. (only recorded when mature capsules or mature spores examined): capsules immature 1-4 (5), 10-12; dehiscing 1-7 [8], [9]; dehisced (3: few) 4-11.

'Dwarf' populations from sea-cliffs in West Penwith (Porthmoina Cove; Kenidjack) and Isles of Scilly (St Martin's: DTH 95-320) appear distinctive, with short stems, small leaves, short seta, capsule small and ovoid to broadly ovoid, and peristome entirely lacking (even from newly dehisced capsules). Since they resemble typical plants of var. controversa in leaf structure and spore size (15-16 µm) they are placed with that taxon. Further study is needed to establish whether the dwarf form has any genetic basis.

60.1.b Weissia controversa var. crispata (Nees & Hornsch.) Nyholm 1 (syn. W. crispata (Nees & Hornsch.) Müll.Hal.). Southern-temperate European element.

*1: On sandy bank, Lizard Point, 1984, HvM & JAP (BBSUK) (Hill 1985: 24). [Older report from vc1 (Kynance Cove, 1921, WW (TTN), and in Rilstone 1926) was based on misidentified W. occidentalis = W. perssonii; deleted by Paton 1969a: 727, Crundwell 1970: 201]. [SW61 and SW71 records shown in Atlas 2 and in BRC data are based on the same record which DTH assigns to SW61V].


There is a single later record from vc1 (SW64H, ca SW 638442, from bare patch of soil amongst turf on bank high on sea cliff (over slaty rock), SW. of Portreath, 30 Mar. 1994, DTH 94-194).

Plants intermediate between var. crispata and var. controversa have been found near Padstow, with some leaves having yellowish nerves up to 80 µm wide at leaf base, but other leaves on same plants with nerves only 40-60 µm wide as usual in var. controversa.

Only recorded c.fr.: capsules immature 3, dehiscing 3.

60.1.c Weissia controversa var. densifolia (Bruch & Schimp.) Wilson S12 Southern-temperate European element.

*1: Near Camborne, 1861, WC (PNZ) (Paton 1969a: 727). This record is older than that published as new for vc1 by Warburg (1962: 370).

Smith (1978: 277) gives a short seta [ca 1.5 mm] as a character by which var. densifolia differs from the common form, but such short setae have not been found in abundant Cornish material, which has setae 3-5 mm.

Differs from var. controversa in forming denser deeper tufts with stems 15-45 mm high and in having leaves of almost uniform size evenly spaced along the stems. However, the gametophyte characters of some Cornish populations of var. densifolia grade into more typical plants of var. controversa. One of several similar examples is that at West Chyverton mine there were tall tufts of var. densifolia on an old wall, apparently typical var. controversa on mine-spoil 'lithosols' nearby, along with various intermediates. Young populations of var. densifolia probably look much like var. controversa until the characteristically taller stems develop, so it may be that the tallest tufts develop only in the most stable sites such as on walls, or on the sites with highest metal levels. However, well-grown patches c.fr. at Roseland (SE. of Liskeard) restricted to band beneath a galvanised iron shed roof were all of perfectly ordinary var. controversa, demonstrating that not all ecotypes tolerant of heavy metals are of the var. densifolia phenotype.

Forms deep cushions, tufts or more extensive patches and most often occurring in substantial quantities, judging from which it may clearly become a long-established perennial. Habitat notes from C&S are as follows. Grows on soil, old concrete, old mortar or in crevices of stone walls, in free-draining places that are fully insolated or only partly shaded. It often grows on substrates that are evidently calcareous and also often on those that must have high levels of copper or zinc, or which receive run-off contaminated by these metals. Most records are from old mortared-stone walls (of barn and other buildings, walls beside tracks and a stream); also recorded four times from slopes of copper mine spoil. Several records are associated with zinc run-off from galvanised iron: on horizontal old concrete, stone walls and soil at bases of galvanised sheds (sometimes covering several square metres), beneath galvanised railings and a galvanised gate, below an old fence made of galvanised wire and on concrete at base of leg of electricity pylon. Zinc run-off might also account for records from near to stored pipes and machine parts on a low bank of china clay spoil, but it is less evident with several records on china-clay spoil at base of large concrete clay-settling tanks (where it grew along with shorter plants that match var. controversa). Plentiful on damp timber (which was originally tanalised, i.e. treated with fungicides?) beneath galvanised-wire netting on boardwalks on damp ground near Argal and College Reservoirs, in light to moderate shade. Several other finds were also not associated with any obvious metalliferous contamination: on thin soil over rocks of open hill top (Carn Brea near Land's End); extensive mainly pure patches on unshaded gravel area close to edge of estuary (Sunny Corner). Commonly forms pure patches. Associates recorded were Bryum pallescens (frequent records) and (once each) Pohlia flexuosa and Pohlia nutans.

Commonly cfr, but also occurs as large non-fertile patches at some localities; capsules immature 1-3, 5 (6 few), 10-12; dehiscing 3, 5; dehisced 4-7.


Although first named as a British species by Crundwell (1971a), it was known to be a distinct taxon for many years before this while being studied by the late E.F. Warburg.

Doubtless under-recorded because mature capsules are needed for reliable identification. Some literature states that *W. perssonii* differs from all congeneres in lacking the short papilllose lamina cells covering the costa on the ventral surface of the leaf, but at least some *W. brachycarpa* are similar in this character.

Grows as low lawns or in loose tufts. Restricted to substrates of free-draining mineral soil (neutral to mildly acidic?), mainly in fully insolated to partly shaded sites (once c.fr. well shaded in hollow among rocks). Occurs only on sea-cliffs and slopes above sea-cliffs (of granite, slates, serpentinite), on patches of soil exposed among turf and on other partly bare areas such as banks. Never recorded inland in Cornwall, despite being searched for. Associates include *Tortella flavovirens*, *Trichostomum brachydontium*. Often close to *Conocephalum conicum*, sometimes close to *Weissia brachycarpa* var. *obliqua*.

Commonly c.fr. (recorded only when mature capsules or mature spores examined, because not safely recognisable from leaf characters alone): capsules immature 1, 3, (4, 5), 11, 12; dehiscing 3-5, [8]; dehisced 5, 8.

60.3 *Weissia rutilans* (Hedw.) Lindb. 12 Temperate European element.

Grows as low lawns or loose tufts. Recorded only from horizontal to near-vertical surfaces of partly bare mineral soil (loamy, stony; mildly acidic?), where fully insolated or slightly shaded by grasses. Records are from soil exposed in unimproved pasture on hillslope, a low N.-facing bank between pastures, bank in grassy flush near coast, on flat floor of quarry, and twice on banks and soil heaps on old mining ground. Associates were not recorded in detail, but include other mosses and common low-growing grasses.

In the grassy flush it occurred close to the very similar *W. brachycarpa* var. *brachycarpa*, providing an identification problem because the very short caducous peristome of *W. rutilans* is often almost impossible to distinguish from the absence of a peristome in *W. brachycarpa*. However, the longer capsules of *W. rutilans* allowed recognition of this species in the mixed gatherings.

Commonly c.fr. (only recorded when mature capsules or mature spores examined): capsules immature 1; dehiscing 1, 2, 4, 5.

[60.4 *Weissia condensa* (Voit) Lindb. (syn. *W. tortilis* (Schwägr.) Müll.Hal. Report from vc1 (Coast near Marazion, 1863, WC (PNZ), and in Curnow 1865) was based on misidentified *W. controversa*: Paton 1969a: 728].


Forms patches or low lawns. Habitat notes from Cornwall are as follows. Locally frequent on Lizard pen. heathland W. of Rosuick, 10 Mar. 2004, on unshaded soil, often among serpentinite rocks e.g. in small old quarries or on banks; associates included *Archidium alternifolium, Bryum rubens, Entosthodon obtusus, Conocephalum conicum*. One other DTH record in vc1: E. of Goonhavern, on damp peaty soil of unshaded disturbed area at edge of wet heath, also close by on clay soil of unshaded soil heap. The Tidna, vc2: damp soil of low unshaded banks in flush near coast (near *Molinia caerulea* tussocks). Siblyback Lake: patch on unshaded acidic soil of low bank just above edge of inundation-zone beside reservoir.

Only recorded c.fr.: capsules immature 3, dehiscing 4, fallen intact 8 (not dehisced).


*1*: Kynance Cove, 1912, LJC (BM) (Paton 1969a: 728). [Earlier report (St Michael's Mount, 1844, AG (PNZ), and in Greenwood 1846) was based on an odd form of *W. controversa*, det. EFW: Paton 1969a: 728].

Some patches of plants from vc1 have many capsules that rupture to release spores as in *W. squarrosa*, but they show no other characters of that species. Other plants have capsules that dehisce in the usual manner through loss of the lid, although top of capsule is then covered by pale membrane through which spores escape by way of rounded hole in centre.

Somewhat under-recorded because mature capsules are needed for reliable identification.

Grows as small tufts or low lawns. Habitat notes from Cornwall are as follows. Mainly on mineral soil exposed amongst turf on upper parts of sea-cliffs, cliff tops and banks near the coast, over granitic and slaty rocks on the north coast and serpentinite on the Lizard pen., perhaps always on somewhat basic substrates and sometimes on soils that include calcareous blown sand. Except on Lizard, generally scarcer inland, with records from earthy banks e.g. between pastures, graves (twice), a hedge-bank, soil in crevices of 'hedges', soil among gravel on disused railway track, soil in cemetery, soil over old mine-spoil (three records), partly bare, dumped soil near china clay quarries and arable field (once, in cereal stubble). Occurs in unshaded or lightly shaded places, once partly shaded by deciduous trees on creekside cliff. Two atypical records from peaty soil on wet heathland over serpentinite on The Lizard, one of them on side of hummock with *Bryum pseudotriquetrum*. Often in pure patches; other associates recorded are *Bryum capillare, Fissidens bryoides* var. *bryoides, Pleuridium subulatum, Trichostomum crisipulum,*
Conocephalum conicum. Unusual record in stubble field was with Bryum rubens, Dicranella staphylina, Trichodon cylindricus, Tortula truncata.

Commonly c.f.r. (only recorded when mature capsules or mature spores examined): capsules immature 3-5; dehiscing 2-6, [7], [8]; dehisced 4, 5, 7, 8.

Unusual plants from near Holywell (DTH 07-26) resemble this taxon, but spores only 18-20 μm and costa at leaf base rather wide (46-75 μm).

[60.7 Weissia rostellata (Brid.) Lindb. [NS] – Tentative records of sterile plants: SS2874/1182 and SS2865/1190, on unshaded clay exposed high in inundation zone beside reservoir, with sparse low mosses, W. edge of Upper Tamar Lake, 3 Nov. 2001, DTH & JAP, no voucher kept because sterile plants cannot be confirmed, but undoubtedly a Weissia resembling W. rostellata, and only that species of genus occurs in this type of habitat. W. rostellata was found on the vc4 bank of this reservoir by DTH in 2003].

60.9 Weissia multicapsularis (Sm.) Mitt. NR:CR 12
Temperate Oceanic element.


A globally threatened species for which three of the four most recent records worldwide are from Cornwall (the fourth being from Monmouthshire). Between 1999 and 2003 it was almost lost from one of these three locations (at Pentire Point East, through spread of Gorse and tall grasses on the ungrazed cliff-top). However, a few other finds of non-fertile and hence unidentifiable Weissia subgenus Astomum on arable fields might have been referable to this species (e.g. 30 Mar. 2002, on soil amongst cereal stubble NW. of Trevalga, SX075900).

Two other records are not supported by vouchers, have not been refunded, and are therefore rejected (from SW61W, SW71T). [Specimens from SW62 (cliffs N. of Church Cove, Gunwalloe, leg. JAP, 1960, 1962, 1990, OXF) have been reidentified as 60.12.a but are erroneously shown for both species in Atlas 2].

Grows as scattered stems on otherwise bare soil, in small to more extensive tufts (up to 6 cm diameter), or scattered in tufts or patches of other mosses (Bryum donianum, Trichostomum brachydontium, Conocephalum conicum). Other habitat notes from Cornish localities are as follows.

S. of Portscatho: on partly bare patches of loamy soil (horizontal to steeply sloping) on tops of low 'hedges' between arable fields/grass leys, close to tops of low sea-cliffs and unshaded. As small pure patches or intermixed with other low mosses, including: Barbula convoluta var. sardoa, Bryum rubens, Ceratodon purpureus, Fissidens bryoides var. bryoides, Fissidens taxifolius var. taxifolius, Trichostomum brachydontium, Conocephalum conicum. Vascular plants close by mainly grasses (Dactylis glomerata, Festuca rubra, etc.)
but others include *Cerastium fontanum*, *Glechoma hederacea*, *Hedera hibernica*, *Plantago lanceolata*.

Talland: horizontal to sloping, often thin, unshaded soil over slaty rock on low banks in unimproved coastal pasture; associates include *Bryum donianum*, *Bryum rubens*, *Didymodon insulanus*, *Fissidens incurvus*, *Tortula truncata*, *Weissia controversa*; vascular plants close by include *Agrostis stolonifera*, *Dactylis glomerata*, *Festuca rubra*, and various common grassland herbs such as *Bellis perennis*, *Plantago lanceolata*.

Pentire Point East: single stem in 1999, with other low mosses on soil near top edge of slaty cliff (DTH).

Only recorded cfr, capsules immature 1-4. It was noted on 1 May 2003 that some of biggest patches S. of Portscatho had capsules maturing in moderate shade of 'canopy' of grasses and herbs 10-25 cm tall.


Two recent records, as follows. On unshaded partly bare patch of soil in short grassland on slope above sea-cliffs near New Polzeath; associates *Pleuridium acuminatum*, *Riccia subbifurca*, *Scleropodium touretii*, *Trichostomum brachydontium*, *Sedum anglicum*. On unshaded partly bare soil in and at edge of arable (stubble) field; near *Bryum dichotomum*, *Bryum rubens*, *Tortula truncata*, sparse low grasses and herbs.

One record c.fr.: capsules immature 12; other record of plants with fully formed perichaetial bracts: late 10.


*2*: On partly bare sandy soil on unshaded grassy slope in small old quarry, 48 m alt., E. side of Brea Hill, SW97, DTH 02-002 (BBSUK) (Rothero 2003: 50).

Apparently extinct at the site in SW75S [grid reference was ca SW 773551, on top of roadside hedge at gap; *fide* JAP pers. comm. 1996], which had become overgrown and unsuitable by 1996.

Also noted on compacted gravelly soil among low grasses and herbs at edge of car park (near small stream) (Kennack Sands, 28 Feb. 1999).
Only recorded c.fr.: capsules immature 1, 2.

61.1 *Tortella tortuosa* (Hedw.) Limpr.
Boreo-temperate Circumpolar element.

*2*: Rough Tor, 1907, RWS *(TRU)* (Paton 1969a: 726).


Recent records in Cornwall are of patches of rather small plants on steep damp mortar of wall of railway bridge, lightly shaded, and a small patch on large old mortared wall, lightly shaded. In addition, there are surprising records of two long-persistent patches in crevices of granitic rocks high on Rough Tor, presumably where some base is present.

Single record c.fr. in Cornwall: few capsules reported on patch on Rough Tor, 17 Apr 2000.

61.5 *Tortella nitida* (Lindb.) Broth.
Mediterranean-Atlantic Oceanic element.


Forms cushions or patches on steep dry to damp calcareous masonry. Recorded growing on mortar and directly on nearby rock surfaces (including granite) of mortared-stone walls e.g. at roadsides, around cemeteries, of churches, and on railway bridge, fully insolated or lightly or partly shaded. Associates include *Rhyynchostegiella tenella, Tortula muralis, Trichostomum crispulum*; seen once with *Grimmia hartmanii*.

Deciduous leaf tips are invariably present and doubtless serving as propagules. A dioicus species for which capsules are unknown in Britain.

[61.7 *Tortella inclinata* (R.Hedw.) Limpr. – Reports from vc1 (Newlyn Cliff and Lamorna, WC, in Braithwaite 1887-1905) not supported by specimens; reports from vc2 not supported by specimen (Gerrans, in Tellam 1892) or based on misidentified *T. flavovirens* (St Minver, 1892, RVT *(B)*, and in Tellam 1892): Paton 1969a: 726].

61.9 *Tortella flavovirens* (Bruch) Broth.

*1*: Newlyn Cliff, 1866, WC *(PNZ)* (Paton 1969a: 726).

*2*: Rock near St Minver, 1890, RVT *(B)* (Paton 1969a: 726).

Crundwell & Nyholm (1962) recognised *glareicola* as a variety of *T. flavovirens*, differing from the typical form in having larger leaf cells (cells in upper part of lamina >12 µm), although they acknowledged that some intermediates occur. They did not see material of var. *glareicola* from Cornwall. Paton (1969a: 726) treated the two forms together 'because it
is often difficult to distinguish between them. Although a recent national checklist (Blockeel & Long 1998: 86-87) continued to recognise var. *glareicola*, recent work in Cornwall shows that intermediate plants are very common. Also, var. 'glareicola' has been found on the same cliffs as var. *flavovirens* (e.g. on gabbro rocks at Coverack), and they frequently occur close together; 'var. *glareicola* has also been recorded alongside the typical form in short dune grassland on calcareous sand (Penhale, Marazion, Upton Towans). Hence, recognition of vars. is probably not worthwhile and Smith (2004: 285) and Hill *et al.* (2008) treated *glareicola* as a synonym of *T. flavovirens*.

Grows as cushions, patches or small lawns. Habitat notes from C&S are as follows. Essentially a coastal species, growing on varied mineral soils including calcareous sand and loams, thin soil layers over rocks and in rock crevices (shales, slates, granitic, gabbro, greenstone and serpentinite lithologies; also on old mortar), among old metalliferous mine-spoil, and occasionally also on such humic substrates as decayed *Armeria maritima* tussocks. Often common in short dune grassland, on blown sand on coastal hillslopes, in partly bare areas on rocky sea-cliffs, including low cliffs near creeks, on 'hedges' and banks above cliffs, and walls and wall tops near coast. Also recorded from trampled grassland just above edge of saltmarsh, and gravel among graves in coastal churchyard. Typically grows fully insolated, or at most lightly or partly shaded. Normally restricted to vicinity of coast, from HWST level upwards, but occurring up to ca 1 km inland on sand-dunes. Found unusually far inland at Holy Vale, St Mary's (one cushion on sheltered wall), where 700 m from nearest coast. Record from Gwithian churchyard (small patch on old grave) was ca 750 m inland, but not far from edge of dunes. Often in pure patches. On some very sheltered creekside-cliffs occurs near HWST level, close to *Schistidium maritimum*. On more exposed cliffs commonly forms zone at somewhat higher levels than *S. maritimum* with associates that often include *Didymodon tophaceus*, *Tortula viridifolia*, *Trichostomum brachydontium*, *Conocephalum conicum*.

No recent records c.fr. in Cornwall, and only female plants have been noticed recently (with archegonia seen: 1, 9, 11, 12). Blockeel (in Hill *et al.* 1992: 321) noted that capsules are very rare in Britain, but they were recorded from Cornwall (Falmouth and Fowey, in spring) by Dixon (1924: 242).

62.1 *Trichostomum brachydontium* Bruch


Easily confused with non-fertile *Barbula unguiculata*, especially forms of that species with small, strongly papillose leaf cells and leaf margins less recurved than usual. Recognition of named varieties of *T. brachydontium* has been abandoned in Britain (Corley & Hill 1981: 84, cf. Warburg 1963: 45; Smith 1978: 291) because intermediates are common, but in Cornwall the form typical of shaded inland banks is considerably larger than that usual on coastal cliffs (as e.g. in *Mnium hornum*).
Grows as usually pure patches or low lawns. Habitat notes from C&S are as follows. Often very common in coastal sites, in wide range of mainly unshaded or lightly shaded, fairly dry habitats with patchy or low vegetation, including soil on cliff-tops and slopes, low creekside cliffs, on 'hedges' and banks on and above sea-cliffs, crevices in walls, soil on wall tops, rocks and soil beside streams, and in short dune grassland. Grows on wide range of substrates on coasts, from calcareous sand and loamy soil to thin soil layers over rock or in earthy crevices (of slaty, granitic, gabbro or serpentinite rocks, also old concrete and mortar) and on spoil from metalliferous mines. A few records from coastal sites were on wet substrates or in rather heavy shade, e.g. in cliff-top crevices, flushed rock in sea-cave, under trees, or a stream bank inside Grey Willow carr.

Less common inland in Cornwall than on the coasts, but large patches occur well inland in old slate and granite quarries, on roadside or laneside banks, on 'hedges', graves, old walls, over old concrete, on masonry debris in woodland, and occasionally on open metalliferous mine-spoil. Unlike its coastal sites, those inland are most often partly to well shaded (usually by deciduous trees) and often in very humid places (e.g. near streams and in rock cuttings and on large damp old mortared wall), but at least a few inland records are from open exposed sites. Inland records commoner than elsewhere on the Lizard pen. on serpentine bedrock and overlying soils. There, however, it occurs not only under trees and inside woodland (e.g. streambank in Bonython Plantation), but often also in the open (e.g. on soil on a track, and in rather bare places on peaty soil of open heathland) and partly shaded (e.g. on banks).

Associates recorded at coastal sites include Aloina aloides, Archidium alternifolium, Bryum dichotomum, Bryum donianum, Bryum dichotomum, Campylopus introflexus, Cephaloziella sp., Ceratodon purpureus, Didymodon fallax, Didymodon liridus, Fissidens adiantoides, Fossombronia 'husnotii', Pleuridium acuminatum, Pleurochaete squarrosa, Saccogyna viticulosa, Scleropodium touretii, T. crispulum, Conocephalum conicum, Sedum anglicum; less often Bryum kunzei, Bryum torquescens, Cephaloziella stellulifera, Gongylanthus ericetorum, Grimmia lisae, Lophozia excisa, Polytrichum juniperinum, Riccia subbifurca, Scleropodium touretii, Tortula viridifolia, Tortula wilsonii, Weissia longifolia var. longifolia; also varied low herbs, e.g. Aphanes sp., and grasses. Noted inland with Aloina aloides, Dicranella varia, Didymodon insulanus, Fossombronia caespitiformis, Lejeunea lamacerina, Rhyynchostegium confertum, Saccogyna viticulosa, Conocephalum conicum.

Rarely c.fr. (five records, mostly of few capsules): capsules immature 1, 9; dehisced 9.

62.2 *Trichostomum crispulum* Bruch


Commonly grows as extensive cushions or larger low patches, which tend to spread vegetatively to form extensive lawns that exclude other bryophytes. Evidently, therefore, long-persistent at many of its sites.
Habitat notes from C&S are as follows. A calciphile that is commonest in Cornwall on calcareous sand in very short grassland on stable sand-dunes. Also occurs in coastal sites where blown sand forms deposits on coastal hillslopes (once over slope of old copper mine spoil), and more locally on soil of sea-cliff ledges and slopes, in old quarries near coasts and open areas in coastal heaths. Scattered also inland and on coast on old calcareous masonry (mortared stonework, concrete; on rather dry to damp, and vertical to horizontal surfaces), e.g. tops and sides of old walls, bridge parapets, beside churches, on graves, and ruins including those of disused china-clay works. Also recorded beside estuaries on slaty rocks and thin overlying soil in a cutting and on a quarried cliff, on steep damp gabbro rock on heathy slope above sea-cliff, and on gravel of a disused railway. Normally grows unshaded, or only lightly shaded; once seen on old wall moderately shaded by deciduous trees.

On stable sand dunes and sandy coastal slopes it often forms extensive pure patches, or occurs with Barbula convoluta, Bryum cf. algovicum, Didymodon vinealis, Ditrichum gracile, Homalothecium lutescens, Hypnum cupressiforme var. lacunosum, Tortella flavovirens, Trichostomum brachydonium, Aphanes sp., Cerastium sp., Festuca rubra, Holcus lanatus, Plantago coronopus, Senecio jacobaea (seedlings), Thymus polytrichus; less commonly with Amblystegium serpens var. salinum, Brachythecium glareosum, Didymodon acutus, Pleurochaete squarrosa. Associates recorded on masonry are Tortella nitida, Tortula muralis. On slate/shale cliff with Bryum capillare, Weissia brachycarpa var. obliqua, Conocephalum conicum.

Occasionally c.fr. (ten records): capsules immature 1, 4; dehisced [4 old], 5, 7.

62.3 Trichostomum tenuirostre (Hook. & Taylor) Lindb.  12
(syn. Oxystegus tenuirostris (Hook. & Taylor) A.J.E.Sm. var. tenuirostris). Boreo-temperate Circumpolar element.

*2: Near St Breward, 1909, RWS (TRU) (Paton 1969a: 726). This record is older than that listed as new for vc2 by Warburg (1957: 332).

Usually grows in small tufts, less often as larger patches. Habitat notes from Cornwall are as follows. On moist rocks (granitic, slaty, gabbro) and thin soil over rocks, on vertical to horizontal surfaces. Only recorded from close to rivers, streams and trickles (once near a small waterfall), in light to rather heavy shade in deciduous woodland, groves of trees, beneath retaining wall of a bridge and in a disused railway cutting. One record was from flood zone at edge of R. Camel. Associates recorded are Fissidens bryoides var. caespitans, Fissidens polyphyllus, Heterocladium heteropterum var. heteropterum, Lejeunea lamacerina, Mnium hornum, Rhizomnium punctatum.

Not seen c.fr. (archegonia seen: 12).
63.1 *Pottiopsis caespitosa* (Brid.) Blockeel & A.J.E.Sm.  


Perhaps now extinct in Cornwall; Paton (1969a: 721) recorded that the track on which it grew was ploughed up in 1967.

64.1 *Pleurochaete squarrosa* (Brid.) Lindb.  
Mediterranean-Atlantic Suboceanic element.  


Grows as patches or more extensive low lawns. Locally common on calcareous sand in short moss-rich dune grassland, and where calcareous blown-sand lies on coastal hillslopes, above sea-cliffs, or on old mine-spoil. Also locally and in small amounts in low vegetation of open slopes above or near rocky sea-cliffs (serpentinite, slates) and in a slate quarry. Restricted in Cornwall to coasts or sites on dunes within 1 km inland of coasts. Normally in fully insolated places (occasionally part-shaded where colonising bushes encroach onto its duneland habitats). Associates on dunes and sandy coastal slopes include *Barbula convoluta*, *Bryum spp.*, *Ditrichum gracile*, *Syntrichia ruralis* var. *ruraliformis*, *Tortella flavovirens*, *Trichostomum brachydontium*, *Trichostomum crispulum*, *Aphanes sp.*, *Cerastium sp.*, *Festuca rubra*, *Plantago coronopus*, *Thymus polytrichus*, less often *Didymodon acutus*. On cliffs recorded with *Fossombronia 'husnotii’*, *Trichostomum brachydontium*, and very short phanerogams.

A dioecious species for which capsules are unknown in Britain.

65.1.a *Hymenostylium recurvirostrum* (Hedw.) Dixon var. *recurvirostrum*  


In Cornwall this species usually grows as dense low lawns of a distinctive very dark green colour, which often extend over several square metres and locally cover tens of square metres and largely exclude other bryophytes (for atypical growth in large low tufts see below). Habitat notes from Cornwall are as follows. Apparently a calciphile, that appears to be closely associated with substrates rich in copper or arsenic. It grows fully insolated or more often partly to rather heavily shaded (especially at bases of N.-facing walls) on substrates that may be free-draining to rather damp (rarely permanently wet: see below). It occurs on horizontal to vertical masonry e.g. of old walls (on stone, mortar and concrete), thin soil over rocks and masonry, and sometimes more extensively on soils where these receive drainage from old mine buildings (especially those formerly used for sorting metalliferous ores or as arsenic works). Also recorded from old mine-spoil, on banks, paths and tracks on old mining ground, in an old quarry, and around an old smelting works on top of a sea cliff. Single records from low on a church wall and a path near a church might also
be associated with metalliferous substrates. Among dunes at Upton Towans it occurs widely on old tracks surfaced with mine-spoil as patches of very low plants. NW. of Reskadinnick it occurs on sparsely vegetated horizontal sand close to concrete of ruins, the sand having been brought here from estuary of Red River for recovery of copper ores. Another atypical site near lower Red River might also be associated with metalliferous residues. Here, *H. recurvirostrum* formed large low tufts in the edge of a small stream, mixed with some *Bryum pseudotriquetrum* and close to *Philonotis fontana*, *Equisetum palustre* and *Juncus effusus*. On old mine sites it commonly forms extensive pure patches. *Bryum pallescens* is sometimes a characteristic associate, growing out of the patches of *H. recurvirostrum*. Other associates recorded include *Didymodon tophaceus*.

The habitats of *H. recurvirostrum* in Cornwall contrast markedly with those elsewhere in western Britain and Ireland, where it is known mainly as a calcicole of moist limestone ledges (often in the mountains), occurring also on boulders and limestone pavement, and on hummocks and gravelly ground in calcareous flushes (T.L. Blockeel in Hill et al. 1992: 290). In western Ireland it also occurs on damp calcareous sandstone crags and on damp calcareous sand in dunes (pers. obs.).

Not known fertile in Cornwall. Capsules are rare in other parts of British Isles (Blockeel *loc. cit.*).

Near the landward edge of Upton Towans it grows as extensive low patches on pathways that were surfaced with metalliferous mine-spoil during the 1939-45 war, with only a thin layer of compressed blown-sand now covering the mine-spoil. In places it grows there with *Petalophyllum ralfsii*. Chemical analyses of its substrates show that it can tolerate high levels of Cu, Pb and Zn, and indeed simultaneous presence of all three of these metals at high concentrations. All substrates investigated were basic.

### Analyses of substrates from localities in Cornwall (metal concentrations given as μg/g dry weight):

<table>
<thead>
<tr>
<th>LOCALITY (N samples)</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
<th>pH</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upton Towans, vc1 (7)</td>
<td>251-4499</td>
<td>31-2242</td>
<td>354-15287</td>
<td>7.1-7.9</td>
<td>Rouen</td>
</tr>
</tbody>
</table>

[66.1 *Anoectangium aestivum* (Hedw.) Mitt. – Report from vc1 (Penzance, Miller, in Tellam & Glasson 1892) not supported by specimen: Paton 1969a: 726].

### 67.1 Gyroweisia tenuis* (Hedw.) Schimp.*

Temperate European element.


Possibly somewhat under-recorded before 1998 owing to confusion with *Gymnostomum viridulum* (see note under that species).

Grows as scattered plants or occasionally forming denser very low (< 5 mm) lawns, but not in compact tufts. Notes on habitats in Cornwall are as follows. A calciphile that occurs on vertical, sloping or horizontal soft masonry (old mortar, less often old bricks or old
concrete) and thin firm overlying soil. Grows on free-draining substrates, where insolated or more often partly to rather heavily shaded (e.g. by tall bushes or woodland), and usually in sheltered and often rather humid situations (e.g. on or at base of N.-facing walls, among buildings, near streams, in quarries, near a well). Commonest in crevices of old walls, including those of old mine buildings, a disused china-clay dry, old mills, a bridge and old garden, churchyard and cemetery walls. Less often found on wall tops and large ledges than Gymnostomum viridulum. Commonly occurs on otherwise bare substrates, or close to sparse low mosses that sometimes include Bryum radiculosum, Didymodon tophaceus and Gymnostomum viridulum.

Protonemal gemmae always (?) present, although sometimes sparse. A dioicous species in which some populations are apparently all-female, others apparently all-male (much less commonly according to Atlas 2). Occasionally c.fr. (four records): capsules immature 3, dehisced 2, 10.

Occasional occurrence of a form of this species with more or less narrowly tapering tips to perichaetial leaves (DTH 99-55, 01-12) may cast doubt on records of Leptobarbula berica from St Mawgan, despite re-checking of its specimens by MOH, HLKW and DTH.

68.1 Gymnostomum viridulum Brid. NS 12


G. calcareum and G. viridulum were not distinguished in Britain until the study by Whitehouse & Crundwell (1991, 1992). Older records that have not been revised subsequently are referred only to G. calcareum s. l. A few of the Cornish records may be errors for Gyroweisia tenuis owing to past confusion over characters of protonemal gemmae of that sp., which are sometimes indistinguishable from those of G. viridulum.

Forms open or dense lawns of tiny plants up to ca 4 mm tall. Notes on habitats in Cornwall are as follows. Grows mostly on old soft mortar and thin accumulated soil on tops or ledges of walls and on other masonry; also single records from walls of it growing on old bricks and on soft surface of old slates. Occurs on free-draining substrates, in unshaded and partly shaded places, although usually where somewhat sheltered and often where damp in winter. Numerous records are from ruined mine buildings, sometimes but not always close to areas with concentrations of copper and other metals. Also on retaining walls, low on church walls and on wall of a ruined water mill. Occurs infrequently in other types of site with exposed free-draining calcareous soil: at Gear Sands on thin soil of calcareous sand on slopes over old mine-spoil in dune grassland, with very short incomplete vegetation cover. Similarly, found locally in dunes at Upton Towans on thin sand overlying paths constructed from old mine-spoil. At Rock on sandy soil on unshaded ledges in old slate quarry. Single
record inland on bank of earthy mine-spoil with much decayed mortar and cement. Usually occurs on surfaces with much bare substrate exposed, and intolerant of shading by even rather small mosses. Associates on walls include Aloina aloides, Barbula convoluta, Didymodon tophaceus, Gyroweisia tenuis, Pseudocrossidium revolutum. On earthy mine-spoil or sandy dune slopes with Aloina aloides, Bryoerythrophyllum recurvirostrum, Fissidens dubius, Trichostomum brachydontium, Trichostomum crispulum.

Protonemal gemmae always present. Two records c.fr. (Lower Carnkie, vc1, DTH; det. conf. HLKW; 6 Apr 1995, numerous capsules, mostly mature but undehisced, few dehisced; Minions, vc2, DTH 99-32, 13 Feb. 1999, numerous immature capsules on small patch, all still green). These were the only records of capsules in Britain, but one record existed of them in Ireland (H.L.K. Whitehouse in Hill et al. 1992) and they have subsequently been reported from Wales.


68.3 Gymnostomum aeruginosum Sm. LS 12
Boreo-temperate Circumpolar element.


Grows as dense pure cushions that may extend for 5 cm or more, but as sparse patches of low plants when becoming established. Notes on habitats in Cornwall are as follows. A calciphile with few records, although locally quite well established and plentiful at two of its sites. Gwennap: plenty on damp vertical mortared-stone retaining wall above stream, partly to fully shaded by trees. Crenver Grove: on soil in crevices of old mortared-stone wall, part shaded (associates included Cephalozia calyculata). Crow's Nest: forming substantial cushions in crevices of old, mortared-stone retaining wall facing east on old mining ground, partly shaded by Gorse bushes.

Not seen c.fr.

70.1 Leptobarbula berica (De Not.) Schimp. NS 12
Mediterranean-Atlantic Oceanic element.

*1: Mortar of damp stone bridge over stream, St Mawgan, near Newquay, 1961, JAP (BBSUK) (Blockeel 1987: 23) [reidentification of plant previously listed as new vice-county record of Gyroweisia tenuis].
Known from two (perhaps three) locations. Grows as scattered plants, sometimes with other mosses, or forming small low turfs. Notes on habitats in Cornwall are as follows. At Porthmeor Beach, St Ives, with Didymodon tophaceus on near-vertical sand-rock part way up low sea cliff above beach (near Soleirolla soleirolii). At Okeltor Mine (near Calstock, vc2) forms extensive low lawns or deeper patches on horizontal or sloping silty soil (old mine-spoil) on tops and ledges of ruined walls of mine-buildings, unshaded to partly shaded. Although often in pure patches, its closer associates include Bryoerythrophyllum recurvirostrum, Bryum pallescens and Cephaloziella integerrima.

Gemmae seen in Cornish specimens from Porthmeor. Not seen c.fr. Unlike most British populations, the Okeltor plants are apparently male (H.L.K. Whitehouse in litt.) but no antheridia have been seen.

At St Mawgan (vc1) what may be this species grows sparsely on damp mortar in crevices of old mortared-stone bridge-wall over river, partly shaded by trees. All material seen from this locality is intermixed with Gyroweisia tenuis and the characteristic protonemal gemmae of the latter species are plentiful. Although vouchers and other specimens were reexamined and redetermined as L. berica by MOH and HLKW in 1998, DTH retains doubts whether this population consists only of G. tenuis with unusually attenuate perichaetal leaves (see account of that species). Other associates found there include Didymodon tophaceus.

72.2 Ephemerum sessile (Bruch) Müll.Hal. NS 12
(Now treated as Ephemerum crassinervium subsp. sessile (Bruch) Holyoak: see Holyoak 2010b). Southern-temperate European element.


Habitat notes from Cornwall are as follows. E. of Nantithet: partly bare soil on damp old track, slightly shaded (near Ephemerum minutissimum, Tortula truncata, Fossombronia pusilla, Dicranella staphylena). S. of Millook: mainly bare, compressed soil in middle of track beside field, almost unshaded. Lizard pen.: on moist, partly bare soil at edges of old tracks over serpentinite, unshaded or lightly shaded (near Bryum dichotomum, Riccia subbifurca). Maenporth: single small patch on unshaded compressed soil of path above sea-cliff, with Dicranella varia. Peninnis Head, St Mary’s: patch on unshaded, thin, damp soil of slope above granitic sea-cliff on exposed headland. Upper Tamar Lake: on unshaded firm clayey substrates exposed high in inundation zone beside reservoir, forming small to rather large patches in areas with sparse vegetation, in open or slightly shaded by Grey Willow bushes (sometimes with Ephemerum serratum and Pseudephemerum nitidum). Partly bare damp trampled soil close to edge of fishing lake, part-shaded by Grey Willows (with Ephemerum serratum s. l.).

Commonly c.fr.: capsules immature 4, 7, 11, nearly mature 4, 9, 11.
Ephemerum serratum (Hedw.) Hampe (syn. E. serratum var. serratum). Temperate European element.

*2: Roche, 1888, RVT (BM) (Paton 1969a: 731). This is much earlier than record published as new for vc2 by Warburg (1965b: 865).


While identification of the species is straightforward, many old records of the varieties of E. serratum are in doubt because their identification was often based on leaf characters (as given by Dixon 1954: 293-294 and Smith 1978: 350), which appear to be unreliable (cf. Crundwell in Hill et al. 1994: 40, Holyoak 2010b). The characters of ripe spores (more coarsely papillose in E. serratum var. serratum, which also lacks the persistent 'veil' commonly present in var. minutissimum) appear to be consistent in allowing two taxa to be separated (Holyoak 2010b).

Virginia S. Bryan (1999 and in litt.) regarded var. minutissimum as based merely on var. serratum with immature spores, but this seems to be untrue of British material, although immature specimens of the latter might be confused with the former. No intermediates have been seen in Cornwall, so that Risse (1996, see also his Errata 1997) is apparently correct in regarding them as distinct species. Unlike the commoner var. minutissimum, var. serratum has not been found in arable fields in Cornwall. Both vars. have been found growing close to each other on exposed sediments at Stithians Reservoir, but they have not been recorded actually growing together in Cornwall.

E. serratum grows as scattered plants or forms sparse low patches, the tiny gametophores growing from a thin layer of persistent protonemata. Habitat notes from Cornwall are as follows. The largest populations (with patches up to 50 cm or more across) are recorded from firm surfaces of soil and sediments exposed high in the inundation zones at edges of several reservoirs and in an old flooded china-clay pit. At these sites it occurs on silty, clayey, loamy or peaty substrates that are mildly acidic to circumneutral and which tend to remain damp but not wet, both in open places and partly shaded by Grey Willows. These populations probably reappear from persistent spore banks in each year when summer water levels fall sufficiently low. Other records are of scattered small patches on unshaded mainly bare soil of disturbed ground beside paths just above sea-cliffs (of serpentinite and slate), on a damp cattle-poached track, beside paths and tracks at wood edges, on damp clay of path among Calluna vulgaris in old china-clay 'dry' and on wet soil of a hummock in an unshaded acidic flush. Often in pure patches; associated species recorded are Archidium alternifolium, Bryum dichotomum, Dicranella rufescens, Dicranella staphylina, Trichodon cylindricus, Entosthodon obtusus, Kindbergia praelonga, Fossombronia wondraczekii, Gymnocolea inflata, Pohlia camptotrichela, Pseudephemerum nitidum, Riccia glauca, Riccia sorocarpa, Riccia subbifurca, Tortula truncata; single records also with Ephemerum sessile, Leptobryum pyriforme.

Mature spores are needed for identification, but capsules apparently develop on almost all female gametophores. Capsules immature 7-12; dehiscing 7, 9-12.
72.7 Ephemerum minutissimum Lindb. (syn. Ephemerum serratum var. minutissimum (Lindb.) Grout). Temperate European element.


See the notes under E. serratum above and Holyoak (2010b). Somewhat under-recorded because Ephemerum in arable fields often lacked mature spores so were placed only as Ephemerum serratum s.l.

Grows as small patches of protonemata a few centimetres across, from which the very small and scattered or more or less clustered gametophores arise. Notes on habitats in C&S are as follows. E. minutissimum is commoner in Cornwall than E. serratum, and unlike that species it occurs widely on arable land. It colonises bare soil surfaces (of clayey, silty or loamy texture, including compressed soil on path edges; of mildly acidic to circumneutral reaction; often where damp, in mainly unshaded places, sometimes where partly shaded e.g. by grasses or Grey Willows). It is common in arable fields (cereal, stubble, flax stubble, bulbfield, fallow) and frequent on exposed patches of soil in pastures, grassy edges of Juncus marshes and grass leys, with records also from soil heaps, disturbed soil on old metalliferous mine areas, edges of paths and damp tracks (including those on and above sea-cliffs and in old metalliferous mine areas), a churchyard and a bank in a cemetery. There is a single record from fine-grained sediment exposed in the inundation zone beside Stithians Reservoir, a habitat type more typical of E. serratum, which was present nearby. E. minutissimum tends to grow in small pure patches on otherwise bare surfaces. Associated species recorded in close proximity include Anthoceros punctatus, Atrichum undulatum, Barbula convoluta, Bryum dichotomum, Bryum rubens, Bryum violaceum, Dicranella schreberiana, Dicranella staphylina, Trichodon cylindricus, Fossombronia pusilla, Phaeoceros laevis, Pleuridium acuminatum, Pseudephemerum nitidum, Riccia glauca, Riccia subbifurca, Phascum cuspidatum, Tortula truncata; more rarely Acaulon mediterraneum, Anthoceros agrestis, Ephemerum sessile, Fossombronia wondraczekii, Solenostoma gracillimum, Pleuridium subulatum. Commonly also near grasses and low herbs.

Mature spores are needed for identification, but capsules apparently develop on almost all female gametophores. Capsules immature 1-3, 9-12; ripe 2-4 [5], 8-12.

74.1 Dialytrichia mucronata (Brid.) Broth. LS 12 (syn. Cinclidotus mucronatus (Brid.) Guim.). Mediterranean-Atlantic Oceanic element.

*1: Very large patch, outside a cottage at the start of the coastal path off the road from Coverack, SW7815/1805, 11 Feb. 2006, NDS, det. MP, conf. DTH (BBSUK) (Rothero 2007: 37).
One record was from a 'typical' site in inundation zone of river (near Crossgate: large patch on vertical silty masonry of N. side of bridge over R. Tamar, ca 2.5 m above summer water-level, but in flood-zone. Five records were from masonry or tarmac, including places where water tends to pond, as follows. Talland: with other mosses on damp horizontal pathway to church, near a small stream. S. of Pantersbridge: plentiful in mainly pure lawns on old crumbled tarmac in middle of lane part-shaded by deciduous trees (near Calliergonella cuspidata). St Austell: tufts on damp edge of tarmac of road inside college grounds, unshaded. Hessenford: old tarmac near church. Titson: plentiful in low moss carpet on pavement shaded by N. wall of graveyard, with Bryum dichotomum, Didymodon insulanus, Didymodon nicolsonii.

Not recorded c.fr.

75.1  *Pseudocrossidium hornschuchianum* (Schultz) R.H.Zander S12


Grows as low lawns, patches, or scattered among other low mosses. Notes on habitats in C&S are as follows. Mainly a colonist of bare or partly bare, slightly acidic, circumneutral or basic mineral soils, often those that are compacted and sandy, gritty or gravelly. Typically occurs on substrates that are not disturbed regularly, so not usually found in arable fields (one record from sandy field left fallow, one from edge of cereal stubble, one from a bulb field). Its usual habitats are on paths, tracks and their edges, soil heaps, a disused railway, gravel car parks, lay-bys, quarries, very short grassland or pathways on calcareous dunes, banks of china-clay spoil, old copper-mine spoil (and on fine-grained 'lithosols' of unshaded mine-spoil areas) and soil on 'hedges'. Also thin soil over mortar or stone on top of old walls and over old concrete or in its crevices; several records of it growing directly on old mortar of wall-tops, twice in crevices of old tarmac, once at head of shingle beach. Typically grows on free-draining substrates and avoids those that are permanently wet. Sometimes on slopes above sea-cliffs (found at least three times on sea-cliffs or cliff tops and subject to salt spray). Usually grows where unshaded, less often lightly shaded. Frequent associates include Barbula convoluta, Barbula unguiculata, Bryum dichotomum, Ceratodon purpureus, Didymodon fallax, Didymodon insulanus, Didymodon tophaceus, Phascum cuspidatum var. cuspidatum; less often Aloina aloides, Didymodon umbrosus, Lophozia ventricosa, Microbryum davallianum.

Rarely c.fr. [two records, Holywell in vc1, Goss Moor in vc2]: capsules immature 5, 11.

75.2  *Pseudocrossidium revolutum* (Brid.) R.H.Zander S12

*2: St Lawrence, Bodmin, 1882, RVT (B) (Paton 1969a: 724).

Grows as short lawns, dense low cushions or dense patches. Notes on habitats in C&S are as follows. A low-growing calcicole of firm free-draining substrates. Most records are from mortar (often on soft or crumbling mortar, but sometimes growing directly on rather hard
mortar), old concrete, or thin soil on top or in crevices of old or ruined walls (of cottages, farm houses, mine buildings, old china-clay dry), also on surfaces of soft basic rock used in walls or buildings, sometimes on fallen masonry, masonry debris or isolated blocks of stone. Once on firm soil atop ridges of china-clay spoil near masonry debris in old quarry. It usually grows in fully insolated sites or only slightly shaded, but less often where partly shaded e.g. by herbs or walls, occasionally persisting as sites become more heavily shaded by scrub. Grows both inland and near coasts, occasionally in exposed cliff-top sites receiving much salt spray. Unusual record of substantial patches on firm soil on top of sheltered low heaps of china-clay spoil. Often in pure patches; frequent associates include *Aloina aloides*, *Barbula convoluta*, *Barbula unguiculata*, *Bryoerythrophyllum recurviostrum*, *Bryum radicusulum*, *Didymodon insulanus*, *Didymodon rigidulus*, *Didymodon tophaceus*, *Encalypta streptocarpa*, *Gymnostomum viridulum*, *Tortula muralis*.

Rarely c.fr. [five records, but one of these was of abundant capsules]: capsules immature 3, 4, 6, 7; dehiscing 7; dehisced [old 4], 7.

76.1 *Bryoerythrophyllum recurviostrum* (Hedw.) P.C.Chen (syn. *Barbula recurviostra* (Hedw.) Dixon). Boreo-temperate Circumpolar element.

*2*: Looe, 1886, RVT (B) (Paton 1969a: 725).

Forms low lawns or smaller patches or tufts. Notes on habitats from C&S are as follows. A calciphile that grows on old masonry (mortar, concrete, asbestos-cement roofing material), on thin soil layers over masonry, and on calcareous sand, less often on other basic soils or on rock. It grows on free-draining horizontal, sloping or vertical surfaces. Most often it is fully insolated, sometimes even growing on exposed cliff tops, but it is also common in sheltered locations and it sometimes tolerates considerable shade (e.g. in old Grey Willow scrub, among ruined buildings, in road cutting and beneath a railway viaduct). Recorded from tops and sides of walls, building rubble, masonry fragments lying on ground and on graves. Also locally frequent with other low mosses in partly bare patches and areas with very short vegetation on fixed dunes and in short dune-grassland, and recorded in similar habitats on sandy soil of coastal hillsides and on a cliff top. Fewer records also from amongst stony mine-spoil, a soil heap, soil of paths and tracks, ledge of granitic rock in disused quarry, vertical slaty rock of road cutting and on thin soil over slate/shale rock of quarried cliff beside estuary. Three records from silted bases of trees in flood-zone of R. Tamar, one of large patch of very well-grown plants. Frequent associates include *Barbula convoluta*, *Didymodon insulanus*. Others recorded include *Bryum sauteri*.

Commonly c.fr.: capsules immature 1-3, 6, 9-12; dehiscing 1-3, 10-12; dehisced 1-8, 10-12.

76.2 *Bryoerythrophyllum ferruginascens* (Stirt.) Giacom. (syn. *Barbula ferruginascens* Stirt.). Boreal-montane Eurosiberian element.

*2*: On open gritty soil near disused granite quarry, 220 m alt., Hantergantick Quarry, SX17, 2001, DTH 01-1060 (BBSUK) (Rothero 2002: 46).

Six records in Cornwall, but easily overlooked so perhaps under-recorded. Grows mixed with other mosses or forms small low patches (low lawns). Hantergantick Quarry, 2001:
small patches and scattered stems with other low mosses, on unshaded disturbed gritty soil near disused quarry. N. of St Ann's Chapel, 2004: numerous patches in two areas, on thin compressed soil on unshaded stony ground with sparse low vegetation, ca 250 m alt., on tracks near old mine and area surfaced with mine-spoil on heathland nearby; associates recorded were Cephaloziella integerrima, Ceratodon purpureus, others close by included Barbula convoluta, Bryum dichotomum, Bryoerythrophyllum recurvirostrum, Scapania compacta. Crow's Nest: unshaded stony soil at track edges in two places at old copper-mine site, with sparse low vegetation, associates including Bryum capillare, Calliergonella cuspidata, Ceratodon purpureus, Cratoneuron filicinum, Hypnum sp., Cladonia sp.; also, with other mosses on thin soil amongst old masonry at top of mine-shaft, lightly shaded. Craddock Moor Mine: on unshaded partly bare soil exposed on slope near ruined mine chimney.

Rhizoidal tubers present on plants from all six localities. Not seen c.fr.

77.1 Leptodontium flexifolium (Dicks.) Hampe
Temperate Oceanic element.


At Rough Tor it grew as a small lawn-like patch on thin soil on ledge of granitic rock of tor.

The Rough Tor specimen (DTH 93-170) has large axillary bulbils with leaf primordia, grading into deciduous branchlets. These are much larger than the mainly uniseriate protonemal gemmae described by Newton & Boyce (1987).

Not seen c.fr.

77.2 Leptodontium gemmascens (Mitt.) Braithw.
Temperate Oceanic element.

*1: Unshaded damp thatch low on roof of inn, ca 10 m alt., SW. end of Shipwright's Arms, Helford, SW7583/2621, 4 Sep. 2006, DTH 06-237 (BBSUK, DTH) (Rothero 2007: 37).

Grows as scattered plants or forms very small patches. Single record in Cornwall (Helford village), on unshaded, damp, rather old thatch low on roof of inn, ca 10 m alt. Growing alone, or among patchy Bryum capillare, Hypnum cupressiforme var. resupinatum and Cladonia sp.

Foliar gemmae present. Not seen c.fr.

78.1. Barbula convoluta Hedw. s. l.

Although Smith (1978) treated var. commutata as a valid taxon, British bryologists have tended to regard it as merely 'a luxuriant form of the species which is found in sheltered, nutrient-rich sites' (T.L. Blockeel in Hill et al. 1992: 262). Hence it has often not been recorded separately and such records are treated here as B. convoluta s. l.. Nevertheless, Frahm & Ahmed (2004) suggested it has several distinctive characters and deserves species
rank, but occurrence of numerous apparent intermediates must cast doubt on this and Hill et al. (2008) returned it to varietal rank (as var. *sardoa*).

Grows as scattered stems, short turfs, often forming lawns, cushions or patches (tending to form rounded cushions especially on walls). Habitat notes on *B. convoluta s. l.* from C&S are as follows. On slightly acidic or more often basic or neutral mineral soils (e.g. in arable fields: barley, stubble, flax, daffodils, grass leys; gardens; bare patches in grassland; short dune grassland; on disturbed ground, soil on top of 'hedge', soil heaps, banks, on old mine-spoil, in plant pots), also on thin or compressed soil on paths, tracks, roadsides, edge of gravel car parks, among marble chippings on graves, in quarries, on old masonry or in crevices of walls. Also directly on old concrete, mortar of walls, and old asbestos-cement roofing material. Withstands desiccation well on free-draining substrates and absent from permanently wet sites. Tolerates sites close to cliff tops and subject to salt-spray. Mainly in unshaded places, sometimes lightly or moderately shaded and occasionally in heavy shade from trees or walls. Single atypical records of it on moist old carpet dumped on mine spoil (Tuckingmill), and on soil in crevice in metal of old farm roller. Associates recorded include *Amblystegium serpens* var. *salinum*, *Anthoceros punctatus*, *Barbula unguiculata*, *Bryum cf. algovicum*, *Bryum dichotomum*, *Bryum klinggraeffii*, *Bryum rubens*, *Ceratodon purpureus*, *Dicranella schreberiana*, *Dicranella staphylina*, *Didymodon acutus*, *Didymodon insulanus*, *Didymodon tophaceus*, *Ditrichum gracile*, *Trichodon cylindricus*, *Fossombronia pusilla*, *Microbryum davallianum*, *Phaeoceros laevis*, *Pleurochaete squarrosa*, *Pseudocrossidium hornschuchianum*, *Riccia glauca*, *Riccia sorocarpa*, *Riccia subbifurca*, *Phascum cuspidatum* var. *cuspidatum*, *Tortula truncata*, *Trichostomum crispulum*, *Aphanes* sp., *Cerastium glomeratum*, *Festuca rubra*, *Lamium pupureum*, *Plantago coronopus*, *Stellaria media*, *Veronica persica*.

Occasionally/frequently c.fr.: capsules immature 1-6, 9, 11, 12; dehiscing 6-8 [9]; dehisced [1 old], 6, 9-12.

78.1.a **Barbula convoluta** Hedw. var. *convoluta* S12

Wide-temperate Circumpolar element.


Majority of records of the species refer to this var., especially from open soil substrates. Grows in soil heaps, gardens, arable fields and their edges (cereal stubbles, maize stubble, brassicas) and disturbed sandy soil at road edge. Associates recorded: *Barbula unguiculata*, *Bryum violaceum*, *Dicranella staphylina*, *Pohlia melanodon*, *Tortula truncata*, rarely *Didymodon tophaceus*.


As noted above, treated as *B. convoluta var. commutata* in the older literature (e.g. Smith 1978: 151), then as merely a luxuriant form or synonym of *B. convoluta* in recent decades (e.g. T.L. Blockeel in Hill *et al.* 1992: 262, Blockeel & Long 1998: 90), until Frahm & Ahmed (2004) revived it as a distinct species (which should be known at species rank as *B. commutata* not *B. sardoa*; see Frahm 2004). Intermediate plants appear to be common in Cornwall and elsewhere in the British Isles, so that varietal status seems more appropriate and for this reason it is treated as a variety here following Hill *et al.* (2006, 2008).

Plants showing characters of var. *sardoa* (larger size, leaves with undulate margins) are common in Cornwall, often growing in damp, nutrient-rich sites on soils, e.g. in gardens, on soil heaps, or at path sides. They apparently also occur more often than var. *convoluta* as dense and sometimes rather deep cushions on old mortar of walls or on concrete, evidently persisting as a short-lived perennial rather than occurring as an ephemeral or annual colonist like the smaller forms of var. *convoluta* that are typical on partly bare soil substrates. Also recorded from an old mine site.


78.2 *Barbula unguiculata* Hedw.

Wide-temperate Circumpolar element.


*2*: Wadebridge, 1876, RVT (B) (Paton 1969a: 724).

Care is needed to avoid confusion of non-fertile plants with forms of *Trichostomum brachydontium*, especially in coastal localities where that species is often very common.

Grows as scattered stems, lawns or patches. Notes on habitats in C&S are as follows. Common as a colonist of bare mineral soil (of loamy, silty or sandy texture) that is neutral or basic. Its habitats include arable land (cereals and their stubble, grass leys, gardens, soil in plant pots), bare patches in pastures and other grassland, short dune grassland, banks, disturbed ground, soil heaps, on graves, in quarries, old mine-spoil, on 'hedges', above sea-cliffs; also compressed soil e.g. on paths, old tracks, roadsides, in field gateways, gravelly lay-bys, edge of gravel car parks, head of shingle beach. Frequently on thin soil over calcareous masonry or in its crevices, and growing directly on crumbling mortar, old concrete or soft basic rocks. A few records from crevices in old tarmac and thin soil over tarmac. Tolerates sites close to cliff tops and subject to salt spray. Typically in free-draining sites where it withstands drought, or on moderately water-retentive soils, but not common on permanently wet substrates (seen once on dried mud at edge of pool). Grows mainly in unshaded or lightly shaded places, but tolerates moderate or occasionally rather heavy shade. Associates often include *Barbula convoluta*, *Bryum dichotomum*, *Bryum rubens*, *Dicranelia schreberiana*, *Dicranelia staphylina*, *Dicranelia varia*, *Didymodon insulanus*, *Pohlia melanodon*, *Pseudocrossidium hornschuchianum*, *Phascum cuspidatum*, *Tortula muralis*, *Tortula truncata*; others recorded less often include *Bryum apiculatum*, *Bryum klinggraeffii*, *Bryum violaceum*, *Didymodon tomaulosus*, *Microbryum rectum*, *Pseudocrossidium revolutum*. 
Frequently c.fr.: capsules immature 1-5, 7, 10-12; dehiscing 1-4, [12]; dehisced 1-5, 7, 11, 12.

79.1 *Didymodon acutus* (Brid.) K.Saito
(syn. *Barbula acuta* (Brid.) Brid.). Southern-temperate Circumpolar element.

**2**: On blown sand amongst rocks on hillside, 45 m alt., SW. slope of Brea Hill, SW97, DTH 02-001 *(BBSUK)* (Rothero 2003: 51).

Grows as low lawns, smaller patches or intermixed with other low mosses. Notes on habitats in Cornwall are as follows. Most records are from short dune grassland developed over calcareous sand, on flat ground or slopes among stable dunes, beside paths, at edges of dune-slacks, or in turf developed on blown sand on cliff tops or coastal slopes. It is often locally common in these habitats in vc1 and appears to have previously been much overlooked because of its rather nondescript appearance. These sites are fully insolated and have free-draining substrates that are dry for long periods. A few records from atypical sites near coasts on thin sandy soil accumulations over hard substrates: once over old horizontal, mortarred brickwork at edge of dunes and two records from thin sandy layers over old copper mine-spoil. Other atypical records include tall dense patches growing with other mosses on thin soil over old unshaded concrete of disused railway platform inland (SE. of Connor Downs), small amounts in crevices of old tarmac of road through fixed dunes (Penhale Camp), and small amount in very low vegetation in open sandy patch near low serpentine outcrop in short coastal heath (Kynance). Associates include *Amblystegium serpens* var. *salinum*, *Barbula convoluta*, *Bryum cf. algovicum*, *Didymodon fallax*, *Didymodon insulanus*, *Didymodon tophaceus*, *Didymodon vinealis*, *Ditrichum gracile*, *Pleurochaete squarrosa*, *Pseudocrossidium hornschuchianum*, *Trichostomum crispulum*, *Aphanes sp.*, *Cerastium sp.*, *Plantago coronopus*.


79.3 *Didymodon rigidulus* Hedw.
(syn. *Barbula rigidula* (Hedw.) Mitt.). Boreo-temperate Circumpolar element.

**1**: Perranporth, 1925, FR *(BM)* (Paton 1969a: 724-725).

Usually grows in small patches or cushions, forming low lawns where plentiful, or growing intermixed with other low mosses where sparse. Notes on habitats in C&S are as follows. Commonest on hard surfaces of calcareous masonry, especially mortar and concrete (also on basic stone surfaces and asbestos cement). It occurs on walls, old buildings, ruins, bridges, grave-stones and grave surrounds, path surfaces and even concrete fence-posts and small bits of concrete on soil heaps. Usually in free-draining places that dry out regularly and for long periods, mainly avoiding permanently wet or heavily flushed situations. Most often in open, sometimes in moderate shade, occasionally in rather heavy shade from trees or walls (T.L. Blockeel in Hill et al. 1992: 274 noted that 'it is not tolerant of intense insolation and is usually found where there is some shelter or shade', but in Cornwall it often occurs in exposed sites that are fully insolated). Unusual records: on granitic boulder; on granite gatepost; thin soil in crevices of tarmac of path in cemetery (Illogan); plentiful on moist old
carpet dumped on mine-spoil (Tuckingmill); patch on hard wood of horizontal, decorticated tree trunk lying in open. Associates commonly include *Bryum radiculosum*, *Grimmia pulvinata*, *Schistidium apocarpum*, *Schistidium crassipilum*, *Tortula muralis*, *Zygodon viridissimus* var. *viridissimus*, less often *Didymodon luridus*, *Orthotrichum anomalum*, *Orthotrichum diaphanum*.

Commonly with foliar gemmae. Rather frequently c.fr. (although capsules sometimes occur in small quantity or are eaten off before maturity): capsules immature 1, 2, 6, 7, [8], 10-12; dehiscing 2, 3; dehisced 2, 3, 5, 6, [9], 10, 11.

79.4 *Didymodon nicholsonii* Culm. (syn. *Barbula nicholsonii* Culm.). Temperate Suboceanic element.


This common moss appears to have been previously overlooked in Cornwall, probably because it is rather nondescript, non-fertile, often small when in trampled places, and it mainly grows in rather mundane or unpromising habitats. However, it may also have spread or increased in recent decades.

Grows as low lawns, sometimes covering several square metres, or in smaller amounts as patches or intermixed with other low mosses. Notes on habitats in Cornwall are as follows. Mostly on firm horizontal surfaces where shallow water tends to stand or flow during or after rain and the substrate is neutral to basic. Frequently on concrete or rather old tarmac on track or road edges (or middles), pavements, and paths (e.g. in churchyards), unsheltered and unshaded or more often sheltered and lightly or partly shaded. Fewer records from low walls, low masonry near churches, bridge abutments, concrete paths by a river, on disused railway station platform, edges of old runways on disused airfield, and in crevice of granite footbridge. Also occurs on compressed soil of old tracks, path edges, lay-bys, gravel car parks, among damp soil/masonry heaps (e.g. on old mining ground), as colonist on soil heaps and other disturbed soil (occasionally in plenty) and once on open soil on coastal headland. Once found on concrete of weir beside stream (in its flood-zone), once on silted base of tree in flood-zone beside R. Tamar, once on damp clay bank near Bude Canal, once on old rotting timber on disused railway track. Once in quantity on vertical surfaces of mortared-stone wall shaded at north side of church, but adjacent to larger populations on horizontal concrete. Common associates are *Bryum argenteum*, *Bryum dichotomum*, *Bryum capillare*, *Ceratodon purpureus*, *Didymodon insulanus*; others recorded are *Cirriphyllum piliferum*, *Dialytrichia mucronata*, *Dichodontium pellucidum* s. l., *Dicranella varia*, *Didymodon luridus*, *Hypnum cupressiforme* var. *resupinatum*, *Hygrohypnum luridum*, *Scleropodium cespitans*, *Syntrichia papillosa*, *Tortula muralis*, *Trichostomum brachydontium*.

No vegetative propagules seen. Not seen c.fr.
79.6 Didymodon umbrosus (Müll.Hal.) R.H.Zander NS S1


Rhizoidal tubers occur abundantly on the Wheal Busy specimen. Not seen c.fr.

Other specimens from W. Cornwall and Isles of Scilly are difficult to identify and are regarded as most likely D. australasiae (Hook. & Grev.) R.H.Zander (J. Kučera, pers. comm.) since they lack tubers, have the leaf margin unistratose or with a few bistratose patches and the lamina cells are papillose, but the identification was also based partly on DNA sequence data from one of the Cornish specimens. D. australasiae is not formally accepted as a British species, but like Kučera (pers. comm.), Jiménez (2004) and Jiménez et al. (2005) treat D. australasiae and D. umbrosus as distinct species.

This vcl material lacks tubers, but it differs from D. vinealis in hyaline basal cells of the leaf and the often slightly hooded leaf apex. The straight leaves and usually deep green (to almost blackish) colour attract attention. It grows as small patches, usually among other low mosses, or extends to form low lawns.

There are several recent records from Isles of Scilly (some originally presumed to be D. umbrosus not D. australasiae): on soil of unshaded to part shaded tracks among bulbfields on St Agnes (discovered by RAF, 2002); 'D. umbrosus' was also found on St Mary's (2002, DTH) at Porthcressa (on compressed soil of partly bare patches of unshaded lawn on coast) and at Harry's Walls (abundantly on gravel in open and part shaded, sometimes with other low mosses).

Specimens from the mainland of W. Cornwall, are from unshaded sandy ground near the coast in and around the Towans, e.g.: At Gwithian forming substantial low patches on unshaded open sandy ground with patchy short vegetation by path near cliff top. Near Hayle on old track near edge of dunes. Truthwall on track inland. At Lelant on disturbed sandy ground and over concrete of floor of ruin. Near Hayle Harbour on open sandy ground with other low mosses. Also near Porthwarra on thin soil in small hollows of unshaded track edge close to concrete. Associates in these mainland sites include Barbula convoluta, Barbula unguiculata, Brachythecium mildeanum (sparse), Bryum dichotomum, Didymodon fallax, Didymodon insulanus, Pseudocrossidium hornschuchianum. A small patch at Porthallow grew with other low mosses just above head of shingle beach (with Barbula convoluta var. sardoa, Barbula unguiculata, Bryum dichotomum, Funaria hygrometrica).

79.7 Didymodon vinealis (Brid.) R.H.Zander S12
(syn. Barbula vinealis Brid.). Southern-temperate European element.

*1: St Mary's, 1908, GBS (RAMM) (Paton 1969a: 725).
Grows as low lawns or smaller patches. Notes on habitats in C&S are as follows. Occurs mainly on sandy and other soils in Cornwall, contrary to statement in the Flora that it is 'never on soil' (Smith 1978: 265) and the Atlas which noted that 'Although it is widespread on well-illuminated rock-outcrops, such as limestone, in most districts it is more frequent on walls' (T.L. Blockeel in Hill et al. 1992: 280), although the latter account adds that it is 'also frequent on hard or stony calcareous ground and in short dry turf'. Commonest in Cornwall in areas of very short vegetation on calcareous sand in dune grassland, where it may be locally abundant as reported by Paton (1969: 725). Also occurs in similar habitats where blown-sand rests on coastal hillslopes, cliffs and cliff tops. Scattered and less common on free-draining basic soil in a variety of other situations with very short or sparse vegetation, including compressed soil of pathways, thin soil on walls and over old concrete and tarmac and in small earth-filled crevices in calcareous masonry. Such records are from coastal and inland sites, including edges of paths and tracks, cemeteries, churchyards (on paths and graves), plant nurseries, an unsurfaced car park, gravel at disused railway station and an old quarry. Also occurs on dry stony calcareous soil of open areas of old mine-spoil near coasts and inland, especially a few years after disturbance or at edges of old paths and trackways. There are five records from tops of old and ruined walls, mainly on crumbling mortar and a single record from old tarmac of a track. Grows mainly in fully insulated sites, but persists locally in partly shaded places as rank grass, herbs or bushes begin to colonise its habitats. Frequent associates include Barbula convoluta, Didymodon acutus, Didymodon fallax, Didymodon insulanus, Trichostomum brachydontium; others recorded include Cephaloziella stellulifera, Lophozia excisa.

Unrecorded c.fr. in Cornwall and rarely fertile elsewhere in Britain.

An atypical form from thin soil on wall tops of mine building ruins in Crow's Nest/Minions area may merit further study: plain green, with very narrowly attenuate leaf apex.

79.8 Didymodon insulanus (De Not.) M.O.Hill S12
(syn. Barbula cylindrica (Taylor) Schimp.). Southern-temperate Eurasian element.

*1: St Mary's, 1908, GBS (RAMM) (Paton 1969a: 725).
*2: Helland Bridge, N. of Bodmin, 1891, RVT (B) (Paton 1969a: 725).

Grows as low lawns or in smaller patches or tufts. Notes on habitats in C&S are as follows. Commonest on slightly acidic to basic soil, including thin soil over masonry and in crevices; also on (mainly soft) calcareous masonry, including concrete and damp vertical wall mortar. Occupies sites that vary from rather damp to free-draining, including dry duneland habitats alongside the scarcer D. vinealis and much damper frequently inundated places with D. nicholsonii. Although it most often grows fully insulated, it is also common in moderately shaded places, including woodland banks and edges where it is more tolerant of shade than most of our common Pottiaceae. Often forms extensive patches on disturbed ground such as soil heaps, in gardens and beside paths (frequent in small amounts in arable fields, although not usually growing to maturity there). Widespread on woodland, laneside, ditch or stream banks, 'hedges', old tracks, track edges, lay-bys and banks on old mining ground, in old quarries, on graves or on walls; sometimes above sea-cliffs and locally on calcareous sand in dune-grassland. Although less common growing directly on firm masonry substrates than on soil it sometimes forms substantial tufts on old partly shaded walls and even on vertical
surfaces of hard old concrete. D. insulanus occurs as a colonist of soil and clay near working china-clay pits, especially where masonry has been dumped, but it is also locally abundant on open, disturbed lithosol substrates there. Locally common also in open sites on old metalliferous mine spoil. Occurs frequently on silted bases of trees in flood-zone beside R. Tamar. An unusual record of it well established with other mosses on decaying carpet lying on mine-spoil (Tuckingmill). Also single record of patch on vertical surface of old damp timber beside track in open woodland. Associates commonly include Barbula convoluta, Barbula unguiculata, Bryum dichotomum, Ceratodon purpureus, Kindbergia praelonga, Fissidens viridulus, Pseudocrossidium hornschuchianum, more locally Anthoceros punctatus, Didymodon nicholsonii, Didymodon vinealis, Lophozia ventricosa, Phaeoceros laevis and many other small mosses and phanerogams. Associates on shaded banks often include Kindbergia praelonga, Fissidens bryooides var. bryooides and Fissidens taxifolius var. taxifolius. On bases of trees in flood zone of R. Tamar it grows with Leskea polycarpa.

Rhizoidal tubers recorded on material from a barley stubble field, Feb. 2006 (CDP). Rarely c.fr.: capsules immature 4, 7, 10, dehiscing 4, 7, dehisced 4, 7, 9, 10.

Rather variable, the smallest (and immature) forms often being difficult to separate from D. vinealis. Several populations have been seen with leaves squarrose to recurved (DTH 96-74, 96-496).

79.9 Didymodon luridus Hornsch. S12
(syn. Barbula trifaria auct. non (Hedw.) Mitt.). Mediterranean-Atlantic Suboceanic element.


Grows as low lawns or smaller patches, sometimes as low tufts of tightly packed stems. Notes on habitats in C&S are as follows. Occurs mainly on calcareous masonry or thin soil overlying it, on vertical and sloping to horizontal surfaces and in shallow crevices, of (mainly old) concrete, mortar and brick, on walls (especially old walls), bridges, masonry near streams, lakes and Bude Canal, graves, discarded concrete blocks and concrete fragments lying on ground and among stony rubble on a track. Despite the Flora’s statement that it does not grow on soil (Smith 1978: 263, cf. T.L. Blockeel in Hill et al. 1992: 276), recorded in small amounts on soil at least 14 times in Cornwall, on hard often stony soil e.g. on tops of walls, on slope of ‘hedge’, among mine-spoil, in old quarry, at compressed edge of gravel car park, but also on soil heaps, on sandy soil close to edge of tarmac of road, on compacted sandy soil of footpath in fixed dunes and on other disturbed ground. Three records from old tarmac at edges of tracks and minor roads; one from slaty rock above old railway cutting; one from granitic boulder on china-clay spoil. Usually grows on free-draining substrates, although often in humid sheltered places. Most often fully insolated or at most part shaded, but a few records in heavier shade; found once at edge of grove of trees and once inside deciduous woodland. Sometimes occurs in fully open situations close to coasts. Associates recorded include Aloina aloides, Barbula convoluta, Didymodon fallax, Didymodon insulanus, Didymodon nicholsonii, Didymodon rigidulus, Grimmia trichophylla
s. l., *Pseudocrossidium hornschuchianum*, *Schistidium crassipilum*, *Syntrichia montana*, *Tortula muralis*, *Trichostomum brachydontium*, *Trichostomum crispulum*.

Rarely c.f.r. in Britain, the capsules maturing in spring (T.L. Blockeel in Hill *et al.* 1992: 276); five records c.f.r. in Cornwall: capsules immature 1-3, 10, dehiscing 3, dehisced 3.

79.11 *Didymodon sinuosus* (Mitt.) Delogne 12


Uncommon. Forms patches or low lawns. Notes on habitats in Cornwall are as follows. Grows on basic masonry or rocks, with substrates recorded as mortared stone walls (1), old mortar (3), old concrete (7), slaty rock (2), serpentinite in wall (1) and hard stone (1), on horizontal to vertical surfaces. Mainly found on old walls, including roadside walls, a church wall, walls near rivers and streams, walls of a disused leat, Bude Canal and a bridge, also on horizontal masonry near bases of walls (including those of a chapel), beside drainage channels and on damp steps in a churchyard. Mainly in humid, sheltered locations, two sites being within flood-zones of a stream and a river, another near a lake, the sites varying from almost unshaded to moderately shaded by trees or inside deciduous woodland.

A few foliar gemmae seen on specimen from near Trago Mills. Not seen c.f.r.

79.12 *Didymodon tophaceus* (Brid.) Lisa S12
(syn. *Barbula tophacea* (Brid.) Mitt.). Southern-temperate European element.


*2*: Rock near St Minver, before 1907, RVT (*B*) (Paton 1969a: 725).

Variable in growth form: commonest as scattered stems less than 1 cm tall or growing into low lawns, but may form denser patches or tufts, rarely (low on wet N.-facing sea-cliff at Porthmeor Cove) forming dense swollen tufts several centimetres high.

Notes on habitats in C&S are as follows. Restricted to calcareous substrates and commonest in damp places, but otherwise occurs on wide range of clay, silty or sandy to loamy soils, mainly soft rocks (such as coastal head deposits and shales, also serpentinite and, rarely, old tarmac) and soft masonry (old mortar, crumbling concrete), on overhanging, vertical, sloping or horizontal surfaces, or in crevices. Often common in range of sites including coastal banks, bases of sea-cliffs and creek-side cliffs, flushes on and above sea-cliffs, in old quarries, sand pits, on masonry of bridges and low on walls e.g. of ruins and bridges, bare patches in coastal grassland, soil on old tracks and paths, soil heaps, gravel car-parks, on ‘hedges’, laneside banks, stream and river banks, and mud in marshes, flushes, quarries and a dried pool. Most often grows fully insolated or in light shade, less often moderately to rather heavily shaded (e.g. inside woodland, in ruined buildings, at base of viaduct). Withstands regular inundation in flood-zones of rivers, growing low down beside middle reaches of R. Tamar and beside tidal R. Camel below HWST level. It tolerates salt-spray well, often
occurring in exposed coastal sites, e.g. low on sea-cliffs, and forming large patches on a rocky raised beach below cliffs. Often plentiful on copper-contaminated substrates, e.g. on mine-spoil and mortar of ruined mine buildings. Also plentiful on horizontal sandy alluvium along track near Red River, where substrate probably copper contaminated. When growing on ground it normally occurs in sparsely vegetated places, often as a colonist of newly exposed soils, but the species is much more persistent in many steep or rocky sites. It often grows in pure patches, but also occurs mixed with many other low bryophytes. Frequent associates include Amblystegium serpens var. serpens, Barbula convoluta, Barbula unguiculata, Dicranella varia, Pohlia melanodon, Pseudocrossidium hornschuchianum, Trichostomum brachydontium. Others recorded include Aneura pinguis, Bryum pseudotriquetrum, Gyroweisia tenuis, Hymenostylium recurvirostrum, Lunularia cruciata, Petalophyllum ralfsii. In saline coastal and estuarine localities recorded alongside Hennediella heimii and Tortella flavovires and at base of Juncus maritimus.

Commonly c.fr.: capsules immature 1-4, 6, 10-12; dehiscing 1-3, 11; dehisced 1-7, 10.

DTH 98-80 seems to be an atypical form of this species with acute, lanceolate leaves, but its identity is questionable.

[79.13 Didymodon spadiceus (Mitt.) Limpr. (syn. Barbula spadicea (Mitt.) Braithw.) – Report from vc1 (Castle Horneck, JR & WC, in Ralfts & Curnow MS. 1881, Rilstone 1948) not supported by specimen; reports from vc2 (Wadebridge and Egloshayle, 1906, RVT (B)) are respectively based on misidentified D. fallax and D. rigidulus: Paton 1969a: 724].


Grows as low turfs, or more sparsely as patches, or scattered plants colonising bare soil or among other low mosses. Notes on habitats in C&S are as follows. A calciphile, typically occurring on free-draining soil in fully insolated sites, but sometimes in damper places, partly shaded, or both (occasionally well shaded by trees). Widespread and common on calcareous sand of dune areas of north coast of vc1, occurring in very short dune grassland with other mosses and in partly bare places such as path sides among dunes, at dune-slab edges and where blown sand rests on hillslopes, cliffs, in quarries or on 'hedges'. Also frequent near coasts and inland on open disturbed mineral soils, including soil heaps, path sides, old tracks, gravel car parks, sea cliff slopes, rocky banks (serpentinite, slaty), quarries (granite, serpentinite), disused railways, roadsides, pavements, graves and over old mine-spoil. Apparently restricted to basic substrates and common only where these are extensive such as in the serpentinite areas of the Lizard pen.. Normally restricted to vicinity of concrete or other base-enriched places in more acidic regions such as the St Austell china-clay district, with numerous records from thin soil over old concrete and on mortared-stone walls, ruined walls and debris of masonry, two records from thin clay films over damp old concrete, one in moss carpet over old tarmac, one from edge of gravel of car park, one from mortar on side of old wall. Seen once growing directly on shale rock in old quarry. Frequent associates include Barbula convoluta, Bryum argenteum, Bryum dichotomum, Bryum capillare, Dicranella varia, Didymodon insulanus, Didymodon vinealis, Pseudocrossidium
hornschuchianum, Tortella flavovirens, Trichostomum brachydontium, Trichostomum crisipulum; others recorded include Aloina aloides, Didymodon luridus, Syntrichia papillosa, Syntrichia ruralis var. ruralis.

Occasionally c.fr.: capsules immature 3, 10-12; dehiscing 1, 3, 11; dehisced 3, 4, 11.

79.15 Didymodon tomaculosus (Blockeel) M.F.V.Corley  

*1: Soil at edge of arable (Brassica) field, ca 80 m alt., ca 3 km SE. of Quintrell Downs, SW8721/5822, 18 Oct. 2006, DTH 06-335 (BBSUK) (Rothero 2007: 37).  

Habitat notes from Cornwall are as follows. SW. of Philleigh: growing as sparsely scattered stems on partly bare soil or among other low mosses, or near herbs and grasses, on partly bare clay-loam in edge of stubble field, with Barbula convoluta, Barbula unguiculata, Bryum dichotomum, Bryum rubens, Bryum violaceum, Dicranella schreberiana, Dicranella staphylina, Trichodon cylindricus, Fos sp., Pohlia melanodon, Tortula truncata; also sparse Poa annua, Senecio vulgaris, Veronica persica. SE. of Quintrell Downs: partly bare soil at extreme edge of arable (Brassica) field, slightly shaded by oak tree; few stems in carpet of low mosses, with Barbula convoluta, Barbula unguiculata, Bryum violaceum, Dicranella staphylina, Pohlia melanodon, Tortula truncata. N.of Tregorrick Road, St Austell: one stem found in field of barley stubble, soil pH 6.4 (CDP). NW. of Pendriscott: barley stubble field treated with weed killer, loam soil pH 6.1, with Dicranella staphylina (CDP). Another vc2 record also on bare patch in barley stubble, with Bryum argenteum, Tortula truncata. Found in another stubble field in vc2 in 2005 (DAP & CDP in Hill 2005: 44).

Tubers plentiful on Cornish specimens as in other material. Not known c.fr.

79.16 Didymodon ferrugineus (Schimp. ex Besch.) M.O.Hill  
(syn. Barbula reflexa (Brid.) Brid.). Boreo-temperate Eurasian element.


Perhaps better treated as a var. or subsp. of D. fallax (as it was e.g. by Wigginton 1995: 69), because forms apparently intermediate between them are not rare in Cornwall (e.g. DTH 98-78).

Grows as low lawns, or more sparsely as patches or intermixed with other low mosses. Notes on habitats in Cornwall are as follows. A calciphile of unshaded habitats. Most common on calcareous sand of fixed dunes and edges of dune-slacks, in very low turf or with other low mosses, and in similar habitats where blown sand rests on hillslopes. Scattered records also from thin/compressed soil of old paths and tracks (over serpentinite and gabbro on Lizard pen., especially near quarries, and on old mining ground elsewhere in vc1), a gravel car park, clay soil receiving drainage from old concrete, and thin soil overlying old concrete (on ruined mine buildings; also once each on a vertical damp wall of
ruin of china-clay 'dry', and on disused railway station platform). Single finds also: on soil dumped on top of 'hedge'; growing directly on weathered old concrete of ruin; in open part of basic flush above sea-cliffs. Associates recorded include *Bryum dichotomum*, *Dicranella varia*, *Didymodon fallax*, *D. insulanus*.

No vegetative propagules recorded. Not seen c.fr.


[82.2 *Aloina rigida* (Hedw.) Limpr. – Listed for vc1 by Paton 1969a: 720 on basis of old specimen (Camborne, 1862, WC ([PNZ]), although remarks that it is 'very common on wall tops near Penzance' (in Greenwood 1844) were thought to refer to *A. aloides*. Penzance record was excluded by MOH in Corley & Hill (1981) but perhaps without checking the specimen involved.

82.3 *Aloina aloides* (Koch ex Schultz) Kindb. s. str. Mediterranean-Atlantic Suboceanic element.


82.3 and 82.4 were often misidentified prior to publication of the *Flora* by Smith (1978), so older records are referred to *A. aloides* s. l. unless redetermined subsequently.

Notes on habitats in Cornwall are as follows. Grows as scattered plants or open turfs, often mixed with other low mosses. Calciphile; usually on dry free-draining substrates where unshaded or at most partly shaded. Commonest on thin soil or weathered old mortar on sides, ledges and tops of old or ruined walls, e.g. on old mine buildings, ruin of china-clay dry, and in quarries. Sometimes on very thin soil or directly on old mortar or concrete. Seen once on thin film of clay on vertical, damp concrete of wall of ruin, where lightly shaded. Mainly grows in places with at least some bare substrate exposed and only very low-growing associates. Commoner associates on walls and ruins include *Bryoerythrophyllum recurvirostrum*, *Barbula convoluta*, *Didymodon fallax*, *Trichostomum brachydontium*; others recorded include *Didymodon luridus*, *Gymnostomum viridulum*, *Pseudocrossidium hornschuchianum*, *Pseudocrossidium revolutum*. Several records from calcareous blown sand on banks e.g. in dunes and on coastal cliffs or cliff-tops; single records from thin soil on top of 'hedge' on cliff-top, from partly bare patches of soil and of mine-spoil at edges of dune-grassland. Four records from soil heaps on old mining ground and two others from banks of earthy spoil that included old mortar or concrete debris. Once on bare stony soil at unshaded edge of old gravel quarry. Associates recorded on soil include *Bryum dichotomum*, *Dicranella varia*, *Fossombronia caespitiformis*, *Trichostomum brachydontium*.

Commonly c.fr. [only recorded with mature capsules]: capsules immature 1-3, 8, 10-12; dehiscing 1-3, [4], 9-12; dehisced 1-6, 8, 10-12.

*1*: Newlyn Cliff, 1865, WC *(PNZ)* (Paton 1969a: 720).


See notes above. Distinguished from *Aloides* by characters given in Smith (1978). They were often misidentified prior to publication of this *Flora*, using other unreliable characters, so older records are referred to *Aloides s. l.* unless redetermined subsequently.

Specimens from NE. of Cape Cornwall (DTH 94-444) have basal membrane projecting above mouth of capsule as usual in *Ambigua*, but rather large spores (mean 18 µm, rather than the 15-16 µm usual in this form), so that they approach *Aloides*. Other plants from Pendeen Watch also appear to be intermediate, with spores averaging 18 µm and basal membrane of peristome with small and variable projection above capsule mouth. Smith *(op. cit.)*: 230 noted that the 'two varieties are distinct in Britain but sometimes intergrade elsewhere'. However, K.J. Adams (pers. comm.) has reported other intermediates in Britain.

The six DTH records are all from coastal areas in West Penwith: of scattered plants or thin turfs on unshaded or almost unshaded tops or sides of walls of ruined mine buildings. They grew on thin soil over old concrete or directly on crumbling old mortar, among rather sparse low cover of mosses. Associates included *Aloina aloides, Barbula convoluta*.

Commonly c.fr. [only recorded with mature capsules]: capsules immature 1; dehiscing 3 [4], 10, 11; dehisced 1, 4.

83.1 *Tortula subulata* Hedw. Southern-temperate Eurosiberian element.


[Vc2 listed in CC 1907, but no record traced by Paton 1969a: 720].

Known in Cornwall only by old records from near Penzance.

83.2 *Tortula cuneifolia* (Dicks.) Turner Mediterranean-Atlantic Oceanic element.


*2*: Road from Torpoint to St John, 1821, JST *(RAMM)* (Paton 1969a: 720).

This species shows evidence of long-term decline in Britain, with loss from all inland sites; the coasts of Cornwall and Devon are now its stronghold (see *Atlas 2*: 227).
Three DTH records are as follows. Sunny Corner (NE. of Malpas): among other low mosses on thin soil (<2 cm) overlying crumbling shaly/slaty rock at angle of 70-80° on part of steep roadside bank facing SSW. near edge of creek, almost unshaded. Growing here as small patches and scattered plants associated mainly with *Tortula atrovirens*, also with *Bryum dichotomum*, *Grimmia pulvinata*, *Zygodon viridissimus* var. *viridissimus* and immature plants of *Umbilicus rupestris*. NW. of Dennis Hill (near Padstow): small patch among *Bryum capillare* and *Tortula viridifolia* on thin sloping soil over ledge on slaty rock of bank (side of Cornish hedge) beside farm track, facing E. and almost unshaded. Other associates within 5 cm were *Kindbergia praelonga* and seedlings of *Cerastium* sp. and *Umbilicus rupestris*; additional spp. at 5-10 cm away were *Cochlearia danica*, *Galium album*, *Lolium perenne* and a seedling of *Sonchus* sp. Talland: on thin mainly bare soil over unshaded slaty rock in small old quarry near coast; associates included *Barbula unguiculata*; *Tortula canescens* was present nearby.

Commonly cfr; capsules immature 1-4; dehisced (3 old).

83.5 *Tortula solmsii* (Schimp.) Limpr. Mediterranean-Atlantic Oceanic element.


Grows as scattered plants or forms pure low lawns that may reach 50 cm or more in diameter. Several records from Isles of Scilly from steep to vertical or slightly overhanging gritty sand of sandrock forming low coastal cliffs, apparently avoiding sunny S.-facing cliffs and forming the largest populations in damp N.-facing sites, occurring only where the cliff is above the splash-zone during the highest tides. Associates sometimes include *Didymodon tophaceus*.

Two records from mainland: both of tiny and rather nondescript ‘shade form’ with leaves almost unbordered: Porthmoina Cove (vc1), in small quantity on bare, red, clayey soil of crevices in old, N.-facing wall of granitic blocks on sea-cliff; species present sparingly on similar substrate close by were *Bryum dichotomum*, *Epipetrygium tozeri* and *Weissia* sp. SE. of Cape Cornwall (vc1): small amounts, forming pure 'lawns' of tiny plants on firm, steep to vertical soil in crevices of old retaining wall (of blocks of granitic rock), on slope above sea-cliff.

Not seen c.fr. on mainland, but capsules frequent on Isles of Scilly: immature 4.

83.6 *Tortula marginata* (Bruch & Schimp.) Spruce Mediterranean-Atlantic Oceanic element.

Only DTH record at Trengwainton (vc1): on vertical bricks of moist, old walls at edge of ornamental garden, partly shaded by trees and bushes; mosses present close by were Gymnostomum viridulum, Bryum radiculosum and Didymodon tophaceus.

Not seen c.fr.

83.8 *Tortula canescens* Mont. Mediterranean-Atlantic Oceanic element.

*2: Penlee Point, Rame Head, 1886, AL (OXF) (Paton 1969a: 720).

[Record in Atlas 2: 219 from SW84G now regarded as probable misidentification].

Four DTH records only: With other mosses on thin, unshaded soil of ledges and banks at and near top of low slaty sea-cliffs; associates mainly Archidium alternifolium, Tortula viridifolia, Trichostomum brachydontium, also Cephaloziella divaricata, Lophozia bicrenata, Tortula wilsonii, Weissia controversa. On thin soil over low slaty rocks of bank in coastal pasture and on thin and deeper soil over slate rocks in small quarry; unshaded. Thin soil over slaty rocks of 'cree' on S.-facing slope in old quarry, unshaded to lightly shaded (associates were Bryum capillare and Conocephalum conicum).

Commonly c.fr. (only recorded cfr): capsules immature 1, dehiscing 1, 3.


Grows in patches, often small but sometimes extensive. Notes on habitats in C&S are as follows. Usually on hard calcareous substrates including concrete, mortar, bricks, asbestos-cement and other calcareous masonry, on horizontal, inclined, vertical or overhanging surfaces that are normally dry and free-draining (although some seepage of water is tolerated). Typically in open or in slight to moderate shade, occasionally in heavy shade (e.g. in woodland) but plants then poorly grown and non-fertile. Commonly on walls, buildings, bridges, graves and other masonry, including isolated patches of concrete; also often on fragments of brick or masonry lying on ground. Occurs almost anywhere that appropriate habitats appear, including widely isolated concrete structures or debris in fields, so it is evidently a remarkably efficient colonist from spores. Almost unrecorded from 'natural' rock habitats in Cornwall, although seen once on granite boulder just above sea-cliff. Also several records of small patches on granitic boulders in 'hedges' or e.g. on granitic gatepost. Occasionally on thin hard soil on walls, and a few plants recorded with other small acrocarpous mosses on firm calcareous soil near base of church wall. A few unusual records of small amounts on hard soil on waste-ground; seen once on unshaded, firm, sandy soil of slope near coast. Once on old slag on mining ground near coast. Tolerates salt-spray, occurring e.g. on harbour wall at Newlyn. Common associates include Barbula convoluta, Barbula unguiculata, Bryum dichotomum, Bryum capillare, Bryum radiculosum,
*Didymodon rigidulus*, *Grimmia pulvinata*, *Rhynchostegium confertum*, *Schistidium crassipilum*, *Zygodon viridissimus* var. *viridissimus*; others recorded include *Sciuro-hypnum populeum*, *Didymodon luridus*, *Gyroweisia tenuis*, *Pseudocrossidium revolutum*, *Scorpiurium circinatum*, *Trichostomum brachydontium*.

At Trevarno some shaded plants on part of old wall of mortared-stone had hair-point of leaves virtually lacking (the character of var. *aestiva*). Most of those nearby had short hair points and some individual plants had short points on just a few leaves. Since various intergradations seemed to be present there seemed little value in recording var. *aestiva* here.

Commonly c.fr.: capsules immature 1-7 [8, 9], 10-12; dehiscing [1-4], 5-10, [11, 12]; dehisced [1-4: old], 6-12.

83.12 *Tortula atrovirens* (Sm.) Lindb.  
NS S12  


Forms low turfs or small cushions, often with other small acrocarpous mosses. Recorded only from coastal sites, on dry free-draining patches of at least partly bare mineral soil, mainly on upper parts of sea-cliffs and slopes above them. Often where there is thin or very thin (often sandy) soil over rocks (serpentinite, gabbro, slate) or on ledges; always unshaded, and often in exposed places. Single record from thin soil on top of 'hedge' on cliff-top. Associates include *Archidium alternifolium*, *Bryum dichotomum*, *Cephaloziella divaricata*, *Tortula viridifolia*, *Trichostomum brachydontium*, *Weissia controversa*, rarely *Grimmia pulvinata*, *Tortula wilsonii*, *Tortula canescens*, *Tortula cuneifolia*, *Zygodon viridissimus* var. *viridissimus*.

Commonly c.fr.: capsules immature 1-3, 6, 11, 12; dehiscing 1-3, [9], 12; dehisced 1, 2, 4.

83.14 *Tortula lanceola* R.H.Zander  
LS I[2]  


Rare in Cornwall. Only recent record: S of Church Cove, Gunwalloe, on thin sandy (calcareous) soil on unshaded top of low 'hedge' on top of sea-cliff

Only recorded c.fr.: immature 1, dehiscing 1.
83.15  *Tortula wilsonii* (Hook.) R.H.Zander  
*NS:*VU  
[S]12  


The species is apparently in long-term decline in Britain, having become extinct since the nineteenth century at all of its inland sites as well as over much of Wales and eastern and south-eastern England (D.F. Chamberlain & C.D. Preston in Hill *et al.* 1992: 245). Records from 19 sites in Cornwall since 1960 form the large majority of all recent British records. Since then it has been re-found at only two localities and several recent attempts to re-find it at other sites where it occurred in the 1960s have been unsuccessful.

Habitat notes for recent Cornish records are as follows. At Pentire Point East: grows in rather small amounts, with other mosses on unshaded, thin soil at top of slaty sea-cliffs; associates were *Archidium alternifolium*, *Bryum dichotomum*, *Bryum kunzei*, *Cephaloziella divaricata*, *Lophozia bicrenata*, *Tortula viridifolia*, *Tortula canescens*, *Trichostomum brachydontium*, *Weissia controversa*. At Talland: on unshaded soil of bank at edge of pasture near coast (in small amount).

Commonly c.fr. (only recorded with capsules): capsules immature 1, 2, dehiscing 1, 2, dehisced 2.

83.16  *Tortula viridifolia* (Mitt.) Blockeel & A.J.E.Sm.  
S12  


Grows as scattered plants, in low patches or forming dense low lawns. Notes on habitats in C&S are as follows. On partly bare humic, rocky and sandy soil (acid to basic) on sea-cliffs and slopes, banks or 'hedges' above them, and on low creekside cliffs; on free-draining substrates, often on thin soil over rocks (including slaty, granitic, or serpentinite lithologies); mainly in unshaded sites (but sometimes in small shady hollows or partly or lightly shaded by grasses, herbs or steep banks; once part shaded by woodland edge and overhangs), often in exposed places. Single records from thin soil over edge of old concrete of ruined mine structure and over top of old mortared wall near mine. Nearly all sites are on sea-cliffs or close to them, recorded up to 200 m inland near Gwithian and near Padstow (on 'hedges' and on rocky bank) and ca 300 m inland on Samson, Isles of Scilly (on crumbling wall). Some sites are low on exposed sea-cliffs where they receive much salt-spray (e.g. at Pendennis Watch and in Isles of Scilly). Associates recorded include *Archidium alternifolium*, *Bryum dichotomum*, *B. capillare*, *Kindberga praelonga*, *Hypnum cupressiforme* var. *resupinatum*, *Scleropodium touretii*, *Tortella flavovirens*, *Trichostomum brachydontium*, *Weissia controversa* var. *controversa*, *Sedum anglicum*; less often *Cephaloziella divaricata*, *Hypnum cupressiforme* var. *lacunosum*, *Lophozia bicrenata*, *Polytrichum juniperinum*, *Tortula canescens*, *T. cuneifolia*, *T. truncata* and *T. wilsonii*. 

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Commonly c.fr. [most but not all records are of plants with capsules]: capsules immature 1-4, 11, 12; dehiscing 10, 11, 1-4; dehisced 1-4, 6.

83.17 *Tortula modica* R.H.Zander


+2*: Waste ground beside creek, old slate quarry, Bodieve, near Wadebridge [SW 9873], 1964, JAP 709 det. EFW, conf. MOH, conf. 1998 TLB) (BBSUK, E) [this is apparently not the record listed in Paton 1969a: 721].

Not consistently recorded in Cornwall in recent years because it is apparently a taxon of dubious validity, although it is reported to be consistently distinct from *T. truncata* in morphology and habitats in other parts of Britain and e.g. in S. Sweden. Apparently intermediate Cornish specimens differ from *T. truncata* and resemble *T. modica* in their large size and long capsules but have only a single row of smaller cells at mouth of capsule (e.g. DTH 94-414) or mainly two such rows (DTH 00-37, 01-1002). Some such 'intermediates' also have rather strongly recurved leaf margins (e.g. DTH 94-480, 01-1002). Care is also needed in distinguishing *T. modica* from *T. viridifolia*, the main differences from the latter being the less papillose leaf cells and less rounded leaf apex, but poor specimens can be indistinguishable.

The few recent Cornish records of *T. modica* had the following habitat notes (implying that it occurs in much the same habitats as *T. truncata*). Pendennis Point: on soil of slope above sea-cliffs of slaty rock, unshaded, growing near *T. viridifolia*. Near Tregunna: on soil near edge of barley field, partly shaded by crop. Edge of Upton Towans: on partly bare patches along pathway in grassland at landward edge of dunes, on sandy soil. Coverack: small amounts in thin soil along middle of gravelly track, unshaded. W. of Bodieve: unshaded partly bare [somewhat basic?] soil of field gateway near edge of estuary (associates *Barbula convoluta*, *Bryum ruderale*, *Microbryum rectum*, *Phascum cuspidatum* var. *cuspidatum*). Efford Down: patch on dry exposed partly bare soil at top edge of sea-cliff. Trewella Park (SW85E): patch of bare loamy soil on unshaded bank near water of fishing lake.

Commonly c.fr.: capsules immature 3, 4, 6, 10, 11; dehiscing 1, [10], dehisced 3, 7, 11.

83.18 *Tortula truncata* (Hedw.) Mitt.


See notes under *T. modica* regarding apparently intermediate specimens.
Grows as scattered stems or low lawns, sometimes forming large patches. Notes on habitats in C&S are as follows. A colonist of bare or mainly bare, usually neutral to mildly acidic soils that are often free-draining (loamy, silty or sandy) but sometimes also damp and clayey. Typical habitats are on or beside paths and tracks, on roadside verges, on and just above sea-cliffs, in quarries (both stone and china-clay pits), open patches in grasslands, in arable fields (e.g. barley, wheat, maize, stubbles, brassicas, flax, daffodils, game-food crop, fallow, grass leys), in gardens, on plant-pots, on soil heaps, on graves, dredgings from ditches and ponds and similar disturbed ground generally, such as on gravel tracks and car parks, lay-bys and about field gateways; also thin soil over rocks or on ‘hedges’. Mainly in unshaded or lightly shaded places, but sometimes partly to moderately shaded, e.g. along woodland tracks. Good patches twice found on very thin soil over concrete in open or light shade (presumably a calcareous substrate). Several records on old tarmac of lanes and a few amongst spoil from metalliferous mines. On mud and firm clay sediments exposed in inundation zones beside reservoirs. A few records on sheltered granitic boulders with very little or no accumulated soil. Associates recorded include *Acaulon muticum*, *Anthoceros agrestis*, *A. punctatus*, *Barbula convoluta*, *Barbula unguiculata*, *Bryum argenteum*, *Bryum dichotomum*, *Bryum klinggraeffii*, *Bryum subapiculatum*, *Bryum rubens*, *Bryum sauteri*, *Bryum violaceum*, *Ceratodon purpureus*, *Dicranella schreberiana*, *D. rufulescens*, *Didranella staphylina*, *Didymodon tomaculosus*, *Entosthodon fascicularis*, *Ephemerum minutissimum*, *Ephemerum serratum*, *Ephemerum terminale*, *Fissidens viridulus*, *Fossombronia caespitiformis*, *Fossombronia pusilla*, *Leptodictyum riparium*, *Phacoceros laevis*, *Phascum cuspidatum*, *Phleum tetragonum*, *P. subulatum*, *Pohlia melanodon*, *Pohlia wahlenbergii var. wahlenbergii*, *Pseudephemerum nitidum*, *Tortula viridifolia*, *Trichostomum brachydontium*, *Weissia controversa*, *Riccia glauca*, *Riccia sorocarpa*, *Riccia subbifurca*. Usually also with herbaceous weeds on arable fields, e.g. *Cerastium glomeratum*, *Lamium purpureum*, *Stellaria media*, *Veronica persica*.

Commonly c.fr. [most but not all records of plants with capsules]: capsules immature 1-12; dehiscing 1-4, 6-12; dehisced 1-12.

83.19 *Tortula protobryoides* R.H.Zander

(syn. *Pottia bryoides* (Dicks.) Mitt., *Protobryum bryoides* (Dicks.) J.Guerra & M.J.Cano)

*1: Partly bare patches of loamy soil among short mosses and grasses on exposed slope just above low slaty sea cliff, ca 8 m alt., Pentire Point East, SW78516/61263, 30 Mar. 2010, DTH 10-25 & DC (*BBSUK, DTH*) (Blockeel 2011: 77).

The only record from Cornwall. Present in small quantity, c.fr. (capsules nearly mature 3).

84.1 *Phascum cuspidatum* Hedw. *s. l.*


First vice-county records of *P. cuspidatum s. l.*:


*2: Polruan, 1891, RVT (B) (Paton 1969a: 723).

For recognition of var. *papillosum* see Blockeel (1995). The *s. l.* consists of 84.1.a and 84.1.d but excludes 84.1.b.
Records of habitats, associated plants and timing of sporophyte production have been kept separately for each of the three vars. and these are given separately below. There do not appear to be any differences in habitats or phenology between var. *acaulon*, var. *papillosum* or the many intermediates between them. However, the much scarcer var. *pilifera* differs in being restricted to free-draining substrates in sunny coastal sites.

All three vars. grow as scattered plants or small patches, often among other mosses. The species is a colonist of bare basic to neutral (or slightly acidic?) soil, whether extensive as on soil heaps or in arable fields (all types) or as small patches, e.g. in grass-leys. Associates recorded (of *P. cuspidatum* s. l.) are *Barbula convoluta*, *Barbula unguiculata*, *Bryum dichotomum*, *Bryum klinggraeffii*, *Bryum rubens*, *Bryum violaceum*, *Trichodon cylindricus*, *Funaria hygrometrica*, *Pleuridium subulatum*, *Tortula truncata*. Usually also with herbaceous weeds on arable fields, e.g. *Cerastium glomeratum*, *Lamium purpureum*, *Sinapis arvensis*, *Stellaria media*, *Urtica urens*, *Veronica persica*.

All records, including those assigned to subsp. or vars.: commonly c.fr.: capsules immature 1-4, 7, 10-12; dehiscing 1-6, 8-12.

84.1.a *Phascum cuspidatum* Hedw. var. *cuspidatum* S12


The characters of var. *papillosum* (spinulose spores, small upper lamina cells, strongly papillose upper lamina cells) all occur independently. Hence many specimens are intermediate between var. *acaulon* and var. *papillosa* (e.g. from SE. of Cape Cornwall, by Basset's Cove, St Austell, near Rosteague), with e.g., variably spinulose spores but only weakly papillose upper laminal cells; spinulose spores but no papillae on cells of upper leaf laminae and upper laminal cells rather large (*ca* 20 µm wide); blunt projections on spores but leaf characters of var. *papillosa*. Several specimens have also been seen with ornamentation on the spores consisting of a mixture of spinules and shorter blunt projections. Both vars. have sometimes been found close together, e.g. in stubble fields at St Erth and near Rosteague, on soil heaps SE. of Tolver, on soil in grounds of St Austell College, or close to intermediate plants. Overall, the frequency of intermediate plants suggests there is little point in recognising var. *papillosum*, which is apparently much commoner in Cornwall than elsewhere in Britain.

Notes on habitats in C&S are as follows. A colonist of bare mineral soil, of mildly acid to basic reaction, often where sandy but also where silty, loamy or much compacted, but usually where free-draining. Commonest in unshaded places or lightly shaded (e.g. by grasses and herbs), but sometimes partly shaded by trees. Typically on partly bare soil in many situations including beside paths and tracks, on banks, soil patches in grassland, on roadsides, in arable fields (stubble, grass leys), in gardens, cemeteries and churchyards, on soil heaps, in plant-pots. Also recorded on and above sea-cliffs, in quarries, at edge of gravel car park, soil amongst old mine-spoil, on dredgings from ditches and on silty mud exposed at reservoir edge. Frequent associates include *Barbula convoluta*, *B. unguiculata*,...
Bryum argenteum, B. dichotomum, B. rubens, Dicranella schreberiana, D. staphylina, Phascum cuspidatum var. papillosum, Pseudocrossidium hornschuchianum, T. trunca; others recorded are Bryum klingraefii, Ephemerum minutissimum, Microbryum davallianum, M. rectum, Tortula modica, Anthoceros agrestis, Fossombronia pusilla, F. wondraczekii, Riccia glauca, R. subbifurca.

An unusual form collected at Cadgwith (from soil patches in short grassland of a cliff-top car park) has large numbers of leafy non-fertile stems (DTH 96-571).

Commonly c.fr. (only recorded as this form when spores mature): capsules immature 1-3, 6, 7, 11, 12; dehiscing 1, 3, 8-12.

84.1.b Phascum cuspidatum Hedw. var. piliferum (Hedw.) Hook. & Taylor

(syn. Tortula acaulon var. pilifera (Hedw.) R.H.Zander). Southern-temperate European element.

*1: Marazion Bridge, 1866, WC (PNZ) (Paton 1969a: 723).

Perhaps just an extreme form of P. cuspidatum with leaves having consistently long hair-points, but unlike the other forms of the species all of the older Cornish records and both of the two recent records are from coastal localities. The recent records are from free-draining substrates in sunny S.-facing locations, as follows: W. of Marazion: sandy soil on slope and top of Cornish 'hedge' beside road, unshaded or lightly shaded by herbs. Black Head: on small patches of compressed, partly bare soil on little-used path on top of serpentinite sea-cliff, slightly shaded by low Festuca (with Trichostomum brachydontium, Weissia sp., Riccia subbifurca).

Cfr: capsules immature 1, 2, dehiscing 2.

84.1.d Phascum cuspidatum Hedw. var. papillosum (Lindb.) G.Roth NR? 12

(syn. P. cuspidatum subsp. papillosum (Lindb.) J.Guerra & Ros, Tortula acaulon var. papillosa (Lindb.) R.H.Zander). Southern-temperate Suboceanic element.


For recognition of var. papillosum see Blockeel (1995). As discussed above, this is a dubious taxon because intermediates with var. cuspidatum are common. Three good specimens exist from vc2 (DTH 99-25, 99-35, 00-829), but others (from SW84G and SW95M, both in DTH) show most but not all characters of var. papillosum.

Notes on habitats in Cornwall are as follows. A colonist of bare soil, of sandy, loamy or compacted textures and circumneutral in reaction. Usually grows in open or lightly shaded, less often in partly shaded sites (e.g. behind north wall of church). Habitats typically include
partly bare patches beside paths and tracks, on banks, in disturbed areas in grassland, sides of old wheel ruts, in arable fields (stubble, flax stubble), in gardens, soil heaps, on top of 'hedge', in churchyards, on and above sea-cliffs, and on old mining ground (including earthy mine-spoil). Also on dumped soil of banks and flat areas near china clay quarries. Often with or near var. *cuspidatum*, or intermediate plants, and hence sharing list of more frequent associates given for var. *cuspidatum*. Associates recorded for this var. include *Bryum dichotomum*, *B. rubens*, *Trichodon cylindricus*, *Ephemerum minutissimum*, *Pleuridium acuminatum*, *P. subulatum*, *Tortula truncata*.

Commonly c.fr. (only recorded as this form when spores mature): capsules immature 1-3, 11, 12; dehiscing 1-6, 9, 11, 12.


*1*: Perranporth, 1914, FR (RAMM) (Paton 1969a: 723, as *Pottia starckeana* subsp. *starckeana* var. *starckeana*). [Other records given later by D.F. Chamberlain in Hill 1980a, Hill 1980b: 37, as *P. starckeana* subsp. *starckeana* var. *brachyodus*].


Differs from *M. davallianum* in spore morphology (see below). No differences are apparent in the habitat preferences of plants with well developed peristomes (formerly separated as 'var. *starckeana*') and those with the peristome absent or rudimentary ('var. *brachyodus*'). Recorded only from coastal sites, except for a single record (of 'var. *brachyodus*') inland near Ventogimps.

Grows as scattered plants or forming low lawns. Habitat notes from Cornwall are as follows. A colonist of mainly bare neutral to more often basic (calcareous) soil that is free-draining and usually dry, often sandy, stony or silty, or thin soil over rock, where unshaded or less often slightly shaded. The usual habitats are on upper slopes of sea-cliffs (sometimes in exposed places), or banks and 'hedges' at top of and above sea-cliffs. Also on old metalliferous mine-spoil amongst dune grassland or open scrub (Gear Sands and Upton Towans). Once inland on thin soil and old mortar of wall of ruined mine building. Associates include various other small acrocarpous mosses, among them *Bryum dichotomum*, *Dicranella varia* and (once) *Tortula muralis*. Also recorded among sparse patches of *Armeria maritima*.

Commonly c.fr. [only recorded with mature capsules and ripe spores]: capsules immature 1, 2, 12; dehiscing 12, 1, 2, dehisced 2, 4.


*1*: Near Marazion, 1897, LJC (BM) (Paton 1969a: 722, as *Pottia commutata*).
A taxonomic review by Ros et al. (1996) concluded that only spore morphology is useful in separating species in the complex of variable forms comprising *M. davallianum* and *M. starckeana*, which D.F. Chamberlain (in Smith 1978) classified as *Pottia starckeana* (with four intraspecific taxa) and *P. commutata*. They emphasised that they 'found no correlation between the type of peristome and any other sporophyte character. Taxonomic value [of peristome]: none.' Blockeel & Long (1998) and Smith (2004) followed this treatment so that the species would include Cornish plants with the peristome well developed (formerly treated as *P. commutata*) and others with the peristome rudimentary or absent (formerly treated as *P. davalliana* subsp. *conica* or *P. starckeana* subsp. *conica*). Both differ from forms now treated as *Microbryum starckeana* in having spores with a regularly rounded outline and papillose or spinose projections, rather than a warty outline formed by fewer large projections (Ros et al. 1996). Hill et al. (2008: 149) restored var. *commutatum* onto the British list on the basis that forms with a long peristome 'are too distinctive to be subordinated completely to *M. davallianum*'. However, they present no evidence of correlation of peristome development with other characters that would contradict the analysis by Ros et al.

A gathering from Lizard (DTH 96-558) is intermediate between 'commutata' and 'conica', in combining a well developed peristome (typical of *commutata*) with spinose spores (which occur in *conica*, whereas *commutata* normally has papillose spores). All of the rather few records of 'commutata' from Cornwall are from sites within 100 m of the coast but a minority of records of 'conica' are from much further inland.

Grows as scattered plants or forming low lawns in small or larger patches. Notes on habitats in C&S are as follows. Occurs as colonist on exposed mainly or partly bare, neutral to basic mineral soils. Most sites are free-draining and rather dry or drought prone, often stony, and unshaded or less often lightly shaded. Habitats include paths and soil patches on cliff slopes, thin soil on top of old mortared-stone wall, thin soil on top of 'hedge' above sea-cliffs, clay-mud of old track, gravel path above cliffs, bank beside path above sea-cliff, other earthy banks, edge of coastal arable field, barley and stubble fields, slope of reservoir dam, and base of wall of church. Associates recorded were other small acrocarps, among them *Barbula convoluta, B. unguiculata, Bryum dichotomum, Bryum ruderale, Fissidens incurvus, Microbryum rectum, Phascum cuspidatum var. cuspidatum, Pseudocrossidium hornschuchianum*.

Commonly c.fr. [only recorded with mature capsules and ripe spores]: capsules immature 1, 6, 9, 11, 12; dehiscing 1, 3, [6], 11, 12, dehisced 3, 6, 11.


*1: Marazion, 1865, WC (PNZ) (Paton 1969a: 723).  
*2: Near Park, SE. of Truro, 1829, JST (RAMM) (Paton 1969a: 723).  

Scattered plants among other mosses, or forming low lawns. Notes on habitats in Cornwall are as follows. Colonises bare mineral soil (often where sandy; sometimes thin soil over...
rock) that is free-draining and at least moderately calcareous. Usually unshaded, sometimes lightly or partly shaded (e.g. by scrub, 'hedges' or walls). Found on disturbed ground inland (including soil heaps, disturbed patches in grassland, base of wall, disturbed track among mine-spoil, stubble fields, arable field left fallow, slope of reservoir dam) and on cliffs (sometimes in exposed locations), on banks and tops of 'hedges' near the coast, earthy banks around a field gateway and amongst dune-grassland. Associates recorded include many small bryophytes of open disturbed ground: *Barbula convoluta*, *Barbula unguiculata*, *Bryum radiculosum*, *Bryum rubens*, *Bryum ruderale*, *Dicranella schreberiana*, *Dicranella staphylina*, *Dicranella schreberiana*, *Fissidens incurvus*, *Microbryum davallianum*, *Phascum cuspidatum* var. *cuspidatum*, *Tortula truncata*, *Trichostomum brachydontium*, once *Tortula modica*.

Commonly c.fr. [only recorded when capsules present]: capsules immature 1-4, 6, 7, 10-12; dehiscing 1, 3, [4, 5], [8], 11, 12; dehisced.

85.4 *Microbryum curvicollum* (Hedw.) R.H.Zander


This is the only confirmed record from Cornwall.

[Report from vc2 (Goss Moor, RVT, in Holmes & Brent 1869) not supported by specimen: Paton 1969a: 723].

85.5 *Microbryum floerkeanum* (F.Weber & D.Mohr) Schimp.


This is the only Cornish record. Only recorded c.fr.: capsules near-mature 1.

86.1 *Hennediella stanfordensis* (Steere) Blockeel


Grows as scattered plants, small patches or low lawns. Recorded from two areas in Cornwall, in rather different habitats: Polbream and Housel Bay (Lizard): on mainly bare compacted soil of paths on cliff top, in open, slightly shaded or less often partly shaded by
grasses and scrub. SE. of Tolver: on soil of side of low ridge in cauliflower field, almost unshaded.

Not seen c.fr.


Forms low lawns or small patches. Notes on habitats in C&S are as follows. Restricted to coastal sites, where it grows on partly bare horizontal, sloping or vertical soil (clay, loamy or gravelly), including thin soil over rocks (several times over slates; once on shale, once on thin soil on old slag), in unshaded or less often partly shaded places (e.g. under bushes). Several records from cliffs or coastal banks above cliffs, one each from edge of a salt-march and from grassland on bank (sea-wall beside river estuary). Some records were from around HWST level or where subject to flooding with brackish water at HWST, others were in locations that receive salt spray. Few associates were recorded, among them *Didymodon tophaceus* (commonly) and *Bryum dichotomum*.

Commonly c.fr. [nearly all records were of plants with capsules]: capsules immature 1, 2, 4; dehiscing 4, 6, dehisced (4 old).


First vice-county records of *A. muticum s. l.* (87.1+2):
*2*: Bodmin, 1893 and 1897, RVT (B), det. DTH as *A. mediterraneum* (Holyoak 2003a: 62) [the same specimens were listed as *A. muticum var. minus* by Perry 1967: 412, Paton 1969: 723].

Earliest vice-county records confirmed as *A. muticum s. str.*:
*1*: Soil on bank in shallow quarry, cliffs S. of Cadgwith, Lizard [SW7113], 1962, JAP 784, det. DTH (E).

*A. mediterraneum* apparently differs from this species only in having spinulose spores (Holyoak 2003a). Hence, only the few records where the spore ornamentation has been checked are referred to the segregate spp., the others being retained here as *A. muticum s. l.*, along with records of plants lacking mature spores.

*A. muticum s. str.* has four records in vc1, three in vc2. Five of these were from compacted soil in bare areas on or beside footpaths near coast or at edge of sea-cliffs, two from nearly bare soil of banks just above sea-cliffs, all sites being unshaded. Associates recorded: *Bryum argenteum, Bryum dichotomum, Bryum subapiculatum, Ceratodon purpureus, Riccia*
sorocarpa, Tortula truncata. It was commonly c.fr. (all records cfr): capsules immature 1, 11, 12.

A. muticum s. l. was recorded recently from a bare patch of unshaded soil in short grassland at gateway into disused bulb field on slope above sea-cliffs (near Bryum dichotomum, Ceratodon purpureus, Tortula truncata). Also on soil of low bank beside track inland, almost unshaded. Capsules were present at both sites; immature 10-12, 1.

87.2 Acaulon mediterraneum Limpr.  

*2: Bodmin, 1893 and 1897, RVT det. DTH (B) (Holyoak 2003a: 62) [the same specimens were listed as A. muticum var. minus by Perry 1967: 412, Paton 1969: 723].


It is a little-known taxon for which 7 of the 11 British records are in Cornwall. Habitat data from Cornwall are as follows. Lizard pen., Vc1: on partly bare, moist earth at edge of wet track (with Trichodon cylindricus, Pseudephemerum nitidum). N. of Porthtowan (atypical, with short spines on spores): small bare patch of compressed, moist soil on path on coastal heath (near Bryum dichotomum). S. of Portscatho: partly bare, thin, unshaded soil on top of 'hedge' near cliff top (close to Weissia multicapsularis). Near Trefusis Point: soil patches in grassland (near gorse scrub) on steep, cattle-trodden, S-facing hillside (with Bryum dichotomum, Bryum rubens, Ephememerum minutissimum, Pleuridium acuminatum, Tortula truncata Trichodon cylindricus). Talland, vc2: thin unshaded soil over low slaty rocks of bank in coastal pasture.

All records c.fr.: capsules immature 1, 10, 11; mature 1, 11.

88.1 Leptosphacum leptophyllum (Müll.Hal.) J.Guerra & M.J.Cano  

*1: Gravelly soil derived from granite, vertical banks at the back of the shore, NE. coast of St Mary's, Isles of Scilly, 1984, JAP & DGL (BBSUK) (Hill 1985: 23).

At least half of the few British records are from Cornwall and the Isles of Scilly.

Grows as scattered stems or small patches of very low plants. Two records from Isles of Scilly were from unshaded soil on a low sea-cliff at Watermill Cove, St Mary's (JAP) and sparsely on almost unshaded soil in several closely adjacent bulbfields on St Agnes (RAF,
2002-2003). At the latter locality it grew with other low acrocarpous mosses. The habitat of the only mainland record (from the coast in SW71H) was not recorded in detail; it had apparently become extinct there by 1995.

No records c.fr.


Recorded in C&S from two main types of dry, normally unshaded, base-rich habitats:

[1] Most records are from calcareous sand of areas with very short vegetation on fixed dunes or banks on coast, forming lawns or low patches on stable substrates in dune grassland areas or colonising sand in bare disturbed areas. Also on calcareous sand on coastal hilltops and ledges of quarries near coast; once on soil on sea cliff. It occurs widely on the Hayle-Gwithian Towans, Gear-Penhale Sands and near Rock but is generally less abundant there than *S. ruralis* var. *ruraliformis*, which is usually present close by (without occurrence of intermediates). Associates recorded: *Bryum dichotomum, Rhynchostegium megapolitanum, Syntrichia ruralis* var. *ruraliformis, Tortella flavovirens, Cerastium diffusum, Festuca rubra, Plantago coronopus.*

[2] Growing as patches or cushions (often large rounded cushions) on old concrete (e.g. in churchyards, cemeteries, concrete fragments lying in floor of quarry), marble chippings (on graves), asbestos-cement (roof of building inland: doubtless under-recorded from such habitats) or tiles (roof of church porch).

Four other records are of small amounts on gravelly or sandy-gravel substrates: of a cemetery path, near gateways and at the edge of an airfield. Unusual records of small amount on old tarmac of track at landward edge of dunes, partly shaded by rank growth of grasses and herbs, and old tarmac of pathway inland where almost unshaded.

Usually non-fertile; three records c.fr.: capsules immature 1, 3.


*2*: Near St Minver, 1891, RVT (B) (Paton 1969a: 719).

Differs from *S. ruralis* var. *ruralis* only in the shape of the leaf apex (lamina acute and tapering into the hyaline point rather than obtuse to rounded) and the usually larger size of the plants. The two occur intermixed in short dune grassland at Gear Sands and Penhale.
Camp, where a small proportion of plants have leaves of intermediate shape, suggesting that their treatment as varieties (as in Gallego 2002: 19, Hill et al. 2008) may be more appropriate than giving both forms species rank.

Forms extensive low lawns. Mainly on fixed and semi-fixed sand-dunes, growing on circumneutral to base-rich sand and sandy soil, mostly in dry free-draining sites but occasionally in small amount in dune-slacks. Occasionally shaded by bushes, herbs or grasses overgrowing its habitats, but normally unshaded. Occurs locally as colonist on landward edges of mobile dunes, but more characteristic and often locally abundant on semi-fixed dunes, where it occurs as pure stands or intermixed with sparse grasses and herbs. Also on blown sand lying on some coastal hillsides downwind of dunes, on similar substrates on coastal banks or 'hedges', and in disturbed areas in longer dune grassland. In Isles of Scilly locally in sandy places at the head of beaches. Associates recorded: Brachythecium albicans, Bryum dichotomum, Homalothecium lutescens, Hypnum cupressiforme var. lacunosum, Pleurochaete squarrosa, Rhynchostegium megapolitanum, Scorpiurium cincatum, Syntrichia ruralis var. ruralis, Festuca rubra, Plantago coronopus, Thymus polytrichus.

Five records of small amounts at unshaded sites well inland: twice on soil on or at edges of gravelly tracks (over serpentinite); few stems on soil of bank at edge of large soil-heap covering land-fill site; bit on concrete covering of old grave in churchyard; small patches on open gravelly soil high on Bodmin Moor (site of former airfield on Davidstow Moor).

One record c.fr.: capsules immature, fully formed Jan. 2005 (Gear Sands). [Another specimen with immature capsules was collected Feb. 1931 by C.H. Binstead at Hayle, now in DTH].

89.3 Syntrichia montana Nees [S]12 (syn. Syntrichia intermedia Brid., Tortula intermedia (Brid.) Berk.). Mediterranean-Atlantic Suboceanic element.

*2: Talland Church, 1893, RVT (TRU) (Paton 1969a: 719).

Gallego (2002: 23) and Hill et al. (2008) regard Syntrichia montana Nees as the earliest valid name for this species.

Sometimes difficult to separate from S. ruralis, differing superficially only in having slight constriction at mid-leaf and less extensively recurved leaf margin. However, characters seen in leaf sections differ clearly and consistently. A specimen from Landewednack churchyard (JAP M3059, in DTH) has a few stems with leaves ending in a short mucro, as in var. calva (Bruch & Schimp.) J.J. Amann (cf. M.T. Gallego in Guerra et al. 2006). However, accompanying stems in the same gathering have leaves with short hyaline awns.

Habitat notes from Cornwall are as follows. Forms cushions or patches in sites that are normally basic, dry, free-draining and unshaded or lightly shaded. Most records are from concrete or mortar, on horizontal, sloping or vertical surfaces, on old walls, buildings (e.g. churches, ruins), bridge over stream, concrete grave-covering and on masonry debris. Twice
on roof slates; two records from slaty 'natural' rock, on dry slate partly shaded above old railway cutting, and on low unshaded outcrop on coastal hillside. Two records were from exposed coastal sites. Several finds on gravel, e.g. covering unshaded graves in churchyard and cemeteries (including records from marble chips) and at edge of lane where sheltered and slightly shaded. Occasionally extends onto thin soil over old masonry. Once found in abundance on sloping asbestos-cement roof (such sites probably under-recorded). One record on old tarmac beside minor road. Three records of small amounts on dry unshaded soil: stony top soil of heap in area of old mine-spoil, hard soil and soft stones on old mining ground, thin soil in crevice at base of mortared wall on exposed hill top. Associates recorded Barbula unguiculata, Bryum capillare, Didymodon rigidulus, Schistidium crassipilum, Tortella nitida, Tortula muralis, Trichostomum crispulum.

Usually non-fertile; five records c.fr.: capsules immature 1, 3, 6, 12, dehisced (old 3).

89.6 **Syntrichia laevispila** Brid. (syn. *Tortula laevispila* (Brid.) Schwägr.; *T. laevispila* var. *laevispilaeformis* (De Not.) Limpr.). Mediterranean-Atlantic Suboceanic element.


Blockeel & Long (1998: 99) maintained var. *laevispilaeformis* as a valid taxon, but Paton (1969a: 719), Smith (2004: 387) and Hill et al. (2008) treated them together. My own fieldwork suggests that in Cornwall plants with bulbils (var. *laevispilaeformis*) occur patchily mixed in with typical plants. Thus, 'var. *laevispilaeformis* ' was found e.g. in some but not all plants on Elder in SW62H, some but not all plants on roadside shale/slate in SW84G, on concrete by church in SW83U, some but not all patches on Sycamores in SW63A, on Ash in SS20C. Near Bude Canal in July 2002 it was noted that most fertile and non-fertile plants lacked bulbils but a few individual non-fertile plants scattered among them had bulbils. Hence, 'var. *laevispilaeformis* ' has usually not been separated in Cornwall because of doubt about its taxonomic validity.

Forms cushions or patches. Notes on habitats in C&S are as follows. Mainly found as epiphyte on bark of trunks or large branches, less often on decorticated wood of branches, growing where almost fully insolated or partly or lightly shaded, on horizontal to vertical surfaces. Several to many records each from Alder, Ash, Elders, Sycamore; few from elms, oaks; single records from Grey Willow, *Cupressus macrocarpa*, oak stump, trunk of evergreen *Quercus* in parkland, *Tilia* x*vulgaris*. Grows on trees or shrubs that not heavily shaded, e.g. at edges of woodland or scrub, a deer-park, in hedgerows or farmland, close to cliff top and in a public park. Frequent on silted bases of trees in flood-zone beside R. Tamar. Associates when growing epiphytically include *Bryum capillare*, *Cololejeunea minutissima*, *Homalothecium sericeum*, *Hypnum cupressiforme* var. *resupinatum*, *Metzgeria furcata*, *Orthotrichum diaphanum*, *Ulota phyllantha*, *Zygodon conoideus*, *Zygodon viridissimus* var. *viridissimus*, more rarely *Leptodon smithii*, *Leucodon sciuroides* var. *sciuroides*, *Syntrichia laitifolia*, *Zygodon viridissimus* var. *stirtonii*.

Frequently also on rocks (granitic, shale/slate), concrete and mortar: of walls, churches, churchyard and cemetery pathways, cliff top, exposed coastal path on slope above
lighthouse, bridges, grave-covers, blocks and boulders, rock in 'hedge', road cutting and masonry fragments. Care is required to avoid overlooking such occurrences as *Syntrichia montana*, *S. ruralis* var. *ruralis* or *Tortula muralis*. Associates on rock/masonry include *Bryum dichotomum*, *Grimmia pulvinata*, *Tortula atrata*.

Frequently c.fr.: capsules immature 1-5, (7 very young), 11, 12; dehiscing 2, 4; dehisced (1, 3 old) 3, 6, 7, 10.

89.7 *Syntrichia papillosa* (Wilson) Jur. 12


Apparently scarce in Cornwall, but likely to have been overlooked when growing on tarmac or concrete in small amounts. Nine DTH records, Lelant: small patch on branch of low Elder in ruined building, with *Orthotrichum diaphanum*. Carbis Bay: single plant on lightly shaded Sycamore branch near coast. Crantock and Poundstock: with other low mosses on tarmac of paths in churchyards (associates *Didymodon nicholsonii*, *Bryum dichotomum*, *Bryum capillare* nearby). Kilkhampton: small patch on bark of *Cotoneaster* tree in unshaded part of churchyard, close to *Frullania dilatata*, *Ulota phyllantha*. St Austell: small patches on vertical bark 2.5 m up on young Sycamore on lawn in college grounds, only lightly shaded even in summer (with *Frullania dilatata*, *Orthotrichum diaphanum*). Penscombe: patches on bark of young Ash and Wych Elm trees, lightly shaded by roadside, near *Frullania dilatata*, *Orthotrichum affine*, *Ulota phyllantha*. Seaton: small patch on concrete of low unshaded wall. Gwills: plentiful as low lawns (large patches to 10 cm across) on old tarmac of unshaded driveway with other mosses (*Bryum capillare*, *Didymodon fallax*).

Almost always with foliar gemmae. Not seen c.fr.

89.8 *Syntrichia latifolia* (Bruch ex Hartm.) Huebener 2
(syn. *Tortula latifolia* Bruch ex Hartm.). Temperate European element.

*2*: Near Sladesbridge, Wadebridge, 1906, RVT (B) (Paton 1969a: 719-720). This record is much older than that given as new for vc2 by Warburg (1964: 725).

DTH records almost entirely in flood-zone beside River Tamar. On silted bases of trunks (and exposed roots) of Alder, Ash, Grey Willow, Hazel, Sycamore, normally within *ca* 1.5 m above summer water-level of river, often partly shaded. Associates include *Orthotrichum rivulare*, *Syntrichia laevipila*. Single record at Bude Canal on vertical concrete wall where flooded at times but dry for much of year; near *Orthotrichum anomalum*, *Tortula muralis*.

90.1 *Cinclidotus fontinaloides* (Hedw.) P.Beauv.  
Southern-temperate European element.


Grows as patches or trailing wefts, or as scattered stems. Notes on habitats in Cornwall are as follows. Occurs mainly on rocks (slaty, granitic and serpentinite; on horizontal to vertical surfaces), locally also on silted bases of flood-zone trees (Alder, Ash, Sycamore), in and at edges of larger streams and most rivers. Grows where shallowly submerged for all or most of year or in lower part of zone of regular flooding (typically within maximum of 0.2-0.5 m above summer water-levels of large streams). In middle reaches of the R. Tamar it is often the commonest bryophyte in a zone above the lowest summer water levels but well below the limits of regular autumn and winter flooding (up to 1.5 m above summer water-level where river floods deeply). A single record from concrete in flood-zone at edge of a reservoir. Grows in open or partly shaded, e.g. by deciduous trees. Often in pure patches. Associates recorded include *Didymodon insulanus, Fontinalis antipyretica var. antipyretica, Fontinalis squamosa, Racomitrium aciculare, Schistidium rivulare*, rarely *Dendrocryphaea lamyana* beside Tamar.

Frequently c.fr.: capsules immature 1-5, 10; dehisced [5 old], 8.

[94.1 *Splachnum sphaericum* Hedw. – An old report from vc2 (Withiel, RVT in Holmes & Brent 1869) was dismissed by Paton 1969a: 732 because no specimen could be traced].

94.2 *Splachnum ampullaceum* Hedw.  
Boreal-montane Circumpolar element.

*2: Tregawn, Withiel, 1889, RVT (B) (Paton 1969a: 732). This record is older than that listed as new for vc2 by Warburg (1961: 168).

*S. ampullaceum* is a widespread moss in upland regions of northern and western Britain where it grows in small patches on dung of cattle, sheep and deer on wet heaths, moorlands and bogs. Investigations of the ecology of this and other species of *Splachnum* (summarised by Koponen 1990 and Marino 1997) have showed that a strong odour from their ripe capsules attracts dung flies, resulting in dispersal of the sticky spores to the widely scattered patches of herbivore dung.

During the 1960s *S. ampullaceum* was frequent on Bodmin Moor (SX17, SX18, SX27), with isolated records also from Rosenannon Downs (SW96N) and E. of Woolley Barrows (SS21T). It grew in small patches on dung on wet heaths and in boggy valleys and was frequently fertile, with capsules mature 7-8 (Paton 1969a: 732).

There have been no records since then despite extensive surveys of the bryophytes in mires on Bodmin Moor, so the species must now be feared extinct in Cornwall. Disappearance of the species from most of its former range in south-eastern England over the past century has been attributed to habitat destruction through drainage (A.C. Crundwell in Hill et al. 1994: 48), coupled perhaps with a decline in the grazing of stock on common land and village
greens (Cox 1999: 35). However, these factors seem unlikely to be responsible for its recent loss from Bodmin Moor which still has extensive mires and stocking levels that are too high in many areas. Instead, it is feared that loss of *S. ampullaceum* may be an indirect result of the widespread use since the 1980s of ivermectin (an avermectin; used as an endectocide) to remove helminths and other gastrointestinal parasites from domestic stock. Very low concentrations of these drugs kill dung flies, and it is now established that ivermectin usage has caused large and widespread declines of these and other coprophilous insects (Cox 1999: 34). Loss of the community of insects responsible for breakdown of herbivore dung has resulted in longer persistence of the dung, which might have been beneficial for *Splachnum* were it not for the concommitant loss of the dung flies that disperse the moss spores.

98.1 *Leptobryum pyriforme* (Hedw.) Wilson

Wide-temperate Circumpolar element.


Grows as scattered stems or small patches, forming low turfs when plentiful. A rather scarce moss in Cornwall, with records from a curious assortment of substrates and habitats:

(1) Most records from 1993-2001 are from horticultural contexts (mainly on soil in plant pots and other containers in gardens, nurseries, garden centres, etc., in open air and fully insolated or partly shaded, and also inside glasshouses). Associates included *Funaria hygrometrica, Marchantia polymorpha* var. *ruderalis*.

(2) Locally common on unshaded firm sediments exposed in upper part of inundation zones beside Argal and Stithians Reservoirs; sometimes associated with *Aphanorrhegma patens, Bryum klinggraefii, Bryum subapiculatum, Dicranella staphylina, Trichodon cylindricus, Ephemeredum serratum, Pohlia annotina, Pohlia camptotrichela, Pseudephemerum nitidum, Riccia subbifurca*. Locally plentiful also on silty humic soil in flood-zone beside incised stream at edge of old mine area N. of Gilbert's Coombe (near *Dicranella varia, Funaria hygrometrica, Pellia endiviifolia, Pohlia wahlenbergii* var. *wahlenbergii*).

(3) Found near Porkellis on unshaded soil and burnt fragments of wood at a fire site on old mining ground. Also on old mine area on unshaded bank of ditch in sandy mine-spoil (near Unity Wood).

(4) On steep damp mortar low on wall of old lime kiln near R. Tamar by Cotehele Bridge.

Axillary and rhizoidal tubers plentiful on plants from reservoir edges: 10, 11. Few records c.fr. [but nevertheless perhaps commonly c.fr. in some habitats]: capsules immature 1, dehiscing 6, 8, 9; dehisced 9.
99.1.a **Zygodon viridissimus** (Dicks.) Brid. var. *viridissimus* S12
Temperate European element.


Forms dense low tufts or cushions, sometimes expanding to become sizeable patches. Notes on habitats in C&S are as follows. Common both as epiphyte and on masonry, frequent also on natural rocks, growing in open and partly to heavily shaded. Epiphytic on bark of trunks and branches of varied trees and shrubs, especially those with nutrient-rich bark, tending to prefer inclined or horizontal to vertical surfaces. Common on Ash, Elder, elms, Grey Willow, Sycamore, also recorded on Hazel and oaks (including once on evergreen oak in parkland); twice on *Cupressus macrocarpa*. Common associates of epiphytes include *Hypnum cupressiforme* var. *resupinatum*, *Metzgeria farcata*, *Orthotrichum diaphanum*; less common include *Microlejeunea ulicina*, *Orthotrichum tenellum*, *Radula lindenbergiana*, *Syntrichia laevipila*, *Zygodon conoideus*, *Zygodon rupestris*. Extends down into flood-zone on tree trunks beside R. Tamar.

Commonly also on basic masonry, of old concrete, weathered mortar, old bricks or associated rocks, on mortared walls, bridges, and ruins, or fallen masonry debris (prefers dry sites and commonly on vertical surfaces, but also on those that are sloping or horizontal). Sometimes persists on old masonry after it becomes rather heavily shaded. On rock of outcrops or cliffs recorded from serpentinite, gabbro, slate and hard shale, less often granite, occurring also on rock of gravestones, unmortared walls, in old quarries, in rocky banks or road cuttings and in 'hedges'. Associates on rock and masonry include *Sciuro-hypnum populeum*, *Didymodon rigidulus*, *Fissidens dubius*, *Grimmia pulvinata*, *Homalothecium sericeum*, *Tortula muralis*; rarely *Cirriphyllum crassineum*, *Pseudocrossidium revolutum*, *Radula complanata*, *Syntrichia laevipila*, *Tortula atrovirens*, *Tortula cuneifolia*.

Tolerant of salt spray since it occurs on walls in exposed places in Scilly and sometimes abundant on elm trees there, where few other epiphytes occur. Often plentiful also on Elders in scrub on exposed cliff tops and slopes above cliffs in Cornwall. Unusual records from old decorticated wood (once) and of a small patch on hard vertical soil of pathside bank above sea-cliff, near Elder scrub.

Only recorded with foliar gemmae, which appear to be invariably present and often abundant. Occasionally c.fr. [although capsules often few]: capsules immature 1-4, 10-12; dehiscing 3, 4; dehisced 4, 6, 9 [12 old].

99.1.b **Zygodon viridissimus** var. *stirtonii* (Schimp. ex Stirt.) I.Hagen S12
(syn. Z. *stirtonii* Schimp. ex Stirt.). Temperate Suboceanic element.


Many populations are clearly distinct from var. *viridissimus* in the excurrent costa that is thickened towards the leaf apex, although this character tends to be less developed in young leaves. However, distinctions between the varieties sometimes appear subjective because of
intermediate forms, in which only the oldest leaves have thick excurrent costae whereas young leaves on stems in the same tuft have the costa ending below the leaf apex. Occurrence of var. stirtonii with many leaf tips missing was noted several times, so deciduous leaf tips presumably function as propagules.

Grows as low cushions. Habitat notes from C&S are as follows. As with the commoner var. viridissimus, recorded on masonry and as epiphyte, but var. stirtonii differs in apparently showing a much stronger preference for masonry than for bark. Recorded mostly from dry base-rich masonry in unshaded or partly-shaded sites, especially old concrete and mortar (also on asbestos-cement), on vertical, inclined or horizontal surfaces, mainly of old walls, also a bridge. Associates recorded on masonry include Amblystegium serpens var. serpens, Radula complanata, Scorpiurium circinatum, Tortula muralis. A few records from rock substrates include serpentinite (on the coast and inland), granitic rocks (on cliff top) and apparently acidic gravestones. Records as epiphyte include several each from Elder, oak and Sycamore, three from Ash, and one each from elm and Tilia × vulgaris. Associates recorded on bark include Orthotrichum diaphanum, Zygodon conoideus. A single unusual record from old tarmac of a track in coastal heath.

Gemmee invariably present. Nine DTH records cfr, but capsules often scarce. capsules present 5 (two capsules); immature 1, 3, 8, 12 (in 12 with numerous capsules, at Cold Harbour); dehiscing 6 (single capsule); dehisced 2, 6 (single capsules), 8 (many capsules, Croft Pascoe).


Eight sites are now known in vc2. Z. rupestris can often be distinguished from Z. viridissimus in the field because it has a narrower leaf apex, but this is unreliable and records have only been accepted here based on microscopic study of the gemmae. In the past, Z. rupestris has apparently been over-recorded by lichenologists during surveys of parkland in Cornwall, since they report it much more often than Z. viridissimus through relying on field identifications.

There are only two recent Cornish records for which habitats have been recorded in detail: on trunk of large old oak in open deciduous woodland on bank of R. Tamar (with Zygodon viridissimus var. viridissimus); on trunk of tree in woodland edge near creek (W. of Lerryn).

Only recorded with foliar gemmae (which have colourless cell walls on DTH 01-11, brown on other specimen); not seen c.fr.
**Zygodon conoideus** (Dicks.) Hook. & Taylor var. *conoideus* S12
Temperate Oceanic element.


Often distinguishable in the field from *Z. viridissimus* by the wider, more shortly acuminate leaf apices, but virtually all my records of non-fertile plants have been confirmed microscopically by examination of the distinctive foliar gemmae. Identifications in the field relying on leaf stance risk errors, as do microscopic determinations based on cell size of the leaf lamina (although plants with most cells 12 μm or more wide are *Z. conoideus*). Var. *lingulatus* S.R.Edwards has distinctive rounded leaf apices and is known only from a single locality in Surrey. Although it was named as recently as 2000, all records from C&S seem safely referable to var. *conoideus*.

Habitat notes from C&S are as follows. It grows as low tufts or cushions, often among other mosses, mainly as an epiphyte but rarely also on rocks or masonry. Grows epiphytically mainly on base- or nutrient-rich bark of trunks and branches, preferring surfaces that are horizontal or inclined to those that are vertical, in unshaded to moderately shaded sites. Common on Elder, frequent on Ash, elm, Grey Willow, Hazel, Sycamore; seen once each on Blackthorn, Traveller's Joy (old stem in shade), young hybrid poplar, Wild Privet, willow (tree). Recorded in scrub and open woodland, Grey Willow carrs, and on isolated trees or saplings in sheltered places. Also found within flood-zone beside R. Tamar. Associates include *Cololejeunea minitissima*, *Cryphaea heteromalla*, *Frullania dilatata*, *Hypnum andoi*, *Leskea polycarpa*, *Metzgeria violacea*, *Metzgeria consanguinea*, *Microlejeunea ulicina*, *Orthotrichum affine*, *Orthotrichum diplanum*, *Radula complanata*, *Ulota bruchii*, *Ulota crispa*, *Ulota phyllantha*, *Zygodon viridissimus* var. *viridissimus*.

Unlike *Z. viridissimus*, this species mainly seems to avoid exposed coasts, occurring up to ca 500 m from coasts mainly in sheltered locations. However, several exceptions to this have been recorded from fairly sheltered locations, e.g. plentiful on old Elder at clifftop of east Lizard near Nare Point, on elms above cliffs S. of Coverack, on Sycamore on cliff above Maenporth, and on wall in elm scrub within 100 m of coast at Tregiffian Cliff.

Although the literature suggests *Z. conoideus* is exclusively an epiphyte in Britain (M.C.F. Proctor in Hill *et al.* 1994: 181), it has also been found rarely on masonry or rock in Cornwall, although only in small amounts: (1) among other mosses on vertical surface of a sheltered gravestone, (2) on side of granitic boulder at edge of pasture, (3) in patch of *Conocephalum conicum* on thin soil over unshaded gabbro on boulder near coast, (4) among other mosses (*Hypnum cupressiforme* var. *resupinatum*, *Rhynchostegium confertum*) on granitic boulder at base of 'hedge' bounding open patch of elm saplings on slope just above an exposed cliff, (5) on wall in coastal elm scrub, (6) with *Tortula muralis* on rock of low unshaded wall ca 150 m inland of exposed cliff-top (S. of Lizard town), (7) patch on low damp concrete of wall below reservoir dam. Unusual record also of a strong patch c.fr. on vertical upholstery of an old car-seat dumped at edge of scrub.

As noted above, mainly recorded when axillary/foliar gemmae seen, but these appear to be invariably present and often abundant. Frequently c.fr.: capsules immature 1-4, 10-12;
dehiscing 4, 5; dehisced [1-3 old], 4-6, 8 [10-12 old]. Male plants with mature antheridia: 3, 10, 11.

100.1 *Orthotrichum lyellii* Hook. & Taylor
Temperate Suboceanic element.

*2*: Wenford in the Camel valley, 1891, RVT (B) (Paton 1969a: 741).

[Atlas 3: 188 gives record from Scilly (SV91), but Paton MS. discounts 'St Mary's, Read' record].

Grows on steep or vertical bark. Most Cornish records are of small patches but at least twice of larger patches on old trees (patchily over up to 1.5 m top to bottom). Seven records in vc1: on trunk of old Ash tree at edge of pasture, on trunks of Grey Willows in carrs and at edge of deciduous grove, in scrub on old mining ground and at upper edge of inundation zones beside reservoir, and on horizontal branch of Hazel in edge of woodland above creek. Most sites were partly but not heavily shaded. In vc2: three times on Grey Willows in scrub, once on large oak near R. Tamar, once on Sycamore in open woodland near stream, once on Wych Elm. Associates recorded: *Cololejeunea minutissima, Frullania dilatata, Hypnum cupressiforme var. resupinatum, Orthotrichum affine, Ulota phyllantha*.

Foliar gemmae apparently always present. Not seen c.fr.

100.2 *Orthotrichum striatum* Hedw.
Boreo-temperate European element.

*2*: Withiel, 1870, RVT (B) (Paton 1969a: 741). This record is older than that listed as new for vc2 by Warburg (1961: 167).

Most records were of small cushions or patches on tree bark, usually with no other patch nearby. Mainly recorded on Grey Willow, few records on Hazel, Ash saplings, and once each on elm sapling, hybrid poplar sapling, Sycamore and on *Salix caprea*. Recorded from sheltered locations which were not heavily shaded, e.g. in scrub at edge of dunes, in open scrub near stream, and in open grove of deciduous trees on side of small valley. Two records on banks of R Tamar on steep, silted bark within flood-zone. Associates recorded are *Frullania dilatata, Homalothecium sericeum Orthotrichum affine, Ulota bruchii*. Two records from old masonry: on mortared stonework of top of bridge and a small patch on old horizontal concrete at edge of deciduous woodland. Single record from granitic boulder lightly shaded by edge of Grey Willow scrub beside china-clay pit (JAP had single record on serpentinite).

All records c.fr. [only identified with large capsules]: capsules immature 1-5, 9-12; dehiscing 1-3, 5, 12; dehisced [1 old], 3, 5, 6, 8-12.
Orthotrichum affine Schrad. ex Brid.

Boreo-temperate European element.

*S12*

100.5 *Orthotrichum affine* Schrad. ex Brid.

**Habitat Notes**

Mainly an epiphyte, preferring bark that is nutrient-rich and basic or circumneutral; very common on Elder; common on Ash, Grey Willow and Sycamore; fewer records on Alder, Apple, Beech, Blackthorn, Buddleja, *Cortaderia*, elms, Garden Privet, Gorse, Hawthorn, Hazel, Pedunculate Oak, *Picea abies* (dead twigs), *Salix caprea*, Sessile Oak, Wild Cherry, hybrid poplar. Twice on decorticated wood of fences. Prefers trees or shrubs in sheltered or waterside sites and avoids those in very heavy shade e.g. inside woodland. Frequently on silted bark within river flood-zones, but usually higher above water-level than most *Orthotrichum rivulare*; also in upper edge of reservoir inundation zones. Prefers bark of trunks or branches that are horizontal or inclined to those that are vertical and often in knot-holes or other irregularities. Detailed studies of colonisation of an old Elder at Porkellis Moor showed new twigs first colonised in second year, but that it doesn't grow large enough to bear capsules until twigs about six years old; by their tenth year it may be replaced by pleurocarpous mosses.

Common associates include *Amblystegium serpens* var. *serpens*, *Brachythecium rutabulum*, *Cololejeunea minutissima*, *Cryphaea heteromalla*, *Frullania dilatata*, *Hypnum andoi*, *Hypnum cupressiforme* var. *resupinatum*, *Lejeunea ulicina*, *Metzgeria consanguinea*, *M. furcata*, *M. violacea*, *Orthotrichum diaphanum*, *Orthotrichum pulchellum*, *Rhynchostegium confertum*, *Ulota bruchii*, *U. crispa*, *U. phylantha*, *Zygodon conoideus*, *Zygodon viridissimus* var. *viridissimus* and various lichens; scarcer associates include *Orthotrichum tenellum*, *Radula complanata*.

Occasional records of occurrence (mainly in small quantity) on rocks or masonry, including concrete (nine records: fence-posts in sheltered places; bridge parapets, blocks of masonry debris on ground in woodland, on china clay spoil and in sheltered quarry, pipe above stream), slaty rock (one record, shaded on bridge parapet under trees) and granite (at least ten records: in open and partly shaded by bushes or trees, on blocks, boulders and grave surrounds). Single records on top of mortared stone wall, on asbestos-cement of old shed and on partly shaded boulder probably of serpentinite.

Commonly c.fr. [only recorded with capsules]: capsules immature 1-7 (8), 10-12; dehiscing [2 exceptional] (5 few) 6-9 [10, 11]; dehisced [old 1-6], 7-12.

100.6 *Orthotrichum rupestre* Schleich. ex Schwägr.

Boreo-temperate European element.

*S12*

100.6 *Orthotrichum rupestre* Schleich. ex Schwägr.

Boreo-temperate European element.

**Habitat Notes**

Known from single locality in Cornwall. In 1996 still present and c.fr. (capsules very immature) in rather small quantity at single place (*DTH* 96-398), on steep slaty rock high on unshaded wall in farmyard.


*2: Tregawn, Withiel, 1879, RVT (B) (Paton 1969a: 741).
Orthotrichum anomalum Hedw.

Wide-temperate European element.

*2: Burnier, Bodieve near Egloshayle, 1877, RVT (B) (Paton 1969a: 741).

Notes on habitats in C&S are as follows. Records nearly all from unshaded calcareous masonry, especially old concrete or mortared walls, growing on horizontal, inclined or vertical surfaces, e.g. on ruins of mine buildings and china-clay dries, old retaining wall, disused sewage works, disused railway station platform, modern reservoir dam, grave stones and grave edges, bridges, on foot-bridge, horizontal concrete, concrete blocks among dumped masonry, twice on concrete fence-posts. Also on old mortar, e.g. on church walls, a railway bridge and bridge over stream. Single records from a slate roof (plentiful), an asbestos-cement roof (plentiful), and from low natural outcrop of serpentinite on unshaded top of sea-cliff. Atypical records include one of it growing partly shaded on horizontal flat concrete of wall top at edge of Sessile Oak woodland (S. of Gweek), and in small quantity on old tarmac of edge of track in rather exposed coastal heathland (near Porthgwarra). Common associates include Barbula convoluta (both vars.), Didymodon luridus, Didymodon rigidulus, Grimmia pulvinata, Orthotrichum diaphanum, Schistidium crassipilum, Syntrichia montana, Tortula muralis, Zygodon virisissimus var. viridissimus; scarcer associates include Bryum argenteum, Orthotrichum affine, O. cupulatum, Syntrichia laevipila, Syntrichia latifolia.

Commonly c.fr. [only recorded with capsules]: capsules immature 1-5 (6), 10, 12; dehiscing 4-7; dehisced [old 3], 4-11.

Orthotrichum cupulatum Brid.
(syn. O. cupulatum var. riparium Huebener). Temperate Eurosiberian element.

*1: On mortar between blocks of horizontal slaty rock of grave in churchyard, unshaded, churchyard at Kea, SW84, 1994, DTH 94-212 (BBSUK, DTH) (Blockeel 1996: 47).

Var. riparium is ‘most likely an environmental modification not worthy of any taxonomic status’ (J. Lewinsky-Haapasaaari in Nyholm 1998: 398).

Unrecorded by Paton (1969a), but now too many records for it to be regarded as LS. Records all from old calcareous masonry (old concrete or old mortar), of wall, ruins, retaining wall, grave-surround, grave-cover, churchyard path, concrete block, old mine-structure and bridges e.g. over railways. Found on horizontal, gently inclined and steeply inclined substrates, all records being from unshaded places. Associates recorded include Grimmia pulvinata, Orthotrichum anomalum, Schistidium crassipilum, Tortula muralis; also near Grimmia trichophylla s. str., Homalothecium sericeum.

Probably commonly c.fr. [only recorded with capsules]: capsules immature 1-5; dehiscing 4-6; dehisced [1 old], 5, 6, 10.
100.11 **Orthotrichum rivulare** Turner
Temperate Suboceanic element.

*2: R. Camel, Bodmin, 1878, RVT (B) (Paton 1969a: 741).


Grows as scattered plants or small patches, tending to trail as short wefts when large. On silted or almost unsilted, steep to horizontal bark of trunks, low branches and exposed roots of trees and shrubs (Alder, Ash, Hawthorn, Hazel, Sycamore) within flood-zone of R. Tamar, typically 0.5-1.5 (to 2.5) m above summer water-levels, where often partly shaded. Associates recorded include *Leskea polycarpa, Orthotrichum affine, Orthotrichum sprucei*, rarely *Dendrocyphaea lamyana*. Also in similar habitat beside Lowley Brook near Penscombe.

Commonly c.fr. Capsules immature: 1-3, 5; dehisced [1, 2, 3, 5 old] 8, 10.

100.12 **Orthotrichum sprucei** Mont.
Temperate Oceanic element.


Grows as scattered stems or low open lawns. Seen only in a few sites beside R. Tamar, on steep silted bark of riverside trees rather low within its flood-zone. Recorded on Alder and Sycamore. Associates recorded include *Leskea polycarpa, Metzgeria furcata, Orthotrichum rivulare*.


[100.13 **Orthotrichum stramineum** Hornsch. ex Brid. – Old records from vc1 deleted because erroneous or unsupported by specimens (Paton 1969a: 742, Crundwell 1970: 207)].

100.14 **Orthotrichum tenellum** Bruch ex Brid.
Mediterranean-Atlantic Suboceanic element.

*1: Miney, Newlyn, 1863, WC (PNZ) (Paton 1969a: 742). This record is older than that published as new for vc1 by Warburg (1962: 371).


Apparently somewhat under-recorded in Cornwall in past, probably due to its small size, frequent occurrence in small quantities and similarity to *O. affine*. Indeed, the species is easily overlooked among small plants of the commoner *O. affine*, from which material collected when moist needs microscopic confirmation through demonstration of the cryptopore stomata on capsules. However, dry plants can often be distinguished in the field by the old capsules being distinctly narrower and darker coloured than those of *O. affine*. 

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Notes on habitats in Cornwall are as follows. Normally as an epiphyte, with most records from Elders, several on Ash, Grey Willow and Sycamores, once on elms. Perhaps prefers sheltered sites and often near water, but also found in an open site on flat dry ground. Once in scrub above sea cliff (Maenporth). Like other Orthotrichaceae, it avoids really heavy shade such as inside dense woodland, and it appears to prefer horizontal or sloping trunks or branches to vertical ones, but recorded at times on vertical trunks in moderate shade. Associates recorded include Cryphearta heteromalla, Frullania dilatata, Orthotrichum affine, Orthotrichum diaphanum, Ulota phyllantha, Zygodon conoideus, Zygodon viridissimus var. viridissimus. Recorded on bark within flood-zone of R. Tamar. Single record of several small patches (cfr) on large granitic boulder at edge of pasture, lightly shaded by Common Nettle (same boulder had Cryphearta heteromalla, Orthotrichum affine, etc.).

Commonly c.fr. [only recorded with capsules]: capsules immature 1-7, 11; dehiscing 6-8, 10; dehisced [1-7 old], 9-11.

[100.15 Orthotrichum pallens Bruch ex Brid. – Old records discounted because unsupported by specimens (vc1 and vc2) or errors (vc1) (Paton 1969a: 742)].

100.17 Orthotrichum diaphanum Schrad. ex Brid. S12
Southern-temperate European element.

*2: Bodmin, before 1907, RVT (B) (Paton 1969a: 742).

Notes on habitats in C&S are as follows. Common both as an epiphyte and on rock or masonry. As epiphyte, commonest on Elder, frequent on Alder, Ash, Grey Willow, Sycamore; few records from Apple, Blackthorn, Buddleja, Cortaderia, Cupressus macrocarpa, elms, Gorse, hybrid poplars, oak, Traveller's Joy, White Willow. Like other Orthotrichum, epiphytic plants prefer bark of horizontal or inclined branches or trunks to that on vertical ones, and they avoid sites with heavy shade year-round (although tolerating considerable shade in summer). Commoner overall than any of its congeners, and often found in more exposed places than those tolerated by O. affine or O. pulchellum (e.g. on bushes on hillsides, and on bushes on tops of exposed sea-cliffs). Frequent in areas of arable agriculture, even occurring on Elders in hedgerows between arable fields where high nutrient levels apparently exclude all other epiphytic bryophytes. Also frequent on silted bark within flood-zone of R. Tamar and large streams and recorded at upper edge of inundation zone beside Stithians Reservoir.

Also common on dry calcareous masonry (old and not so old concrete and mortar), including walls, ruins, bridges, graves, concrete fence-posts, a reservoir dam, masonry debris, etc., where it grows on horizontal, vertical or inclined surfaces, in unshaded or partly shaded places. Few records also from serpentinite (natural boulders, on heath and by pool), gabbro (natural boulder close to coast), a gravestone and cliff bases of acidic rock, and several on granite boulders or granite in walls. Unusual records also on old tarmac of edge of tracks on coastal heaths (two records, both cfr) and on thin hard soil and concrete dried onto metal of farm roller parked at edge of field (many tufts, cfr).
Associates when growing as an epiphyte are essentially those listed as associates for *O. affine*; including *Cololejeunea minutissima*, *Cryphaea heteromalla*, *Orthotrichum tenellum*, *Syntichia laevipila*, *Ulota phyllantha*, *Zygodon conoideus*, *Zygodon viridissimus* var. *viridissimus*; also a record with *Syntichia papillosa*. Associates when growing on concrete or mortar are much like those listed for *O. anomalum*, including *Schistidium crassipilum*, *Syntichia montana*, *Syntichia laevipila*, *Tortula muralis*.

Foliar gemmae frequent, often present in abundance. Commonly c.fr. [but differing from other *Orthotrichum* in that young plants of this species were often recorded without capsules]: capsules immature 1-12; dehiscing 1-11; dehisced 1-12.

100.18 *Orthotrichum pulchellum* Brunt.
Temperate Oceanic element.

*1*: Trefusis, Falmouth, 1845, EAW (TRU) (Paton 1969a: 742).
*2*: Near Helman Tor, 1891, RVT (B) (Paton 1969a: 742).

Usually grows in small cushions, occasionally forming large patches. Notes on habitats in Cornwall are as follows. Normally only seen as an epiphyte: commonest on Elder and Grey Willow, frequent on Blackthorn, Hazel, Sycamore; fewer records on Alder, Ash, elm, Gorse, Sessile Oak, Traveller's Joy; once each on *Cortaderia*, *Cotoneaster integrifolius*, *Picea abies* (dead twigs), Rowan and Wild Privet. Almost always in sheltered, moist places such as carr of Grey Willow, other damp scrub or deciduous woodland, but avoiding sites that are really heavily shaded. Occurs on vertical, inclined and horizontal bark of trunks and branches, from near ground-level to over 2 m above it, sometimes on twigs in humid locations. Often growing as just a few small patches that are easily overlooked among other epiphytic mosses, but occasionally forming large patches (once in patches up to 15 cm long on a sheltered Elder). Frequent on bark within flood-zone of R. Tamar and occasional in upper part of inundation-zone of reservoirs. Sometimes an early colonist in scrub, e.g. around china clay quarries.

Unusual record of small patch growing on stem of *Cryphaea heteromalla* that was itself epiphytic on a small branch of an Elder in stream-side scrub near Lavrean. Single record of well-grown, fertile patch on vertical side of granite boulder under Grey Willows but near track in working china-clay quarry that produces much dust. Another record c.fr. on horizontal top of granitic boulder slightly shaded by Sycamores; once on granite block by stream; another record on granite of bridge parapet in light shade; also a single small patch c.fr. on granite boulder in open high on Rough Tor. Several patches on a concrete fence post near old quarry.

Common associates include *Brachythecium rutabulum* (sparse growths), *Cololejeunea minutissima*, *Cryphaea heteromalla*, *Frullania dilatata*, *Hypnum andoi*, *H. cupressiforme* var. *resupinatum*, *Microlejeunea ulicina*, *Metzgeria consanguinea*, *M. furcata*, *M. violacea*, *Orthotrichum affine*, *O. diaphanum*, *Ulota bruchii*, *U. crispa*, *U. phyllantha*; less common associates include *Orthotrichum tenellum*.

Commonly c.fr. [only recorded with capsules]: capsules immature 1-5 [7], 10-12; dehiscing 3-6 [7]; dehisced [old 1-4], 3-12.
101.3 **Ulota crispa** (Hedw.) Brid. *s. str.*
(syn. **U. crispula** Brid.). Temperate European element.

1st vice-county records presumably referable to this form:
*2*: Treliggon near Lanivet, 1872, RVT (B) (Paton 1969a: 742).

Smith & Proctor (1993; revising Smith & Hill 1975) and Garilleti *et al.* (2000) argued that 101.3 and 101.4 should be regarded as distinct spp. They can be distinguished with absolute reliability only using rather subtle characters of capsule mouth areolation combined with careful microscopic study (ideally SEM study) of peristome ornamentation. This was carried out only for occasional samples of Cornish specimens, but the results indicated that few errors will have been involved in routinely distinguishing *U. bruchii* from *U. crispa s. str.* during the present study by shape of [moderately] old, empty capsules: narrowest at mouth in *U. bruchii*, contracted below mouth in *U. crispa s. str.* These differences in shape of mature but empty capsules were used to separate the taxa by JAP in the 1960s. Since both forms currently regarded as species are widespread in Cornwall, older records are therefore assigned to them even though a few errors may be involved.

During the present study field determinations were made only on completely dry plants; others were collected and checked after they were dried. Most material in good condition was readily assigned to a capsule shape category, and most of that identified as *U. bruchii* was larger and had the dried leaves less crisped than in *U. crispa s. str.* *U. bruchii* also tended to have capsules maturing from autumn to spring, whereas most capsules of *U. crispa s. str.* matured in summer, although there appeared to be some overlap in seasons in the autumn, and several records of ‘out of season’ sporophytes of both species.

The *U. crispa s. l.* category is reserved for published records assigned only to the group and to recent records of plants lacking mature, empty capsules (or with only very old ones). Several records referred only to *U. crispa s. l.* were of small patches at coastal locations, from which both *U. bruchii* and *Ulota crispa s. str.* are usually absent (e.g. small tuft c.fr. on Blackthorn on slope above cliffs near Chynhalls Point).

Notes on habitats of *U. crispa s. str* in Cornwall are as follows. Usually as epiphyte, growing in cushions or small patches, on bark of trunks, branches and sometimes larger twigs of variety of trees and shrubs, extending high above ground in sheltered locations, occurring in woodland, scrub, carr and groves of trees, or sometimes on isolated trees. Frequent or numerous records from Ash, Grey Willow, Hazel, Sessile Oak, Sycamore; few each on Alder, Beech, Blackthorn, Bramble (dead stem in scrub), Turkey Oak. Occurs both in well insolated and rather shady sites, including some inside Grey Willow carrs or open woodland that are well shaded in summer. One record of single cushion on vertical, granitic rock of grave surround in old churchyard, where sheltered but almost unshaded. Commonly grows close to *U. bruchii*, often within centimetres of it on same branch, or even touching it. Other associates include *Cryphaea heteromalla*, *Frullania dilatata*, *Microlejeunea ulicina*, *Metzgeria furcata*, *M. violacea*, *Orthotrichum affine*, *Zygodon conoideus*.

Commonly c.fr. [only recorded when mature or old capsules present]: capsules immature 1-12; dehiscing [1, 4] 5-12 (mainly 6-8 ??); dehisced [old 1-7], 6-12.


*2*: Dunmere Wood, Bodmin, 1891, RVT (B) (Paton 1969a: 742).

See notes under *U. crispa* s. str. above.

Notes on habitats in C&S are as follows. Usually grows as epiphyte, on bark of trunks, branches and twigs of varied trees and shrubs, in woodlands, scrub, carrs, or less often small groves or isolated trees. Commonly grows high above ground, especially in sheltered locations. Many records from Grey Willow (the commonest phorophyte), Hazel, Sessile Oak, Sycamore; moderate numbers from Ash, Blackthorn, Elder, elms; few each on Alder, Beech, Bramble (dead stems in sheltered site), Gorse (in tall scrub), Hawthorn, Honeysuckle (on an old stem), larch (twigs), Rhododendron, Turkey Oak. Once each on *Cortaderia*, *Picea abies* (dead twigs), *Pinus contorta* and on *Styrax hemslyana* tree at Trengwainton Garden. One record of a little on a node of a stem in a clump of bamboos (Carwinion) probably referable to this form rather than *U. crispa* s. str. Single record on silted bark within flood-zone on riverside Alder. Also occasionally in upper part of inundation-zone of reservoirs. It prefers horizontal or inclined branches and trunks to vertical ones and is commonest in sheltered places; occurs on twigs in humid sites. Although often in moderate shade (especially in summer), it avoids really heavily shaded sites. Commonly occurs close to *U. crispa* s. str. (q.v.), even on the same branch, but overall tends to be commoner than that species. No differences were apparent in their choices of host trees or their occurrence in woodland or scrub sites of differing ages or ecological types. Associates recorded commonly include *Frullania dilatata*, *Hypnum andoi*, *Hypnum cupressiforme* var. *resupinatum*, *Metzgeria violacea*, *Metzgeria furcata*, *Microlejeunea ulicina*, *Orthotrichum affine*, *Ulota crispa*, *Ulota phyllantha*.

Three records of small amounts on granitic rocks in sheltered sites under trees or Grey Willow. Single record (patch cfr) on exposed granite boulder on slope at edge of working china clay quarry.

Commonly c.fr. [only recorded when mature or old capsules present]: capsules immature 1-12; dehiscing 1-4, [5, 8, exceptional], 9-12 (mainly 10-3); dehisced [old 4, 7] 1-12.

101.5 *Ulota calvescens* Wilson

Southern-temperate Oceanic element.

*1*: On branch of *Salix cinerea* in Grey Willow carr, Penhale camp, E. edge, SW75, 2000, DTH 00-423 (BBSUK, DTH) (Rothero 2001: 45).

Two records, as follows. Single tuft at Penhale Camp: on branch of *Salix cinerea* in tall carr of that species, close to *U. crispa*, *U. bruchii* and *U. phyllantha*. It may be significant that this area has soils of calcareous dune-sand since in other regions *U. calvescens* appears to be commonest over limestone, e.g. in western Ireland. Single tuft: NW. of Lamorna: ca 1.5 m above ground on branch of large *Salix cinerea* bush in partly cleared area (with lichens).
Only recorded c.fr.: capsules immature 4, 7, dehisced (old) 4, 7.

101.6 *Ulota hutchinsiae* (Sm.) Hammar
Boreal-montane Suboceanic element.


Probably now extinct in Cornwall, the only other record being from 1906 (SX17P, Brown Willy, 1906, Holmes (Paton 1969a: 742, MS.: 266)).

101.7 *Ulota phyllantha* Brid.
Boreo-temperate Oceanic element.

*2: Halgavor Moor near Bodmin, 1900, RVT (B) (Paton 1969a: 742).

Grows as small tufts or cushions, or increases to form extensive and rather dense patches. Notes on habitats in C&S are as follows. Generally much commoner near coasts than inland, apparently because it tolerates salt-spray better than most epiphytes or saxicolous mosses, becoming comparatively much scarcer and usually occurring only in small quantity far inland, especially in vc2. Occurs mainly as an epiphyte over most of Cornwall where much less common on rocks or masonry, but common on rocks on exposed coasts of the Isles of Scilly and Land's End peninsula.

Epiphytic on bark of shrubs and trees of many kinds including Alder, Apple, Ash, Grey Willow, Elder, elms, Gorse, Hawthorn, Hazel, Pedunculate Oak, Sessile Oak, Sycamore, less often hybrid poplar, Holm Oak; a few records on Blackthorn, two on Garden Privet, one each on Broom, *Cortaderia, Cotoneaster* (tree), *Euonymus japonicus* (St Mary's), Honeysuckle, ivy (itself an epiphyte), *Picea abies* (dead twigs), *Pinus contorta, Pittosporum crassifolium* (which mainly lacks epiphytes), Silver Birch, Sitka Spruce, *Styrax hemslyana* (Trengwainton Gardens), Sweet Chestnut, Tamarisk, *Tilia x vulgaris*, White Willow. Grows in wide range of situations where there are shrubs or trees, including scrub, woodland and its edges, Grey Willow carr, isolated trees, and in groves or scrub above sea-cliffs. Often very common and the predominant epiphyte on bark of branches and upper trunks in exposed coastal locations, where it is the commonest of the Orthotrichaceae and occurs on many types of trees including oaks, apparently without any strong preferences for different phorophyte species. Also occurs on twigs in humid sites. Further inland it generally occurs in smaller amounts and is more restricted to bark that is nutrient-rich (e.g. of Elder, Sycamore), or of moderate nutrient-status (Grey Willow), occurring less often on oaks. Inland it also shows a clear preference for horizontal or inclined trunks and branches to those that are vertical, and avoids heavy shade. Frequent on bark within flood-zone of R. Tamar, several times seen within inundation-zone of streams, and also occurs in upper part of inundation zones beside reservoirs.
Records from rocks mainly on granitic types but also on gabbro, serpentinite and slates.

Often on very exposed rocks on coasts (e.g. in open on top of sea-cliffs) as well as in sheltered sites, but inland occurrences on rocks are mostly in humid, sheltered places (e.g. streamsides under trees, grave surrounds shaded by churchyard trees, on partly shaded stone gateposts), but also e.g. on boulders at edge of pasture inland, under incomplete cover of trees, or near tors. Occasionally seen on masonry, including dry-stone walls, rocks in 'hedges' and once the mortared-stone wall of a bridge. Atypical records (each of them of a single small patch) on unshaded edge of tarmac of track across coastal heath and on soil in arable field (latter fide CDP). An unusual record of substantial patches on thick roots exposed in remains of Armeria maritima tussocks on lip of steep, low bank on slope above sea-cliffs, unshaded but N.-facing (W. of Sennen Cove).

Common associates when growing as epiphyte include Cololejeunea minutissima, Cryphaea heteromalla, Frullania dilatata, Hypnum andoi, Hypnum cupressiforme var. resupinatum, Metzgeria violacea, Metzgeria furcata, Neckera pumila, Orthotrichum affine, Orthotrichum diaphanum, Orthotrichum pulchellum, Orthotrichum tenellum, Ulota bruchii, Ulota crispa, Zygodon conoideus, Zygodon viridissimus var. viridissimus, others include Microlejeunea ulicina, Orthotrichum lyellii, Syntrichia laevipila, rarely Syntrichia papillosa. Associates on rock include Hypnum cupressiforme var. resupinatum and Ramalina and other lichens.

Gemae at tips of leaves usually present (although perhaps lost seasonally, or in heavy rain) (none seen 7, 9, 11, 12; very immature gemmae on almost concealed leaf tips 1, 11, 12; exposed obvious gemmae 1-7, 12; many gemmae lost already 2, 5, 6, 8-11). Not seen cfr; sporophytes unrecorded in Cornwall and very rare throughout British Isles (M.C.F. Proctor in Hill et al. 1994: 206).

102.2 **Hedwiga stellata** Hedenäs
Temperate European element.

First vice-county records for *H. ciliata* (Hedw.) P.Beauv. *s. l.:
*2: Helman Tor, 1888, RVT (B) (Paton 1969a: 743).

First vice-county records for *H. stellata*:
+2: On exposed boulder of granitic rock, Rough Tor, Bodmin Moor, SX18, 1993, DTH 93-149B (BBSUK, DTH) (Blockeel 1997: 45).

This was described as a species distinct from *H. ciliata* (Hedw.) P.Beauv. by Hedenäs (1994). British records of the group were revised by Crundwell (1995; cf. Blockeel 1996: 47). Although only *H. stellata* has been confirmed in Cornwall, *H. ciliata* (Hedw.) P.Beauv. *s. str. might also occur although if so it must be rare. Older records are listed are listed as *H. ciliata* *s. l. unless specimens have been revised more recently.

Grows as patches or mats, less often longer wefts. Notes on habitats in Cornwall are as follows. On surfaces mainly of granitic rock (but also gabbro), most often where horizontal to moderate sloping (less often on vertical surfaces) with incomplete vegetation cover and
unshaded (but sometimes partly shaded), mainly avoiding very exposed places. Sites include outcrops such as tors, rocks and boulders in heathland and on hillsides with acidic grassland, old quarries and their spoil, rock in ‘hedges’ and Riverside boulders (just above normal flood-zone). Close associates often include *Andreaea rothii, Dicranoweisia cirrata, Grimmia trichophylla, Racomitrium heterostichum*, lichens; others recorded include *Ceratodon purpureus*.

Frequently c.fr.: capsules immature 1, 4, [11 tiny], 12; dehiscing 5, 7; dehisced 5, 7-9, 11, 12.

104.1  *Plagiopus oederianus* (Sw.) H.A.Crum & L.E.Anderson  
*NS*  
[1]  
(syn. *P. oederi* (Brid.) Limpr.). Boreo-arctic montane Circumpolar element.


The species is locally distributed in Britain from W. Gloucestershire and S. Wales northwards. There is only this single old record from Cornwall, where its occurrence seems surprising because it is widely disjunct from the main area of its distribution and unusual in apparently being from a coastal site with base-poor granitic rock, whereas the species is mainly a basiphile of hilly or montane regions inland (T.L. Blockeel in Hill *et al.* 1994, Dierssen 2001, Hill *et al.* 2007). However, some of the other nineteenth-century bryophyte specimens labelled as from 'near Land's End' apparently came from large areas of the Land's End peninsula from Penzance westwards, including areas with slaty rocks, not just from the exposed granitic headland (in SW32M) that gives its name to the region. The record is not mapped because of uncertainty about its provenance, even to the hectad.

105.2  *Bartramia pomiformis* Hedw.  
Boreo-temperate Circumpolar element.

*1*: Flushing near Falmouth, 1840, EAW (TRU) (Paton 1969a: 739).  

Grows mainly as scattered plants and small tufts or patches or partly intermixed with other mosses. Notes on habitats in Cornwall are as follows. On steep to near-vertical soil (acidic, free-draining and often loamy, friable, or partly bare), mainly on laneside banks and on Cornish hedges. One record from thin soil over granite rock of a tor. Its sites vary from unshaded to moderately shaded or well shaded by herbs or deciduous trees. Associates include various other mosses with records of *Dicranella heteromalla, Fissidens bryoides var. bryoides, Mnium hornum, Pogonatum aloides, Pseudotaxiphyllum elegans, Conocephalum conicum*.

Frequently or commonly c.fr.: capsules immature 1, 3-5; dehisced 3 (old), 9-12.
105.3  *Bartramia ithyphylla* Brid.  
Boreo-arctic montane Circumpolar element.  


This is the only record from Cornwall.

107.1  *Philonotis rigida* Brid.  
Mediterranean-Atlantic Oceanic element.

*1: Cave near Mousehole, 1842, WC (OXF) (Paton 1969a: 739).  

Habitats in vc1 were described as follows. Portheras Cove: patches low on N.-facing sea-cliff, beneath small overhangs and in crevices of flushed rocks. Porthmeor Cove: locally plentiful, on granitic rock and gritty detritus on base of N.-facing sea-cliff, on horizontal, or more typically steep or vertical surfaces, always where flushed with water, often in crevices. Associated with *Bryum pseudotriquetrum, Cratoneuron filicinum, Didymodon tophaceus, Sagina procumbens, Samolus valerandi*; occasionally *Philonotis fontana*.

Two records c.fr.: capsules immature 5, 7 (few, large).

107.3  *Philonotis arnellii* Husn.  
(syn. *P. capillaris* auct. non Lindb.). Temperate European element.


Grows as small patches or scattered stems. Notes on habitats in Cornwall are as follows. Enys: few stems in carpet of low bryophytes at edge of old gravel track; unshaded. N.of Treen: bit in open wet patch of soil at edge of small ditch dug into flush above sea-cliff (with *Bryum sauteri, Trichodon cylindricus*). W. of Carbis Bay: small patch on thin compressed soil among stones on path near old mining area, almost unshaded. S. of Millook: on soil beside edge of track, partly shaded by trees. Other records: on damp partly bare compressed soil of tracks in heathy area and in spruce plantation, in open or lightly shaded (near *Archidium alternifolium*); thin soil on vertical granite of low rocks on path through open deciduous woodland on slope above river.

Not seen c.fr.
107.4 *Philonotis caespitosa* Jur.
Boreo-temperate Circumpolar element.

*2*: St Clether's Well near Tresmeer, 1901, CEL (*NMW*) (Paton 1969a: 740). This record is older than that published as new for vc2 by Warburg (1962: 372).

Although sometimes difficult to distinguish from forms of *Philonotis fontana* and hybrids may occur, detailed studies suggest *P. caespitosa* is best regarded as a distinct species (Buryová 2004; Blanka Shaw pers. comm.). In the present study material placed as this taxon was small and had leaves of mature growth (from low on stems or among tomentum of rhizoids) that lacked plicae in the base, had non-recurved margin with single teeth, and cells rectangular throughout leaf and not much larger in its basal part. However, intermediates apparently occur that cannot be dismissed as just poorly grown *P. fontana*.

Grows as scattered stems or small patches (lawns). Notes on habitats in Cornwall are as follows. Small amounts on damp or wet soil at edges of tracks, unshaded or almost unshaded, e.g. beside an old wet track through Grey Willow carr. Plentiful in a damp grass ley near Retire Common, with *Brachythecium mildeanum*, *Brachythecium rutabulum*, *Oxyrrhynchium hians*, *Kindbergia praelonga*, *Phaeoceros laevis*. On wet soil of low earthy hummocks in open acidic flush (with *Fossombronia wondraczekii*). In small quantity on stony sediment in upper part of inundation-zone beside Cargenwen Reservoir, amongst sparse low vegetation (with *Archidium alternifolium*, *Chamaemelum nobile*).

Not seen c.fr.

107.5 *Philonotis fontana* (Hedw.) Brid.
Wide-temperate Circumpolar element.


See account of *P. caespitosa* for notes on occurrence of plants intermediate between *P. fontana* and that species.

Grows as tufts or patches that may be extensive and pure, forming low lawns. Notes on habitats in Cornwall are as follows. Characteristically in damp or wet places (often at edge of shallow trickling water) with slight to moderate base enrichment, on soil (often humic, peaty, or clayey, or among gravel) or in thin soil accumulations on rock (granitic, slaty, horizontal to vertical; occasionally on concrete or old crumbling tarmac). Most sites are open or only lightly shaded, less often in moderate shade (once in rather heavy shade in deciduous woodland). Habitat types in which it occurs are most commonly flushes (often apparently acidic, on moorland, wet heathland, cliff-slopes or in poor pastures, less often in open deciduous woodland), gravelly or rocky tracks (e.g. across heaths or moorland), roadside verges, ditches, beside streams, in old mine areas, granite quarries and their spoil, clay-pits, around old china-clay 'dries' and on newer concrete in china-clay works, damp china-clay spoil, with single records from a disused railway cutting, a woodland clearing, moist peat of heathland on the Lizard, on a rock emergent from a stream and tarmac of a sheltered lane. An unusual record was of a patch in a wheat stubble field (CDP). Associates
recorded include *Aneura pinguis*, *Archidium alternifolium*, *Brachythecium rivulare*, *Bryum alpinum*, *Bryum pellens*, *Bryum pseudotriquetrum*, *Calliergonella cuspidata*, *Chiloscyphus pallescens*, *Trichodon cylindricus*, *Fossombronia incurva*, *Pellia neesiana*, *Pohlia annotina*, *Pohlia melanodon*, *Pohlia wahlenbergii* var. *wahlenbergii*, *Platyhypnidium riparioides*, *Riccardia chamedryfolia*, *Riccia sorocarpa*; *Equisetum palustre*, *Eriophorum angustifolium*, *Juncus effusus*, *Molinia caerulea*.

One record cfr, capsules immature 6.

107.8 *Philonotis calcaria* (Bruch & Schimp.) Schimp.  LS  2 Boreo-temperate European element.


A calciphile species that is rare in Cornwall, possibly now extinct.

108.1 *Breutelia chrysocoma* (Hedw.) Lindb.  12 Temperate Hyperoceanic element.


Grows as lawns of erect stems or amongst other plants. The few recent Cornish records were in unshaded sites in or at edges of acidic mires, on wet heathland and in similar situations on hummocks in two open acidic flushes. Also in a runnel between *Molinia caerulea* tussocks in spring-fed mesotrophic mire, unshaded. Close associates include *Molinia caerulea*, also near *Calluna vulgaris*, *Erica tetralix*, *Myrica gale*, *Schoenus nigricans* and bryophytes including *Calliergonella cuspidata*, *Calypogeia fissa*, *Hypnum jutlandicum*, *Sphagnum capillifolium*, *Sphagnum subnitens*.

Not seen c.fr.

[109.1 *Plagiobryum zierii* (Hedw.) Lindb.: vc1 records dismissed because no specimens located (Paton 1969a: 734, Crundwell 1970: 204)].


Three DTH records were from old mining ground in Camborne-Redruth region of vc1, on unshaded damp soil in area of old mine-spoil, on stony soil at path edge and on unshaded soil on stony track. Associates include *Bryum dichotomum*.

Only recorded non-fertile, but once with plentiful axillary bulbils/deciduous branchlets.
[110.2 *Anomobryum concinnatum* (Spruce) Lindb. (syn. *A. julaceum* var. *concinnatum* (Spruce) J.E.Zetterst.) – A doubtful old record from vc1 was discounted by Paton (1969a: 734)].

[111.3 *Bryum calophyllum* R.Br. – Vc1 record (Marazion Marsh, 1921, leg. Watson, in Rilstone 1926) was dismissed because no specimen was located (Paton 1969a: 734, Crundwell 1970: 204)].

[111.5 *Bryum uliginosum* (Brid.) Bruch & Schimp. – An old record from vc1 (Perranporth, 1861, ES, TRU) reidentified as *B. pseuderotriquetrum*; old report from vc2 (Near Probus, ES, Stackhouse 1865) discounted because no specimen located (Paton 1969a: 735)].

111.6 *Bryum pallens* Sw. ex anon. S12
Wide-boreal Circumpolar element.

*1: Near Redruth, 1861, WC (PNZ) (Paton 1969a: 735).

Grows as scattered stems, often mixed with other bryophytes, or forming small patches, less often more extensive low lawns. Notes on habitats in C&S are as follows. Occurs on mineral soil in wide range of situations, on clay, silt, sand, loams or gravelly textures (occasionally on humic soils), of moderately acidic to basic reaction. These are in rather dry or more often damp places, usually where unshaded, less often part-shaded e.g. by bushes and trees or by banks. Records are from coastal cliffs (especially in flushes), paths and tracks through grassland on calcareous-dunes, inland banks, soil heaps, heathland paths and tracks, in crevices of walls, adjacent to old concrete, cattle-trampled area in a wet pasture, a tussock on marshy ground, disturbed area on a roadside verge, on a 'hedge', on ditch and stream banks, mud of a dried pool and upper parts of reservoir inundation-zones. It is frequent on old metalliferous mining areas, on paths, tracks, walls and banks of spoil, and on alluvium of streams draining from mines, where it undoubtedly tolerates substrates with at least moderately high levels of copper and other metals. Grows in open or partly bare patches or mixed with other plants in short vegetation. Associates recorded include e.g. *Brachythecium rivulare, Bryum alpinum, Phaeoceros laevis, Philonotis fontana, Physcomitrium pyriforme, Pohlia andalusica, Pohlia annotina, Pohlia wahlenbergii var. wahlenbergii, Pseudephemerum nitidum*; also grasses, *Juncus effusus*.

At least some populations have fragile stems so that vegetative reproduction presumably occurs from deciduous shoot tips. Filamentous axillary gemmae occur rarely in British populations (Holyoak 2004) but have been recorded only once from C&S (near Three Gates, vc2, SX28E, 1972, JAP, BBSUK C.2001.019.9715).

Not previously reported c.fr. in Cornwall. Capsules rare: immature 4 (Brea Addit), present 6.

[111.7 *Bryum turbinatum* (Hedw.) Turner – An old record from vc1 (Wendron, 1861, ES, TRU) is discounted because the specimen is non-fertile and too scanty to name (Paton 1969a: 735)].
111.11 *Bryum algovicum* Sendtn. ex Müll.Hal. var. *rutheanum* (Warnst.) Crundw.  

*S12*  

*1*: Constantine Sands, St Merryn, 1889, RVT (B) (Paton 1969a: 734).  

A few records were of plants determined only as the species because the synoicous sexuality of var. *rutheanum* was not established. These are mapped as var. *rutheanum* because the autoicous var. *algovicum* is unknown in Britain; dioicous plants reported from Scotland (A.C. Crundwell in Hill *et al.* 1994: 93) are of uncertain significance.

Grows as low lawns or in smaller patches. Habitat notes from C&S are as follows. Characteristic of calcareous sand or sandy soil among semi-fixed and stable sand-dunes and short grassland over calcareous blown sand on coastal slopes, growing in unshaded places with short, thin grassland or cover of mosses, less often part shaded by *Ammophila arenaria* or other grasses. Other associates recorded include *Bryum capillare*; also various low grasses and herbs. A few records inland are from damp sand beside a drying pool in sand quarry (at landward edge of dunes, Loggans Moor), coastal sand dumped near ruins of buildings (NW. of Reskadinnick), on calcareous gravel and masonry debris at a disused railway station (near Roseworthy), and on an unshaded old gravelly track, with other low mosses (Ruddlemoor).

Commonly c.fr. [but only recorded with mature capsules]: capsules immature 4; dehiscing 5-7; dehisced 7.

111.14 *Bryum archangelicum* Bruch & Schimp.  

*S12*  

*2*: Bodmin Road Station, 1893, RVT (B) (Paton 1969a: 734).

There has been much debate over the correct name for the species long known to British bryologists as *B. inclinatum*; Ochi (1980: 144), Demaret & Geissler (1990) and Holyoak (2003c: 351) adopted *B. amblyodon*, but Holyoak (2004) argued that *B. archangelicum* should be used and this was followed by Hill *et al.* (2008).

Grows as small tufts or larger patches. Notes on habitats in C&S are as follows. Several records are from old mortar or concrete or its immediate vicinity, at bases of walls and a bridge and inside a cattle grid, where unshaded or almost unshaded. Also found once in a more natural habitat on unshaded sandy soil of a rather bare area in short grassland over calcareous blown sand near to dunes. Other finds were from a wide variety of unshaded situations: on a plant pot in a sheltered garden, on old metalliferous mine-spoil, in flushed area on quarry floor (on soil and low rotting wood, partly shaded by *Schoenus nigricans*), and on an old track in a china-clay pit (apparently on acidic substrate, with *Archidium alternifolium*).
Commonly (?) c.fr. [only recorded with mature capsules]: capsules immature 6, 11, 12; dehiscing 5-8, 11; dehisced 9.

111.15  **Bryum intermedium** (Brid.) Blandow
Temperate Eurasian element.

*1*: Kenwyn, Truro, 1861, ES *(TRU)* (Paton 1969a: 735); (vc1 placed in brackets because no recent record: Paton 1969a: 735, Crundwell 1970: 204).


No recent records from Cornwall.

111.16  **Bryum donianum** Grev.
Mediterranean-Atlantic Oceanic element.


*2*: St Minver, EMH (Holmes 1906, Paton 1969a: 737).

Grows in patches, often as rather small isolated patches, but sometimes forming a low lawn up to ca 10 cm across. Notes on habitats in C&S are as follows. On thin or deeper soil (stony 'protosols', loams, among gravel, etc.) or in crevices of concrete or other masonry with little or no soil, usually on substrates of basic to neutral reaction (sometimes slightly acidic). In free-draining situations, often where rather dry, normally unshaded or partly shaded e.g. by trees or bushes (occasionally in deeper shade). Typically found on banks (at woodland edges, in cemeteries and churchyards, on and above sea-cliffs, on a streamside, at lanesides or roadsides, on old mine areas including banks of mine-spoil), on field and laneside 'hedges', on tops and ledges of stone walls (usually mortared walls), on thin soil in crevices of stone walls inland and near coast and on gravel near walls or on graves. Less typical records are of single patches on soil of path on a hillside, on steep slag/earthy minespoil of steep bank on old mining ground near coast, on damp old mortared brickwork of ruin in open deciduous woodland, in crevices of old wall inside ruins of mine boiler house and in crevice of old mortared-stone wall of ruin. Found once in crevices of retaining wall of bridge over R. Tamar, within its flood-zone. Associates recorded: *Amblystegium serpens* var. *serpens*, *Bryum capillare*, *Bryum radiculosum*, *Bryum rubens*, *Cephaloziella hampeana*, *Ceratodon purpureus*, *Oxycrysta lium hi ans*, *Oxycrysta lium pumilum*, *Kindbergia praelonga*, *Fissidens dubius*, *Fissidens incurvus*, *Fissidens taxifolius* var. *taxifolius*, *Lophocolea heterophylla*, *Lunularia cruciata*, *Mnium hornum*, *Tortula muralis*, *Trichostomum brachydontium*, *Conocephalum conicum*, low grasses and herbs; also, rarely, *Bryum pallens*, *Weissia multicapsularis*, *Sedum anglicum*.

Not seen c.fr.
Bryum capillare Hedw.  
Boreo-temperate Circumpolar element.


Holyoak (2004) gives reasons for not recognising subsp. or vars. in B. capillare; var. rufifolium (which is unknown in Cornwall) is merely an inconstant form connected by intermediates.

Grows as tufts or cushions which sometimes extend to form a low lawn. Habitat notes from C&S are as follows. A common moss that grows on varied substrates and in a wide range of situations, on soil (loam, sand, gravel, etc.), among rocks or masonry, on old tarmac, gravel and sometimes on bark, wood or old thatched roofs; preferring basic or neutral substrates but also occurring where mildly acidic. Commonest in dry or free-draining situations and rarely where persistently damp; in full sun, partly shaded or less often in moderate or rarely heavy shade e.g. of trees or walls.

Frequent in varied situations including e.g. among rocks where often in crevices with little or no soil (gabbro, granitic, serpentine, slate; on boulders, tors and walls, and in quarries and cuttings); on masonry (including concrete, old mortar, old bricks, asbestos-cement roofs); on marble chippings on graves; thin soil on ledges of outcrops and on cliff tops; in guttering of houses; in old quarries; on 'hedges'; also on deeper soil at times, e.g. on a rocky bank in old mine area, in plant pots, on laneside banks, on banks in grassland and in barer patches of grassland on calcareous sand-dunes. Sometimes in exposed places on upper parts of sea-cliffs and above sea-cliffs as well as in sheltered sites. The plants on top of exposed sea-cliffs may be dwarfed and difficult to identify.

Often also as epiphyte, recorded e.g. on bark of Apple, Ash, Elder, Grey Willow, oaks, Sycamore trunks (once on sloping 'trunk' of Gorse, once on Cortaderia); also on decorticated wood of old tree trunks in open. Common on silted bark of trees in flood zone of R. Tamar and also recorded from top of a boulder in flood zone of a stream.

Many associates recorded, reflecting the wide range of substrates and habitats in which it occurs, including: Sciuro-hypnum populeum, Bryum algovicum, Bryum argenteum, Bryum dichotomum, Bryum donianum, Bryum radiculosum, Didymodon rigidulus, Grimmia pulvinata, Grimmia trichophylla s. l., Hypnum cupressiforme var. resupinatum, Leskea polycarpa, Metzgeria furcata, Pseudocrossidium revolutum, Saccogyna viticulosa, Schistidium apocarpum, Schistidium crassipilum, Syntrichia montana, Syntrichia laevipila, Tortula muralis, Tortula viridifolia, Trichostomum brachydontium, Trichostomum crispulum, Conocephalum conicum; Sedum anglicum; rarely Leptodontium gemmascens, Syntrichia papillosa, Tortula cuneifolia.

Commonly c.fr.: capsules immature 1-6, 10-12; dehisning 6-8; dehisced [old 1-3], 6-8, 10-12.
[111.18 *Bryum elegans* Nees (syn. *B. capillare* var. *elegans* (Nees) Husn.) – Recorded for Cornwall on basis of specimens apparently all from the same place labelled 'Between stones of walled bank, Lamborne, 1944, Rilstone' in BM (Paton 1969a: 738), and several specimens labelled 'Between stones of walled bank, Perranzabuloe, W. Cornwall, 17.12.45, F. Rilstone', that were entered into the BBS Exchange. The record was accepted by Syed (1973: 277), Crundwell (1974: 172) and Blockeel & Long (1998), but my re-examination of three substantial specimens (BBSUK, NMW) in 2001 revealed that they lacked several of the important characters of *B. elegans* and perhaps represent merely an odd form of *B. capillare*. Hence the rather surprising Cornish records of this calcicole of mainly upland limestone habitats have been dismissed as unsafe if not erroneous (Rothero 2009: 77, 2010: 76).


*2*: On open sandy slope in dunes, 5 m alt., NW. of Rock, SW97, DTH 02-003 (BBSUK) (Rothero 2003: 56).

[Older reports from vc2 (Wadebridge and Bodmin: Holmes 1906) were discounted because no specimens were located (Paton 1969a: 738, Crundwell 1970: 206)].

Almost certainly under-recorded because overlooked as the much commoner *B. capillare*, from which it is mainly distinguishable microscopically by the synoicous inflorescences.

Forms small patches or low lawns. DTH records had habitat data as follows. N. of Mount: on partly bare calcareous sand of low bank in short dune grassland; unshaded; with *Bryum dichotomum*. NW. of Rock: on partly bare, unshaded, calcareous sand of slope in dunes. W. of Black Head on Lizard: on unshaded soil of low bank beside path above serpentineite sea-cliffs. Also, with other bryophytes on thin soil on grassland slope above slaty cliffs, with *Campylopus introflexus*, *Ceratodon purpureus*, *Scleropodium touretii*, *Trichostomum brachydontium*, *Aphanes* sp.

Only recorded c.fr. or when (synoicous) inflorescences checked: Capsules immature 1, 12.


Boreo-temperate Circumpolar element.


Numerous records, but undoubtedly under-recorded, since only determinations based on study of plants with mature capsules and spores are reliable. However, among similar-looking *Bryum* spp., only *B. pallescens* was identified from obviously metal-contaminated substrates in Cornwall, so that numerous patches seen on mine-spoil with capsules lacking or immature should probably be referred to this species as should many patches on concrete below galvanised iron of steps, railings, currogated roofing etc.

All plants seen during the present study were synoicous (none autoicous), but dissection of several perichaetia was commonly necessary to find even a few antheridia, since a majority contained only archegonia. A few populations were atypical, e.g. those from Greensplat (DTH 01-50) have endostome with short cilia only. More often some cilia are long and appendiculate, others long and nodulose, a few short.

Typically forms patches, often pure and 10 cm or even 2 m across, so doubtless persisting in same place year after year. Notes on habitats in Cornwall are as follows. Commonly forming substantial patches on old concrete and firm soil below bases of old galvanised-iron sheds, such as those used or formerly used to store explosive in quarries and near mines, unshaded to partly shaded, often associated with *Weissia controversa* var. *densifolia*, but usually no other plants close by. Also on mine-spoil receiving drainage from areas of concrete, e.g. near buildings at South Crofty Mine. Treviscoe: on gritty soil beside concrete at base of galvanised iron steps, near china clay settling tank, slightly shaded. Whitemoor: patch on unshaded low bank of china clay spoil with *Pohlia flexuosa* and *Weissia controversa* var. *densifolia*, close to stored metal pipes and machine parts. E. of Bugle: thin soil on concrete block resting on slope of china clay spoil lightly shaded by scrub. Pool: patches on old horizontal concrete beneath fence of galvanised iron wire, unshaded. Okeltor: plentiful in patches and lawns on silty soil (old mine-spoil) on tops and sides of ruined walls of mine buildings, in open or partly shaded. On laneside stone wall with *Weissia controversa* var. *densifolia*, almost unshaded. W. Chyverton Mine: presumably this sp. plentiful as often substantial patches on 'lithosol' of metalliferous mine/quarry spoil. Goss Moor: on unshaded soil of open area in acid grassland on old landfill site, probably on toxic substrate. On unshaded old bonfire site on copper-mine spoil.

Chemical analyses of its substrates show it can tolerate high levels of Zn and also of Cu and Pb at Cornish localities:

**Analyses of substrates from localities in Cornwall (metal concentrations given as µg/g dry weight):**

<table>
<thead>
<tr>
<th>LOCALITY (N samples)</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
<th>pH</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Crofty, vc1 (3)</td>
<td>133-350</td>
<td>73-206</td>
<td>1029-2852</td>
<td>6.6-7.0</td>
<td>Sullivan (2004)</td>
</tr>
<tr>
<td>East Bassett, vc1 (1)</td>
<td>1668</td>
<td>337</td>
<td>2502</td>
<td>7.8</td>
<td>Sullivan (2004)</td>
</tr>
<tr>
<td>Greensplat, vc2 (2)</td>
<td>26-517</td>
<td>128-2074</td>
<td>833-9298</td>
<td>5.6-6.0</td>
<td>Sullivan (2004)</td>
</tr>
<tr>
<td>Hantergantick, vc2 (3)</td>
<td>18-104</td>
<td>60-199</td>
<td>447-8088</td>
<td>6.5-6.7</td>
<td>Sullivan (2004)</td>
</tr>
</tbody>
</table>
Commonly (?) c.fr. [only recorded with mature capsules]: capsules immature 2, 3, 5, 11; dehiscing [1], 2, 3, 5, 6, [9, 11, 12]; dehisced [1: old], 2, 3, 7, 9, 10, 11, 12. Capsules full of spores often fail to dehisce properly, some seen with germinating spores (e.g. 11, Greensplat).

111.24  *Bryum pseudotriquetrum* (Hedw.) P.Gaertn. *et al. s. l.*  
Wide-boreal Circumpolar element.

Most finds of this species were of plants lacking inflorescences or capsules, even where there were substantial populations, so they could not be identified to either of the varieties discussed below.

Notes on habitats of *B. pseudotriquetrum s. l.* in C&S are as follows. Damp or wet heathland, in areas of short and patchy vegetation and often in flushes (often with or near *Calliergonella cuspidata, Campylium stellatum, Philonotis fontana*, also near *Drepanoclados polygamus*). Flushes on and above sea-cliffs (with *Oxyrrhynchium speciosum, Pellia endiviifolia, Pellia epiphylla, Rhizomnium punctatum*). Patches in marshy area with short grasses at edge of pool in floor of small old serpentinite quarry above sea-cliffs, unshaded. With other mosses in short vegetation on damp ground of floor of old quarry in slaty Carboniferous rock. On firm soil or clay exposed high in inundation zones beside reservoirs; unshaded or part shaded among patchy *Molinia caerulea*. Damp disturbed ground at pool edge. Bit low on wet wall of ruin of mine building. Patch on flushed vertical slate in old quarry in deciduous woodland. Damp calcareous sand with sparse vegetation in disused sand-quarry at landward edge of dunes. Once on open damp ground on china-clay spoil.

Two records of plants with filamentous axillary gemmae, from high in inundation-zone at edge of Cargenwen Reservoir (*DTH* 04-475) with *Drepanoclados aduncus*, and by a fishing pool near Retire.

Rarely or occasionally c.fr.: single vc1 record c.fr. (6). See below for additional specimens identified to varietal level.

111.24.a  *Bryum pseudotriquetrum* var. *pseudotriquetrum*  

*1*: Tremethick Moor, Penzance, 1861, WC (*PNZ*) (Paton 1969a: 735).
+1: In ditch in old tin settling tanks, Reskadinnick, Camborne, SW64, 1971, RJM, det. DTH (BBSUK) (Rothero 2010: 76-77).
*2*: Penhargard Wood near Bodmin, 1888, RVT (B) (Paton 1969a: 735).
+2: Dripping rock face in old slate quarry, S. side of road to Tintagel, SX08, 1961, RJM, det. DTH (BBSUK) (Rothero 2010: 77).

Notes on habitats in Cornwall are as follows. N. of Lowertown: patches on near-vertical flushed granite in disused railway cutting, part shaded by deciduous trees (near *Fissidens adiantoides*). Goss Moor: low turfs on damp muddy soil of unshaded partly bare patches in disturbed acidic grassland.

Only recorded c.fr.: capsules from previous year old, dehisced in June.
111.24.b *Bryum pseudotriquetrum* var. *bimum* (Schreb.) Lilj. (syn. *B. bimum* (Schreb.) Turner). Wide-boreal Circumpolar element.

*1*: Near Truro, 1865, WC (PNZ) (Paton 1969a: 735); vc1 placed in parentheses by Paton (1969a: 735) because there are no modern records.


Single DTH record near Seaton, dense patches on wet soil at base of bank beside a track, on edges of unshaded wet hollows.

Only record c.fr.: capsules immature 4.

111.25 *Bryum caespiticium* Hedw. Boreo-temperate Circumpolar element.

*1*: Trefusis, 1840, EAW (TRU) (Paton 1969a: 735); (vc1 placed in brackets because no recent record: Paton 1969a: 735, Crundwell 1970: 204).


Only records supported by specimens were accepted by Paton (1969a: 735). In addition to those, other records by T. Laflin (SW53A, SW54W, SW97C, SX27Q) are probably correct as his Cornish specimen (SS21W: in CGE) is correctly determined.

Habitat notes for recent records in C&S are as follows. Reen Sands: in sparsely vegetated area on slope in dunes, near old mine-shaft. St Martin's: on hard, sandy soil of slope just above beach; unshaded.

Only recorded c.fr. [only identified with mature capsules]: capsules dehiscing 6.


*1*: On unshaded thin loamy soil among slaty rocks just above low sea-cliff, with other low bryophytes on partly bare patches in short grassland, *ca* 15 m alt., Pentire Point East, SW76, 2003, DTH 03-87 (BBSUK) (Rothero 2004a: 41, as *B. funckii*).


There is only the single locality in Cornwall listed above, in two places close together at Pentire Point East. In 2003 and 2007 it grew as small patches, low lawns and scattered plants on unshaded thin loamy soil among slaty rocks just above low sea-cliffs, with other low bryophytes (*Archidium alternifolium*, *Cephalozia* sp., *Fossombronia 'husnotii'*, *Grimmia lisae*, *Hypnum cupressiforme* var. *lacunosum*, *Scleropodium touretii*, *Trichostomum brachydontium*, *Riccia* sp., *Bryum dichotomum*, *Tortula wilsonii*), *Cladonia* sp. and near small herbs and grasses (*Aphanes*, etc.) on partly bare patches in short grassland at *ca* 15 m alt.
Not known c.fr. in Britain.

111.27  **Bryum argenteum** Hedw.  

*2: Near St Breward, 1897, RVT (B) (Paton 1969a: 736).

Notes on habitats in C&S are as follows. Thin or deeper soil (or sand) on tracks, paths, roadsides, in gardens, crevices of little-used tarmac (or edges of minor roads), edges of gravel car parks, unshaded to partly shaded (commonly with *Bryum dichotomum*, *Bryum capillare*, *Ceratodon purpureus*, *Dicranella staphylina*, *Didymodon nicholsonii*, *Trichodon cylindricus*, rarely *Fossombronia incurva*, *Philonotis fontana*, *Riccia sorocarpa*). Occasional in arable fields (barley stubble, flax), but usually in small amounts. Bank of ditch. Thin soil in crevices of unshaded concrete debris. Frequently with other mosses on thin 'soil' accumulation on unshaded horizontal concrete, asbestos-cement and tarmac, e.g. of little-used old tracks and road edges (with *Bryum dichotomum*, *Ceratodon purpureus*, *Didymodon nicholsonii*). Thin soil over old timber, e.g. of steps of railway bridge. Sometimes on old copper mine spoil where apparently contaminated with copper. Soil heaps and dumped soil near china clay quarries, locally on china clay spoil, unshaded. Soil on paths on slopes above sea-cliffs, unshaded and rather exposed; associates *Acaulon muticum*, *Bryum dichotomum*, *Ceratodon purpureus*, *Bryum dichotomum*, *Tortula truncata*. In small amounts on soil or firm clay exposed in inundation zones beside reservoirs, unshaded. Sometimes plentiful on open bonfire sites with *Funaria hygrometrica*, e.g. in heathland. On asbestos-cement roof with *Orthotrichum anomalum*. Common associates include *Bryum dichotomum*, *Bryum capillare*, *Ceratodon purpureus*, sometimes *Didymodon nicholsonii*, rarely with many others (e.g. *Didymodon tomaculosus*). Occasionally growing directly on rock of granitic boulders, in apparently eutrophicated areas.

Commonly reproduces vegetatively by means of axillary bulbils. Occasionally/frequently c.fr. (usually in sites where it has grown undisturbed for a year or two): capsules immature 2, 8-12; dehiscing 11; dehisced.

111.29-31.  **Bryum dichotomum** Hedw. s. l. (additional records only)

Records from prior to the revision of this group by Smith & Whitehouse (1978) are treated as *B. dichotomum* s. l. here, although most will be of 111.31.

111.29  **Bryum gemmiferum** R. Wilczek & Demaret  
Temperate Suboceanic element.


First recognised in Britain by Smith & Whitehouse (1978).
Notes on habitats in Cornwall are as follows. Portheras Cove: locally plentiful on near-vertical sand-rock low on N.-facing sea-cliff, mainly in unshaded sites that are damp or even running with water. Kennack Sands: locally on compacted gravelly soil among low grasses and herbs at unshaded edge of car park (near small stream). NE. of Foxhole: on china clay spoil on top and slopes of bank above ditch, unshaded, with patchy low vegetation.

Only recorded with bulbils. Not seen c.fr.


Holyoak (2003b, 2004: 254-255) gave reasons for regarding *Bryum bicolor*, *B. dunense* and *B. barnesii* as forms of the same variable species, for which the correct name is *B. dichotomum*. It is very variable in morphology in C&S as in other parts of BI. Phenotypes with a long excurrent costa and large leafy bulbils in leaf axils (*'B. dunense'*) intergrade with acute-leaved muticous forms that have several smaller bulbils in each leaf axil (*'B. bicolor'*) and they in turn intergrade with blunt-leaved muticous forms having up to six bulbils per leaf axil (*'B. barnesii'*). More than one of these phenotypes may be produced where parts of a single population grow in adjacent dry and wet microhabitats, implying considerable vegetative plasticity.

Notes on habitats in C&S for the 'B. bicolor phenotype' and scarcer 'B. barnesii phenotype' are as follows. Very common colonist of bare soil in wide range of situations, including thin soil layers on paths, tracks or over rocks, old tarmac, asbestos-cement or concrete. Colonising bare soil in fields (arable and pastures) and gardens, on slopes and banks on and above sea-cliffs, in quarries, on old mine-spoil, gravel car parks, roadsides, beside paths and tracks, on top of walls. Colonist of mud, soil and firm clay exposed in inundation zones beside reservoirs. Indifferent to lithologies, occurring over serpentinite, granite, slates, china clay spoil, concrete, old timber or old tarmac. Frequently occurs on small soil accumulations around windows of old cars, also at times on dumped rubbish such as decaying carpets.

Common associates include *Barbula convoluta*, *Bryum argenteum*, *Bryum capillare*, *Bryum dichotomum*, *Ceratodon purpureus*, *Dicranella staphylina*, *Dicranella varia*, *Didymodon insulanus*, *Didymodon nicholsonii*, *Kindbergia praelonga*, *Funaria hygrometrica*, *Pseudocrossidium hornschuchianum*, *Tortula truncatula*. Numerous others recorded e.g. *Archidium alternifolium*, *Bryum donianum*, *Bryum subapiculatum*, *Dicranella rufescens*, *Didymodon tophaeus*, *Ephemenum serratum*, *Epipertygium tozeri*, *Fissidens exilis*, *Hennediella heimii*, *Pseudephemerum nitidum*, *Riccardardia chamedryfolia*.  

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In 'B. bicolor' phenotype' and 'B. barnesii phenotype' axillary bulbils abundant (all months), but quite often absent. Brown rhizoidal tubers apparently frequent. Frequently c.fr.: capsules immature 1-5, 8, 10-12; dehiscing 1-3, 5, 7, 8, 11, 12; dehisced 1-5.

Habitat notes on the 'Bryum dunense' phenotype in C&S are as follows. This form is characteristic of soil in bare patches on cliffs, banks, tracks, paths and 'hedges' above sea-cliffs; also in very short grassland on calcareous dune sand and on cliff slopes; unshaded. Associates recorded: Acaulon muticum, Archidium alternifolium, Barbula convoluta, Brachythecium albicans, Bryum argenteum, Ceratodon purpureus, Microbryum davallianum, Phascum cuspidatum, Pseudocrossidium hornschuchianum, Rhynchothecium megapolitanum, Syntrichia ruralis var. ruraliformis, Syntrichia ruralis var. ruralis, Tortula flavovirens, Tortula truncata, Tortula viridifolia, Cerastium diffusum, Festuca rubra, Plantago coronopus; rarely Bryum torquescens. Other records of 'B. dunense' were as follows. From partly bare patches of soil in grassland, including with Festuca rubra low on exposed sea-cliff (with Bryum bornholmense, Bryum subapiculatum). Unshaded gravel area near estuary. Partly bare sandy soil in churchyard near dunes. Partly bare patches of soil over serpentinite, slates or granite (once over concrete), among rocks, at edges of paths, on coastal headlands and at top of sea-cliffs (associates include Ceratodon purpureus, Archidium alternifolium, sometimes Bryum capillare, Trichostomum brachydontium, Weissia sp., but a more rapid colonist than most of these and hence often in pure patches). Inland on unshaded gravelly track edge at base of slope of mine-spoil and at edge of gravel car park. Inland on slope of earthy mine-spoil, almost unshaded (with Bryum rubens, Bryum subapiculatum, Dicranella staphylina, Phascum cuspidatum var. papillosum, Trichodon cylindricus, Tortula truncata). Soil in arable fields (flax-stubble, cereal stubbles, maize stubble, weedy fallow), in several places including inland sites (e.g. near Bodmin) and c.fr. (with Barbula convoluta, Bryum rubens, Dicranella schreberiana, Dicranella staphylina, Trichodon cylindricus, Fossombronia pusilla, Tortula truncatula).

The 'B. dunense' phenotype was only recorded when axillary bulbils seen, these common. Brown rhizoidal tubers apparently frequent. 'B. dunense phenotype' occasionally c.fr.: capsules present 3, 5; immature 2, 4, 8, 11, 12.

111.32 **Bryum dyffrynense** Holyoak
Temperate Oceanic element.

*1: Unshaded, partly bare, damp sand in disused sand quarry, with sparse low vegetation, occurring over tens of square metres, ca 5 m alt., Phillack Towans, SW53, 2003, DTH 03-443 (BBSUK) (Rothero 2004a: 41).

This is the only record from Cornwall. B. dyffrynense is an uncommon coastal species described new to science by Holyoak (2003b).

The single record from Cornwall was of scattered plants and small open patches occurring abundantly over tens of square metres on unshaded, partly bare, damp sand on floor of a disused sand quarry, with sparse low vegetation. With Aneura pinguis, Bryum pseudotriquetrum, Didymodon tophaceus, Dicranella varia, Petalophyllum ralfsii.

Specimens collected on 18 Sep. 2003 had axillary bulbils and young capsules. On 20 Feb. 2005 only sparse immature plants seen (with few bulbils).
111.33  **Bryum radiculsum** Brid.
Mediterranean-Atlantic Suboceanic element.

*2: Gunwen near Bodmin, 1878, RVT (B) (Paton 1969a: 736).

Species 111.33-42 were poorly understood before the revision by Crundwell & Nyholm (1964); older records are given only where determinations of old specimens have been revised more recently.

Habitat notes from C&S are as follows. Usually recorded on mortar, crumbling mortar or concrete, of walls (including those of modern reservoir dam, ruined mine buildings, church and old bridges), blocks of concrete debris, unshaded to lightly shaded (and not infrequently also more heavily shaded in deep crevices in masonry). Also on thin soil in crevices of old walls and on old bricks, occasionally on deeper free-draining soil on banks. Associates commonly include *Bryum dichotomum*, *Bryum capillare*, *Didymodon rigidulus*, *Didymodon tophaceus*, *Grimmia pulvinata*, *Orthotrichum diapahanum*, *Schistidium crassipilum*, *Tortula muralis*, sometimes *Bryum donianum*, *Didymodon luridus*, *Gyroweisia tenuis*, *Hypnum cupressiforme* var. *cupressiforme*, *Microbryum rectum*, *Pseudocrossidium revolutum*, *Tortula nitida*, *Trichostomum brachydontium*.

Rhizoidal tubers often rather sparse. Commonly/frequently c.fr.: capsules immature 1-6 (7), 11, 12; dehiscing [8]; dehisced [1, 4, 7 old] 8-10.

111.34  **Bryum ruderale** Crundw. & Nyholm
Temperate European element.


See note under 111.33 above.

Habitat notes from C&S are as follows. Not usually in arable fields or on other ground that is regularly tilled, but one record of small patch from partly bare ground well inside field of cereal stubble (with *Bryum dichotomum*) and patches in horticultural field (with *Barbula convoluta* var. *sardoa*, *Barbula unguiculata*, *Bryum dichotomum*, *Dicranella staphylina*). Unshaded gritty soil on floor of old quarries. Damp soil along old, part shaded tracks; on disused railway track. Partly bare soil in field gateways; on grave in cemetery. Disturbed soil on unshaded tracks and at their edges. Clay soil of lightly shaded bank beside Bude Canal. Thin sandy soil of ledge in old quarry in dune grassland. Gravelly tracks, e.g. in churchyards, near coast and across heath, in gateway (with *Didymodon insulanus*). Thin soil of unshaded gravel car parks. On flat, unshaded, partly bare ground in area of sandy, old, copper-mine spoil. Thin sandy soil at edge of track in old copper-mine area near coast, unshaded. Unshaded soil of heap at edge of old mine area. Soil on lightly shaded top of 'hedge', with *Conocephalum conicum*. Track in conifer plantation, partly shaded. Associates recorded include *Barbula convoluta*, *Barbula unguiculata*, *Bryum dichotomum*, *Bryum rubens*, *Dicranella staphylina*, *Dicranella varia*, *Fissidens incurvus*, *Microbryum*.
davallianum, Microbryum rectum, Phascum cuspidatum var. cuspidatum, Pohlia melanodon, Tortula modica, Tortula truncata.

All but young plants probably always with rhizoidal tubers, although these sometimes sparse. Not reliably recorded c.fr. [noted as having immature capsules with plants from patch on thin soil over old concrete on wall of ruin, which were thought to be B. radiculosum when collected, but these had dull purple papillose rhizoids with pink-red tubers, unfortunately specimens not kept].

111.35 *Bryum violaceum* Crundw. & Nyholm Temperate European element. 

*S12*


See note under 111.33 above.

Habitat notes from Cornwall are as follows. Frequent records from soil in arable fields, its commonest habitat (cereal stubbles, brassicas, set-aside), with *Barbula convoluta, Barbula unguiculata, Bryum dichotomum, Bryum klinggraeffii, Bryum rubens, Dicranella staphylina, Trichodon cylindricus, Entosthodon fascicularis, Funaria hygrometrica, Phascum cuspidatum, Pohlia melanodon, Riccia glauca, Tortula truncata, rarely Didymodon tomaculosus*. In small quantity on partly bare gravelly soil of roadside lay-by, almost unshaded, near *Barbula convoluta, Barbula unguiculata, Bryum argenteum, Bryum dichotomum, Dicranella staphylina, Trichodon cylindricus, Tortula truncata*. Soil exposed in roadside ditch. On light loamy soil exposed in mainly bare patch on roadside bank near estuary, lightly shaded.

Only identified when rhizoidal tubers seen (which often abundant). Not seen c.fr. [unknown c.fr. in British Is.].

111.36 *Bryum klinggraeffii* Schimp. Temperate European element.

*S12*

*1:* Near Towednack, St Ives, 1962, JAP (BBSUK) (Paton 1969a: 737).


See note under 111.33 above.

Grows as scattered plants among other low mosses or forming small patches or low lawns. Habitat notes from Cornwall are as follows. On firm mud or clay-soil exposed in inundation zones beside Argal and Stithians Reservoirs and Upper Tamar Lake, unshaded; associates *Aphanorrhegma patens, Trichodon cylindricus, Leptobryum pyriforme, Pohlia annotina, Pseudephemerum nitidum, Riccia sorocarpa*. Rosewarne: on moist soil of track, part-shaded by grasses and hedgerow (very close to *Aphanorrhegma patens*). Three times in arable fields (cereal stubbles; edge of brassica crop), with *Barbula convoluta, Barbula unguiculata, Phascum cuspidatum, Tortula truncata*. On partly bare unshaded soil of soil
heap (near *Bryum dichotomum*, *Bryum rubens*, *Bryum violaceum*, *Pleuridium subulatum*, *Dicranella staphylina*, *Dicranella varia*).

Tubers abundant, even on small plants. Not seen c.fr.

111.37 *Bryum sauteri* Bruch & Schimp. S12
Temperate European element.


See note under 111.33 above; first reported in Britain by Crundwell (1962).

Grows as scattered plants or forms small tufts, infrequently as larger patches (short lawns). Habitat notes from C&S are as follows. Normally grows on circum-neutral or somewhat acidic soil (often loamy, occasionally clayey, sandy or gritty; sometimes compacted or compressed) in partly bare areas or open patches in mainly free-draining to damp or occasionally rather wet sites. It occurs in open sunny places but more often where sheltered and lightly or partly shaded. The species is mainly a colonist of disturbed soil or soil patches which become unsuitable as larger plants colonise and shade it out, e.g. beside a badger sett, bare patch in a grass-ley, on soil dung from small ditch.

Recorded mainly on banks (beside lanes, at deciduous woodland edges, above streams, beside a spring, edge of disused railway embankment) and 'hedges', also soil heaps, edge of a gravel car park, soil over old concrete, cemeteries, churchyards, on or beside old tracks, on paths, in a field gateway, beside a cliff-top flush, on N.-facing sea-cliffs and in cleared woodland. Not recorded from arable fields in Cornwall until CDP detected it on stubble fields in several different places in 2005-2006 during a detailed study of bryophytes on arable land. CDP found it mainly in small quantity but occasionally frequent (e.g. in two fields in barley stubble on loam, pH 5.7, 6.0). It was apparently rare in a wheat stubble on loam (pH 6.2).

Associates recorded (all habitats combined) were *Bryoerythrophyllum recurvirostrum*, *Bryum rubens*, *Dicranella rufescens*, *Dicranella staphylina*, *Didymodon insulanus*, *Trichodon cylindricus*, *Ephemerum serratum s.l.*, *Epipterygium tozeri*, *Fissidens bryooides var. bryooides*, *Fissidens bryooides var. caespitans*, *Fissidens exilis*, *Fissidens viridulus*, *Fossombronia pusilla*, *Funaria hygrometrica*, *Physcomitrium pyriforme*, *Pleuridium acuminatum*, *Pleuridium subulatum*, *Pogonatum sp.*, *Pohlia lutescens*, *Tortula truncata*, *Conocephalum conicum*.

Apparently always with abundant rhizoidal tubers (although unidentifiable without them). Numerous plants from stream bank near Trewoofe studied in Apr. 2006 had the upper stem very fragile, so that the leafy shoot tips were deciduous.

Not seen c.fr. Normally thought to be dioicous in Britain. Female inflorescence seen: 4. CDP made the first record for Britain of plants with synoicous inflorescences from a stubble field N. of Bosence Farm (E. of Relubbus) in March 2005 (in Hill 2005: 45).
111.38  *Bryum valparaisense* Thér.  ALIEN  NR  S


This is the only record from Britain of a species otherwise known in Europe only from single records from S. Portugal and S. Spain.

Found in two arable fields on St Agnes (leg. RAF), both from traditionally managed fields used to grow bulbs and other flowers. A specimen collected in Apr. 2005 has several small tufts of this distinctive species on silty soil with *Barbula convoluta*, *Bryum rubens*, *Dicranella staphylina*, *Leptophascum leptophyllum*, *Trichodon cylindricus* and *Phascum cuspidatum*.

The only specimens are non-fertile but have abundant rhizoidal tubers.

111.39  *Bryum tenuisetum* Limpr.  NS  S12
Boreo-temperate European element.

*1*: Prospidnick, N. of Helston, 1961, HLKW (Paton 1969a: 736); [NMW; det conf DTH 2004]

*2*: Retire Common, W. of Lanivet, 1963, JAP (Paton 1969a: 736). The voucher could not located by DTH in 2003-2004, but other material from just S. of Bodmin (at E, NMW) was correct.

See note under 111.33 above.

Apparently rare in Cornwall. Revision of specimens in Dec. 2001 revealed that most DTH records were errors (the plants having tubers that are too large, often >200 µm, and commonly dull brownish rather than bright yellow). Only the following record appears to be correct: on humic sandy soil by edge of lake, partly bare of higher plants, unshaded, NW. edge of Dozmary Pool, SX 193745 (SW17X), 17 Oct. 1996, DTH 96-478 (DTH).

Revision of specimens from *BBSUK, E* and *NMW* by DTH revealed many other errors; two correct records have notes as follows: soil beside ditch, heath N. of Tretoil; clover field on Prospidnick Hill, N. of Helston. As noted above, no voucher has been located to support the records from Retire Common (SX06B, 1961 and 1963, JAP) which include the first record in vc2; these are mapped but need confirmation.

All gatherings have tubers. Not seen c.fr. Prospidnick Hill material is male.
111.40  *Bryum subapiculatum* Hampe  


See note under 111.33 above.

A variable taxon; includes plants with brownish tubers; others with tubers small (120-180 µm diameter, cfr, in DTH). Several populations in Isles of Scilly have tubers of typical shape and size, but yellow, brownish-yellow or yellow varying to orange (DTH). Dutch workers have advocated merging this species with *B. rubens*, but it is usually distinct in the narrower leaf cells and lack of a well-defined leaf border of ca 3 rows of very narrow incrassate cells. Holyoak & Pedersen (2007) present DNA sequence data showing they are only distantly related species.

Habitat notes from Cornwall are as follows. On patches of mainly bare soil on unshaded tops and slopes of serpentinite and slaty sea-cliffs (with *Acaulon naticum*, *Ceratodon purpureus*). Colonising thin soil over serpentinite rock in old quarry above sea-cliff, unshaded (with *Trichostomum brachydontium*, *Tortula truncata*). Abundant on unshaded soil over shaly rock on and above sea-cliffs. Unshaded soil on 'hedges' above sea-cliff. Unshaded humic soil on coastal heaths. Plentiful as colonist on partly bare, acid, dumped soil (flat areas and banks) near china clay quarries (with *Bryum dichotomum*, *Ceratodon purpureus*, *Trichodon cylindricus*, *Tortula truncata*). Recently burnt humic soil on slope above creek, part shaded by open Sessile Oakwood (with *Ceratodon purpureus*). Partly bare acidic soil on tracks, including those on old mining ground, on heathland and in a conifer plantation, also on a grave, unshaded to part shaded (with *Ceratodon purpureus*). Earthy mine-spoil on unshaded slope (with *Bryum rubens*, *Dicranella staphylina*, *Phascum cuspidatum* var. *papillosum*, *Trichodon cylindricus*, *Tortula truncata*). Peaty soil of open area on heathland. Sandy soil in short grassland at edge of brackish pool, unshaded. Unshaded sediment exposed high in inundation zone beside Stithians Reservoir, with sparse low vegetation (including *Leptobryum pyriforme*). Twice in arable fields, including cereal stubble (with *Bryum dichotomum*, *Bryum rubens*, *Dicranella staphylina*, *Trichodon cylindricus*, *Tortula truncata*). Other associates recorded include *Bryum argenteum*, *Bryum dichotomum*.

Frequently (commonly ?) c.fr.: capsules immature 1, 3-5, 7, 10, 12; dehiscing 7.

111.41  *Bryum bornholmense* Wink. & R.Ruthe  
Temperate European element.

*1*: Peaty ground, Black Head, Lizard, SW71, 4 April 1962, EFW (OXF) (Crundwell & Whitehouse 2001: 174). Older records (e.g. in Paton 1969a: 736) were based on misidentified *B. rubens*.

*2*: On soil on disturbed bank of pool west of Temple SX17, 18 Apr. 1998, DTH (DTH) (Crundwell & Whitehouse 2001: 174). Older records (e.g. in Paton 1969a: 736) were based on misidentified *B. rubens*.
Not reported from Cornwall until after it was redescribed by Crundwell & Nyholm (1964). However, uncertainty about distinctions between this species and the next persisted from the early 1960s until revisions by ACC and HLKW during 1996-1998 found numerous specimens had been misidentified (see Crundwell & Whitehouse 2001). Records older than 1996 are thus only accepted here when voucher specimens have been checked recently (these include a few based on vouchers that were subsequently lost in the post), plus records made by DTH in 1994 and 1995 that are known to have used reliable characters. This results in rejection of numerous records shown in Atlas 3: 129, including all those shown from vc2 (new first vc2 record is therefore DTH 98-109 from SX17G, conf. ACC and HLKW 1998). The older records thus considerably under-record a locally common moss.

Habitat notes from Cornwall are as follows. Apparently restricted to acid soils in places that are not subject to frequent disturbance; unrecorded on arable fields. Mainly bare, humic and acid, often moist acid soil along and beside old tracks or paths and on disturbed areas in heathland, sometimes abundant, in open or lightly shaded (associates mainly Archidium alternifolium, Campylium introflexus, Campylium pyriformis, Ceratodon purpureus, Dicranella heteromalla, Trichodon cylindricus, Kindbergia praelonga, Pleuridium acuminatum, Pohlia camptotricha, Weissia sp., also recorded with Atrichum tenellum); and on soil heap at edge of heathland, unshaded. Acidic soil on disturbed banks of pool in old china clay pit, unshaded. On sparsely vegetated china clay spoil. On partly bare patch of soil in grassland (of Festuca rubra) low on exposed sea cliff (with Bryum dichotomum).

Partly bare patches of soil on top and slopes of exposed granitic and serpentinite sea-cliffs. Unshaded soil on 'hedge' above slaty sea-cliffs. Bare soil patches in grass-ley. On partly bare loamy acidic soil of laneside bank, partly shaded by trees, with Pohlia lutescens. On soil exposed at entrance to animal burrow on slope of mined ground well shaded by trees. Thin damp soil over gabbro boulder partly shaded in Grey Willow scrub (with Bryum rubens, Ephemerum serratum s. l., Fossombronia husnotii, Riccia beyrichiana, Riccia subbifurca).

Only recorded with rhizoidal tubers. At least seven records c.fr.: capsules immature 1, 2, 4, 6 [near ripe 6]; dehiscing 7; dehisced 7.

111.42 **Bryum rubens** Mitt.  
Temperate European element.


See notes under 111.33 and 111.41 above.

Habitat notes from C&S are as follows. Often abundant on soil in arable (barley, wheat, maize, flax, stubbles, grass leys, set-aside) fields, unshaded; associates incl Anthoceros agrestis, Anthoceros punctatus, Barbulava convoluta, Barbula unguiculata, Bryum dichotomum, Bryum violaceum, Dicranella schreberiana, Dicranella staphylina, Ephemerum minutissimum, Fossombronia pusilla, Funaria hygrometrica, Phaeoceros laevis, Riccia glauca, Riccia sorocarpa, Riccia subbifurca, Phascum cuspidatum, Tortula truncata, Trichodon cylindricus. Also usually with herbaceous weeds such as Cerastium glomeratum, Lamium purpureum, Sinapis arvensis, Stellaria media, Urtica urens, Veronica persica. Besides widespread occurrence on unfertilised or lightly fertilised soils, sometimes
near exposed coasts, *B. rubens* is one of the few mosses that is frequent in arable fields receiving high inputs of artificial fertilisers (along with *Oxvrrhynchium hians*, *Funaria hygrometrica* and *Tortula truncata*).

Also, soil of mainly bare patches in pastures, grass leys and other grassland (with *Bryum dichotomum*, *Dicranella schreberiana*, *Dicranella staphylina*, *Dicranella varia*, *Trichodon cylindricus*, *Fossombronia pusilla*, *Microbryum rectum*, *Phaeoceros laevis*, *Pleurdium acuminatum*, *Pseudepheremerum nitidum*, *Phascum cuspidatum* var. *papillosum*, *Tortula truncata*), soil heaps, garden soil, churchyards, cemeteries, soil at edge of gravel car park, bare soil patches on laneside banks, track edges and roadsides, cleared woodland, soil disturbed at entrance to badger sett, open or lightly shaded (with *Barbula convoluta*, *Bryum saxteri*, *Trichodon cylindricus*, *Fissidens incurvus*, *Phascum cuspidatum* var. *papillosum*, *Pleuridium subulatum*, *Tortula truncata*). Clay-soil on soil-heap in woodland clearing, lightly shaded, with *Ceratodon purpureus*. Thin soil over sloping granite on boulder by viaduct, lightly shaded. Patch of mainly bare soil on slope in pasture (with *Trichodon cylindricus*). Rather acid soil among low granitic rocks in acid grassland on hillside. Dumped, partly bare soil near china clay quarries, unshaded. Abundant over large area of coastal heath (over serpentinite) burnt in previous year, on unshaded slopes (locally with *Funaria hygrometrica*). Soil on low banks beside path above sea-cliff. On open area of peaty soil on heath. Soil on old track in woodland, part shaded. Sandy soil in dunes (with *Bryum dichotomum*). On unshaded soils and sediment exposed beside reservoirs, where occasionally plentiful in upper-part of inundation-zone (with *Bryum dichotomum*, *Campylopus introflexus*, *Ceratodon purpureus*, *Pohlia annotina*, *Pohlia camptotrichela*). Earthy slope of mine-spoil, almost unshaded (with *Bryum dichotomum*, *B. subapiculatum*, *Dicranella staphylina*, *Phascum cuspidatum* var. *papillosum*, *Pleurdium acuminatum*, *Pseudepheremerum nitidum*, *Tortula truncata*, *Trichodon cylindricus*). Thin soil on unshaded path near coast. Unshaded soil on shaly sea-cliff. Thin damp soil over gabbro boulder partly shaded in Grey Willow scrub (with *Bryum bornholmense*, *Ephemerum serratum* s. l., *Fossombronia 'husnotii*', *Riccia beyrichiana*, *Riccia subbifurca*). Thin dry sandy soil on top of block of concrete, partly shaded by Ash sapling.

Only recorded when tubers seen (rhizoidal, axillary, or both), these are common on well-grown plants but absent on young plants. Large patches from inundation-zone beside Colliford Lake had many tubers that were all dull yellow-brown (DTH 06-236). There are several other records of plants with whitish, yellowish or pink tubers; these tubers might have been immature.

Occasionally c.fr.: capsules immature 1, 3-5, 7; dehiscing 7-9; dehisced 6, 8, 9.

[111.46 *Bryum gemmiparum* De Not. – A record from vc2 (sandy detritus by stream, Marsland Mouth, Morwenstow, Sep.1949, TL, in Warburg 1961: 170) has been deleted because it was based on a form of *B. bicolor*, i.e. *B. dichotomum* (Paton 1969a: 737, Crundwell 1970: 205); another specimen (Rock crevices at stream edge, halfway between coast and footbridge, Marsland Mouth, N. of Morwenstow, SS2117, 29 Mar. 1961, ARP & JAP (NMW C96.29.757) was reexamined by DTH in Nov. 2004 and regarded as either a small form of *B. gemmiparum* or an odd large form of *B. dichotomum*].
Bryum alpinum Huds. ex With.  
(syn. B. alpinum var. meridionale Schimp., B. alpinum var. viride Husn.). Temperate European element.

*2: Rame Head, 1866, AL (BM) (Paton 1969a: 737).

Grows in patches that may be extensive, or scattered amongst other mosses. Habitat notes from C&S are as follows. Often plentiful on gritty or compressed soil on and beside tracks, on trampled pathways, on banks and among rocks in old granite quarries; unshaded. In small crevice of vertical granitic rock of wall of old quarry. On thin soil on unshaded top of granitic boulder. Damp clayey soil of edges of tracks around working and disused china clay quarries, unshaded; wet, disturbed ground among china clay spoil and beside tracks near spoil heaps (close to Archidium alternifolium, Aulacomnium palustre, Philonotis fontana). Patches on inclined surface of flushed granitic rocks on upper and lower parts of sea-cliffs and on slope above coast, unshaded. On damp path high on cliffs. Wet stony pathway on heath over gabbro. Very short vegetation at edge of acidic flush beside mire. On slaty rock in open acidic flush and locally on soil of low hummocks and a bank. Scattered small patches widespread on peaty substrates exposed in upper part of inundation-zone beside Colliford Lake, always of immature plants. Abundant on damp tarmac at edge of car park, almost unshaded. Small amount with other mosses on old tarmac of sheltered lane. Plentiful on tarmac edges of access road to disused granite quarry, extending over hundreds of metres; with Bryum capillare, Ceratodon purpureus. Other associates recorded include Archidium alternifolium, Campylopus introflexus, Pohlia annotina, Cladonia sp.

With rhizoidal tubers (usually present?). Gathering from Greensplat has small axillary bulbils in axils of some upper leaves (DTH 01-49); these previously unreported in this species. Not seen c.fr.

Bryum apiculatum Schwägr.  
ALIEN NR 12

*1: On thin silty soil among rocks and gravel in unshaded area on floor of disused gabbro quarry, 65 m alt., Dean Quarries, SW8008/2024, 2009, DTH 09-42 (BBSUK, DTH) (Rothero 2010: 77).
*2: Unshaded, part-bare patches of stony soil in short grassland of car parking area beside track at edge of heathland, ca 135 m alt., W. edge of Retire Common, SW9977/6313, Jan. 2007, DTH 07-09 (BBSUK, DTH) (Rothero 2008: 61, Holyoak 2009); new to British Isles.

These are the first two records from Europe of a weedy species that is widespread in the tropics and subtropics. It was subsequently found atorkells Moor in 2010 (DC).

At Retire Common it grew on unshaded, part-bare patches of stony soil in short grassland of car parking area beside track at edge of heathland. It was frequent as scattered plants and small patches (1 -2 cm across) in area ca 2 m in diameter. Occurring in gaps amongst sparse low grasses, associated with Barbula convoluta, Bryum dichotomum, Ceratodon purpureus, Didsymodon tophaceus, cf. Funaria hygrometrica (no capsules); Agrostis capillaris, Taraxacum sp., Sagina procumbens, Plantago lanceolata, Poa annua, Aphanes sp. The B. apiculatum plants had immature capsules and abundant axillary gemmae.
112.1  *Rhodobryum roseum* (Hedw.) Limpr.  LS  2
(syn. *Bryum roseum* Hedw.). Boreo-temperate Circumpolar element.

*2: Trevathan Lane, St Endellion, 1869, RVT (NMW) (Paton 1969a: 738).

No recent records.

114.1.a *Pohlia elongata* Hedw. var. *elongata*  LS  2
Boreal-montane Circumpolar element.


An older record (Lanivet, Tellam 1888) was dismissed by Paton (1969a: 732) because no specimen has been located.

There are no other records from Cornwall.

114.4 *Pohlia nutans* (Hedw.) Lindb.  12
Wide-boreal Circumpolar element.

*2: Gunwen Moor, Bodmin, 1890, RVT (B) (Paton 1969a: 732).

Grows as small patches, as scattered stems intermixed with other bryophytes, or forms low pure turfs. Notes on habitats in Cornwall are as follows. Typically on acidic mineral (clayey, loamy, sandy or gritty) and humic soils, peat, or thin soil over acidic rocks or in their crevices, on dry to distinctly wet substrates, mainly in unshaded or lightly or partly shaded sites. Records are mostly from heathland, open patches in acidic grasslands, partly bare places on 'hedges' and among granitic rocks, old quarries, slopes near sea-cliffs, banks, track edges, stream banks, china-clay spoil and spoil of metalliferous mines. Fewer records were from various other habitats including soil on old walls of ruins, bared peat of hummocks in open acidic mires, and a partly shaded track at the edge of woodland. Atypical records are from under overhanging granitic rocks of tors (sparse non-fertile stems growing in heavy shade), on rotting wood of top of fence-post in an old mine area, on soil in a plant-pot at a nursery, and on hard concrete at base of the leg of an electricity pylon in wet heathland. *P. nutans* is sometimes plentiful on thin copper-rich soil or deeper sandy or clayey 'lithosols' over old mine-spoil. In these places it often forms pure patches or grows from mats of *Cephaloziella* spp. and is one of the few bryophyte species tolerant of high copper concentrations in the substrates. Associated plants often include other common acidophiles such as *Campylopus introflexus*, *Polytrichum juniperinum*, *Polytrichum piliferum*, and grasses and low herbs. On mine areas with high [Cu] recorded associates include *Cephaloziella massalongi*, *Cephaloziella nicholsonii*, *Cephaloziella stellulifera*, *Gymnocolea inflata*, *Solenostoma gracillimum*, *Lophozia excisa*, *Pohlia andalusica*, *Pohlia annotina*. 
In all of its main Cornish habitats it often produces very large axillary bulbils (small deciduous branches, typically 1-3 mm long, with imbricate leaves). These are apparently not mentioned in the British literature, but form the basis of 'stat. gemniclada' (cf. Hegewald 1970).

Commonly or frequently c.fr.: capsules immature 1-12; dehiscing [7], 8; dehisced 1-3, 7-10.

114.6-14. *Pohlia annotina* s. l. (additional records only)

Distinctions between these spp. were confused in Britain until the revision by Lewis & Smith (1978), and some nomenclatural and other muddles remained for a few years after this (see notes below).


Not generally recognised in Britain until the revision by Lewis & Smith (1978). Records of 'P. rothii' made in Cornwall during the 1960s were referred to this species by Paton (MS.) but most were probably of *P. andalusica* since DTH records suggest different relative frequencies of these spp. in vc1.

Usually grows as scattered plants colonising partly bare substrates, sometimes mixed with other low bryophytes, occasionally forming very small pure patches. In Cornwall *P. drummondii* is a rather uncommon moss of acidic soils (recorded on clay and gravel), often in damp places. It usually occurs in the open but is sometimes lightly shaded (e.g. by a bush). Habitats recorded include mainly bare patches on heaths, a stream bank (in open area of acidic grassland and flushes), bank beside a pool, a lake edge, damp tracks (e.g. in acidic grassland, near pits on heathland and amongst old china-clay spoil), a field gateway and a gravelly path near buildings at a disused copper mine. Associates recorded were *Archidium alternifolium*, *Philontis fontana*, *Pohlia annotina*, *Pohlia bulbifera*, *Scapania irrigua*, *Trichodon cylindricus*.

Only identified from well-grown axillary bulbils, which appear to be present in most months (3, 7, 11). Not seen c.fr. in Cornwall (M.J. Wigginton in Hill et al. 1994: 62 noted that sporophytes are occasional in Scotland, rare elsewhere in Britain).
114.8 *Pohlia filum* (Schimp.) Martensson  
Boreo-arctic montane Circumpolar element.  


Recorded only from china-clay workings, in St Austell area and on Bodmin Moor. Grows as scattered stems or forming sparse lawns. Habitat notes from Cornwall are as follows. W. of Foxhole, E. of Bugle, Park Pit: on damp to wet unshaded gritty, sand, clay and muddy sediments of edges of pools (including mica dams), where probably inundated at times; associates *Blasia pusilla, Solenostoma gracillimum, Lophozia incisa, Nardia scalaris, Pohlia annotina, Scapania irrigua, Lythrum portula, Radiola linoides*. On unshaded damp gritty china-clay spoil on slightly flushed edge of track near quarry, with *Pohlia annotina*. Locally plentiful, forming small lawns, in hollows subject to flooding in unshaded china clay spoil. On near-horizontal damp clay on bank of china-clay spoil near works.

Only recorded with bulbils. Not seen c.fr. (sporophytes are rare in Britain, mature in late spring, according to M.J. Wigginton in Hill et al. 1994: 64).

114.9 *Pohlia andalusica* (Höhn.) Broth.  


Not generally recognised in Britain until the revision by Lewis & Smith (1978), who used an incorrect name for it. Its British distribution was revised by M.O. Hill (in Corley & Hill 1981) and the nomenclature was amended by Shaw (1981).

Sometimes appears to intergrade with *P. annotina*, with which it is very often associated, but apparent 'intermediates' may be plants of *P. andalusica* with immature bulbils or those of *P. annotina* with few old bulbils remaining. Besides bulbil form and their red-brown colour, usually distinct from *P. annotina* in shorter more erect leaves.

Grows as scattered stems or forms low and rather open patches or turfs, sometimes pure and extensive and covering several square metres. Habitat notes from Cornwall are as follows. On ± acidic substrates that are almost if not entirely in places with high concentrations of copper and possibly other heavy metals. Occurs on clayey, silty, sandy, gravelly or loamy mineral 'soils', most often on partly bare mine-spoil and frequently at edges of paths and tracks or in hollows where water forms temporary puddles in winter. Also occurs on copper-rich sandy-silt alluvium alongside the lower Red River on banks of this stream and path sides in heathy areas nearby. One record from Gear Sands of small amount on otherwise bare soil of a path through dune-grassland near to mine-spoil. Most populations are in unshaded places, with some in light partial shade, but it is normally absent where there is heavier shade e.g. from bushes. Recorded associates include *Cephalozia massalongi, C.*
nicholsonii, C. stellulifera, Dicranella varia, Pohlia annotina, Pohlia nutans, Scapania compacta, Solenostoma gracillimum.

Two records c.fr: Cambrose, vc1 and Gunnislake, vc2 (both in DTH), numerous capsules immature 4. These are the only British records of sporophytes (cf. M.J. Wigginton in Hill et al. 1994: 65).

114.10 *Pohlia bulbifera* (Warnst.) Warnst.  
Boreo-temperate Circumpolar element.


Not generally recognised in Britain until the revision by Lewis & Smith (1978).

Grows as scattered stems with other low mosses, forming mall patches or tiny lawns of low stems when more plentiful. Habitat notes from Cornwall are as follows. On damp humic soil with sparse grasses and herbs on shore of lake (with *Pohlia drummondii, Pseudephemerum nitidum*). On firm clay exposed in inundation zone beside reservoir (near *Bryum dichotomum, Dicranella rufescens, Pohlia annotina*). On soil of bank of stream among *Juncus*. Unshaded at all sites.

Axillary bulbils always present. Not seen c.fr. (sporophytes are very rare in Britain according to M.J. Wigginton in Hill et al. 1994: 66).

114.11 *Pohlia annotina* (Hedw.) Lindb.  
(syn. *P. proligera* auct. non (Kindb.) Lindb. ex Broth. *pro parte, P. annotina* taxon (b) of Paton 1969a: 733). Boreo-temperate European element.

*1: Trengwainton gravel pits, Penzance, 1863, WC (PNZ) (Paton 1969a: 733); (vc1 listed without details by Lewis & Smith 1978: 24, as *P. proligera*).
*2: Fowey, 1905, RWS (TRU) (Paton 1969a: 733); this record is older than that listed as new for vc2 by Warburg (1962: 372). (Vc2 listed without details by Lewis & Smith 1978: 24, as *P. proligera*).

Distinctions between this and some allied species were confused until the revision by Lewis & Smith (1978). Those authors and Smith (1978) continued to confuse *P. annotina* with *P. proligera* (Kindb.) Lindb. ex Broth., the distinctions between them being pointed out by Shaw (1981). *P. proligera s. str. does not occur in Cornwall.*

The morphology of the bulbils differs widely among local populations of *P. annotina* in Cornwall as elsewhere, but the extreme types appear to be connected by a range of intermediates. It seems likely that much as in *Bryum dichotomum* the varying size and form of the bulbils confers a range of adaptations for dispersal within a genetically variable, mainly clonal species.

Grows as scattered plants, in pure populations or mixed with other low bryophytes, sometimes forming patches or low lawns. Habitat notes from C&S are as follows. Occurs mainly if not entirely on acidic substrates, typically as a colonist on partly bare mineral
soils’ of gravelly, sandy, silty, clayey or loamy textures, but sometimes also on humic substrates, firm mud, or growing erect from thick carpets of liverworts such as *Cephalozia* spp., *Gymnocolea inflata* and *Solenostoma gracillimum*. Large populations frequently occur on substrates with high concentrations of copper and probably other heavy metals, but it is often common also on china-clay spoil and other substrates with minimal metal concentrations. It occurs in a range of places that vary from free draining ridge-tops to moist hollows and seasonally inundated sediments beside rivers, pools and reservoirs, most commonly in the open but also in light to heavy shade (e.g. in deep hollows in banks or inside woodland).

The largest populations occur on old mining ground, where it is sometimes abundant, especially in hollows prone to seasonal floodling and also on banks of streams draining old mine areas. The wide range of other habitats recorded includes ditch, stream and river banks, paths and path edges (e.g. in a churchyard), tracks and their edges (e.g. on heathland, through open Grey Willow carr, in young conifer plantation, in a disused railway cutting, and near a pool in acid grassland), damp field gateways, wet soil in marshes and flushes (where often on hummocks or steep low banks), woodland clearings, soil on open areas in acid grassland, soil heaps on disturbed ground, soil in crevices of Cornish hedges and old walls, in granite quarries (on soil on slopes, banks and thin soil among rocks), in and around working china clay quarries and on their spoil heaps (on banks and flat areas), edges of mica dams, and inundation zones (of reservoirs and an old china-clay pit).

Frequent associates include several common tolerant species and acidophiles of open ground and banks, e.g. *Anthoceros punctatus*, *Archidium alternifolium*, *Bryum argenteum*, *Bryum bicolor*, *Ceratodon purpureus*, *Dicranella rufescens*, *Dicranella varia*, *Diplophyllum albicans*, *Fossombronia pusilla*, *Lunularia cruciata*, *Nardia scalaris*, *Pellia epiphylla*, *Phaeoceros laevis*, *Pogonatum aloides*. On mine-spoil with high copper concentrations it regularly occurs in species-poor communities mixed with strict metallophyte rarities, including *Cephalozia massalongi*, *C. nicholsonii*, *Ditrichum cornubicum*, *Pohlia andalusica*, *Scopelephila cataractae* and such commoner toleraters of copper as *Cephalozia stellulifera*, *Gymnocolea inflata* and *Solenostoma gracillimum*. In inundation zones beside reservoirs it may be associated with *Aphanorrhegma patens*, *Archidium alternifolium*, *Bryum klinggraeffii*, *Bryum rubens*, *Ceratodon purpureus*, *Dicranella rufescens*, *Trichodon cylindricus*, *Leptobryum pyriformis*, *Pohlia annotina*. Other occasional associates recorded in various habitats include *Bryum pallens*, *Cephalozia bicuspidata*, *Entosthodon obtusus*, *Pohlia camptotrichela*, *Pohlia filum*, *Pohlia flexuosa* and *Pseudephemerum nitidum*.

Only recorded with axillary bulbils, which are usually present and often abundant, in both open and ± heavily shaded sites. Recorded c.fr. at two sites in vc1: capsules immature 4, 5; dehiscing [7]; dehisced 7. Sporophytes are very rare elsewhere in Britain, maturing in early summer (M.J. Wigginton in Hill et al. 1994: 67).


Not generally recognised in Britain until the revision by Lewis & Smith (1978).

Grows as scattered stems, sometimes mixed with other low bryophytes, or forms small low patches. Notes on habitats in Cornwall are as follows. It is usually found as a colonist on damp or wet acidic substrates, including clayey, loamy, gritty and gravelly soils and firm clay or peaty mud beside reservoirs. Its sites were mainly unshaded, occasionally lightly shaded. Most records were from damp edges of marshes, near streams, small pools, or on wet flushed ground (commonly on tops of earthy ridges or hummocks of cattle-poached areas, often near _Juncus_). Others were from a damp heathland track, other wet tracks, a path in the grassy edge of heathland, a stream bank, high in inundation zones beside reservoirs and in old china clay workings (e.g. near pools and on tracks). One record was from the edge of an arable (barley) field. Recorded associates were _Archidium alternifolium, Atrichum undulatum, Bryum dichotomum, Bryum bornholmense, Ceratodon purpureus, Dicranella rufescens, Trichodon cylindricus, Ephemerum serratum, Fossombronia wondraczekii, Leptobryum pyriforme, Pohlia annotina, Pseudephemerum nitidum, Tortula truncata, Juncus bufonius, J. effusus, Lythrum portula, Montia fontana._

'Always' with axillary bulbils, which are usually plentiful. Not seen c.fr. (sporophytes are unknown in Britain according to M.J. Wigginton in Hill _et al._ 1994: 69).


Three records imply this species is tolerant of heavy metals, or at least of zinc: Whitemoor: On low bank and flat areas of china clay spoil near quarry, unshaded, close to _Weissia controversa_ var. _densifolia_ and _Bryum pallescens_, in and beside area where metal pipes and machine parts stored. Hantergantick Quarry: patch among thick carpet of _Bryum pallescens_ and _Weissia controversa_ var. _densifolia_ overlying steep edge of concrete at base of quarry building made from galvanised iron. Greensplat: on china-clay spoil of track beside quarry, close to galvanised shed (with _Pohlia annotina_).

Other habitat notes from Cornwall are as follows. SW of Roche: on unshaded, sparsely vegetated, free-draining low bank of china-clay spoil. SW. of Stenalees: in two places on
damp china clay spoil and silty soil of low bank near china-clay works, unshaded to slightly shaded by scrub edge. Goss Moor: on partly bare muddy soil exposed in acidic grassland and on unshaded or partly bare edges of damp tracks through disturbed ground near Grey Willow carrs (with Ceratodon purpureus, Cephaloziella hampeana, Pohlia annotina).

Only recorded with bulbils (short bulbils only at Whitemoor and Goss Moor, long and short at Greensplat and Roche). Not seen c.fr. (sporophytes are very rare in Britain according to M.J. Wigginton in Hill et al. 1994: 69).

114.16  **Pohlia lutescens** (Limpr.) H.Lindb.  
Temperate European element.  


First recorded from Britain by Watson (1968), but identification presented difficulties until Whitehouse (1973) described the rhizoidal tubers. *P. lutescens* is probably commoner than records indicate, since it is a rather inconspicuous moss that has only been recorded when tubers were seen. Similar plants, often small and sparse, and lacking tubers, which could not be identified with confidence (with rather narrow leaves toothed above and leaf cells about 14 µm wide) were seen from additional localities.

Grows as scattered plants, or forms very small patches or tiny low lawns. Habitat notes from C&S are as follows. Colonises partly bare soil, often with other low mosses. Characteristically recorded from mildly acidic loamy soil on horizontal to inclined free-draining surfaces, but it also occurs on humic, silty and clayey soils, sometimes in damp places. Most of its populations are slightly to rather heavily shaded e.g. by deciduous trees or overhanging banks. It is frequent on laneside banks and Cornish hedges, with records also from stream banks, banks in woodlands, groves and churchyards, soil among roots of a wind-thrown tree in woodland clearing, low on a N-facing sea-cliff, track edges (both in the open and in woodland), a low bank near a china clay quarry and a cattle-poached area in wet pasture. Atypical records were from the edge of an arable field (cereal stubble, but partly shaded by hedgerow) and on thin soil on bark of felled saplings in a wood pile. *Dicranella heteromalla* is the commonest associate; others recorded were *Bryum bornholmense*, *Bryum sauteri*, *Dicranella staphylina*, *Trichodon cylindricus*, *Epipterygium tozeri*, *Fissidens bryoides* var. *bryoides*, *Fissidens celticus*, *Fossombronia wondraczekii*, *Mnium hornum*, *Pohlia melanodon*, *Pseudotaxiphyllum elegans*, *Pseudephemerum nitidum*.

Rhizoidal tubers usually present, but often few in number and often lacking from small plants. Perigonia seen: 6. Not seen c.fr.

114.17  **Pohlia lescuriana** (Sull.) Ochi  
(syn. *P. pulchella* (Hedw.) Lindb.). Temperate Eurosiberian element.  

*1*: On bare patch of moist soil at base of *Juncus effusus* in small wet pasture, just NE. of St Enoder, 10/85, 1995, DTH 95-240 (BBSUK, DTH) (Blockeel 1996: 46).  
*2*: On soil on low bank beside track in clearing, woodland N. of Tutwell, SX37, 2000, DTH (BBSUK, DTH) (Rothero 2001: 43).
First recognised as British by Warburg (1965a), but identification presented difficulties until Whitehouse (1973) described the rhizoidal tubers. This is an inconspicuous species that is apparently rather rare in Cornwall, but it has doubtless sometimes been overlooked.

Grows as scattered stems or forms small low patches. Recorded from partly bare damp soil and clayey soil or sediments, in moist unshaded or lightly shaded sites. The four confirmed records were from a bare patch at base of *Juncus effusus* in a small wet pasture, low bank beside damp track in cleared area of woodland (near R. Tamar), dried pools along an old track and sediment exposed high in inundation zone beside Stithians Reservoir. Associates recorded were *Juncus effusus*, *Aphanorrhegma patens*, *Kindbergia praelonga* and *Pseudephemerum nitidum*.

Only recorded with rhizoidal tubers. Not seen c.fr., although well grown perichaetial leaves were present on one gathering (11). Elsewhere in Britain, sporophytes are occasional to rare, maturing from spring to autumn (M.J. Wigginton in Hill *et al*. 1994: 73).

114.18  *Pohlia melanodon* (Brid.) A.J.Shaw

*2*: St Endellion, 1888, RVT (B) (Paton 1969a: 734).

Reported for Isles of Scilly (Paton 1969: 734; SV91 in *Atlas 3*: 74), but perhaps in error since *Pohlia lutescens* was not usually recognised at that time and latter sp. has since been recorded in SW91G.

Grows as scattered plants that may be mixed with other small bryophytes, sometimes forming low lawns or denser pure patches. Habitat notes from Cornwall are as follows. On basic to circumneutral (or weakly acidic?) loamy, clayey, silty or sandy mineral soil, on firm sand or consolidated sand-rock, where moist or wet, mainly in partly shaded or sheltered places, or on N.-facing slopes but sometimes in open sunny places. Occurs on steep soil of banks of streams or rivers (often abundant and commonly within flood-zones), also banks beside a canal, ponds and lakes and a reservoir, steep soil on banks beside roads and lanes, exposed soil in woodland, Grey Willow carr, beneath Elders on dunes, in churchyards, a garden, edges of waste-ground, among flushed granitic rocks, hollows in 'hedges', tracks, path-sides, damp sea-cliffs and dry mud at a pool edge. Several records from arable land (barley, maize, stubble, brassicas) in mainly small amounts (occasionally plentiful) or at field edges. Occasionally on old, earthy mortar and soil of damp walls and crevices among old concrete. Common associates include *Barbula convoluta*, *Barbula unguiculata*, *Bryum rubens*, *Bryum pallens*, *Conocephalum conicum*, *Dicranella staphylina*, *Dicranella varia*, *Didymodon tophaceus*, *Epipterygium tozeri*, *Fissidens viridulus*, *Pseudephemerum nitidum*, *Tortula truncata*, others recorded include *Bryum radiculosum*, *Bryum violaceum*, *Dicranella rufescens*, *Didymodon tomaculosus*, *Fissidens incurvus*, *Pohlia lutescens*, *Phascum cuspidatum*.

Tubers have been reported in British material but they have not been noticed or searched for in Cornish plants. Only one record c.fr.: single dehisced capsule: 6 (near Mullion Cove).
Large patches with many mature setae but all capsules aborted: 3 (on stubble field edge W. of Philleigh).


Wide-boreal Circumpolar element.

*2*: Camel valley, Dunmere, 1879, RVT (B) (Paton 1969a: 734).

Grows as scattered plants (often among other low mosses), or forms small patches or low lawns. Habitat notes from Cornwall are as follows. On damp or wet, mineral soil (mainly acidic) in unshaded, lightly shaded or partly shaded places. Records are from paths (e.g. on heaths), tracks, gravelly lay-bys and gateways, soil on banks e.g. beside track and at edge of reservoir, old copper-mine spoil, china clay spoil, disturbed hummocks in marsh, soil over wet slate rock, stream edge in flush above cliffs, a soil heap and edge of path in nursery garden. A few records were from apparently basic sites including crevices or edges of old concrete and thin soil or clay overlying concrete or masonry. Associates recorded were *Bryum argenteum*, *Bryum dichotomum*, *Cratoneuron filicinum*, *Dicranella staphylina*, *Didymodon insulanus*, *Trichodon cylindricus*, *Fossombronia incurva*, *Philonotis fontana*, *Riccia sorocarpa*, *Tortula truncata*, sparse grasses.

Not seen c.fr.


At Roseland (SE. of Liskeard) it grew as small dense patches (to *ca* 7 cm across) on damp soil among slaty rocks on a bank near a disused quarry, slightly shaded by trees, near *Dicranella varia*, *Didymodon fallax*. These plants had very fragile stems from which the numerous leafy fragments breaking off are likely to function as propagules.

Not seen c.fr.


In British Isles has southern and western range, commonest in SW. England. Widespread in C&S, but it avoids much of the granite uplands, coastal sands and serpentinite; 'highly
coast-tolerant' (Table 2). Status ± stable since 1960s, or perhaps slight decrease (change index -13.29: Table 5).

It grows as scattered plants, often among other low mosses, or occasionally forms extensive pure low turfs 10 cm across. Habitat notes from C&S are as follows. Colonises stable, partly bare surfaces of loamy, silty or clay soil (occasionally sand), on moist water-retentive or less often rather dry free-draining substrates, of mildly acidic to circumneutral or weakly basic reaction, often more or less heavily shaded or in humid sheltered places (e.g. on N-facing slopes, or inside entrances to animal burrows) but sometimes in full sun. Often found on banks in deciduous woodland (including soil on wind-thrown trees and edges of wheel ruts on earthy tracks), beside lanes (commonly at the lowest level where soil is scraped by tyres), beside streams and rivers (where often common within flood-zones), on 'hedges', crevices at base of old walls, in old quarries, cemeteries, gardens, flushes, old pastures, grassland or scrub above sea-cliffs, exposed soil or sandrock on sea-cliffs (commonly inside shallow caves in low sandrock on Scilly). Eight records are from arable fields (mainly cereal stubbles; once in new grass-ley; twice found to be common in sheltered bulbfields and other horticultural fields).


Tubers not searched for on most plants, but plentiful on small plants from soil of a trackside bank in damp pasture. CDP also reported rhizoidal tubers from gatherings from four arable fields in vc1 and a bulbiform stem base in one of these samples (in Hill 2005: 44). See Arts & Nordhorn-Richter (1986) for review of vegetative propagules, ecology and distribution. Capsules rare (dioicous); seen twice since 1992: immature 4; dehiscing [4].

116.1 *Mnium hornum* Hedw. S12
Temperate European element.

*2*: Hay Wood, St Breock, 1906, RVT (B) (Paton 1969a: 738).

Habitat notes from C&S are as follows. Acidic soil on banks, slopes and among rocks in deciduous woodlands, edges of conifer woodland, groves of trees, shaded stream-banks, river banks (extending into flood-zones), Grey Willow carrs, 'hedges', laneside banks, on tors. Extends onto rotted wood and living tree bases in woodlands and old damp Grey Willow carrs, etc. Also grows in open on sea-cliffs, often as diminutive form. Soil at edge of short lawn in churchyard, at top of low retaining wall; unshaded. Partly shaded grave in cemetery. Base of *Molinia caerulea* tussocks in wet hollow in china clay spoil, with *Campylopus pyriformis*. Sides of fern tussocks in swampy deciduous woodland and Grey Willow carrs. Occasional in open mires with sphagna, on sides of hummocks and bases of
**Molinia** tussocks. Occasional on banks of metalliferous mine-spoil. Small patch on heathy bank of old china-clay spoil. Local on serpentinite bedrock: W. of Trevenwith in wooded valley seen on bark at base of old pine and on exposed roots of Beech trees, but absent from rocks and most of woodland floor. Unusual record of large patch c.fr. on wood of old railway sleeper projecting above stream, part shaded. Occurs locally as epiphyte on bases of woodland trees, especially in humid sheltered locations such as near pools, and on Grey Willow trunks and boughs in damp or wet carr. Associates recorded include *Calycopegia arguta*, *Calycopegia fissa*, *Cephalozia bicuspidata*, *Kindbergia praelonga*, *Fissidentes bryoides* var. *bryoides*, *Plagiothecium denticulatum* var. *denticulatum*, *Plagiothecium succulentum*, *Rhizomnium punctatum*, *Thuidium tamariscinum*, less often e.g. *Bryum dichotomum*, *Dicranum scoparium*, *Didymodon insulanus*, *Epipterygium tozeri*, *Fissidentes bryoides* var. *caespitans*, *Fissidentes exilis*, *Fissidentes polyphyllus*, *Heterocladium heteropterum* var. *heteropterum*, *Tortula truncata*, *Trichostomum tenuirostre*.

Commonly c.fr.: capsules immature 1-4, 10-12; dehiscing 3, 4 [5]; dehisced 3-10.

116.5.a  *Mnium marginatum* (Dicks.) P.Beauv. var. *marginatum*  LS  [2]
Boreo-temperate Circumpolar element.


Perhaps now extinct in Cornwall since there are no modern records.

118.1  *Rhizomnium punctatum* (Hedw.) T.J.Kop.  S12

*2: St Breward, 1886, HND (BM) (Paton 1969a: 739).

Rare in Isles of Scilly, where only record is of a few stems found in Apr. 2003 growing among other mosses on a damp shaded pathside bank at Higher Moor, St Mary's (DTH).

Grows as scattered stems, or forming low lawns, but the brown protonemata is often extensive where few gametophores develop. Habitat notes from Cornwall are as follows. Mostly on soil in wet places, usually in shade of woodland or Grey Willow carr or scrub, e.g. flushes, stream, ditch and river edges (extending low into flood-zones where it sometimes forms large pure patches); small plants and protonema also on tree bark (overhanging stream), rotting branches, fern bases, rock and boulders. Bits on *Molinia caerulea* tussocks in mire. Fern tussocks in swampy deciduous woodland.Flushes and on unshaded streambank on and above sea-cliffs (with *Bryum pseudotriquetrum*, *Pellia epiphylla*, *Riccardia chamedryfolia*). Large plants on flushed steep slate rock in quarry in deciduous woodland. Associates include *Amblystegium serpens* var. *serpens*, *Cephalozia bicuspidata*, *Kindbergia praelonga*, *Fissidentes bryoides* var. *bryoides*, *Fissidentes bryoides* var. *caespitans*, *Hookeria lucens*, *Hycomonium armoricum*, *Lophocolea bidentata*, *Lophocolea heterophylla*, *Mnium hornum*, *Pellia epiphylla*, *Pellia neesiana*, *Plagiomnium undulatum*, *Plagiothecium denticulatum* var. *denticulatum*, *Chrysosplenium oppositifolium*; less often *Fissidentes polyphyllus*, *Heterocladium heteropterum* var. *heteropterum*, *Trichostomum tenuirostre*.  

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Frequently c.fr.: capsules immature 1, 2, 9-12; dehiscing 1, 2; dehisced 1-5.


*1*: Sennen Green, 1861, ES (TRU) (Paton 1969a: 738).
*2*: St Minver, RVT (Tellam 1888, Paton 1969a: 738).

At Crowdy Reservoir it grew in unshaded short grassland close to edge of reservoir.
Not seen c.fr.


*2*: St Wenn, before 1907, RVT (B) (Paton 1969a: 738); this record is older than that listed as new for vc2 by Warburg (1962: 373). (Vc2 listed by Koponen 1971; listed without details by Crundwell 1973: 512).

Poorly grown plants can be very difficult or impossible to distinguish from scanty material or young or poorly grown *P. undulatum*, e.g. when on walls (cell size is not a reliable distinction). Our material of *P. affine* is commonly small and sparse.

Forms low lawns or more often grows sparsely with e.g. other mosses or among short grasses. Habitat notes from Cornwall are as follows. Soil with low grasses, etc., at base of low concrete and mortared walls of ruins in mine areas, quarries, china clay works, often among other mosses in short damp turf, unshaded or partly shaded. Soil on ledge of masonry low on large bridge, lightly shaded. Small patch on ledge of churchyard wall. Numerous records on soil in short turf in churchyards. Soil inside ruin of mine engine-house, well shaded. With low grasses, etc., on bank just north of mine engine house, part shaded. In crevice of damp masonry below north side of church; at base of concrete wall of building in moderate shade. Silty-loam of river banks (often low in flood-zone) under trees of woodland edges and in open beside R. Tamar. At base of *Phragmites australis* in fenny clearing of Grey Willow carr at edge of Penhale Camp. Patch on steep silted face of granitic boulder in large stream (within flood zone), part shaded by Ash trees.
Not seen c.fr.

[119.4 *Plagiomnium elatum* (Bruch & Schimp.) T.J.Kop. (syn. *Mnium seligeri* Jur. ex Lindb.) – Old records from vc2 (including near Sowden's Bridge, West Looe R., FR, in Rilstone 1948) are discounted because no specimens have been located (Paton 1969a: 739, Crundwell 1970: 206)].
119.5 *Plagiomnium ellipticum* (Brid.) T.J.Kop.  

*1*: Marshy ground at edge of willow carr behind sand-dunes, between Mount and Cubert, near Perranporth, July 1963, JAP (BBSUK) (Warburg 1964: 730); same record given as 'between Mount and Crantock' by Paton (1969a: 739).


The locality near Mount (variously listed as Penhale, Mount Field or Glanville's Field) is the only site in Cornwall. It grows here on wet humic substrates of rather bare places in a marsh between landward edge of dunes and Grey Willow-carr, among sparse cover of herbs such as *Epilobium hirsutum*, *Filipendula ulmaria* and *Juncus effusus*, almost unshaded in early spring but shaded by autumn.

Not seen c.fr.

119.6 *Plagiomnium undulatum* (Hedw.) T.J.Kop.  
(syn. *Mnium undulatum* Hedw.). Temperate European element.

*1*: Trevaylor Bottom, Penzance, 1861, WC (PNZ) (Paton 1969a: 739).  

Habitat notes from Cornwall are as follows. Frequently grows tall and luxuriantly on soil in woodland, most often in damp places such as flushes or streambanks, Grey Willow carrs, very humid sites such as in old quarries or on soil among rocks near small rivers and silty-loam of banks of larger rivers, within flood-zones. Smaller plants often occur in drier sites with some base-enrichment, e.g. on damp soil at base of masonry of bridge, near churches, and on bases of old walls where part shaded; bit in old granite quarry near concrete of ruins, on thin soil and decayed mortar of ledge on low ruined wall of mine building (unshaded), damp soil of shaded roadside lawn near stream. On shaded 'hedge' and on damp banks. On base of concrete and mortared-stone walls e.g. of ruined mine buildings and reservoir dam, part shaded (small forms such as those from these walls can be very hard or impossible to distinguish from *P. affine*). On damp shaded rocks (gabbro?) under Sycamore trees near pond. Bits in open flush above sea-cliff. Associates include *Atrichum undulatum*, *Brachythecium rivulare*, *Cirriphyllum piliferum*, *Conecephalum conicum*, *Kindbergia praelonga*, *Hyocionum armoricum*, *Rhizomnium punctatum*, *Thamnobryum alopecurum*. Often near *Chrysothamnium oppositifolium*.

Single record c.fr.: immature capsules on *ca* 10 stems of patch growing part shaded at base of wall in ruined mine buildings, Minions, vc2, 13 Feb. 1999, DTH 99-33. All other Cornish records c.fr. are old (19th Century?).
119.7 *Plagiomnium rostratum* (Schrad.) T.J.Kop. (syn. *Mnium longirostrum* Brid.). Boreo-temperate European element.

*2: Dunnere Wood, before 1907, RVT (B) (Paton 1969a: 738).

[Several old records from vc1 were dismissed as doubtful because no specimens were located and there may have been confusion with *P. affine* (Paton 1969a: 738, Crundwell 1970: 206)].

There are no recent records.

121.1 *Aulacomnium palustre* (Hedw.) Schwägr. S12
Wide-boreal Circumpolar element.

*1: Tremethick Moor, Penzance, 1862, WC (PNZ) (Paton 1969a: 739).

Grows as lawns or often mixed with other bryophytes and vascular plants. Forming pure hummocks up to 25 cm high locally on wet heathland at Retire Common. Habitat notes from Cornwall are as follows. In open, wet, acid, oligotrophic to mesotrophic mires or wet heathland, or flushes e.g. in pastures or above sea-cliffs, commonly with sphagna (including *Sphagnum denticulatum, S. inundatum, S. capillifolium, S. fallax, S. fimbriatum, S. palustre, S. papillosum, S. subnitens*), other common associates include *Calypogeia fissa, Odontoschisma sphagni, Pleurozium schreberi*, less often *Dicranum bonjeanii*; usually at base of such vascular plants as *Calluna vulgaris, Erica tetralix, Juncus effusus, Molinia caerulea, Potentilla erecta, Ulex gallii*, or mixed with low growth of these, less often *Schoenus nigricans*.

Unusual records (as colonist): six records, often of substantial patches, on partly bare clay of slopes and flat areas of tips of china clay spoil, others of patches on wet track edges or developing wet heathland on china clay spoil (with *Bryum alpinum*, sparse *Calluna vulgaris, Molinia caerulea, Pleurozium schreberi*). Single record on wet clayey track edge in young coniferous plantation. Single record also of small patch with other mosses in damp, sparsely vegetated hollow on old metalliferous mining ground; unshaded. At base of granitic boulder near reservoir edge, with *Hypnum jutlandicum* and other mosses. A bit growing on soil of plant pot in open air at Burncoose Nurseries then two years later in several places there on peaty soil, perhaps having arrived with horticultural peat.

Recorded several times with gemmae at stem or branch apices. One record cfr, capsules immature 6, dehisced 6.
121.3 *Aulacomnium androgynum* (Hedw.) Schwägr. LS {1}[2]
Temperate European element.


Recorded in vc1 only as horticultural weed in SW64F (with ornamental fern in plant-pot in garden of RJM at Reskadinnick, the pot brought from Wisley) (DTH). There are no recent records from vc2.

Not seen c.fr.

122.1 *Orthodontium lineare* Schwägr. ALIEN S12
Temperate European element.


Grows as small patches or extends to form a short turf. Notes on habitats in Cornwall and Scilly are as follows. Most records are from damp, rotting, decorticated wood of tree trunks or large logs on or near the ground (old wood of various deciduous trees was involved, including Beech; it sometimes also extends onto rotting bark). The finds on rotting wood were in rather open to partly shaded or shaded sites, mostly in deciduous or mixed woodland or at its edges, but also once each in a shrubbery and a churchyard. Atypical records are from a crevice low on the trunk of a living oak growing on a hedgebank, and on humic soil on top of an old, N-facing wall of a ruin (at Chysauster). Associates recorded were *Campylopus introflexus, Dicranum scottianum, Kindbergia praelonga, Lophocolea heterophylla, Tetraphis pellucida*.

Commonly c.fr.: capsules immature 1, 3, 5, 12; dehiscing; dehisced 1, 5, 7, 9.

123.1 *Leptotheca gaudichaudii* Schwägr. ALIEN {1}[2]
Temperate Hyperoceanic element.

*1: On base of tree fern ['trunk' (i.e. erect rhizome)], 30 m alt., Trebah Gardens, SW7627, 7 Apr. 2005, JDS conf. HWM (Rothero 2009: 77); subsequently categorised as 'persisting introduction' (Blockeel 2010: 55).
*2: On 'trunk' of tree fern in outdoor garden, 100 m alt., Eden Project, SX047548, 2009, NGH 7512.

It was listed by Rothero (2010: 79) as a 'persisting introduction', defined by Blockeel (2010) as present at the location for at least 10 years. However, when the Eden Project opened in 2000 the outdoor gardens were of small extent and lacked tree ferns, so the moss has certainly not grown in this location for 10 years.
125.1 *Achrophyllum dentatum* (Hook.f. & Wilson) Vitt & Crosby  

**ALIEN NR** {1}  

Temperate Hyperoceanic element.

An alien from the Southern Hemisphere, reported by Rumsey (2001) as well established when it was collected in April 1991 from grotto with filmy-ferns near a waterfall in a large private garden near Truro [the locality is at Tregye, near Carnon Downs, *ca* SW898398 (SW83E)]. This population was subsequently categorised as a 'persisting introduction' (Blockeel 2010: 55). The species is a native of temperate regions of the Southern Hemisphere. It has been found several times in glasshouses in Britain but there are no other reports of it becoming established in the open air.

The record (from Tregye) was from a damp grotto in the spray zone of a small waterfall, a feature created from natural rock sometime in the 19th century. The grotto is at the base of a steep, N.-facing bank, and is constantly damp and sheltered. Within this, extensive mats of the filamentous gametophytes of filmy-ferns (*Trichomanes* spp.) occur, often pendant or on ledges, and the *Achrophyllum* occurs as scattered plants creeping through these mats. The Cornish plants had filamentous outgrowths from the leaves, but these had not produced the typical L'-shaped gemmae of *A. dentatum*. Sporophytes and gametangia were not seen on the Cornish material.

126.1 *Calyptrochaeta apiculata* (Hook.f. & Wilson) Vitt  

**ALIEN NR** S  


Native only in the Southern Hemisphere. See Streimann (2000) for details of its Australian distribution and habitats, variability, and differentiation from congeners.

Our only locality is on Tresco; elsewhere in Britain only in Sussex. Forms small patches or low pure lawns. Seen in three places about the Tresco Abbey gardens and grounds during 1995-1997 and found at two others [at least] in the past. Largest patches (extending for over a metre in 2003) were on soil of bank beside lane (Abbey Drive), on vertical and inclined surfaces, fairly well shaded by trees or shrubs (including *Rhododendron* bushes and coniferous trees). Young plants also seen in small quantity on very thin soil over stones at edge of path in garden, shaded by trees.


Not seen c.fr.

128.1 *Hookeria lucens* (Hedw.) Sm.  

Temperate Suboceanic element.


Often forms substantial patches. Habitat notes from Cornwall are as follows. Usually on soil in moist or wet, sheltered places such as in flushes or on stream banks under trees (often in woodland, Grey Willow-carrs, or other scrub with Grey Willows on wet ground including that on heaths and in old quarries); extends into flood-zone in woods beside R. Tamar. Also, mainly in small quantities, on soil on woodland banks, under hedgerows, or on laneside banks. Commonly on wet, humic soils and recorded e.g. on bases of tussocks formed by Osmunda regalis or Dryopteris spp. and litter under Carex paniculata, but also on loamy and mineral soils in wet sites. Also in small amounts on thin soil over flushed rocks or on edges of rocks in damp places, including a flush above sea-cliffs, once on wet shaded wall in small quantity. Commonly in light to heavy shade, but also in some fully insolated sites. Frequent associates include Brachythecium rivulare, Chrysosplenium oppositifolium, Dryopteris, Kindbergia praelonga, Oxyrrhynchium pumilum, Pellia epiphylla, Plagiomnium undulatum, Plagiothecium denticulatum var. denticulatum, Thamnobryum alopecurum; less common associates include Plagiothecium denticulatum var. denticulatum, Trichocolea tomentella.

Single records of it extending onto bases of tree trunks (reaching 0.5 m above ground), on rotting log on ground in woodland and growing on bark of old tree fallen across stream, all in well shaded, humid sites. Once in flush on unshaded slopes high above N.-facing sea-cliff (NW. of Morvah). Unusual record ca 2 m above head of shingle beach inside small sea-cave near Porthkerris Point, on overhanging, moist, slaty rock in heavy shade, close to Asplenium marinum (H. lucens was in some quantity here, but small and sterile).

Plants with many gemmae on tips of leaves frequently seen (perhaps commonest on small plants in heavily shaded or rather dry places; recorded 7, 10-12). Frequently/commonly c.f.r.: capsules immature 1-3, 7-12; dehiscing 1, 2; dehisced 2-5. Capsules are often eaten off before they mature.

129.1 Cyclodictyon laetevirens (Hook. & Taylor) Mitt. NR:EN 1
Southern-temperate Hyperoceanic element.

*1: Mousehole Cave, c.fr., 1840, JR (Greenwood 1844) and 1843, AG (PNZ) (Paton 1969a: 745, given in parentheses because there were no recent records).

Known from one small area in vc1, with records restricted to single site for past century (the only locality in England). Recorded at single site well inside a sea-cave near Mousehole, where the single patch known had maximum dimensions of 58 cm high by 38 cm wide in 1997. It is on granitic rock forming the north wall of the cave, on the near-vertical surface of a shallow groove that is trickling with water, in a location partly shielded from the exterior, so in rather weak light.

The only plants in contact with it are Conocephalum conicum (which surrounds it on one side) and a few stems of Plagiothecium nemorale. Vegetation on ledges nearby is mostly of nearly pure stands of Agrostis stolonifera or of Osmunda regalis; other species present in lesser amounts nearby on the ledges or on steep rock are Fissidens adiantoides, F.
polyphyllus, Oxyrrhynchium hians, Trichostomum brachydotium, Samolus valerandi and Scrophularia nodosa.


130.1.a  **Fontinalis antipyretica** Hedw. var. *antipyretica*  
(syn. *F. antipyretica* var. *gigantea* (Sull.) Sull.). Boreo-temperate Circumpolar element.


Although var. *gigantea* was recognised by Welch (1969) and Smith (2004) it may not be worthy of taxonomic separation from var. *antipyretica*. Material from Drift Reservoir (SW433289, low on trunks of Grey Willow bushes at S. edge of Drift Reservoir, where normally submerged, 14 Aug. 1995, DTH 95-264, 265, 266) has some shoots showing characters of var. *gigantea* and others indistinguishable from var. *antipyretica*.

Grows as lax wefts, often long (5 to 20 cm, occasionally 35 cm), in shallow water (at least to 40 cm depth) or where intermittently inundated. Habitat notes from Cornwall are as follows. It grows attached to rocks (granitic, gabbro, slate, serpentinite), masonry, firm soil or living or dead wood, in standing water, trailing in flowing water, or hanging vertically in trickling water e.g. at sluices. Most records are from small to large streams and rivers. It is widespread in the winter-flooded zones at the edges of Argal, Cargenwen, College, Drift and Stithians Reservoirs, often where exposed to wave action, but also occurs permanently submerged in sheltered water of small lakes (e.g. at Penjerrick). Along the lower R. Tamar it occurs at levels subject to regular tidal flooding with fresh water whereas plants growing at the highest levels further upstream may be flooded only by high-stage flows. It grows unshaded, partly shaded, or sometimes well shaded in woodland streams.

*Fontinalis antipyretica* is replaced by *F. squamosa* in streams with really soft water, but both occur where hardness levels appear slightly higher e.g. at Crowan and in the R. Tamar. It tolerates moderate levels of eutrophication, but not the highest levels where only *Leptodictyum riparium* and *Platyhypnidium riparioides* persist. It is most often found in pure patches but sometimes close to *Chiloscyphus polyanthos*, *Cinclidotus fontinaloides*, *Fontinalis squamosa*, *Leptodictyum riparium*, *Platyhypnidium riparioides*, or lichens. At Cargenwen Reservoir it is co-dominant in a closed sward with *Equisetum fluviatile*, *Mentha aquatica* and *Pilularia globulifera*, in shallow water that dries back in most summers. See the account of *Fontinalis squamosa* below for additional notes.

One record c.fr.: capsules dehisced 8 (Drift Reservoir, vc1).

130.1.b  **Fontinalis antipyretica** var. *gracilis* (Lindb.) Schimp.  
Boreo-temperate Eurosiberian element.

*1*: In shallow quick-flowing water on lip of small weir, slightly shaded by trees and *Prunus laurocerasus* scrub, Clowance, SW63, 1994, DTH 94-359 (BBSUK, DTH) (Blockeel 1996: 47). An older record from vc1 (Land's End, Holmes 1906) was discounted because no specimen was located (Paton 1969a: 743).
Habitat notes from Cornwall are as follows. Clowance: at lip of small weir, in quick-flowing shallow water, slightly shaded by trees. Further upstream (just W. of Crowan) larger plants approaching var. gracilis were found, along with typical material of var. antipyretica. NW. of Trevenna: on rocks in small quick-flowing stream, lightly shaded by deciduous trees (with no other other submerged macrophytes except sparse Chiloscyphus polyanthos and Platychyntium riparioides). Upper Tamar Lake: small patch on unshaded surface in inundation zone beside reservoir.

Not seen c.fr.

130.2. Fontinalis squamosa s.l.

The vars. of this sp. are only identifiable on the rather infrequent occasions when they bear capsules and have perichaetial bracts that survive with uneroded apices, so all records of non-fertile plants and some of fertile plants are referred only to F. squamosa s.l.

Grows as wefts, 5-20 cm or not infrequently up to 25 cm long. Notes on its habitats in Cornwall are as follows. Attached mainly to rocks (granitic, slaty), but also masonry, concrete, stable gravel, firm hard soil or wood, trailing in shallow water (to 20 cm depth) or hanging where intermittently inundated (up to 20 cm above water level). It grows in soft-water streams and rivers, usually where ± quick-flowing, but is also widespread in winter-flooded zones at edges of Drift, Stithians and Siblyback Reservoirs (mainly in places exposed to wave action). It grows in the open, lightly shaded or sometimes in rather heavily shaded places.

The present species is restricted to soft water, unlike F. antipyretica (see above), and mainly found in well oxygenated quick-flowing water. In middle reaches of R. Tamar F. squamosa grows mainly where permanently submerged, whereas F. antipyretica withstands more desiccation and occurs alongside it up to 0.7 m above low summer water levels. In contrast, where F. squamosa occurred with F. antipyretica at Drift Reservoir the latter species was much more plentiful and more widespread, occurring in deeper water and more sheltered sites. In a stream near Cape Cornwall it was recorded as extending downstream to near the shore.

Fontinalis squamosa mostly occurs in pure patches but its associates sometimes include Chiloscyphus polyanthos, Fontinalis antipyretica var. antipyretica, Hygrohypnum ochraceum, Platychyntium riparioides, Scapania undulata, lichens, less often Leptodictyum riparium, Fissidens fontanus, Platychyntium lusitanicum, Thamnobryum alopecurum.

Occasionally c.fr.: capsules immature [3], 8; dehiscing 8; dehisced 4, 7, 8.
130.2.a *Fontinalis squamosa* Hedw. var. *squamosa*  
Temperate Suboceanic element.

First records for species as a whole:

The vars. of this sp. are only identifiable on the rather infrequent occasions when they bear capsules, so all records of sterile plants are referred to *F. squamosa s. l.* (see above). Many of these records doubtless refer to var. *squamosa*.

Recorded c.fr. (see above).

130.2.b *Fontinalis squamosa* var. *curnowii* Cardot  
Temperate Oceanic element.


At least six Cornish localities, apparently forming a majority of all those known worldwide:

**SW42P**: SW 453293, stones submerged in fast-flowing stream, NW. of Newlyn, 28 July 1994, DTH 94-350. Habitat recorded as on rocks submerged in shallow water of quick-flowing stream, shaded by deciduous trees; with *Chiloscyphus polyanthus*.

**SW43M**(*vc1*): Newmill, Penzance, 1865, Curnow (E) (Braithwaite 1905: 213 as Penzance; Paton 1969a: 743, MS.: 268; = part of Trevaylor Valley, 1865).


**SX17E**: SX 1078, E. of Hamatethy N. of St Breward, 1960s (Paton 1969a: 743, MS: 268).


Specimen from Skimmel Bridge (DTH) may link var. *curnovii* and var. *squamosa* since it has the large spores of the former but a small apiculus on some perichaetial bracts as in the latter. The few records identified to vars. do not suggest any difference between their habitats (see above).

Recorded c.fr.: capsules immature: 7.
Climacium dendroides (Hedw.) F.Weber & D.Mohr

Wide-boreal Circumpolar element.

*1: Railway cutting near Truro, 1863, WC (PNZ) (Paton 1969a: 743). This record is much older than the one listed as new for vc1 by Warburg (1964: 731).

Habitat notes from Cornwall are as follows. Leswidden: locally plentiful on quartzose gravel within flood-zone at edge of large pool (disused china-clay quarry), unshaded or slightly shaded by Grey Willows. Large population in inundation-zone at edge of Cargenwen Reservoir, Nov. 2004, growing on sparsely vegetated open banks and partly to moderately shaded at edges of and beneath Grey Willow scrub. Associates include Archidium alternifolium, Calliergonella cuspidata, Drepanocladius aduncus, grasses and herbs. Widespread in upper part of inundation-zone beside Colliford Lake (reservoir), where locally plentiful among short grasses and herbs in a few places, but mainly occurring as scattered immature plants in areas partly bare of vegetation. Small patch with other mosses and low phanerogams on soil in sheltered hollow at base of old mortared wall of ruin of mine building (Crow's Nest). Discovered new to Scilly in 2003, with sparse very low plants on unshaded damp acid sand among very short vegetation of dune-slack at Appletree Banks, Tresco.

Not seen c.fr.

Palustriella commutata (Hedw.) Ochyra

(syn. Cratoneuron commutatum (Hedw.) G.Roth var. commutatum, C. commutataum var. virescens (Schimp.) P.W.Richards & E.C.Wallace, Palustriella commutata var. commutata). Boreo-temperate Eurosiberian element.

*1: Sennen Green, 1894, HB (RAMM) (Paton 1969a: 746).


Habitat NE. of Coverack was on flushed slope above sea-cliffs, growing on ground in wet heath with Schoenus nigricans and other marsh plants.

Not seen c.fr.

Palustriella falcata (Brid.) Hedenäs

(syn. Cratoneuron commutatum var. falcatum (Brid.) Mönk., Palustriella commutata var. falcata (Brid.) Ochyra). Boreo-temperate Circumpolar element.

*1: Dean Point near St Keverne, 1961, JAP (BBSUK) (Paton 1969a: 746).
*2: Rock near St Minver, 1905, RVT (B) (Paton 1969a: 746). This record is much older than the one listed as new for vc2 by Warburg (1964: 732).

Not seen c.fr.
133.1 *Cratoneuron filicinum* (Hedw.) Spruce
(syn. *C. filicinum* var. *fallax* (Brid.) Roth). Wide-temperate Circumpolar element.


Habitat notes from Cornwall are as follows. On calcareous masonry (including mortar and concrete), especially where damp or wet, e.g. on edges of concrete roads, on and near damp walls (e.g. of bridges, viaducts, pond edges and ruins), on and around debris of dumped masonry, on soil (often thin stony or gravelly soil) of paths and tracks, gravel car parks, in gardens and churchyards, in open or lightly shaded, occasionally in moderate shade. Many associates, often include *Barbula convoluta, Barbula unguiculata, Bryum dichotomum, Calliergonella cuspidata, Didymodon insulanus, Didymodon nicholsonii, Eucladium verticillatum, Oxyrrhynchium hians, Kindbergia praelonga, Pellia endiviifolia, Rhynchostegium confertum*. Plentiful on sparsely vegetated damp calcareous sand in floor of old sand pit at landward edge of dunes (with *Aneura pinguis, Bryum pseudotriquetrum, Brachythecium rivulare, Calliergonella cuspidata, Drepanoclados aduncus, Petalophyllum ralfsii*). Alone or on algae and with other bryophytes on serpentinite and slaty rocks or firm soil in very shallow water, dripping or trickling water on banks, a road-cutting, in edges or flood zone of streams, in open or lightly to part shaded in deciduous woodland on granitic boulder and slaty rocks at or just above water-level in small streams, often in shade of trees. On rock at base of sea-cliff of mica-schist granulite (Porthallow). On earthy copper-mine spoil, unshaded or lightly shaded. On dumped masonry in old mining area and on china clay sites, unshaded. In small quantity on old unshaded tarmac. On wet, flushed bank at edge of stream in fenny area on Lizard pen. heath. In flushes and at stream edges on slopes above sea-cliffs. In open damp hollows in grassland on old landfill site. Sometimes forms large pure patches on flushed slaty rocks in old quarries inland and near coast, and road-cuttings (associated with *Conocephalum conicum, Eucladium verticillatum, Fissidens adianthoides, Pellia endiviifolia, Thamnobryum alopecurum*). Plentiful on serpentinite low in inundation-zone of large stream (Poltesco). In short vegetation of calcareous dune-slack. Unusual records from old tarmac of lane, and of patch on damp old timber of unshaded seat beside reservoir, growing close to mortared masonry.

Two records c.fr. (both records of plants on rock in streams, vc1 and vc2): capsules dehiscing 5.

134.1 *Campylium stellatum* (Hedw.) Lange & C.E.O.Jensen
(syn. *C. stellatum* var. *stellatum*). Boreo-temperate Circumpolar element.


Treatment of *C. stellatum* and *C. protensum* as distinct species follows Hedenäs (2003).

Grows intermixed with other vegetation or sometimes as lawns of erect and arching stems. Notes on habitats in C&S are as follows. Characteristic of damp peaty substrates on heaths on Lizard pen., mainly where cover of phanerogams is open or patchy (often with *Bryum pseudotriquetrum, Calliergonella cuspidata, Fissidens adianthoides*). In open mire with *Sphagnum* (including *S. subnitens*). In small quantity among *Didymodon tophaceus* at base
of *Juncus maritimus* in flushed area on rocky raised beach near sea-level. In flushes and beside small streams on open slopes on and above sea-cliffs, sometimes forming large pure patches (sometimes with *Calliergonella cuspidata*, *Cratoneuron filicinum*, *Drepanoclada* *d* *aduncus*). Bodmin Moor: in open mesotrophic parts of wet mires, especially in trickling water of runnels or flushes; associates include *Calliergonella cuspidata*, *Scorpidium revolvens*, also close to *Erica tetralix* and *Molinia caerulea*.


134.2 **Campylium protensum** (Brid.) Kindb. 12
(syn. *Campylium stellatum var. protensum* (Brid.) Bryhn). Boreo-temperate Circumpolar element.


Recorded as growing on thin calcareous sandy soil on slope of old copper-mine spoil near coast, unshaded, with *Southbya tophacea*.

Not seen c.fr.

135.1 **Campyliadelphus chrysophyllus** (Brid.) R.S.Chopra 12


*2*: St Minver, RVT (Tellam 1888); Brea Hill near Rock, 1962, JAP (Paton 1969a: 747).

Grows mainly on calcareous sand in unshaded grassland on fixed sand-dunes, often as substantial patches in areas of short or very short vegetation on sandy soil of flat ground, slopes or mounds. Also in similar situations on blown sand resting on coastal hillside.

Not seen c.fr.

135.2 **Campyliadelphus elodes** (Lindb.) Kanda NS 1
(syn. *Campylium elodes* (Lindb.) Kindb.). Temperate European element.

*1*: Hayle Causeway, RVT (Holmes & Brent 1869); Crousad Downs near Coverack, 1962, JAP (BBSUK) (Paton 1969a: 747).


Two recent records include the following habitat notes. NE. of Coverack: on flushed slope above sea-cliffs with wet heath vegetation, occurring low down amongst tussocks of *Schoenus nigricans* (with *Juncus inflexus* and *Molinia caerulea* close by), where rather heavily shaded and intermixed with *Fissidens adianthoides*. W. of Rosuick (Lizard pen.): in
unshaded wet hollow in old serpentinite quarry on heath (in small quantity intermixed with *Drepanocladus polyganus*).

Not seen c.fr.

136.1.a **Amblystegium serpens** (Hedw.) Schimp. var. *serpens*  
(syn. *A. juratzkanum* Schimp.). Boreo-temperate Circumpolar element.


Habitat notes from C&S are as follows. Most often a calciphile, but apparently not always. Frequently near water, in open and shaded. Common on concrete or mortar or over softer stones of old walls, unshaded (but mainly where humid or sheltered) to moderately shaded. Also on and beside blocks or bits of dumped calcareous masonry, in open or part shaded. At bases and sometimes higher on concrete fence-posts, not or part shaded. On blown sand shaded by grasses and Bracken near coast. On soil with very short turf on upper part of sea-cliff. On granitic and serpentinite rocks near and above water level of streams. Soil of banks and over masonry debris in old mine areas, unshaded to lightly shaded. On damp decorticated wood of fallen elm trunk near stream. Common on silted bark of trees and firm soil within flood-zone on banks of rivers, and in upper parts of inundation zones beside reservoirs, usually part shaded. On Sycamore trunk above flood level beside stream. Decorticated wood of fallen tree trunk, in open. Bark of trunks and living branch low on Elder bushes (with *Rhynchostegium confertum*). Damp sand in fenny area near stream at edge of dune grassland; unshaded.

Recorded associates often include *Bryum capillare*, *Didymodon insulanus*, *Oxyrrhynchium hians*, *Kindbergia praelonga*, *Rhynchostegium confertum*, *Tortula muralis*, *Zygodon viridissimus*, also *Sciuro-hypnum plumosum*, *Bryum donianum*, *Lejeunea cavifolia*, *Leptodictyum riparium*, *Radula complanata*.

Commonly c.fr.: capsules immature 1-7, 12; dehiscing 3-8 [10, 12]; dehisced (1-4, 6 old), 6-12.

136.1.b **Amblystegium serpens** var. *salinum* Carrington

*2*: On steep bank of sand at landward edge of dunes, 5 m alt., NW. of Rock, SW97, 2002, DTH 02-005 (*BBSUK*) (Rothero 2003: 60).

Most records are from calcareous sand in areas of very short vegetation in dune grassland, including damp hollows and dry sites, and sandy soil on partly bare ground and short turf on unshaded tops of sea-cliffs. Associates recorded: *Barbula convoluta*, *Bryum cf. algovicum*, *Homalothecium lutescens*, *Hypnum cupressiforme* var. *lacunosum*, *Pleurochaete squarrosa*, *Trichostomum brachydontium*, *Festuca rubra*, *Holcus lanatus*, *Thymus polytrichus*, seedling *Senecio jacobaea*; rarely *Brachythecium glareosum*, *Didymodon acutus*. Also recorded among very short vegetation on thin soil over ledge of upper part of slaty crag near sea-cliffs; on steep sandy bank at landward edge of dunes, partly shaded by Ash sapling.
Occasionally c.fr. (three records, all vc1): capsules immature 3; dehisced 10.

136.2 *Amblystegium radicale* (P.Beauv.) Schimp.  
(syn. *A. saxatile* Schimp.). Temperate European element.


See Hedenäs (1997) for taxonomic treatment. Blackstock & Holyoak (2004) gave notes on its history at English and Welsh localities. Bosanquet (2006b) reported the discovery of this species in several *Phragmites australis* beds in Wales and in arable fields in S. Wales and N. Scotland, so that it appears either to have been overlooked in these habitats or to have recently increased its range. There is one recent record from an arable field in Cornwall: small quantity in wheat stubble field E. of Herodsfoot, on reddish loam soil, pH 6.2 (*fide* CDP).

At the Bugle locality in an old china clay working, it was recorded amongst and on dead stems of *Juncus* in marshy hollow; as several small scattered patches in 1962, nearly exterminated by flooding in late 1960s (JAP typescript notes). It was refound at SX030591 on 18 Apr. 1995, with other pleurocarpous mosses on bark of rotting branches, just above wet ground in edge of *Salix cinerea* carr (*DTH* 95-104, 95-105). The species was still present in small amount in same area in 1997 (*DTH* & PAG). Not refound with brief search on 24 Jan. 2002 (*DTH* & FJR), when clearance, drainage and other damage had occurred to parts of site.

Commonly c.fr. at Bugle site.

136.3 *Amblystegium confervoides* (Brid.) Schimp.  


There are no other records from Cornwall.

137.1 *Hygroamblystegium fluviatile* (Hedw.) Loeske  
(syn. *Amblystegium fluviatile* (Hedw.) Schimp.). Boreo-temperate European element.


Probably not a valid species: see notes under *A. varium*.

Grows as patches or wefts. Habitat notes from Cornwall are as follows. On rocks and thin soil over horizontal rocks (slaty) near and at water level (always in flood-zone) beside large stream and rivers, part shaded by deciduous trees. Thin silt/soil on rocks in flood-zone beside R. Tamar, part shaded by deciduous trees. On slate rock shallowly submerged in...
clean flowing water of large stream; almost unshaded (Rocky Valley). Associates include *Aneura pinguis, Sciuro-hypnum plumosum, Fissidens pusillus, Hygrohypnum ochraceum, Platyhypnidium riparioides*.

Not seen c.fr.

137.2 *Hygroamblystegium tenax* (Hedw.) Jenn.  


Probably not a valid species: see notes under *A. varium*.

Grows as low patches. Most records are from streams at or close above water-level, usually growing on steep, horizontal or sloping rock (granitic, serpentinite or slate), but with single records of it extending onto firm soil and wood of a log. Two records were from open but sheltered sites but most were noted as being either partly shaded by banks, scrub, etc. or more heavily shaded by deciduous trees or woodland. A single record (S. of Pantersbridge) of it growing close above water-level of a small river, within the usual flood-zone. Associates recorded were *Amblystegium serpens var. serpens, Brachythecium rivulare, Chiloscyphus polyanthos*.

One record c.fr.

137.3 *Hygroamblystegium varium* (Hedw.) Mönk.  
(syn. *Amblystegium varium* (Hedw.) Lindb.). Temperate Circumpolar element.


[A record from vc2 (Bodmin, RVT, in Tellam 1888) was dismissed as doubtful because no specimen was located (Paton 1969a: 747, Crundwell 1970: 209)].

Only the single record from Cornwall given above is now accepted: Gwendreath (Lizard), on steeply inclined surface of boulder just above water-level in small quick-flowing stream, shaded by deciduous woodland, with a little *Platyhypnidium riparioides*.

Not seen c.fr.

Vanderpoorten (2004) argued from cultivation studies and molecular data that the morphological characters of the three species usually recognised within *Hygroamblystegium* (*H. fluviatile, H. tenax, H. varium*) result from 'plasticity, accelerated evolutionary rates with little phylogenetic association'. He therefore treated all three taxa as forms of *H.*
On that basis, the first vice-county records in Cornwall of *A. varium sensu lato* would be as follows:


Habitat notes from Cornwall are as follows. On stones and rocks (including slates), firm soil, exposed tree roots or dead wood in shallow flowing water of ditches, streams and rivers, often where only inundated for part of each year, almost unshaded or shaded by trees. In similar habitats in inundation zones around reservoirs. Apparently tolerates eutrophication: found twice in streams not far below outlets from sewage works (with *Platyhypnidium riparioides* as associate once). On concrete close to water level of pool, slightly shaded. On masonry near ditch. Patch on flat concrete above ground near a ruin. On gabbro rocks at water level in pond (of clean water) under open cover of Sycamore trees. Thin soil over roots in Grey Willow carr, shaded. Base of trunks of Grey Willows beside pool in old quarry and at edge of pond in dunes; bit also on old metal of rusted oil drum near water-level. In small quantity on partly bare patch of damp soil in pasture, near woodland edge but almost unshaded. On rotting wood on wet ground under trees near stream and in a wet Grey Willow carr. On stony soil and old concrete of wet, partly shaded lanes. Scrap in crevice of tarmac of part-shaded lane. On damp sand at base of open, unshaded fen vegetation near small stream at edge of dune grassland. Small amount in arable field (new grass-ley), with *Bryum dichotomum*, *Dicranella staphylina*, *Trichodon cylindricus*, *Epiperygium tozeri*, *Fossombronia caespitiformis*, *Tortula truncata*. Small amounts on soil in stubble field (just) within zone occasionally inundated by R. Tamar. Plentiful on rather dry loam soil in arable field (brassicas), with *Kindbergia praelonga*, *Oxyrrhynchium hians*, *Brachythecium rutabulum*.

Often grows in pure patches, but sometimes associated with or close to *Hygroamblystegium fluviatile*, *Amblystegium serpens* var. *serpens*, *Chiloscyphus polyanthos*, *Éphemerum serratum*, *Fontinalis antipyretica* var. *antipyretica*, *Fontinalis squamosa*, *Hygrohypnum ochraceum*, *Platyhypnidium riparioides*, *Scapania undulata*.

Frequently/commonly c.fr.: capsules immature 1, 3-7, 9-11; dehiscing 4-6, 8-10; dehisced 1, 9-11.

*2: On E-facing rocks at base of crag by stream, 20 m alt., Rocky Valley near Boscastle, SX08, DTH02-354 (BBSUK) (Rothero 2003: 61).

This is the only Cornish record. It grew in mainly pure patches totalling ca 1.5 m² on sloping E-facing slaty rocks at base of damp crag on slope above stream, partly shaded by deciduous trees.

Not seen with foliar gemmae (frequent in this species elsewhere); not seen c.fr.

Drepanocladus polygamus (Schimp.) Hedenäs (syn. Campylium polygamum (Schimp.) Lange & C.E.O.Jensen, Hypnum polygamum (Schimp.) Wilson). Boreo-temperate Circumpolar element.


Easily confused with forms of D. aduncus, from which it differs in the shorter, often double costa (double and extending 30-50% of leaf length or single and 40-65% leaf length: Hedenäs 1997: 82) and channelled leaf acumen. Also rather similar to forms of Campylium stellatum with a short weak costa, but leaves narrower and monoicous nor dioicous.

Grows on unshaded, damp or wet soil or over rock, mostly among short vegetation of flushes on unshaded slopes above sea-cliffs, also in similar situations at edges of streams and beside a small ditch, all close to coasts. Associates include other mosses and short grasses. W. of Rosuick (Lizard pen.) it grew in unshaded wet hollow in old serpentinite quarry on heath (with Campyliadelphus elodes). Also recorded in small quantity in upper part of inundation-zone around Cargenwen Reservoir.

Not seen c.fr.


*2: Trescoll Moor near Rocke, 1924, FR (BM) (Paton 1969a: 748).

D. aduncus was split into three segregate species by Żarnowiec (2001), but after detailed study of British specimens Hill (2002, 2003) regarded these as merely distinctive phenotypes of a 'remarkably plastic' species.

Grows in various moist and wet habitats, or shallowly or intermittently submerged, in basic to rather acidic places, unshaded to lightly or partly shaded. More detailed habitat notes from Cornwall are as follows. Damp and partly bare areas on wet heathland and in marshy heaths, on Lizard pen. and near lower Red River. On old mine-spoil, in marshy areas with sparse acidophilous vegetation, in shallow acidic pools, in damp hollows that flood in winter, on damp paths or tracks and their edges, on a bank and in moist gravelly areas, all
sites unshaded (with *Amblystegium serpens* var. *serpens*, *Calliergonella cuspidata*, *Didymodon insulanus*, *Rhizidiadelphus squarrosus*). Soil at edge of small stream, slightly shaded (near Sithney). On thin wet soil where water trickles around ruin of concrete wall of china-clay works, lightly shaded. Wet areas on concrete near china clay works. Calcareous dune-slacks, on wet humic soil of edges of pools that flood in winter, in short vegetation or extending into edges of taller fen vegetation, unshaded or partly shaded by Grey Willows. Plentiful on wet calcareous sand in flushed floor of disused sandpit (with *Aneura pinguis*, *Bryum pseudotriquetrum*, *Brachythecium rivulare*, *Calliergonella cuspidata*, *Dicranella varia*, *Pellia endiviifolia*, *Petalophyllum ralfsii*). At Hayle Kimbro Pool growing emergent or submerged in shallow water, locally to 20 cm depth in summer; growing intermixed with *Myriophyllum alterniflorum*, *Pilularia globulifera*, etc. High in inundation zone at edge of Stithians Reservoir, on ground dry for part of each year, some parts shaded by Grey Willows. Seasonally dry edge of Croft Pascoe Pool among macrophytes and near to *Sarmentypnum exannulatum* growing in oligotrophic water. Forming mats or pure patches, or among other plants, on damp ground and in pools in calcareous dune-slacks near north coast (locally plentiful at Penhale Sands, recorded also at Gwithian Towans and Upton Towans): growing among sparse low herbs at marshy edge of slack, in small shallow pool near spring in flushed area above low sea cliff, in unshaded edge of shallow calcareous pool in dune-slap, and submerged in shallow temporary pool in slack. St Agnes: unshaded dune ground beside pool, at base of *Potentilla anserina*, *Holcus lanatus*, *Bolboschoenus maritimus*. Hayle Kimbro Pool: among open cover of herbs at unshaded margin of large, partly dried pool (*Drepanoclados polygamus* and *Drepanoclados sendtneri* also known nearby). Treckillard: in short patchy turf on unshaded ground of old mining area. Hayle Kimbro Pool: in shallow edge of large pool, amongst macrophytes (mainly *Littorella uniflora*, *Hydrocotyle vulgaris*, *Eleocharis multicaulis*, charophyte). Lower Carnkie: on moist vertical concrete just above water of small trough in disused mine buildings, slightly shaded. Goss Moor: on unshaded muddy soil of partly bare patch in damp acidic grassland. On damp flushed slope of china-clay spoil above pit (with *Calliergonella cuspidata*).

Not seen c.fr.

140.3 *Drepanoclados sendtneri* (Schimp. ex H.Müll.) Warnst.       NS 12
(syn. *D. sendtneri* var. *wilsonii* (Schimp. ex Lorb.) Warnst.). Boreo-arctic montane Circumpolar element.

*1*: Near Ruan Minor, 1909, AW (GL) (Paton 1969a: 748). This record is older than that listed as new for vc1 by Warburg (1962: 376).

*2*: Whitehay Moor, Withiel, no date [= late 19C], RVT (CMM) (Paton 1969a: 748).

*D. sendtneri* is distinct from *D. aduncus* mainly in having groups of alar cells that are relatively small and separated from the costa by a relatively large area of undifferentiated basal lamina cells, the alar cells extending 40-60% of distance to leaf middle at insertion, whereas the enlarged alar cells reach ± to the costa in *D. aduncus* (Hedenäs 1998: 84, 98, 2003). Several other characters given for *D. sendtneri* by Smith (1978: 561, 563; 2004) do not provide reliable distinctions from those species.

It was realised in 2001-2005 that records of this species from dune-slacks along the north coast of Cornwall were based on misidentification of forms of *D. aduncus* with a strong costa, apparently including all records from the Towans (SW53U, SW54V, SW54W) and
most of those from the Gear Sands-Penhale Sands areas (SW75S, SW75T, SW75Y; some of those still mapped here may also prove to be incorrect if voucher specimens can be located and checked). The errors arose because the standard flora (Smith 1978, 2004) gave inaccurate descriptions and figures of the alar cells of *D. sendtneri* and also relied on width of costa and other unreliable characters to separate this species from *D. aduncus*. Redetermination was based on the more reliable characters given by Hedenäs (2003).

Near Hayle Kimbro Pool (Lizard pen.) it grows submerged in and emergent from shallow water (<10 cm) of pool, in short fen vegetation of area that dries in most summers, and on damp ground at base of open cover of herbs in dried-up edge of large pool. Associated with *Agrostis stolonifera, Calliergonella cuspidata, Eleocharis multicaulis* (dominant), *Hydrocotyle vulgaris* (plentiful), *Eleogiton fluitans*, *Ranunculus flammula*.

Not seen c.fr. by DTH. Specimen from Newlyn East, 20 June 1964 (JAP 1952, E, conf. DTH) has capsules fresh but already dehisced (not mentioned in Paton 1969a).

142.1 *Sanionia uncinata* (Hedw.) Loeske


*1:* Trevelloe near Lamorna, 1864, WC (PNZ) (Paton 1969a: 748).

*2:* Bodmin Road Station, RVT, 1889 (B) (Paton 1969a: 748).

Forming mats or patches on bark or growing to form low lawns on the ground. Grows in drier places than *Drepanocladus* or *Warnstorfia* spp., but recorded from a variety of ± acidic situations. Detailed habitat notes from Cornwall are as follows. Frequent records on bark of Grey Willows ± shaded in old scrub or carr, up to 1.5 m above ground or water's edge. Often on fallen branches in Grey Willow carr and sometimes extends onto leaf-litter and other debris at base of bushes. Also epiphytic on Grey Willow in more open situations: a patch on trunk of small isolated bush growing in edge of pool in old granite quarry; on bark at base of scrub at upper edge of inundation zone beside Stithians Reservoir; base of young bush on wet heath. Other records are from the ground in open, acidic sites: plentiful at edge of a heathland track; locally plentiful at Porkellis Moor on damp open ground over old copper-mine spoil in short heathy vegetation and at path edges; small amounts on Goss Moor on unshaded bare patches of muddy soil in acidic grassland; strong patches on really wet ground of open marsh forming on floor of china-clay pit. Also one record on granitic boulder, unshaded, beside track of a disused railway. Associates recorded include *Homalia trichomanoides, Hypnum andoi, Leskea polycarpa, Sphagnum denticulatum*, other mosses, grasses.

Six records c.fr.: capsules immature 3, 4, 6, 11; dehiscing 6, dehisced 11.
143.1 *Hygrohypnum ochraceum* (Turner ex Wilson) Loeske
Boreo-arctic montane Circumpolar element.

*1:* Trengwainton near Penzance, 1844, AG (PNZ) (Paton 1969a: 748).
*2:* Halgavor Moor near Bodmin, 1888, RVT (B) (Paton 1969a: 748).

Forms rather flaccid trailing patches, wefts, or low mats or carpets. Habitat notes from Cornwall are as follows. Mainly grows on rocks (granitic, slaty, or masonry) shallowly submerged or close above water-level, in soft-water streams (often quick-flowing) or rivers; also in inundation zones beside reservoirs. Grows in open and where partly to well shaded. Occasional records were from firm soil, mud on Grey Willow roots, moist concrete (beside a stream and in roadside drains) and once on an exposed tree root. In ditches and streams near china clay works it sometimes persists where the water is 'milky' with suspended fine sediment. Also recorded in a stream very close to the sea-shore near St Just in Penwith, where it must be exposed to heavy salt-spray during winter storms. Mainly grows within a few cm of water level (maximum noted was ca 0.5 m), but an unusual record was low on unshaded, sheltered, granitic boulders a few metres away from a stream.

Usually found as pure patches; associates include *Hygroamblystegium fluviatile*, *Chiloscyphus polyanthos*, *Fontinalis antipyretica* var. *antipyretica*, *Fontinalis squamosa*, *Platyhypnidium ripariooides*, *Scapania undulata*, whereas *Racomitrium aciculare* and *Sciurohypnum plumosum* are usually at slightly higher levels.

Not seen c.fr.

143.3 *Hygrohypnum luridum* (Hedw.) Jenn.
Boreo-temperate Circumpolar element.

*1:* Neside well in churchyard, St Mawgan, SW8765, 2006, JAP, det. DTH (BBSUK) (Rothero 2007: 45).

There are few records from Cornwall, numerous old reports being referable to 143.1.

Single DTH record (N. of Tremorebridge, vc2) of substantial patches on horizontal concrete of low wall-top of bridge above stream, slightly shaded by trees (with *Hypnum cupressiforme* var. *resupinatum*, near *Didymodon nicholsonii*, *Tortula muralis*). JAP 3063 collected in 2008 was from damp ground beside church at St Martin (SX25M).

Not seen c.fr.
144.1 *Pseudocalliergon lycopodioides* (Brid.) Hedenäs

(syn. *Drepanocladius lycopodioides* (Brid.) Warnst.). Temperate European element.

*1: Lizard, 1876, RVT (CMM) (Paton 1969a: 748).

Habitat notes from Cornwall are as follows. Near Hayle Kimbro Pool in edge of pools up to

ca 10 cm deep in winter but normally dry in summer. In rather short fen vegetation in pure
patches or mixed with *Calliergonella cuspidata* or *Scorpidium scorpioides*, and
phanerogams: *Agrostis stolonifera*, *Carex* sp., *Eleocharis multicaulis* (often dominant),
*Hydrocotyle vulgaris* (plentiful), *Mentha aquatica*, *Molinia caerulea* (often dominant),
*Ranunculus flammula*, *Potamogeton polygonifolius*, *Littorella uniflora*, *Eleogiton fluitans*,
etc. Lizard Downs: forming carpet in small areas of wet hollow in heathland. By Ruan Pool
on wet ground of mire, among short vegetation.

Not seen c.fr.

145.1 *Warnstorffia fluitans* (Hedw.) Loeske

(syn. *Drepanocladius fluitans* (Hedw.) Warnst.; *D. fluitans* var. *falcatus* (Sanio ex

*1: Chyenhal Moor near Newlyn, 1844, AG (PNZ) (Paton 1969a: 748).
*2: Gunwen Moor near Bodmin, 1891, RVT comm. JAP (B) (Warburg 1964: 733, Paton
1969a: 748).

Often grows in pure patches in shallow water of small pools in open oligotrophic mires.
Detailed habitat notes from Cornwall are as follows. Two sites on Woon Gumpus Common,
at bottom of shallow stream in acidic heathland and in shallow water of oligotrophic pool
with *Potamogeton polygonifolius*, *Juncus bulbosus* and *Sarmentypnum exannulatum*. E. of
Goonhavern: shallow pools and marshy area among mine-spoil, not far from sphagna; some
partly shaded by Grey Willows. Tregonning Hill: submerged in shallow water in small part-
shaded pool in heathy area at edge of old china-clay pit.

Not seen c.fr.

146.1 *Sarmentypnum exannulatum* (Schimp.) Hedenäs

(syn. *Drepanocladius exannulatus* (Schimp.) Warnst., *D. exannulatus* var. *rotae* (De Not.)

*2: Rescorla Moor, S. of Bugle, 1870, RVT comm. JAP (B) (Warburg 1964: 733, Paton
1969a: 748).

Forming pure patches or mats or loosely branching mass when growing submerged, or
trailing to erect stems growing among other plants. Habitat notes from Cornwall are as
follows. On wet peat or clay or in shallow water, in open acid mires (commonly with or near
sphagna), on low hummocks in acidic flushes, in shallow oligotrophic pools and other wet,
seasonally wet, or at least moist places in heathland and among old china-clay workings (in
ditches and other wet places, including edges of large pools). Grows in fully insolated sites
or partly shaded e.g. by bushes. By Ruan Pool found in short vegetation on wet ground of
mire that was presumably circumneutral as *Scorpidium scorpioides* and *Pseudocalliergon lycopodioides* were present nearby. Other unusual records: on granitic rocks in unshaded flush on heathy hillside (partly associated with *Nardia compressa*); small quantity on rock just above flood zone beside river, under trees (with *Lejeunea lamacerina*; perhaps having reached this site originally as flotsam).

Other associates recorded: *Calliergonella cuspidata*, *Straminergon stramineum*, *Campylopus flexuosus*, *Chiloscyphus pallescens*, *Cladopodiella fluitans*, *Kurzia pauciflora*, *Scapania irrigua*, *Sphagnum capillifolium*, *Sphagnum cuspidatum*, *Sphagnum denticulatum*, *Sphagnum inundatum*, *Warnstorfia fluitans*, *Drosera rotundifolia*, *Eleocharis multicaulis*, *Eriophorum angustifolium*, *Galium palustre*, *Hydrocotyle vulgaris*, *Hypericum elodes*, *Juncus bulbosus*, *J. effusus*, *Molinia caerulea*, *Potamogeton polygonifolius*, *Ulex gallii*.

One record c.fr.: few immature capsules 3 (NE of Bugle, DTH, 5 Mar. 2005).


*2*: Halgavor Moor near Bodmin, 1878, RVT (BM) (Paton 1969a: 749). This record is older than that listed as new for vc2 by Warburg (1962: 377).

Now very rare in vc1 and vc2. Habitat notes for recent finds are as follows. Silverwell Moor: in shallow, trickling water in bog low on side of valley; with or near much *Schoenus nigricans* (tussocks), *Erica ciliaris* and *Molinia caerulea*. At Retire Common forms strong patches in a few small areas of open wet heathland with flushing, near open cover of *Schoenus nigricans* and locally with *Scorpidium revolvens*.

Not seen c.fr.


*2*: Helman Tor Moor, 1888, RVT (B) (Paton 1969a: 749).

Usually grows as scattered stems amongst other bryophytes (including sphagna), less often as short lawns. In mainly short vegetation (but sometimes at base of taller *Molinia caerulea* or *Juncus*) on wet areas in acid flushes and mires, unshaded or almost so. A bit seen in unshaded shallow water of ditch in old china clay works. Associates recorded include *Aneura pinguis*, *Aulacomnium palustre*, *Brachythecium rivulare*, *Calliergonella cuspidata*, *Calypogea fissa*, *Campylopus flexuosus*, *Cephalozia bicuspidata*, *Cladopodiella fluitans*, *Kurzia pauciflora*, *Riccardia multifida*, *Sphagnum capillifolium*, *Sphagnum denticulatum*, *Sphagnum fallax*, *Sphagnum fimbriatum*, *Sarmentypnum exannulatum*; *Anagallis tenella*, *Drosera rotundifolia*, *Erica ciliaris*, *Juncus effusus*, *Molinia caerulea*, *Narthecium ossifragum*, *Schoenus nigricans*.
Not seen c.fr.

149.1+2 *Scorpidium revolvens* (Sw. ex anon.) Rubers *s. l.*  
(syn. *Drepanoclados revolvens* (Sw. ex anon.) Warnst.). Boreo-arctic montane Circumpolar element.

*1*: Trungle Moor near Paul, 1861, WC (OXF) (Paton 1969a: 748).  
*2*: Tretoil Moor S. of Bodmin, 1891, RVT (B) (Paton 1969a: 748).

*S. cossonii* is now regarded as a valid taxon separable from *S. revolvens s. str.* by characters described by Blockeel (2000). Cornish material identified as either of the segregate species by TLB (during 1997-1999) or subsequently by DTH using the same characters is listed below. The remainder of the records are mapped only as *S. revolvens s. l.*

149.1 *Scorpidium revolvens* (Sw. ex anon.) Rubers *s. str.*  
Boreo-arctic montane Circumpolar element.


See notes above.

Grows as low lawns or mixed with other plants. Near Blisland in trickling water of flushed area below spring in open mire. Associates included those listed above and *Calliergonella cuspidata, Anagallis tenella* and *Drosera rotundifolia*, NE. of Blisland, SX17, 1997, DTH 97-320, det. TLB 1997.

Not seen c.fr.

149.2 *Scorpidium cossonii* (Schimp.) Hedenäs  


See notes under *S. revolvens s. l.* above.

Habitat notes from two recent records are as follows. W. of Rosuick (Lizard pen.), 10 Mar. 2004: in unshaded hollow with shallow standing water among patchy *Schoenus nigricans*
and *Molinia caerulea* on heath, occurring over several square metres in wet flushed hollow. Other record was in open area by path on damp heath on Lizard.

Not seen c.fr.

149.3 *Scorpidium scorpioides* (Hedw.) Limpr. 12
Boreo-arctic montane Circumpolar element.

*1: Tremethick Moor near Penzance, 1844, AG (PNZ) (Paton 1969a: 749).
*2: Retire Common, 1963, JAP (BBSUK) (Paton 1969a: 749) ['Lanivet (Tellam 1888)' was not supported by a specimen].

Habitat notes from recent records in Cornwall are as follows. Goonhilly N.N.R.: edge of water of shallow peaty pool by track on heathland, amongst sparse rushes. By Ruan Pool: among short vegetation on wet ground in mire by pool. Near Hayle Kimbro Pool: in and near pools in wet part of heath, in depressions among *Molinia caerulea* and *Schoenus nigricans* hummocks, or in shallow pools (that dry in summer) with *Pseudocalliergon lycopodioides* and phanerogams (*Agrostis stolonifera*, *Carex* sp., *Eleocharis multicaulis*, *Hydrocotyle vulgaris*, *Mentha aquatica*, *Molinia caerulea*, *Ranunculus flammula*, and other marsh and water plants); often locally dominant. Near Bonython Wind Farm: in small amount on unshaded humic soil of hollow in wet heath (dried in summer), near *Schoenus nigricans*. Near Clodgy Point: in small quantity in open part of wet flush on slope above sea-cliffs.

Not seen c.fr.

150.1 *Calliergon cordifolium* (Hedw.) Kindb. 12

*1: Chyenhal Moor, Newlyn, 1864, WC (PNZ) (Paton 1969a: 749).
*2: Near Helman Tor Moor, 1905, RWS (TRU) (Paton 1969a: 749).

Grows as open lawns or mixed with grasses or other low plants. Notes on habitats in Cornwall are as follows. Most often found in shallow water and on wet or seasonally flooded, acidic, humic mud and plant debris shaded or part-shaded under old Grey Willow carrs, often forming extensive pure stands. Also in open or lightly shaded in shallow water among *Juncus* spp. or *Phalaris arundinacea* in wet rush-pastures, marshes, in and beside ± acidic pools (including those in mine-spoil and china clay spoil), at edge of a small stream and at a reservoir edge. Associates recorded include *Brachythecium rivulare*, *Calliergonella cuspidata*, *Chiloscyphus pallescens*; *Agrostis stolonifera*, *Juncus acutiflorus*, *Juncus articulatus*, *Juncus effusus*, *Juncus inflexus*, *Phalaris arundinacea*.

Two records c.fr.: capsules immature 1, 4.
150.2  **Calliergon giganteum** (Schimp.) Kindb.  


No recent records.

151.1  **Leskea polycarpa** Hedw.  
Temperate Circumpolar element.


*2: By the R. Camel, Boscarne near Bodmin, 1879, RVT (**B**) (Paton 1969a: 745).

The only record in West Penwith (Newlyn Cliff, SW42U) is from 1863 and was on a Gooseberry bush in an orchard, possibly an introduction.

Grows in mats. Commonest on silted bark in inundation-zones of rivers or large streams, on bark (Alder, Ash, Sycamore, Blackthorn, etc.) or sometimes rock (including serpentininite), often where partly shaded. Also on tree bases beside Bude Canal. Elsewhere, extends outside flood-zones in some humid and sheltered locations, occurring with other epiphytes e.g. on sheltered branches of coppiced Hazels on open wooded slopes. One record low in old wet Grey Willow carr (on Goss Moor). Common associates include *Kindbergia praelonga*, *Homalia trichomanoides*, *Metzgeria furcata*, *Orthotrichum rivulare*, more rarely *Dendrocrysthæa lamyana*, *Sanionia uncinata*, *Zygodon conoideus*.

Commonly c.fr.: capsules immature 1, 3, 5, 7; dehiscing 6, 7; dehisced [old 3, 5] 10.

156.1.a  **Abietinella abietina** (Hedw.) M.Fleisch. var. *abietina*  


Grows as scattered ± erect stems among other mosses and low herbs and grasses or forms small lawns. Locally plentiful in short or very short grassland growing over calcareous sand on fixed dunes from Phillack Towans to Gwithian Towans. Occurs on dune crests and slopes, in drier hollows and at edges of slacks, in open insolated sites. Associates include *Hypnum cupressiforme* var. *lacunosum*, *Pseudoscleropodium purum*, low grasses and herbs, also near taller plants e.g. *Festuca rubra*, *Ammophila arenaria*.

Not seen c.fr.
157.2 *Thuidium tamariscinum* (Hedw.) Schimp.
Temperate European element.

*2*: Withiel near Bodmin, 1870, RVT (B) (Paton 1969a: 746).

Grows as ± tall lawns or rough mats, often covering many square metres, or intermixed with other robust bryophytes or low grasses and herbs. Habitat notes from C&S are as follows. Typically on soil and ground-litter that may be rather dry and free-draining to permanently moist, of acidic, neutral or basic reaction, in open sunny sites and in light to rather heavy shade. Occurs on banks or flat ground in and at edges of deciduous woodland and groves of trees, in open coniferous woodlands, edges of conifer plantations, in Grey Willow carrs or scrub, on shaded stream and river banks, laneside and roadside banks, old quarries, about tors, rough damp grassland, wet heathland, on hummocks or old *Molinia caerulea* tussocks in open mires, on coastal slopes (but not usually on sea-cliffs), over old mine-spoil (in some heathy areas and among scrub), also on 'hedges', about bases of walls and in earthy crevices, on graves, in lawns, locally on banks of china clay spoil, and over or among concrete of ruins.

Often locally dominant and forming large patches, especially in open woodland or at wood edges, where it may also extend over rocks and boulders where these are small or gently sloping, also locally in heath almost or quite degraded to acid grassland on Bodmin Moor (where distinction from *Thuidium delicatulum* commonly requires microscopic checking). Locally as epiphyte on tree bases, extending onto lower 0.5–1.0 m of Grey Willow trunks in carrs and up to 1.0 m up Beech trunks in a plantation.

Common associates include *Brachythecium rutabulum*, *Dicranum scoparium*, *Kindbergia praelonga*, *Eurhynchium striatum*, *Isothecium myosuroides* var. *myosuroides*, *Mnium hornum*, *Polytrichastrum formosum*, and many grasses, herbs and low shrubs (e.g. *Agrostis capillaris*, *Calluna vulgaris*, *Galium saxatile*, *Potentilla erecta*, *Vaccinium myrtillus*); other frequent associates are *Hylocomium splendens*, *Pleurozium schreberi*, *Rhytidiadelphus loreus*, *Rhytidiadelphus squarrosus*, *Rhytidiadelphus triquetrus*, *Pseudoscleropodium purum*, *Thamnobryum alopecurum*.

Single record c.fr. by DTH in Cornwall, capsules old: 2 (three dehisced capsules from single inflorescence where species was growing luxuriantly in old scrub beside disused china-clay pit).

157.2 *Thuidium delicatulum* (Hedw.) Schimp.


Probably now extinct in vc1. On Bodmin Moor it grows in short, damp or wet, acidic grassland and short vegetation of edges of mires and acidic flushes, unshaded. *T. tamariscinum* often occurs in much the same habitat, so material needs microscopic
checking. At Red Moor N.R. in short grassland on wet heath. Associates commonly include *Hylocomium splendens*, *Pleurozium schreberi*, *Rhytidiadelphus squarrosus*; *Agrostis curtisii*, *A. stolonifera*, *Molinia caerulea*, *Potentilla erecta*.

Not seen c.fr.


*1*: Carclew near Perranarworthal, 1840, EAW (TRU) (Paton 1969a: 753).


Habitat notes from C&S are as follows. On calcareous sand in dune grassland. On soil among grasses on laneside banks, among concrete ruins, and in old quarries. Soil at track edges in open beside heathland, in deciduous or mixed woodland part shaded, sometimes moderately shaded in open woodland or encroaching scrub. Widespread on soil of heathy and short grassland areas (common over large areas in short acid grassland on Bodmin Moor, usually with *Rhytidiadelphus squarrosus*; also frequent on roadside verges), on hummocks in mires, over old 'hedges', ruined walls or wide wall tops, on graves and in churchyard turf, about tors, thin soil over old concrete, old metalliferous mine spoil; also sometimes abundant alone or with grasses under scrub and in part shade under groves of trees on old mining ground. In and near old granite and slate quarries, old and working china clay quarries and their spoil heaps, typically with grasses and at edge of heathy vegetation but often also as primary colonist on more open surfaces. Mainly uncommon or absent from exposed coastal sites, but occasional records e.g. from grassland above slaty cliffs (abundant near an estuary in this situation) and in small amounts in short turf on top of exposed serpentinite sea-cliffs. Sometimes abundant in short grassland of mown lawns.

Many associates, of which commonest and most characteristic include *Brachythecium rutabulum*, *Calliergonella cuspidata*, *Hypnum jutlandicum*, *Polytrichastrum formosum*, *Rhytidiadelphus squarrosus*, *Thuidium tamariscinum* and grasses, often also *Pleurozium schreberi*, *Rhytidiadelphus triquetrus*, *Calluna vulgaris*, *Vaccinium myrtillus*.

Rarely c.fr. (three records: few dozen capsules on sheltered china-clay spoil near Carthew, vc2; several capsules near Rock, vc2; one record of single capsule, Praa Sands, vc1): capsules immature 1, 11; dehiscing 12, dehisced 1.


Forms low patches of procumbent stems, sometimes spreading to form low lawns covering several square metres. Habitat notes in C&S are as follows. Frequent in very short mossy grassland on calcareous sand in dunes, on slopes above sea-cliffs (e.g. on blown sand and edges of serpentinite rocks on unshaded cliff top) and on coastal hillsides near dunes. Sometimes frequent on old, mortared stone walls e.g. by a coastal hotel and around a cemetery (with *Rhynchostegeiella tenella*, *Tortula muralis*, *Zygodon viridissimus* var.
stirtonii). Also in very short vegetation on sand in hollows between cobbles of old track at edge of dunes; unshaded.

Not seen c.fr.

162.1  *Eurhynchium striatum* (Hedw.) Schimp.  S12
Temperate European element.

*1*: Between Hayle and St Ives, 1844, AG (PNZ) (Paton 1969a: 751).
*2*: Withiel, 1870, RVT (B) (Paton 1969a: 751).

Often abundant, forming extensive patches with arching shoots. Habitat notes from C&S are as follows. On soil and plant-litter of slopes, banks and path-sides in deciduous woodlands and open conifer plantations (or edges of denser stands), laneside banks with trees, in open to moderately shaded, sometimes rather heavily shaded; often growing over low rocks, tree bases and fallen, dead wood. Also recorded on ground in churchyards and in open scrub area among low serpentinite rocks. Base of walls of ruins and sometimes growing over sheltered old walls, e.g. on old mine-spoil, in open to well shaded. Bits on soil in short lawn edge, tops of low walls (beside road, in churchyard), unshaded. On 'hedges' in open or more often shaded by woodland and scrub. Once in Grey Willow carr, extending 0.5 m up trunks as epiphyte. One record from soil of banks high on sea-cliff of apparently rather base-rich slates (Bossiney Haven). Apparently a calcicole, or at least absent from more base-poor sites and common mainly in woods with better soils. In two china clay areas of predominantly acid soils large patches were associated with old concrete and not present elsewhere in vicinity, but a single record in third area from partly vegetated bank of china-clay spoil with no concrete or masonry. Also near ruins of mine and other buildings. Common associates include *Atrichum undulatum*, *Brachythecium rutabulum*, *Kindbergia praelonga*, *Lophocolea bidentata*, *Plagiochila asplenioides*, *Polytrichastrum formosum*, *Thuidium tamariscinum*.

In most regions only occasionally cfr, but frequently c.fr. in some woods: capsules immature 1, 2, 4, 10-12; dehiscing 1-3, 10, 12; dehisced 1-6.

163.1  *Platyhypnidium riparioides* (Hedw.) Dixon  S12

*1*: Mousehole Cave, 1859, WC (PNZ) (Paton 1969a: 752).

An aquatic or semi-aquatic moss that can vary widely in appearance even when only submerged forms are studied (Wehr & Whitton 1986). Some fertile plants with small leaves from sites high in the flood-zone are much smaller and softer than the usual aquatic forms and might be mistaken for *Rhynchostegium confertum*, but their leaves are more rounded and the spores are larger.

Forms patches (smooth mats) or occasionally extends as pendant wefts on vertical surfaces where water trickles or spray lands. Habitat notes from C&S are as follows. Grows mostly on rock and boulders (gabbro, granitic, serpentinite, slate), masonry, concrete, tree roots or hard soil in and beside water, sometimes also established on firm mud. Mainly found from
ca 10 cm below normal summer water-levels to 50 cm or more above them, but usually within the flood-zone (except occasionally in the most humid and shaded places); also on rocks receiving spray from waterfalls. Sometimes found in the open, commonly partly to moderately shaded, occasionally in rather heavy shade.

Habitat types occupied are mainly along streams and rivers (both hard- and soft-water, oligotrophic and eutrophic), sometimes mere trickles or in spray from waterfalls, or flushed rocks in quarries or on sea-cliffs (down to near HWST level). It apparently prefers sites with fast-flowing water, such as at weirs and other obstructions, but was also recorded occasionally from ditches, along the Bude Canal and the inundation zones at edges of two reservoirs. Once seen well established on concrete around a leak in a water trough in pasture.

Evidently tolerant of hypertrophic conditions in streams since it was found in pure stands on vertical concrete of the outlet channel at one sewage works and not far below the outlet from another. It is often the only bryophyte in eutrophicated streams below sewage outlets, typically occurring just above normal water-level in these situations rather than submerged (presumably because it can grow only where high concentrations of pollutants are diluted during high-stage river discharges).

Often occurs as pure patches, but its closer associates frequently include *Chiloscyphus polyanthos*, *Fontinalis antipyretica* var. *antipyretica*, *Fontinalis squamosa*, *Hygrohypnum ochraceum*, *Scapania undulata*, less commonly *Cratoneuron filicinum*, *Fissidens crassipes*, *Fissidens pusillus*, *Leptodictyum riparium*, *Platyhypnidium lusitanicum*.

Commonly c.fr.: capsules immature 1, 7-12; dehiscing 1-3, 9-12; dehisced 1-5, 11. Some large populations of robust plants on rock in streams apparently do not bear capsules, especially where they grow permanently submerged, while small slender plants in rather dry sites may fruit freely.

163.2 *Platyhypnidium lusitanicum* (Schimp.) Ochyra & Bednarek-Ochyra


Grows as low patches (smooth mats) or when large forms short wefts. Habitat notes from Cornwall are as follows. On low rocks (base-poor: granitic, slaty; occasionally extending onto tree roots or dead wood close by), in and beside streams, from just below to not far above normal water-level (mostly within 0.2 m, occasionally 0.5 m; always within flood-zone). Sometimes in open sites, more often partly to moderately shaded e.g. by deciduous woodland, groves of trees or Grey Willow carr. Records are mainly from small quick-
flowing streams of soft water, including small streams near a spring and on a cliff top, but also found in trickling water by an old mill and occasionally along larger rocky rivers.

Often without close associates; other species occurring close by include Fontinalis squamosa, Scapania undulata. Platyhypnidium riparioides was recorded with or adjacent to it at three sites; at Seworgan P. lusitanicum tended to form a clearly marked higher zone (0-0.5 m above water) on streamside rocks than accompanying R. riparioides (which was often submerged).

Three records c.fr. (vc1): capsules immature 8, 10; dehiscing 2 (capsules pentiful).

164.1 Rhynchostegium murale (Hedw.) Schimp. 12
(syn. Eurhynchium murale (Hedw.) Milde). Temperate European element.


Habitat notes from Cornwall are as follows. Several records on horizontal old concrete and vertical mortared walls of ruins, in open, in sheltered places, or partly to rather heavily shaded. S. of Georgia: on vertical mortared-stone wall of ruins of china-clay works, well shaded by tall scrub. Minions: on N.-facing, vertical damp concrete of ruins of mine building, part shaded by Cotoneaster integrifolius. Crows Nest: bit on vertical base of low mortared wall in old mining area, part shaded (near Oxyrrhynchium hians). Poltesco: low wall of serpentinite at edge of disused mill pond. Low on old wall at wood edge, well shaded. Small patch on concrete of pipe beside stream in open heathland.

Commonly c.fr.: capsules immature 1, 10, 12; dehiscing 1, 3; dehisced 3-5.

164.2 Rhynchostegium confertum (Dicks.) Schimp. S12
(syn. Eurhynchium confertum (Dicks.) Milde). Temperate European element.

*2: Bodmin, 1878, RVT (B) (Paton 1969a: 753).

Forms low smooth mats, sometimes extensive, or sparser and intermixed with other bryophytes. Habitat notes from C&S are as follows. Common on various firm basic to circum-neutral substrates, including rock (slaty, serpentinite, gabbro, sometimes granitic), masonry (mortar, mortared-walls, concrete) and firm soil, or growing as epiphyte (see below). Its sites are normally free-draining, often dry, sometimes rather moist, varying from fully insolated to (most often) partly or moderately shaded, or sometimes heavily shaded. Habitat types in which it occurs frequently are walls, ruins, bridges, viaducts, mill leats, concrete fence-posts, masonry debris, graves, gravestones, etc., on and above sea-cliffs and in 'hedges' (often as small patches in otherwise rather acidic surroundings) and soil at base of walls and on banks (occasionally in woodland). Once on soil of plant pots in a nursery garden.
Frequent also as epiphyte, especially on the moist nutrient-rich bark of Elders, where typically on the trunk or low horizontal or inclined branches. Other records are from Ash, elm, Grey Willow and Sycamore bark, mainly on tree bases. It occurs as an epiphyte in scrub, woodland edges, etc., including bark in inundation zones beside reservoirs; also e.g., on an old decaying elm trunk on ground.

Associates on rock and masonry often include Amblystegium serpens var. serpens, Barbula convoluta, Barbula unguiculata, Brachythecium rutabulum, Bryum capillare, Oxyrrhynchium hians, Kindbergia praelonga, Homalothecium sericeum, Lejeunea lamacerina, Metzgeria furcata, Rhynchostegiella tenella, Tortula muralis; those recorded on bark include Amblystegium serpens var. serpens, Brachythecium rutabulum.

Commonly c.fr.: capsules immature 1, 8-12; dehiscing 1-3 [4, 5] [8, 9] 10-12; dehisced 1-6, 11, 12.


Forms low patches (smooth mats) or straggles through grasses, herbs and other bryophytes. Habitat notes from C&S are as follows. Mainly coastal and commonest on calcareous sand in and near sand-dune areas, in unshaded or lightly shaded grassland (or partly shaded by grasses, or lightly shaded by edges of scrub), or on banks, in free-draining sites but avoiding the barest and driest places. At Holywell it is locally abundant on semi-fixed dunes, dominating the ground layer in some areas at the base of Ammophila arenaria. R. megapolitanum extends from the dunes to other coastal areas that receive blown sand, including the base of 'hedges' near dunes (e.g. at Riviere Towans, where often part-shaded by brambles and tall grasses), hillslopes immediately downwind of dunes or above beaches and on an old grave in Lelant Cemetery. In other coastal areas it occurs on thin soil over slaty or serpentinite rocks on open slopes of coastal headlands, often on south-facing slopes and sometimes in exposed places.

There are only a few records inland in Cornwall: large patch on gravelly surface of grave in churchyard ca 0.5 km inland; on top of wide mortared-stone wall near stream, part-shaded by deciduous trees (St Mawgan); on soil of disturbed ground in area of metalliferous mine-spoil (Porkellis Moor).

Associates at coastal sites include Bryum dichotomum, Syntrichia ruralis var. ruraliformis, Syntrichia ruralis var. ruralis; Ammophila arenaria, Festuca rubra. One of the few inland records was with Brachythecium rutabulum, Cirripodium crassinervium.

Commonly c.fr.: capsules immature 1, 12; dehiscing 1, 2 [3], 11; dehisced 3-5.
Rhynchostegiella tenella (Dicks.) Limpr.
Mediterranean-Atlantic Suboceanic element.

*2: Trevanion, Wadebridge, 1905, RVT (B) (Paton 1969a: 753).

On calcareous stone (slates), concrete, old bricks, or mortar of walls (including bridges, buildings such as churches, and ruins, etc.). Habitat notes from C&S are as follows. Mainly on man-made structures, also in old quarries. Often on vertical surfaces, sometimes in rather dry places under overhangs. Commonly in moderate to heavy shade, but sometimes also grows fully insolated. Single record of small patch on rather thick layer of soil on ledge of old wall. Commonly in pure patches in shade; recorded associates include Kindbergia praelonga, Homalothecium sericeum, Neckera complanata, Tortula muralis, Zygodon viridissimus var. stirtonii, less often Eucladium verticillatum, Scorpiurium circinatum.

Commonly c.fr.: capsules immature 1-4, 7, 9-12; dehiscing 1-3 [4], 10-12; dehisced 1-6, 10, 12.

Rhynchostegiella litorea (De Not.) Limpr.
Mediterranean-Atlantic Oceanic element.

*2: On damp shaded stone by path, 80 m alt., near E. end of church, Talland, SX228516, 16 Sep. 2008, JAP conf. TLB (Rothero 2009: 78).

The only site in Cornwall. The plants are rather variable, with some material from the same patch resembling R. curviseta. However, a recent molecular study (Aigoin et al. 2009) did not resolve R. litorea and R. curviseta as different from each other or from R. teneriffae, suggesting their taxonomic treatment as distinct spp. may need reassessment.

Rhynchostegiella curviseta (Brid.) Limpr.
Mediterranean-Atlantic Oceanic element.


The only record from Cornwall. See taxonomic note under R. litorea above.

Rhynchostegiella teneriffae (Mont.) Dirkse & Bouman (syn. Rhynchostegiella teesdalei (Schimp.) Limpr.). Mediterranean-Atlantic Suboceanic element.

*2: Dripping well, Porthluney Cove, 1929, DGC (BBSUK) (Paton 1969a: 753).

See taxonomic note under R. litorea above.
At the site W. of Trevenwith it grew on wet rocks very close to water level of stream and in trickles and splash from waterfalls, partly shaded by deciduous trees; associates included algae, *Cratoneuron filicinum* and *Platyhypnidium riparioides*.

One record c.fr.: capsules immature 10.

166.1  *Cirriphyllum piliferum* (Hedw.) Grout  12  Boreo-temperate Circumpolar element.

*1*: Trefusis Grove near Falmouth, 1850, EAW (TRU) (Paton 1969a: 751).
*2*: Wadebridge, 1894, RVT (B) (Paton 1969a: 751).

Grows as scattered stems among other mosses, etc., or where plentiful may form smooth mats or low-growing wefts, sometimes extending over many square metres. Habitat notes from Cornwall are as follows. Most often on soil (humic or loamy, typically circum-neutral to slightly basic; sometimes apparently moderately acidic although this not checked by pH measurements) or ground-litter of dead leaves etc., sometimes on thin soil layers over rocks or masonry (concrete, masonry debris), less often trailing over rock (slaty). It is typically in damp to rather wet places, often sheltered, with light to moderate shade, less often in open. Habitat types commonly occupied are woodland edges (deciduous or mixed with conifers, often e.g. beside tracks or on stream or river banks, occurring on slopes or flat ground), beside groves of trees or hazel coppice, in flushes in damp deciduous woodland, on laneside banks or stream and river banks. Less frequently it occurs in short grassland of pastures or meadows near rivers, lakes or woodland edges, in churchyards, on a bank above a creek and in *Salix cinerea* carrs. One record was among short turf and masonry debris near the wall of a ruined mine building.


*2*: Millpool, Cardinham, 1960, JAP (BBSUK) (Paton 1969a: 751). ['Fowey (Tellam 1888) not supported by specimen].

Grows as smooth mats, which sometimes form large patches. Habitat notes from Cornwall are as follows. Most records are from more or less basic rock or masonry or thin soil layers over them (gabbro, granitic, serpentinite, slate; mortared-stone walls, concrete; on sloping or horizontal surfaces), less often steep soil on banks; normally on free-draining substrates but often in rather sheltered and humid places. It most often grows in partly shaded sites but also sometimes where more heavily shaded or in the open. Habitat types occupied include laneside cuttings and banks, ‘hedges’, on large boulders, rock outcrops, in old quarries, old
walls (e.g. of ruins, around churchyards, of old bridges and churches, especially their north and east sides) and concrete near churches (on graves; beside pathways). Also recorded twice on boulders in the flood-zone of streams (a habitat more closely associated with the rather similar looking *Scleropodium cespitans*). Associates recorded include *Anomodon viticulosus*, *Zygodon viridissimus* var. *viridissimus*, atypically *Sciuro-hypnum plumosum*.

Not seen c.fr.

167.1 *Oxyrrhynchium pumilum* (Wilson) Loeske  

*2*: St Minver, 1878, RVT (B) (Paton 1969a: 753).

Habitat notes from C&S are as follows. Commonly on circumneutral loam or friable soil, especially in humid and sheltered places such as river banks, stream and ditch banks in deciduous woodland or groves of trees, shady laneside banks, where it may form extensive pure patches (or mixed with *Oxyrrhynchium hians*, *Kindbergia praelonga*, *Fissidens taxifolius* var. *taxifolius*, *Plagiothecium nemorale*). Damp clay soil of bank under trees at edge of pasture. Soil in churchyards, cemeteries, banks on and above sea-cliffs. Sandy soil at base of granitic outcrop on slope above coast, part shaded. Soil on sheltered and part shaded ‘hedges’ e.g. at wood edges, in gardens, in scrub above sea cliff, by lane. Damp soil at edge of stream, part shaded. Sheltered soil on slope above sea cliff. Patches low on mortared walls, e.g. beside lane and above cliffs, part shaded to rather heavily shaded. Also in hollow in ruin of wall. On steep face of boulder of serpentinite in shade of scrub. Extending onto slaty rocks in disused railway cutting, in rather heavy shade. On rocks of shaded walls in humid sites, also in small amount on unshaded laneside bank on soil above wall. On masonry debris lying on old mining ground, only part shaded. Soil among shaded ruined walls of old mine buildings in woodland. Other associates recorded include *Calypogeia arguta*, *Fissidens bryoides* var. *bryoides*, *Hookeria lucens*.

Occasionally c.fr.: capsules immature 1, 2, 11, 12; dehiscing 2, [3], 11, 12; dehisced 3-5.

167.2 *Oxyrrhynchium hians* (Hedw.) Loeske  

*2*: St Kew Highway, 1888, RVT (B) (Paton 1969a: 752).

Plants showing the characters of ‘var. *rigidum*’ (crowded erect branches, crowded leaves) are rare in Cornwall (SW75U, SW76V), the only recent record being from a hollow in calcareous sand dunes, corresponding to the preference shown by this form elsewhere for open turf in basic habitats (Smith 1978: 616). Blockeel & Long (1998: 149) discontinued taxonomic recognition of this variety, which is ‘rather ill-defined’ (Preston in Hill *et al.* 1994: 346).
Robust (non-fertile) plants that are sometimes plentiful in flushes on sea-cliffs have the appearance of *E. speciosum* (*q.v.*) but they are referred to the present species because they have shorter cells in the leaf lamina (<80 µm).

Habitat notes from C&S are as follows. Commonest on mildly basic to circumneutral soils, often those that are loamy, silty or clayey. Often common on soil in moist or wet deciduous woodland on good soils, in scrub, on laneside banks, in gardens, cemeteries, churchyards, and on soil of banks of streams and rivers (often in flood-zones). Near lake edge under trees; on unshaded sediment exposed in inundation zone of reservoir. Associates in typical shaded habitats include *Amblystegium serpens* var. *serpens*, *Brachythecium rutabulum*, *Kindber gia praelonga*, *Oxyrrhynchium pumilum*, less often *Bryum donianum*.

Also regularly occurs on soil in arable fields (barley, cereal stubbles, cauliflower, game-food crop, weedy fallow), grass-leys and on disturbed ground in pastures; never seen fertile in fields; associates recorded in arable land: *Barbula convoluta*, *Bryum rubens*, *Dicranella schreberiana*, *Dicranella staphylin a*, *Ephemerum minutissimum*, *Kindber gia praelonga*, *Fossombronia pusilla*, *Phaeoceros laevis*, *Riccia glauca*, *Riccia sorocarpa*, *Riccia subbifurca*, *Tortula truncatula*.

Other habitat notes from Cornwall are as follows. Soil on cliffs and at path edges close to cliff-tops, often lightly shaded. Soil at foot of old mortared-granite walls of viaduct and mill buildings and inside ruined mine engine-house. Bits on soil among granitic boulders in deciduous woodland on valley-side slope. In one acidic woodland restricted to old concrete. Soil near base of north wall of church; base of old walls of ruins (part shaded); soil near walls of ruins where shaded. Compressed soil on paths and tracks. On old mortared walls or concrete walls, by streams or low down in sheltered spots. Occasionally (on thin soil?) on boulders in streams. In flood-zone on soil of bank by R. Tamar. Bit as colonist on clay soil of sparsely vegetated bank near working ch ina clay quarry. On unshaded firm soil and loose slate rocks in flush on sea-cliff (see note above).

Occasionally/rarely c.fr. (11 records, mostly of only a few capsules, all from sheltered and rather stable sites): capsules immature 10, 11; dehiscing 2, [4], 5, 11, 12; dehisced 2, [4, 5].


[167.4 *Oxyrrhynchium speciosum* (Brid.) Warnst. (syn. *Eurhynchium speciosum* (Brid.) Jur.). Temperate European element.]

*1*: Near Mousehole Cave, 1861, WC (PNZ) (Paton 1969a: 752).
*2*: Porthbean Beach, Gerrans Bay, 1960, JAP (BBSUK) (Paton 1969a: 752). ['Withiel and Bodmin' (Tellam 1888) not supported by specimens].

Although *E. speciosum* is commonly fertile (and then distinct in being synoicous; autoicous plants not seen in Cornwall), it is easily overlooked as the commoner *E. hi ains* when non-fertile (although distinguishable by the longer cells of the stem-leaves, mainly >70 µm) (see
also notes under preceding species). Note that Smith (1978, 2004) gave erroneous cell measurements and other misleading comments.

Habitat notes from Cornwall are as follows. On wet ground and trickles of water in flushes on and above sea-cliffs (of granitic and other rocks, gabbro), often part shaded. Associates include Agrostis stolifera, Pellia endiviifolia. Near small rocky (granite) streams and trickles on coastal slopes, partly to well shaded by scrub and low trees. On soil under tall Grey Willow carrs, in areas occasionally flooded, shaded or only part shaded. Edge of stream shaded by old Grey Willow carr and deciduous trees, where subject to occasional inundation. Small flush under old Grey Willows (with Aneura pinguis, Chiloscyphus polyanthos s. l.).

Commonly [?] c.fr.: capsules immature 8-11; dehisced 4.

168.1 Kindbergia praelonga (Hedw.) Ochyra

*1: Sunset, Kea near Truro, 1855, EAW (TRU) (Paton 1969a: 752).

Large, branched plants corresponding to 'var. stokesii' (see Smith 1978: 614) are common in Cornwall, especially in moist to wet shaded habitats where they are usually the commonest form of the species. However, intermediate plants are so common that it is often impracticable to record stokesii separately. Hence, following Blockeel & Long (1998: 149) it is not treated as a separate taxon. Other distinctive plants sometimes occur on and above sea-cliffs, with sparsely branched prostrate stems and long branch leaves; intermediates apparently connect these to the typical form.

Habitat notes from C&S are as follows. K. praelonga is perhaps the commonest moss in Cornwall, in a wide range of habitats (and probably becoming commoner because of its robust growth habit and tolerance of eutrophication). It is often the commonest bryophyte by far on Cornish hedges separating fields of agriculturally 'improved' grassland, doubtless because of its tolerance of artificially high nutrient levels. Also very common on banks and slopes near the coast, reflecting both salt tolerance and good colonising ability.

Occurs on soil and rocks on banks and slopes in woodland (deciduous and conifer), in scrub, Grey Willow carr, at path or track edges, on 'hedges', laneside banks, in cemeteries and churchyards. Bases of walls and under scrub or trees in old mine areas, sometimes on more open areas of mine-spoil. Common as colonist of soil heaps, arable fields (including bulbfields in Scilly), grass leys, bare patches in pastures, clay and soil in and near working china clay quarries and on spoil heaps and in stone quarries (including serpentinite).

Grows in fully insolated and well shaded sites, but especially common in sheltered and humid woodlands or beside woodland rivers, streams, ditches or flushes, and in Grey Willow carr. Spreads onto bases of Grey Willow or Elder trunks in humid places and onto lower branches in very humid situations. Extends well into flood-zone of rivers, and frequent to abundant on silted bases of trees beside R. Tamar; also in upper parts of inundation zones beside reservoirs. Often also in exposed places on soil on and above sea-
cliffs, e.g. amongst sparse grasses in turf and at edges of paths and tracks. Also in flushes on and above sea-cliffs and at landward edge of exposed boulder beach. Bits, poorly grown, in open acid mire near *Molinia caerulea* and sphagna. Unusual record of plenty on cast-iron of old pipe above river bank, lightly shaded by trees.

Many associates recorded, those typical in humid woodlands and on shaded banks including *Brachythecium rutabulum*, *Brachythecium rivulare*, *Cirriphyllum piliferum*, *Eurhynchium striatum*, *Fissidens bryoides* var. *bryoides*, *Isothecium myosuroides* var. *myosuroides*, *Lejeunea lamacerina*, *Mnium hornum*, *Plagiomnium undulatum*, *Plagiothecium denticulatum* var. *denticulatum*, *Plagiothecium nemorale*, *Plagiothecium succulentum*, *Rhizomnium punctatum*, and grasses and herbs; on garden soil or in arable fields with *Oxyrrhynchium hians*, *Oxyrrhynchium pumilum* and various small acrocarps; in bulbfields in Isles of Scilly with *Riccia crystallina*, *Sphaerocarpos* spp.; on silted riverside tree-bases with *Homalia trichomanoides*, *Leskea polycarpa*, occasionally *Dendrocryphaea lamyana*, *Scleropodium cespitans*; on edge of cliff-top path with *Archidium alternifolium*, *Bryum dichotomum*, *Ephemerum serratum*.

Frequently/commonly c.fr.: capsules immature 1-4, 7-12; dehiscing 1-3, [4], 10-12; dehisced 1-5, 12. Mainly non-fertile in exposed sites, such as on coastal cliffs, where plant nonetheless is often very common.

169.4 *Sciuro-hypnum populeum* (Hedw.) Ignatov & Huttunen (syn. *Brachythecium populeum* (Hedw.) Schimp.). Temperate Circumpolar element.


Habitat notes from Cornwall are as follows. Commonly on surfaces of granitic, gabbro or slaty boulders, in open, lightly shaded to moderately shaded (e.g. in woodlands, groves, laneside banks, gardens, cemetery). On mortared-granitic masonry of walls, including those of bridges and ruined mine or other buildings. Unshaded or partly to well shaded. Thin soil over rocks on old mine areas, unshaded. On slaty rock on unshaded rocky bank and in old quarry. Sparsely on boulders in edge of inundation zone beside Siblyback Lake (Reservoir). On serpentinite blocks in 'hedge' beside field. On top of old concrete fence-post at wood edge in sheltered site. Several records on concrete, unshaded to lightly shaded. Patch on firm, gritty china clay spoil on unshaded bank. Strong patch c.fr. on wood of old fence under deciduous trees near stream. Associates recorded include *Kindbergia praelonga*, *Lejeunea lamacerina*.

Commonly/frequently c.fr.: capsules immature 1-3, 8-12; dehiscing [10], 1-3, [5 - one capsule]; dehisced 2-4, 7, 10-11.
169.4 **Sciuro-hypnum plumosum** (Hedw.) Ignatov & Huttunen (syn. *Brachythecium plumosum* (Hedw.) Schimp.). Boreo-temperate Circumpolar element.

*S12*

**1:** Trengwainton near Penzance, 1844, JR (**PNZ**) (Paton 1969a: 751).

**2:** Trehane near Probus, 1861, ES (**TRU**) (Paton 1969a: 751).

Habitat notes from C&S are as follows. On top and sides of boulders and other rock (granitic, slaty, serpentinite) and damp masonry in and at edges of streams, small and larger rivers, and reservoirs, unshaded or in light to moderate shade (including woodlands). Common on silted and unsilted bark on trees and shrubs (Alders, Ash, Grey Willow, Sycamore, etc.) and on boulders in flood-zones beside reservoirs and R. Tamar and larger streams. Associates include *Amblystegium serpens* var. *serpens*, *Kindbergia praelonga*, *Homalia trichomanoides*, *Hycoomium armoricum*, *Hypnum cupressiforme* var. *cupressiforme*, *Isothecium holtii*, *Leskea polyca*, *Plagiochila porelloides*, *Racomitrium aciculare*, rarely *Dendrocryphaea lamyana*.

Less often grows away from water, on granitic boulders on hillsides, sheltered but not much shaded, and on boulders part shaded by trees on hillslop. On edge of track away from water. On damp concrete and among masonry in sheltered part of cemetery and masonry dumped on moist ground near china clay works. On concrete where water escaping near china clay settling tank, part shaded. On concrete of ditch edge near china clay works. Away from water on firm soil of top of low 'hedge' beside track in deciduous woodland (with *Diphyscium foliosum*), on part-shaded hedge at edge of deciduous grove, and on low rocks or boulders e.g. in shady deciduous woodland edge. Unusual records of pure patch several metres long on concrete beneath edge of wall of old galvanised-iron sheeting, and of plenty on cast-iron of old pipe above river bank, lightly shaded by trees.

Commonly c.fr.: capsules immature 1-4, 8, 10-12; dehiscing 1-3; dehisced 1-8.

170.1 **Brachythecium albicans** (Hedw.) Schimp.

Boreo-temperate Circumpolar element.

*S12*

**1:** Hayle Sands, 1864, WC (**PNZ**) (Paton 1969a: 750).

**2:** Withiel, 1876, RVT (**B**) (Paton 1969a: 750).

Habitat notes from C&S are as follows. Dune grassland; sandy banks on and near coasts, unshaded, among low grasses (associates: *Bryum dichotomum*, *Homalothecium lutescens*). On gravelly soil over serpentinite on track on slope near coast; unshaded. Thin soil on partly bare ground and in thin short turf on top of exposed sea-cliffs (slate, serpentinite) and in old serpentinite quarry above sea cliff, generally unshaded. Unshaded edges of gravel carparks or partly bare patches at road edges. Colonising china clay spoil, and on acid soil of disturbed ground among china clay spoil. Acid soil on unshaded, disused track of old railway. Base of heap of mine spoil, unshaded. In short acid grassland on bank inland. Head of shingle beach. Bits on gravel in lightly shaded field gateway and by track edge inland. Bits in thin turf over edge of unshaded old concrete near coast. Compressed soil of paths and tracks on slopes above sea-cliffs, with sparse grasses. Unshaded bank above sea-cliffs. Cliff-tops and cliff edges on dry soil with sparse low vegetation or on soil among rocks.

Not seen c.fr.
170.3 Brachythecium glareosum (Bruch ex Spruce) Schimp.

Boreo-temperate Eurasian element.

*2: Nanstallon Downs near Bodmin, 1870, RVT (B) (Paton 1969a: 750).

Found new to Isles of Scilly in 2003, in three unshaded sites: on a coastal bank (St Agnes), substantial patches amongst short vegetation on blown sand near low dunes above the coast (St Martin's), and in small quantity on soil in the middle of a track near a bulbfield (Penninnis Head, St Mary's).

Habitat notes for two recent records from the mainland of Cornwall are as follows. In short mossy turf on calcareous dune sand on slope above west facing sea-cliff; associates Amblystegium serpens var. salinum, Homalothecium lutescens, Hypnum cupressiforme var. lacunosum, Pleurochaete squarrosa, Trichostomum crispulum, Festuca rubra, Holcus lanatus, Plantago lanceolata, Senecio jacobaea (seedlings), Thymus polytrichus. In low vegetation on soil among slaty rocks on pathside banks on upper part of N.-facing sea-cliff (Bossiney Cove), apparently where some base present.

Not seen c.fr.

[170.4 Brachythecium salebrosum (Hoffm. ex F.Weber & D.Mohr) Schimp. – Vc1 records dismissed as doubtful because only specimen traced was misidentified: Paton 1969a, Crundwell 1970: 209].

170.5 Brachythecium mildeanum (Schimp.) Schimp.

Temperate Circumpolar element.

*1: Connor Downs, 1866, WC (PNZ) (Paton 1969a: 750).

M.O. Hill (in Corley & Hill 1981 and in Hill et al. 1994: 318) revised British records because this species had often been misidentified. Cornish records accepted by MOH are accepted here, as also are recent records [and older specimens] checked by DTH following study of material sent by MOH. The entire or weakly denticulate leaf margin is best distinction from Brachythecium rutabulum, but care needs to be taken to avoid muddles with forms of B. albicans (dioicous not autoicous; shoots string-like when dry due to erect leaves; short basal cells in triangular group ascending leaf margin) and Sciuro-hypnum plumosum (leaves often secund, often fertile, typically in wetter habitat and not usually on soil).

Probably often overlooked as poorly grown B. rutabulum. Habitat notes from Cornwall are as follows. Growing on or beside paths and tracks, or in gateways, where usually seen on damp soil with incomplete or low cover of mosses, herbs and grasses. Compressed soil on path and track edges, gateways, almost unshaded (associates Barbula convoluta, Barbula unguiculata, Bryum argenteum, Bryum dichotomum, Didymodon insulanus, Didymodon nicholsonii, Didymodon umbrosus). Damp, compacted soil with patchy cover of vegetation
in little used area of gravel car park near coast. Gravelly soil still partly bare of roadside layby, almost unshaded, associated with small acrocarps including \textit{Barbula unguiculata}, \textit{Dicranella staphylina}, \textit{Tortula truncata}. Edge of grass verge beside lane across a Lizard pen, heath, close to edge of old tarmac. Other records of it growing over tarmac at edge of road through heathland (near \textit{Bryum dichotomum}) and at base of wall of old bridge. N. of Crow's Nest: on edge of gravelly track on old mine area, slightly shaded by embankment and trees. Millook: with rather sparse grasses and other mosses on compressed soil in middle of track, almost unshaded. Compressed soil among short grasses in middle of track at edge of arable field. Gravelly roadside verge used as parking place, gravel in field gateway, gravelly edge of track, all three sites with incomplete low vegetation cover, unshaded. Over old unshaded damp tarmac. With low vegetation on unshaded old track near serpentinite quarries on coast. At Porthallow sparsely on head of shingle beach. Unshaded disturbed gravelly soil near disused granite quarry. Locally plentiful at Polcrebo Downs as colonist on unshaded disturbed lithosol on area of old mining ground. One record from arable field (cereal stubble) by CDP. In damp edge of grass ley with \textit{Brachythecium rutabulum}, \textit{Oxyrrhynchium hians}, \textit{Kindbergia praelonga}, \textit{Philonotis caespitosa}, \textit{Phaeoceros laevis}.

Not seen c.fr.

170.6 \textit{Brachythecium rutabulum} (Hedw.) Schimp. \textbf{S12}
Temperate European element.


Habitat notes from C&S are as follows. Common on soil or over decayed wood, in woodlands, groves of trees, scrub, on base of 'hedges', in gardens, on stream banks, in cemeteries and churchyards. Apparently avoids very exposed places on coast, so perhaps intolerant of much salt-spray. Frequent on bark low on Elders and occasionally on bases of old Grey Willows and various tree species. On serpentinite rock of boulders and soil in shade of scrub. On inclined surface of ledge of mortared-granite masonry, slightly shaded. Base of mortared walls of reservoir dam. Old mortared walls and over old concrete. Thin soil on banks and at edges of tracks on old mining ground. Colonist in open and part shaded sites in and near china clay quarries and spoil heaps. Soil and thin soil over rock in old serpentinite quarry above sea-cliffs, unshaded. Soil on upper parts of sea-cliffs and slopes above, e.g. sparsely amongst turf. Small amounts on soil in pastures and a grass ley. Soil at base of masonry. Soil and decaying wood of rotted logs in and at edges of deciduous woodland and conifer-woodland edges. Frequent associates among many noted were \textit{Calliergonella cuspidata}, \textit{Oxyrrhynchium hians}, \textit{Kindbergia praelonga}, \textit{Lophocolea bidentata}, \textit{Rhynchosporium confluentum}, \textit{Rhytidiadelphus squarrosus}; also herbs and grasses.

Commonly c.fr.: capsules immature 1-3 [4], 8-12; dehiscing 1-3 [4], 11, 12; dehisced 1-8, 10.
Brachythecium rivulare Schimp.
Boreo-temperate Circumpolar element.

*1: Castle Horneck near Penzance, 1866, WC (PNZ) (Paton 1969a: 751).

A variable species, with some plants apparently intermediate in gametophyte characters between this and preceding species. An unusual form with strongly plicate leaves found occasionally, e.g. from beside R. Tamar near Gunnislake.

Habitat notes from C&S are as follows. It grows mainly in wetter sites than those preferred by B. rutabulum, but their ranges overlap in moist sites and they often occur together. Often plentiful on wet ground in flushed areas, stream sides and near rivers in deciduous woodlands and on wet ground in Grey Willow carrs, where lightly to rather heavily shaded, growing on soil, damp rock, decaying wood, leaves and ground litter. Associates include Calliergonella cuspidata, Conocephalum conicum, Oxyrrhynchium hians, Kindbergia praelonga, Hookeria lucens, Lophocolea bidentata, Plagiommium undulatum, Plagiothecium denticulatum var. denticulatum, Rhizomnium punctatum, Chrysosplenium oppositifolium, Oenanthe crocata, occasionally Calliergon cordifolium, Chiloscyphus pallescens.

Other detailed habitat notes from Cornish sites are as follows. Commonly on silty-loam of banks in flood-zone of R. Tamar. Damp ground near reservoir edges, with Calliergonella cuspidata. On clay soil in short grassland on bank (sea wall) beside R. Tamar, unshaded. Damp grassland, including pastures, damp slope in churchyard. Damp track in light shade of Sycamores (with Calliergonella cuspidata). Plentiful on wet disused railway track in cutting. Mesotrophic to lightly acid areas of open mire. Unshaded stream edges and flushes on and above sea-cliffs (with Oxyrrhynchium hians). On top of rocks in quick-flowing stream in open near coast. Colonist in damp to wet hollows in areas of china clay spoil, sometimes near working quarries, unshaded or part shaded by Grey Willows. Damp lawn. Damp grassland on slope in pasture. Base of Juncus (J. acutiflorus, J. effusus, J. inflexus) and grasses in wet rush-pasture (with Calliergon cordifolium, Calliergonella cuspidata), and in fen. Damp gravelly ground at edge of road. Flushed patch on laneside bank.

Often difficult to separate from B. rutabulum, which fruits much more commonly, so fruiting records of B. rivulare need careful checking. Frequently c.fr.: immature 1, 2, 10, 11; dehiscing 3, 11; dehisced 2-5.

Scleropodium cespitans (Wilson ex Müll.Hal.) L.F.Koch

*1: [Record from St Mary's, 1908, GBS (BM) accepted by Paton (1969a: 751) but rejected here as likely to represent misidentified S. tourettii, as discussed below]. Another voucher specimen from vc1 is therefore needed!

See notes under S. tourettii regarding plants resembling this species from Isles of Scilly.
Habitat notes from C&S are as follows. Most sites are close above water-level of streams and rivers, within usual flood-zone, or where flooded in at least some years, hence extending 2 (-3) m above water of R. Tamar but only ca 1 m above stream at Poltesco. Grows on silted bases of trees (Alder, Ash, Grey Willow, Sycamore recorded), boulders and partly silted rocks (including serpentinite), mostly where partly shaded by deciduous trees. Although very local, sometimes occurs in considerable amounts, forming large pure patches. Associated species in these habitats include Sciurohynum plumosum, Homalia trichomanoides, Leskea polycarpa and Thamnobryum alopecurum.

Also recorded in several man-made sites that combine hard substrates with periodic inundation and usually some shading by deciduous trees: near Roseworthy a bit on concrete lining of roadside ditch near stream, where almost unshaded; at Trengwainton on inclined concrete of gutter at edge of roadway, part shaded by deciduous trees. At Hessenford on old tarmac of sloping footpath (with Didymodon nicholsonii and other mosses); E. of Roche in sparse mats on damp old tarmac of lane (with much Didymodon nicholsonii). At Kenwyn Churchard (Truro), locally plentiful on old tarmac of little-used path, moderately shaded by trees; also on low rocks and concrete (vertical and horizontal) of grave surrounds and path edges nearby, and in small amounts on hard soil of sparsely vegetated banks (all in partly to fairly heavily shaded places). In Mawnan churchyard on granitic chippings of grave covering, slightly shaded by trees. At Titson on pavement with other mosses, shaded by N. wall of graveyard (with Bryum dichotomum, Didymodon insulanus).

Not seen c.fr.

171.2 Scleropodium tourettii (Brid.) L.F.Koch S12 Mediterranean-Atlantic Oceanic element.

*2: St Kew Highway, 1888, RVT (B) (Paton 1969a: 751).

Typical plants of this species are common in the Isles of Scilly in unshaded habitats with sparse or very short vegetation, such as on edges of rocky paths. In addition, plants of this genus have been collected from shaded habitats there, e.g. on granitic rocks under elm trees and on sandy soil in bulbfields, some of them closely resembling 171.1 in having longer, straighter and more slender leafy stems than typical plants of 171.2, although they are generally rather featureless and sometimes more slender than is usual even in 171.1, with longer acuminate leaf apices. However, the shade plants from Scilly often grow in drier habitats than those usual for 171.1 on the mainland, in places that are not subject to periodic inundation. Hence, and also since a full range of intermediates connect the Scillonian shade plants with typical 171.2, they are all referred to the latter species. González-Mancebo & Hernández-García (1996) report similar variability within 171.2 in the Canary Islands, where an extremely slender form with elongate leaf apices has been named as var. teneriffae Cardot & Wint., although they show that it is connected to the typical form by intermediates. The slender forms are shown by these authors to occur in habitats with higher humidity conditions and lower light intensity than those where the typical form is growing, as in the Isles of Scilly. The only mainland record of a well marked 'shade form' (resembling 171.1) was from S. of Georgia in W. Penwith in 1996: in middle of little-used track in former china clay works, amongst short grasses and herbs, but partly shaded by tall Grey
Willow scrub (typical 171.2 was recorded in same area in 1965 by JAP, before the scrub grew up).

Habitat notes from C&S are as follows. Commonest at or near coast in unshaded places that are dry for long periods in normal summer conditions, with very short turf or almost bare ground. Found on basic to acidic soil, often where soil is thin over rocks or compacted on or beside pathways or tracks, overlying many rock types (slates, schist, greenstone, granitic, serpentinite). Locally abundant at Porthallow in trampled areas just above head of shingle beach. Common associates include Archidium alternifolium, Bryum dichotomum, Campylopus introflexus, Ceratodon purpureus, Fossombronia spp., especially F. 'husnotii', Pleuridium acuminatum, Riccia subbifurca and Trichostomum brachydontium, Cladonia spp., and various low phanerogams (especially Aphanes sp., Festuca rubra, Plantago coronopus, Poa annua, Sedum anglicum). Others recorded include Barbula unguiculata, Bryum kunzei, Bryum torquescens, Grimmia lisae, Hypnum cupressiforme var. lacunosum, Lophocolea bidentata, Lophozia excisa, Tortula wilsonii, Weissia longifolia var. longifolia. Frequently occurs in exposed sites subject to salt-spray.

Records inland are mainly of smaller amounts in similar unshaded habitats on tracks, partly-bare road sides, in an old quarry, at edge of gravelly car park, sandy ground trampled and grazed by rabbits at landward edge of dunes, a bank on old mining ground, a rocky patch on laneside bank, side of a 'hedge'; once among low mosses on old crumbling mortar of top of wall of ruin; once a small patch on horizontal concrete by path in edge of scrub; once on near-horizontal low slaty rock at road edge where partly shaded by woodland trees.

Habitat range more extensive in Isles of Scilly than on mainland, where shade forms can resemble 171.1 (see above). Besides records on paths, tracks, etc., recorded there in bulb fields (on firm sandy soil, and on soil partly shaded by herbaceous weeds), on old mortar of base of wall beside lane (St Martin's), and on low concrete wall in Tresco Abbey Gardens, both of the latter sites almost unshaded. However, records of 'shade form' were on granitic boulders partly shaded by elm trees near Tresco Abbey, and on similar substrates but well shaded by elm trees beside small stream (ditch) near Lenterverne on St Mary's.

One record c.f.r. (vc1; DTH): capsules immature 9.

[172.1 Eurhynchiastrum pulchellum (Hedw.) Ignatov & Huttunen (syn. Eurhynchium pulchellum (Hedw.) Jenn.) – Rejected for vc1 by Paton 1969a: 752. A specimen ('sent from near Bodmin', no date, RVT (CMM)), was accepted for vc2 by Paton 1969a: 752 and Crundwell 1969: 890, but later rejected by Hill 1993 and Blockeel 1994: 41 because of serious doubt over its true provenance].

173.1 Brachytheciastrum velutinum (Hedw.) Ignatov & Huttunen (syn. Brachythecium velutinum (Hedw.) Schimp.). Temperate Circumpolar element.

*2: Bodmon, 1897, RVT (B) (Paton 1969a: 751).

Apparently rare in Cornwall, and often reported in error by bryologists from 'up country' who regard it as a common plant that does not need close examination!
Habitat notes from Cornwall are as follows. Grows in small patches, or mixed with other bryophytes. On concrete and mortar of ruins of walls and buildings near china clay quarries; unshaded. On granitic rock partly shaded by saplings at edge of disused area of granite quarry. On steep slaty rock of laneside bank, almost unshaded.

Four records c.fr. (vc1): capsules immature 1, 3, 11, 12; dehiscing 3, dehisced 2.

174.1 *Homalothecium sericeum* (Hedw.) Schimp. S12
(syn. *Camptothecium sericeum* (Hedw.) Kindb.). Southern-temperate Eurosiberian element.

*2*: Withiel, 1888, RVT (B) (Paton 1969a: 750).

Forming patches, sometimes extending over several square metres. Habitat notes from C&S are as follows. Unshaded or partly shaded (occasionally persisting as sites become heavily shaded), horizontal, sloping or vertical concrete and masonry of calcareous or mortared walls (stone or brick), slates of a roof. Serpentine rock part shaded in woodland or by scrub. Slaty or serpentine rocks in open on slopes above sea-cliffs, on exposed headlands and on unshaded rocky bank near coast. Vertical granite of S-facing rock wall in old quarry. Slate rock in quarries. Vertical granite of mortared masonry of ruins, old viaduct and old mill-leaf, vertical granite of part-shaded 'hedge' and on granite boulders (presumably where basic). On gravestones and grave surrounds. Firm soil of steep almost unshaded banks. Epiphyte on Ash, Beech, Hazel, Sycamore trunks, twice on Grey Willow (exceptionally, at Heligan, epiphyte on *Ginkgo biloba* trunk), noted twice on Elder, once on oak stump. Also on decorticated wood of fallen trunks in open.

Associates on rock and walls include *Brachythecium rutabulum*, *Bryum capillare*, *Grimmia trichophylla* s. l., *Neckera complanata*, *Schistidium crassipilum*, *Tortula muralis*, *Zygodon viridissimus* var. *viridissimus*, rarely *Porella obtusata*. On bark with or near *Cryphaea heteromalla*, *Hypnum cupressiforme* var. *resupinatum*, *Metzgeria violacea*, *Orthotrichum affine*, *Radula complanata*.

Frequently c.fr.: capsules immature 1, 2, 7-12; dehiscing 1, 10, 12; dehisced 1-5, [6, 7 old] 9, 10, 12.

174.2 *Homalothecium lutescens* (Hedw.) H.Rob. S12
(syn. *Camptothecium lutescens* (Hedw.) Schimp.). Southern-temperate European element.

*2*: Rock near St Minver, 1888, RVT (B) (Paton 1969a: 750).

Grows as scattered stems, patches or tall turfs. Habitat notes from C&S are as follows. Often common on calcareous sand in dune grassland and on sand-dunes, also on blown sand accumulated on cliff tops and other coastal slopes. Associates recorded: *Brachythecium albicans*, *Hypnum cupressiforme* var. *lacunosum*, *Pleurochaete squarrosa*, *Syntrichia ruralis* var. *ruraliformis*, *Festuca rubra*, *Holcus lanatus*, *Plantago lanceolata*, *Senecio jacobaea* (seedlings), *Thymus polytrichus*; rarely *Amblystegium serpens* var. *salinum*, *Brachythecium glareosum*. 

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Unusual record of good patches with other mosses on thin soil over old unshaded horizontal concrete of platforms of disused railway station. At Goss Moor on unshaded sparsely vegetated gravel of disused railway track. On open S.-facing grassy bank in old mine-spoil area at Polcrebo Downs. Small patch on almost unshaded soil at base of old mortared wall inside ruin of mine building.

Two records c.fr. (Gear Sands and Penhale Sands, vc1): capsules dehiscing 2, dehisced late 1.

177.1 *Calliergonella cuspidata* (Hedw.) Loeske (syn. *Acrocladium cuspidatum* (Hedw.) Lindb., *Calliergon cuspidatum* (Hedw.) Kindb.). Temperate Circumpolar element.


A common species occupying a very wide range of mainly moist or wet unshaded habitats, mainly where more or less basic. Habitat notes from C&S are as follows. Stony or clayey soil on and beside little-used tracks, e.g. in old quarries, on old metalliferous mine sites, in spruce plantation, in churchyards. Soil of gravelly clearing in woodland, persisting to form carpet among sparse grasses and low herbs, unshaded to moderately shaded. Over old concrete on paths, in churchyards, gardens, and among ruins. Gravel of car park. Abundant over old crumbling tarmac of sheltered lane. Often plentiful in lawns and other short grasslands e.g. on roadside verges a few years old, especially in damp or humid situations such as near streams or where partly shaded, or on heavy water-retentive soils, but also e.g. on calcareous sands. With other mosses in open and well shaded in old slate quarries. Often common as colonist on clayey banks, slopes, flat surfaces, in wet hollows and on tracks in and around working china clay quarries (common associates include *Brachythecium rutabulum*, *Rhytidiadelphus squarrosus*, also with *Bryum alpinum*, *Cirriphyllum piliferum*, *Drepanocladius aduncus*, *Philonotis fontana*). Abundant in flat patches and wefts on thin film of damp clay on vertical concrete of wall of ruin, lightly shaded (with *Didymodon fallax*, *Dicranella varia*). On vertical masonry and at bases of mortared walls, on and near dumped calcareous masonry, not uncommon growing directly on old damp concrete. Bits or more extensive patches (often with *Brachythecium rivulare* or *Calliergon cordifolium*) on wet floor of old Grey Willow carrs, sometimes where moderately to heavily shaded in summer. Occasionally dominant over tens of square metres in open acidic mires, perhaps where somewhat eutrophicated. Also in flush on river bank moderately shaded by deciduous woodland. Plentiful at reservoir edges, with small amounts occurring within inundation zones (e.g. with *Climacium dendroides*). Also in the inundation zones beside pools on Lizard pen. heathland. Plentiful among short vegetation on wet ground in mire by Ruan Pool. In open parts of fen near stream on heath. In open parts of mires, especially where flushed or near springs, but usually absent from open oligotrophic mires with sphagna and no flushing (associates recorded include *Sarmentypnum exannulatum*). Bit among wet fern tussocks inside swampy woodland. Often abundant in flushes above sea-cliffs. On blown sand of slope near coast, with low grasses. Not usually found in exposed coastal localities, but seen on soil in short grassland of quarry on slope above exposed sea-cliff. Other frequent associates include *Brachythecium rivulare*, *Campylium stellatum*, *Cratoneuron filicinum*, *Didymodon fallax*, *Didymodon insulanus*, *Drepanocladius aduncus*, *Calliergonella lindbergii*, *Pseudoscleropodium purum*, grasses (e.g. *Agrostis stolonifera*) and varied herbs.
Rarely/occasionally c.fr. (three recent records in vc1 and three in vc2, all from shallow water in sheltered places: three of them in acid pools or wet ground in heathy areas, one of these sites near old mine spoil; dune-slack pool; edge of stream in Grey Willow scrub): capsules immature 4, 5; dehiscing 5.


A form with rather long-tapering, acuminate leaf apices has been recorded several times in Cornwall (Smith 1978, 2006 described leaf apex as shortly tapering and acute or subacute). Grows as low lawns or mixed with other bryophytes or low grasses and herbs. Habitats in Cornwall are as follows. A colonist on moist compressed soil and clayey, gritty and gravelly substrates of tracks and their edges, paths, banks, sparsely vegetated hollows and roadside verges. Usually grows unshaded, sometimes partly shaded. Rather local in Cornwall but often common around old and active china clay quarries and their works. Single records from disused railway track, edge of track on old metalliferous mine area, patches of mainly bare damp soil in pasture, wet heathland and on vertical granite of low step on pathway. Widespread but very sparse in upper part of inundation-zone beside Colliford Lake (reservoir) occurring mainly as sparse young stems, but with a few well-grown patches. Associates recorded include *Archidium alternifolium*, *Calliergonella cuspidata*, *Campylopus introflexus*, *Oxyrrhynchium hians*, *Fossombronia pusilla*, *Phaeoceros laevis*, *Pleurozium schreberi*, *Racomitrium ericoides*, *Centunculus minimus* and varied short grasses and herbs.

Not seen c.fr.

181.3-6 *Hypnum cupressiforme* s. l. (additional records only)

Records since 1950 should be mainly of 181.3-4 but include some 181.6; older records involve all of these taxa.

181.3.a *Hypnum cupressiforme* Hedw. var. *cupressiforme* Wide-temperate Circumpolar element.

*2*: Trevathan St Endellion, 1892, RVT (B) (Paton 1969a: 754).

Difficult to distinguish from the much commoner *H. andoi* except when rostrate rather than conical lid of capsule seen. Very slender non-fertile plants were recorded as *H. andoi* in the field, but more robust non-fertile material was only recorded as *H. cupressiforme* s. *str.* when cell size checked in several stem leaves was mainly >50 µm long, when it was mainly shorter plant was recorded as *H. andoi*, but numerous variable or intermediate gatherings were nevertheless not recorded as either.
Robust forms also provide a series of apparent intermediates with *H. cupressiforme* var. *lacunosum*, such that really intermediate material was recorded as neither of them. Thus, *H. cupressiforme* var. *cupressiforme* was doubtless somewhat under-recorded. There anyway still seems good reason to doubt whether *lacunosum* represents anything more than a robust form of *H. cupressiforme* var. *cupressiforme*, unworthy of any taxonomic recognition.

Forms mats. Habitat notes in C&S are as follows. Often appears to be more of a calciphile than *H. andoi*, with records on sides or tops of old mortared walls (stone, less often brick, e.g. in churchyards) and on old concrete of walls and ruins, on gabbro boulders near coast, unshaded to part shaded. However, fewer records are from apparently acidic sites. Habitats recorded include: On unshaded granitic boulders in pastures, top of large granite block part-shaded in river, on boulders of granite in top edge of inundation-zone beside Siblyback Lake, acid walls. On unshaded granite boulders in china clay spoil and near quarries. On slaty rocks of unshaded 'scree' in old quarry. Also acid grassland slopes, a grassy heathland edge and bark of an oak tree. On grave in churchyard. Also on 'hedges', on masonry debris near ruin. Once as epiphyte on *Cortaderia* trunk with other mosses.

Associates recorded include *Isothecium myosuroides* var. *myosuroides*, *Plagiochila porelloides*, *Racomitrium aciculare*.

Frequently c.fr.: capsules immature 1-3, 10-12; dehiscing 1-3, 10; dehisced 1, 3, 4.

181.3.b  **Hypnum cupressiforme** var. *lacunosum* Brid.  

*2*: St Minver, 1879, RVT (B) (Paton 1969a: 755).

Treated at species rank in the revision by Smith (1997). However, *lacunosum* appears to be little more than a robust form of *H. cupressiforme* to which it is connected by intermediate plants, so Hill *et al.* (2008) treated it as a variety.

'Var. *tectorum'* is connected to var. *lacunosum* by intermediate plants at some of its few Cornish localities (SW76V, SW83F, in DTH). It is probably best regarded as a straight-leaved variant of *H. cupressiforme* var. *lacunosum* unworthy of even varietal separation.

Habitat notes from C&S are as follows. Plentiful on calcareous sand of fixed dunes, typically in short turf of dune-grassland or on sandy slopes above sea-cliffs; also where blown sand rests on open coastal hillsides. Associates recorded: *Homalothecium lutescens*, *Pleurochaete squarrosa*, *Syntrichia ruralis* var. *ruraliformis*, *Festuca rubra*, *Holcus lanatus*, *Plantago lanceolata*, *Senecio jacobaea* (seedlings), *Thymus polytrichus*; rarely *Ambylystegium serpens* var. *salinum*, *Brachythecium glareosum*. Thin soil over rocks (granitic, gabbro, slates, serpentinite), attached to horizontal or gently sloping rock surfaces and on edges of rocks or tops of boulders (also a few records on top of old mortared-stone walls), on sea-cliffs, exposed coastal headlands, heaths, heathy banks, unshaded hilltops, bare patches in pastures and other acid grasslands, in old quarries and on their spoil, heathy areas on old mine-spoil, on unshaded 'hedges', often in short turf. Often on distinctly acid soils. Locally frequent as colonist on china clay spoil heaps and on clay soil of banks near...
working china clay quarry, unshaded. Gravelly top of grave in churchyard, unshaded. Sloping masonry low on wall of reservoir dam, unshaded. Over old concrete, e.g. edges of runway of disused airfield and on disused china clay dries. Unshaded gravelly soil of disused railway track, well drained, on bridge. On thin soil over rocks and on granite in open place on heath; old quarry; often on acid soils. Soil over rocks above sea-cliff; unshaded. In short turf and bare patches on soil and thin soil over slaty rocks on unshaded slopes of coastal headland. On thin, unshaded, partly bare soil over slaty rock of upper part of low sea cliff. On low bank of unshaded china-clay spoil above ditch. With open vegetation cover on unshaded top of old stone wall around mine shaft. Associates often include Campylopus introflexus, Dicranum scoparium, Pseudoscleropodium purum; among many others recorded are Bryum kunzei, Cephaloziella divaricata, Grimmia lisae, Lophozia excisa, Polytrichum juniperinum, Scleropodium touretii, Tortula viridifolia, Tortula wilsonii, Trichostomum brachydontium, Conocephalum conicum, Cladonia spp., low herbs (e.g. Aphanes) and low grasses.

Infrequently c.fr. (about seven recent records); capsules immature 10-12, dehiscing 1, 12.


Var. *resupinatum* is locally very common in Cornwall and usually distinct from var. *cupressiforme* in the straight leaves and erect capsules, but plants are frequently found which are intermediate in leaf or capsule characters, suggesting varietal rank might be more appropriate. (e.g. DTH 06-336 has erect capsules but downcurved leaves).

Var. *resupinatum* is often abundant in vc1, where ubiquitous on the coast, but apparently much scarcer well inland in vc2 (and mainly in open sites there, on rock, walls or trees, with *H. andoi* tending to replace it inside woodlands). On sea-cliffs in western parts of vc1 a form grows with all stems more or less erect so as to form firm cushions 3 or 4 cm deep; it is unclear whether this is a luxuriant form of humid coastal sites or an ecotype; it has not been found with capsules. Capsules are much rarer in exposed sites on sea-cliffs than at sheltered locations inland. Very slender trailing forms are frequent on bark and on dry slaty rocks.

Habitat notes from C&S are as follows. Epiphyte on bark of trunks and branches of Alder, Ash, Grey Willow, elms, Hazel, oaks including Sessile Oak, Sycamore; also recorded on Elder, Gorse, Horse Chestnut, *Picea abies* (dead twigs), poplar. Tends to occur higher on trunks and more often on branches than *H. andoi* where they occur together. Often persistent for some years on fallen trunks and branches. Occurs within flood-zone of R. Tamar, but mainly above zone of regular flooding. Grows unshaded to moderately or heavily shaded e.g. inside woodlands. On serpentinite, gabbro, slaty and granitic rock of sea-cliffs, outcrops, road cuttings, walls, gravestones and in and about old quarries or mines; locally on soil on slopes or steep banks (including china clay spoil, occasionally metalliferous mine spoil) and thin soil over granitic rocks on exposed slopes above sea-cliffs. On masonry e.g. of bridges and concrete, e.g. of walls, ruins, graves and old fence-posts.

Commonly c.fr.: capsules immature 1, 2, 7-12; dehiscing 1-4, 9-12; dehisced 1-12.


Clearly distinct from *H. cupressiforme* in characters of the capsule lid, so that treatment as a distinct species appears correct. However, as discussed above, non-fertile plants can be hard to identify even using combinations of characters.

Notes on habitats in C&S are as follows. Common as epiphyte, frequently forming large patches or sheets, mainly on lower parts of trunks and low main branches (but typically above level dominated by *Isothecium myosuroides* var. *myosuroides*) where it may form the dominant bryophyte cover. Recorded on Ash, Beech, Grey Willow, Gorse, Hazel, Japanese Larch, *Pinus contorta*, Rhododendron, Sessile Oak, Sycamore (but probably grows on almost all tree types and varied shrubs). Not infrequently in open sites but commonly also well-shaded inside woodland or groves of trees, also Grey Willow carrs and *Rhododendron* scrub. On Japanese Larch on low twigs, covering old cones, in part shade of woodland edge. On granitic (and gabbro) rock in old quarries and in shaded 'hedges', granitic boulders on china-clay spoil, on granitic crags of a valley side. On firm unshaded clay of old china clay spoil on sheltered slope. On old roofing felt of shed under tree edges near pool.


Commonly c.fr.: capsules immature 1, [few: 2-6], 7-12; dehiscing 1-3, (4), [7 - one], 8-12; dehisced 1-7 (8-10 old), 12. Capsules much scarcer or absent in exposed sites (including most areas within several km of exposed coasts)
Hypnum jutlandicum Holmen & E.Warncke (syn. H. cupressiforme var. ericetorum Schimp.). Temperate Suboceanic element.

*2: Carclaze, St Austell, 1962, JAP (BBSUK) (Paton 1969a: 755). ['Cardinham' (Tellam 1888) not supported by specimen].

Stunted plants on tops of exposed sea-cliffs may be hard to identify. Also occurs as form with erect stems on rock above sea-cliffs.

Habitat notes from C&S are as follows. A very common moss in heathland and acid grassland habitats, sometimes abundant to dominant over large areas e.g. beneath Calluna vulgaris. On hummocks in mires and flushes (and sparsely amongst sphagna on flat areas of some mires). In heaths and wet heaths, especially in more or less open places. On slopes of earthy mine spoil under Calluna vulgaris or Gorse scrub. On heathy areas and under scrub or groves of trees over old mine-spoil, unshaded to moderately shaded (occasionally rather heavily shaded, e.g. on trackside bank in deciduous woodland). Soil in gravelly woodland clearing (unshaded to lightly shaded), on banks and in edges of conifer and deciduous woodland and groves of trees. Soil on 'hedges', heathy bank, about tors, occasionally on and near graves in cemeteries. Heathy areas and slopes in old granite quarries, and as often plentiful colonist of banks and flat ground around working china clay quarries and their spoil heaps; mainly occurs in later stages of vegetation succession to heathland, but sparsely also as early colonist. At base of heathy vegetation, in short turf and on soil on ledges or over edges of rocks on slopes and tops of sea-cliffs (granitic, slates, mica-schist granulite); on bank in old serpentinite quarry above sea-cliffs, unshaded. Small amounts shaded under trees in old quarries (Carboniferous slates). Extending onto lower branches of Grey Willows in sheltered moist carr of Grey Willow. One patch on low Grey Willow shrub in open carr, but not on ground anywhere nearby.

Many associates recorded, commonly Hylocomium splendens, Pleurozium schreberi, Polytrichastrum formosum, Rhytidiadelphus squarrosus, Scapania compacta, Pseudoscleropodium purum, Sphagnum spp., Thuidium tamariscinum; Calluna vulgaris, Erica spp., Molinia caerulea, Potentilla erecta, Pteridium aquilinum, Ulex gallii, Vaccinium myrtillus.

Occasionally c.fr.: capsules immature 1, 2, 9-12; dehiscing 1-3, [4], [9], 12; dehisced 1, 3-6. Sporophytes are reported to be 'occasional' in most of British Isles (Smith 2006); in Cornwall they are apparently produced regularly and in good numbers in some sheltered sites, but they are absent on exposed sea-cliffs.

[181.7 Hypnum imponens Hedw. – Old records from vc1 and vc2 rejected by Paton 1969a: 755 because the specimens were misidentified; Crundwell 1970: 211 removed vc2 from the Census Catalogue].
183.1.a & c *Ctenidium molluscum* s. l. (additional records only)

Records assigned to any of the named vars. are given below. Many older records were given only the species name, so these remain as *C. molluscum* s. l.

Two other recent records are of *C. molluscum* var. undet.: (1) on steep old mortared-stone wall, part shaded by trees; rather lax so not possible to assign it to any var.; (2) near Goonhilly in small amount on soil of wet heath, part-shaded at base of tall herbs, etc.

183.1.a *Ctenidium molluscum* (Hedw.) Mitt. var. *molluscum* 12
Boreo-temperate European element.

*1*: Between Hayle and St Ives, 1844, AG (*PNZ*) (Paton 1969a: 755).

Grows as low mats or intermixed with other mosses or low grasses, herbs, etc. Habitat notes from Cornwall are as follows. Locally common towards landward edge of Gear Sands on calcareous sand of slopes and flat areas with very short vegetation in dune grassland. Single record of small amount at Sennen Cove in similar habitat, in very short grassland on steep hillslope above beach with cover of calcareous blown sand. Scattered records from several other mostly basic habitats: At Kynance in thin short grassland growing unshaded on shallow soil layer over low outcrop of serpentinite on heathland near sea. Small amount in short vegetation near pathway on damp heath over gabbro (NW. edge of Crousaw Downs). Twice on old concrete of ruins of china-clay dries, almost unshaded to partly shaded. On fallen masonry inside ruin of old mine building. On damp granitic rock lightly shaded by saplings in disused part of quarry, near river.

Not seen c.fr.

183.1.b *Ctenidium molluscum* var. *condensatum* (Schimp.) E.Britton 1
Boreo-temperate European element.


Typical material is known from a single Cornish locality, NW. of Morvah, among flushes on N.-facing slope above sea cliff, growing almost unshaded among tussocks of *Molinia caerulea* and on sheltered, vertical, granitic rock.

Not seen c.fr.

183.1.b (?) *Ctenidium molluscum* 'Woodland Taxon'

This was described by Smith (1978: 659, 661; 2006: 917-920) as differing from var. *condensatum* in having branch leaves shorter than stem leaves and in being a calcifuge plant of soil in woodland rather than a calcicole of basic rocks. This taxon has never been given a valid name (*C. molluscum* var. *sylvaticum* F.Rose, 1980 as cited by Smith 1979 in the

Recent records of the 'Woodland Taxon' from Cornwall have the following habitat notes. Grows as patches or more extensive low mats. On firm soil (loamy, clayey, hard and stony), low granitic rocks, granitic boulders or slaty rock, on flat ground, slopes or banks in deciduous woodlands, groves of trees, on stream banks and on laneside banks. Grows in lightly to well shaded places, apparently often in places with at least some base in the soil. Associates recorded are Kindbergia praelonga, Fissidens bryoide var. bryoide, Plagiochila asplenioide, Rhizomnium punctatum; once Plagiothecium cavifolium.

A gathering from Lower Bostraze (SW33V) is closest to this form, but growing on near-vertical concrete of partly shaded base of an old wall (of a ruined china-clay dry).

Few records c.fr. (only one record in vc1, winter: DTH).


*2: Dunmere valley, Bodmin, 1879, RVT (B) (Paton 1969a: 755).

Forms patches (tall lawns), typically pure and sometimes several metres across, or grows mixed with other mainly robust bryophytes. Habitat notes from Cornwall are as follows. It occurs mainly in moist, shaded sites, less often in the open, most commonly on acidic rocks close to water-level, but also on firm soil (silty-loam), or locally on exposed tree-roots or dead wood. Many records are from vertical, sloping or horizontal surfaces of granitic or slaty rocks, shallowly submerged to close above water-level at edges of small to large streams and rivers (0-2 m above water, but higher up where rivers flood deeply), in places that are almost unshaded to rather heavily shaded by deciduous woodlands. Besides occurrences close to flowing water it occurs in the upper part of the inundation zone beside Siblyback Lake (Reservoir). In very humid conditions it occasionally grows away from water, e.g. well above flood-levels near the R. Tamar inside deciduous woodland on soil in flushes and on slaty rock and thin overlying soil of a N.-facing slope. Associates recorded include Kindbergia praelonga, Pellia epiphylla, Plagiomnium undulatum, Racomitrium aciculare, Rhizomnium punctatum, Thamnobryum alopecurum, less often Isothecium holtii, Solenostoma hyalinum. An atypical record was from deep inside a shady mine adit high on a sea-cliff.

Rarely c.fr. (one record at Porthmeor, vc1): capsules immature 5.
186.1.a *Heterocladium heteropterum* Schimp. var. *heteropterum* 12
Temperate Suboceanic element.

First vice-county records of *H. heteropterum s. l.:
*2: Helman Tor, 1879, RVT (B) (Paton 1969a: 745).

*H. wulfsbergii* was not generally recognised as distinct by British bryologists until the studies by A.C. Crundwell beginning in 1995 (see Crundwell & Smith 2000). Only material revised during these studies or recorded subsequently is referred to 186.1.a and 186.2; older records of these are listed here as *H. heteropterum s. l.*; older records of 186.1.b should be reliable.

Forms patches (low mats), often pure, or grows mixed with other bryophytes. Notes on habitats in Cornwall are as follows. An acidophile, usually found on rocks (granitic, slate, serpentinite; often on steep or overhung surfaces of crags but also on tops of boulders) or thin soil over rocks, less often firm soil, in humid or damp places, sometimes on intermittently flushed rocks. Commonly grows in moderate to heavy shade in deciduous woodland and usually in sheltered places, but occasionally unshaded or almost so on hillsides or tors. Recorded from stream banks (sometimes at water's edge or in flood-zone but more often above it; typically in woodland), tors (often in crevices), other crags, old quarries, entrances to mine adits and on laneside banks. Associates recorded include *Diplophyllum albicans*, *Kindbergia praelonga*, *Fissidens bryoides* var. *caespitans*, *Lejeunea lamacerina*, *Metzgeria furcata*, *Rhizomnium punctatum*, *Saccogyna viticulosa*, less often *Fissidens polyphyllus*, *Trichostomum tenuirostre*.

Not seen c.fr.

186.1.b *Heterocladium heteropterum* var. *flaccidum* Schimp. 12
(syn. *H. flaccidum* (Schimp.) A.J.E.Sm.). Temperate Suboceanic element.

*2: St Cleer, RWS (in *MEC Section II Report* 1922 CHECK); near Lesnewth, 1961, JAP (BBSUK) (Paton 1969a: 745).

Usually distinct from var. *heteropterum* in its smaller size, with stem leaves no larger than branch leaves. It was treated as a distinct species by Smith (2004), but occasional specimens appear to consist of slender var. *flaccidum* growing from otherwise typical var. *heteropterum*, so the former may consist only of weak shaded forms of the latter.

Grows among other bryophytes or forms small low mats. Notes on habitats in Cornwall are as follows. Apparently differs from var. *heteropterum* in sometimes occurring in habitats that are at least moderately basic (although not conspicuously so in Cornwall) as well as in acid sites, sometimes in drier places, and in being confined to shaded sites. Grows on rock (granitic, slates, serpentinite, gabbro; on steep or vertical surfaces, under overhangs and on boulders; once on old masonry), less often on thin soil over rock or firm soil of a steep bank; its sites are shaded or heavily shaded by woodland or scrub. Recorded from rock outcrops, boulders, rocks on slopes above streams and rivers (occasionally within the flood-zone), old walls (twice), an old quarry, a water-mill and at base of crag on slope above sea-cliffs.
Associates recorded are *Kindbergia praelonga*, *Oxyrrhynchium pumilum*, *Lejeunea lamacerina*, *Lophocolea fragrans*, also noted as growing under overhanging *Dryopteris affinis*.

Not seen c.fr.

186.2 **Heterocladium wulfsbergii** I.Hagen


See notes under 186.1a above.

Grows as scattered stems among other bryophytes or forming low mats. Notes on habitats in Cornwall are as follows. Acidophilous, occurring on rocks (mainly granitic; found once on slates, once on masonry of a sluice), crumbling rock or thin soil among rocks, at water-level or not far above it in and beside streams and small rivers; part shaded by trees, Grey Willow-carr or banks, shaded by deciduous woodland or its edges, or less often almost unshaded. Associates recorded include *Sciuro-hypnum plumosum*, *Fissidens bryoides* var. *caespitans*, *Lejeunea lamacerina*, less often *Fissidens polyphyllus*, *Heterocladium heteropterum* var. *heteropterum*. An unusual record from the Mousehole, on flushed near-vertical rock in the shaded interior of the deep sea cave.

At four localities in Cornwall (S. of Treloquithack, Draynes Wood, Hendergrove Wood, NE. of Waterloo) *H. wulfsbergii* has been found close to *H. heteropterum* var. *heteropterum* but apparently remaining distinct from it. At each of these stations *H. wulfsbergii* appears closely confined to stream or river edges (within the regularly flooded zone or extending a little higher) whereas *H. heteropterum* var. *heteropterum* occurs both near water (usually above the flood-zone) and widely on slopes or wooded hillslopes above.

Not seen c.fr.

188.1 **Pleurozium schreberi** (Willd. ex Brid.) Mitt.

Boreo-temperate Circumpolar element.


Notes on habitats in Cornwall are as follows. Restricted to acid substrates and characteristically in open or only partly shaded places on well-drained mor humus and plant litter of heathlands or less often in or at edges of mires or on broken ground in short acid grassland. Commonly on banks or slopes, or spreading over edges of rocks, sometimes forming thin cover over granitic boulders. Sometimes also on slopes in open deciduous woodlands, such as hillside Sessile Oak woods with heathy ground-layer, and on bank of creek in open woodland. Persists until considerable shade develops from young birch or
spruce trees when they colonise its heathland sites. Sometimes plentiful in heathy areas of short vegetation on unshaded old mine-spoil, and recorded on soil of banks in old granite quarry, on old china-clay spoil, wet heathy areas developing in old china-clay workings, laneside banks, edges of damp heathland tracks, and in heathy vegetation on a 'hedge'.

Common associates include Calluna vulgaris, Erica cinerea, [low] Ulex spp., Vaccinium myrtillus; various grasses; Campylopus introflexus, Hylocomium splendens, Hypnum jutlandicum, Pseudoscleropodium purum, Rhytiadelphus squarrosus, Thuidium tamariscinum. Others recorded included Aulacomnium palustre, Dicranum bonjeanii, Calliergonella lindbergii, Odontoschisma sphagni, Polytrichastrum formosum, Racomitrium ericoides, Sphagnum fallax and other sphagna.

Not seen c.fr.

189.1 **Rhytiadelphus triquetrus** (Hedw.) Warnst. **S12**
Boreal-temperate Circumpolar element.

*2: Dunmere valley, Bodmin, 1871, RVT (B) (Paton 1969a: 756).

A robust moss that often forms extensive pure patches (tall lawns), or grows intermixed with other tall bryophytes or low herbs and grasses. Notes on habitats in C&S are as follows. Its presence often (not always) hints at good nutrient-rich soil with at least moderate base content, whereas *R. loreus* is much more strictly acidophile. Occurs on soil, plant-litter, less often gravel (e.g. on graves) or sand, in light to moderate shade (occasionally in heavy shade) or in open insolated places. Often common in deciduous and mixed woodlands (especially on banks or slopes) and at woodland edges, occasional under mature conifers. In woodland this species can grow on flat ground by pushing its erect shoots through the accumulated leaf-litter, whereas *R. loreus* is mainly confined to steep slopes and rocks that do not accumulate leaf-litter.

Other habitats include heathy banks, rocky and heathy slopes (e.g. near tors), short grassland, laneside banks, cemeteries and churchyards, disused quarries, also occasionally on 'hedges'. At Gear Sands and Penhale Sands locally plentiful and locally dominant on calcareous sand of some damp, mainly N.- or E.-facing slopes in fixed dunes or dune grassland. Several records near buildings and ruins on old metalliferous mine areas and found twice on slopes over old china clay spoil. Unusual records include a few stems clinging to rock of a gravestone, near plentiful growth of the species on soil.

Recorded associates include Cirriphyllum piliferum, Kindbergia praelonga, Eurhynchium striatum, Rhytiadelphus loreus, Rhytiadelphus squarrosus, Pseudoscleropodium purum, Thuidium tamariscinum, and varied grasses and herbs. Occurs with or under Ammophila arenaria locally on dunes.

Not seen c.fr.
189.2 *Rhytidiadelphus squarrosus* (Hedw.) Warnst.
Boreo-temperate European element.


Grows as low lawns or mixed with other large bryophytes or small herbs, grasses, etc. Notes on its habitats in C&S are as follows. Commonest as a grassland weed, often forming extensive, apparently clonal, pure patches or grows among short (but not very short) grasses in damper places, such as grazed unimproved pastures and in mown lawns, and at edges of paths and tracks, on neutral or moderately acidic soils, gravels or sands. Recorded in many habitats including roadside verges, roadside and laneside banks, churchyards, cemeteries, old quarries, woodland clearings, wet unimproved pastures, grassy areas and scrub on old mine-spoil and china-clay spoil (where sometimes an early colonist on bare areas), edges of heaths, soil among rocks of tors, and many other grassy places. Most often unshaded or lightly shaded, but sometimes tolerates (or persists in) moderate shade at wood edges, in open creekside woodland and in scrub or under Grey Willows. Nevertheless, *R. squarrosus* is much less often found in woodlands than our other two *Rhytidiadelphus* species.

In the most acidic heathland regions it is sometimes restricted to roadsides and other places with some base enrichment, and there are a few records from turf over calcareous sand of dunes, but it is generally rare in this habitat and infrequent in any really base-rich places, although small amounts have been recorded among other mosses growing over old concrete. Also recorded in small amounts as colonist on old tarmac, but more frequent as pioneer on edges of gravelly and other paths and tracks, on tops or ledges of boulders, and often plentiful on clayey or gritty china-clay spoil. Generally rather rare in exposed coastal sites, but there are several records of it being found in small amounts in turf on very exposed cliff tops and headlands, including slopes above Pendeen Cliff and Portheras Cove in West Penwith. Also on top of low sea-cliff among Gorse at Trefusis Point.

Very often locally dominant or co-dominant with short grasses (*Agrostis stolonifera*, *Agrostis tenuis*) and herbs; commonly also with *Calliergonella cuspidata*, *Hylcomium splendens*, *Hypnum jutlandicum*, *Pseudoscleropodium purum*, *Thuidium tamariscinum*, also commonly in contact with acrocarpous mosses and small liverworts.

Single DTH record c.fr. in Cornwall: near Greensplat, vc2, small patch with near-mature but undehisced capsules in sheltered but almost unshaded hollow in old china-clay spoil, 21 Feb. 2002 (apparently just the ordinary weedy form of this species).

189.4 *Rhytidiadelphus loreus* (Hedw.) Warnst.
Boreo-temperate Suboceanic element.

*1*: St Just, 1864, WC (PNZ) (Paton 1969a: 756).

Notes on its habitats in Cornwall are as follows. A large, robust moss that often forms extensive pure patches (mats) on (mainly) well-drained acid soil, mor humus and plant litter, especially of slopes in deciduous woodland such as hillside Sessile Oak woods, where it also spreads over low rocks, dead wood and plant litter. Other sites are in open conifer
plantations (e.g. larch), at wood edges, on laneside banks and sometimes among rocks in open (e.g. near tors), grassy heathland, acid grassland or on wet ground in mires. Commonly grows in light to moderate shade, but also in open or not infrequently persisting in rather heavy shade, including that of well-grown coniferous plantations. An unusual record of a patch on soil near low serpentinite outcrops, where lightly shaded by scrub. Twice in quantity on heathy slopes over old china-clay spoil, and two other records near clay quarries, so evidently able to colonise new sites. Once about base of Beech tree in grassy churchyard. Also occurs in small amounts among sphagna in open mires and wet heathland.

Its associates often include Vaccinium myrtillus, various grasses, as well as other robust bryophytes of acid woods (e.g. Dicranum majus, Eurhynchium striatum, Hypnum jutlandicum, Thuidium tamariscinum).

Occasionally c.fr. (capsules widespread in Draynes and Hendergrove Woods in spring 2000 and fruiting perhaps regular there; otherwise two records cfr, from vc1 and elsewhere in vc2): capsules immature 1, 3, 12, dehiscing 2, 3, dehisced 3.

190.1 *Loeskeobryum brevirostre* (Brid.) M.Fleisch. 12
(syn. *Hylocomium brevirostre* (Brid.) Schimp.). Temperate European element.


Although local, it often forms substantial pure patches where it occurs. Notes on its habitats in Cornwall are as follows. Grows on acidic soil and plant-litter, extending over edges of rocks and fallen dead wood. Occurs mainly on slopes or banks in deciduous woodland, sometimes on wooded streambanks or under trees on laneside banks. Especially common in Sessile Oak woods on hillslopes, but also recorded in mixed deciduous woodland with much Beech, in larch plantation and at edge of grove of planted Douglas Fir. One record among low granitic rocks on hillside with acid grassland and Bracken. Unusual records on dry and wet walls of ruins of china-clay 'dries', slightly to well shaded by Grey Willows. On almost unshaded soil at base of low mortared wall on old mine area. Well grown patches on bark 0.5 m up trunk of Grey Willow in open scrub among ruins of china clay dry. Also patches on old copper mine-spoil in open on N.-facing slope near edge of scrub.

Associates include other large mosses (often Dicranum majus, Dicranum scoparium, Eurhynchium striatum, Hylocomium splendens, Polytrichastrum formosum, Rhytidiadelphus loreus, Thuidium tamariscinum), Hyacinthoides non-scripta, low Hedera hibernica.

Not seen c.fr.
192.1 *Hylocomium splendens* (Hedw.) Schimp.  
Wide-boreal Circumpolar element.

*1*: Bejew Bridge, NE. of St Buryan, 1859, WC (PNZ) (Paton 1969a: 756).  

Notes on its habitats in Cornwall are as follows. Mainly on unshaded or lightly shaded, acid ground, forming mats on soils, mor humus and plant litter of heathland. Commonly on banks or slopes, often among rocks, and spreading over low rocks, or growing at edges of heathland tracks or firebreaks where vegetation is shorter than on most of heathland, or on broken ground in acid grassland and on hummocks in open mires. Also occurs in acid woodlands where shade is not too great and ground-layer is heathy, such as some Sessile Oak woodlands on hillslopes, and at woodland edges, sometimes including tracks inside or edges of conifer plantations.

Other records are from varied heathy or acid-grassland areas, in an old granite quarry, on old china clay spoil, on laneside banks and a 'hedge', in a churchyard, beside a reservoir, below reservoir dam and amongst old concrete of ruins of china-clay dry. Sometimes plentiful in areas of short, heathy vegetation on unshaded old, metalliferous mine-spoil, especially on banks. Bit persisting under well grown Gorse on bank of old mine-spoil.

Common associates include *Calluna vulgaris, Erica cinerea, Ulex spp.*, various grasses; *Hypnum jutlandicum, Pleurozium schreberi, Pseudoscleropodium purum, Rhytidiadelphus squarrosus* and *Thuidium tamariscinum*.

Not seen c.fr.

[196.2 *Orthothecium intricatum* (Hartm.) Schimp. – Old vc1 records dismissed because they seem unlikely and no specimens exist: Paton 1969a, Crundwell 1970: 210].

197.1 *Plagiothecium latebricola* Schimp.  
Temperate Circumpolar element.


Known in Cornwall from three records. Habitat notes on two additional finds made in 2003 were as follows. On rotting wood of tree stump at base of flushed E.-facing rocky slope near river bank, lightly shaded by deciduous trees. On slightly overhanging damp rotten wood of low stump in damp mixed woodland of larch, Ash, etc. (near former canal), near *Pseu dotaxiphyllum elegans*.

Gemmae recorded on stems. Two of three records c.fr.: capsules dehisced 3.
197.3.a *Plagiothecium denticulatum* (Hedw.) Schimp. var. *denticulatum* S12
Boreo-temperate Circumpolar element.


*P. ruthei* was treated as a valid species by Smith (1978: 626) and Blockeel & Long (1998: 152) and as var. *undulatum* of *P. denticulatum* by Smith (2004: 872) although the latter author commented that 'it is a very poorly defined taxon'. Lewinsky (1974: 204) found *P. ruthei* to be very constant in Denmark and 'therefore easy to recognise', but she apparently examined only seven specimens. My own experience of it is more like that of Paton (1969a: 754), who commented that it is 'An unsatisfactory species which may only be a wet habitat form of *P. denticulatum*'. Likewise, Laflin (1971: 687) noted that 'Examination of more than a hundred Warwickshire gatherings of *ruthei* type makes me strongly suspect that British *P. ruthei* is no more than a wet habitat form of *P. denticulatum*.'

Habitat notes from Cornwall are as follows. More or less acidic soil on banks and among rocks in and at edges of deciduous woodland and groves, on laneside banks, on stream banks. Soil and leaf litter in Grey Willow carr (often in wet sites), Grey Willow scrub near china clay quarries. Edge of scrub on old mine site. Acid soil among rocks on 'hedges' e.g. beside lanes and between pastures, on bank near reservoir and at edge of pasture. Steep clay soil of ditch bank beside china clay spoil, part shaded. On ground litter or fern tussocks on wet ground inside Grey Willow carr or wet deciduous woodlands. Base of *Juncus* and *Molinia caerulea* in ungrazed, overgrown acid mire (with *Calypogeia fissa*, *Chiloscyphus pallescens*). Other associates recorded include *Brachythecium rivulare*, *Kindbergia praelonga*, *Hookeria lucens*, *Lophocolea bidentata*, *Mniium hornum*, *Plagiothecium nemorale*, *Rhizomnium punctatum*, once *Fissidens bryoides* var. *caespitans*. Also near *Chryso splenum oppositifolium*.

Commonly/frequently c.fr.: capsules immature 1, 3-7, (9), 11; dehiscing 1, 5-9; dehisced 1-5, 7-9, 11, 12.

197.3.b *Plagiothecium denticulatum* var. *obtusifolium* (Turner) Moore 2
Boreo-temperate Circumpolar element.


Grows in small patches in crevices of granitic rock of a few tors. Recent records from Rough Tor and Brown Willy are of it growing partly shaded, with associates including *Diplophyllum albicans*.

Not seen c.fr.
197.5 *Plagiothecium curvifolium* Schlieph. ex Limpr. Temperate European element.

*2: On acid humus under larches, 75 m alt., Clarrick Wood, Milbrook, SX45, 1996, MP (**BBSUK**) (Blockeel 1997: 46).

This is the only record from Cornwall.

197.7 *Plagiothecium cavifolium* (Brid.) Z.Iwats. Boreal-montane Circumpolar element.

*2: On steep, damp, granite rock on slope close to river in woodland, Draynes Wood, SX26, 2000, DTH 00-8 (**BBSUK, DTH**) (Rothero 2001: 47).

These are the only records of typical material from Cornwall. More detailed habitat notes were as follows. Chygarkye Wood (vc1), on damp soil of flushed area inside deciduous woodland (with *Kindbergia praelonga, Lophocolea bidentata*). Draynes Wood (vc2), with other mosses on damp steep low granitic rock in deciduous woodland on slope close above river; associates included *Ctenidium molluscum 'Woodland Taxon' and Rhizommium punctatum*.

A specimen from damp woodland slope N. of Seaton (DTH 05-91) appears intermediate between *P. cavifolium* and *P. nemorale*, with the imbricate concave leaves of the former but the acuminate leaf apices and short cells of the latter.

Not seen c.fr.

197.8 *Plagiothecium succulentum* (Wilson) Lindb. Boreo-temperate Eurosiberian element.

*2: Trehane near Probus, 1858, ES (**TRU**) (Paton 1969a: 754).

Plants intermediate between *P. succulentum* and *P. nemorale* occur in Cornwall as elsewhere in Britain and Ireland. A proportion of the intermediate plants have some leaves on different branches of the same plant showing characters of each species. However, the extreme forms seem rather distinct and most gatherings can be assigned to one or the other taxon even if this appears somewhat arbitrary. Doubts thus remain about their taxonomic distinctness.

Habitat notes from C&S are as follows. Steep soil (or soil over or among rocks) on stream and other banks or slopes in deciduous woodland and groves and in Grey Willow scrub. Associates include *Brachythecium rivulare, Cirriphyllum piliferum, Kindbergia praelonga, Fissidens brooides* var. *bryoides, Hookeria lucens, Lophocolea bidentata, Mnium hornum, Plagiothecium nemorale*, and herbs and grasses (e.g. *Geranium robertianum, Valeriana officinalis, Viola riviniana*). Soil on laneside banks and sides of 'hedges', usually at least partly shaded, e.g. by scrub or trees. Sheltered and shaded soil among granitic rocks below
tor. Soil in Grey Willow scrub beside disused china-clay pit. With other bryophytes on damp shaded walls. Thin soil on ledges over flushed granite on upper part of sea cliff, almost unshaded. Soil beside path through scrub above sea-cliff. On peaty plant litter on flushed slope on N.-facing sea-cliff. Unusual record of patches ca 2 m above ground on mossy tree trunk beside lane (with Hypnum andoi).

Occasional/frequent c.fr.: capsules immature 2, 3, 5, 6; dehiscing 2, 8; dehisced 3, 11.

197.9  **Plagiothecium nemorale** (Mitt.) A.Jaeger  
(syn. *P. sylvaticum* auct. non *Hypnum sylvaticum* Brid.). Temperate European element.


See notes under the preceding species.

Habitat notes from C&S are as follows. Apparently prefers more basic substrates than those on which *P. succulentum* often occurs, although the two not infrequently grow close together. Soil on banks or slopes, over exposed tree roots, or over sloping rocks (granite, serpentine) or soil on old walls, on 'hedges', in woodland, on ditch and streambanks, laneside banks, in churchyards, on slopes above sea-cliffs, in light to moderate shade. Floor of Grey Willow carrs e.g. under ferns. With other bryophytes on damp shaded walls (e.g. on wall of low bridge over stream, shaded by trees). Associates recorded include *Oxyrrhynchium hians*, *Kindbergia praelonga*, *Fissidens bryoides* var. *bryoides*, *Hookeria lucens*, *Plagiomnium undulatum*, *Plagiothecium denticulatum* var. *denticulatum*, *Plagiothecium succulentum*.

Occasionally/frequently c.fr.: capsules immature 1, 3-7, 11, 12; dehiscing 1-3, 5-8, 10, 11, [12]; dehisced 1, 3-6, 10, 11.

197.10  **Plagiothecium undulatum** (Hedw.) Schimp.  
Boreo-tempere Suboceanic element.

*2*: Rough Tor, 1876, RVT (B) (Paton 1969a: 754).

Habitat notes from Cornwall are as follows. Amongst other mosses or forming pure mats, on soil and ground-litter in deciduous woodland and at edges of conifer woodlands. On acid soil and edges of flat or sloping granitic (less often slate) rocks, in open, partly shaded among boulders or moderately to heavily shaded (e.g. under Beech trees in valley-side woodland, under Rhododendrons near ruined china-clay works, in grove of deciduous trees, in edge of spruce plantation). Among other bryophytes and on soil among rocks on tors and heathy hillsides near tors and persisting sometimes among boulders in acid grassland after overgrazing destroys the heath vegetation. Patch with other mosses (*Hypnum*) on flat top of large rounded granitic boulder in open oak woodland (only presence of species in region). Among grasses lightly shaded by Grey Willows in area of old mine spoil. In heathy area on old mine spoil (Bodmin Moor). Twice on heathy banks on old china clay spoil (once near *Hylocomium splendens*). On acid clayey soil of steep, part shaded streambank. Small patch
on rotting wood of old decorticated branch in generally rather basic flush beside stream in deciduous woodland.

Two records c.fr. in Cornwall: capsules immature 4, 5, dehiscing 5, dehisced 5.

199.1 *Pseudotaxiphyllum elegans* (Brid.) Z.Iwats. (syn. *Isopterygium elegans* (Brid.) Lindb.). Boreo-temperate Suboceanic element.

*1*: Trevelloe Carn near Lamorna, 1866, WC (PNZ) (Paton 1969a: 753-754).

Often in pure smooth mats or patches, sometimes extensive, or as scattered stems on soil or among other bryophytes. Notes on its habitats in Cornwall are as follows. Common and sometimes locally dominant on acidic soil of banks and slopes in woodland (deciduous and conifer); also occurring on streamsides, laneside banks, on shaded parts of 'hedges', etc., or growing on well rotted fallen wood or over edges of slaty or granitic rocks. Usually in lightly to heavily shaded places, and frequently on steep banks and under overhangs in greatly reduced light and extending even into rather dry places inside burrow entrances or under overhanging quarry banks. Its commonest associates include *Calypogeia arguta*, *C. fissa*, *Dicranella heteromalla*, *Kindbergia praelonga*, *Fissidens bryoides* var. *bryoides*, *Lejeunea lamacerina*, *Mnium hornum*, *Plagiothecium denticulatum* var. *denticulatum*, rarer ones include *Calypogeia muelleriana*, *Cephalozia lunulifolia*, *Lepidozia reptans*, *Lophocolea fragrans*, *Nowellia curvifolia*, *Schistostega pennata*, gametophytes of *Trichomanes speciosum*.

Other records are from: shaded or part shaded hollows in banks of china clay spoil; low on granitic boulder near reservoir margin; in crevices and under overhanging rocks on hilltop tors; abundant on granitic rocks of low tor shaded by deciduous woodland; occasional on peat of sides of hummocks in mires.

Usually with filiform axillary branches that serve as propagules, these perhaps especially numerous on plants growing in heavy shade. Rarely c.fr. (five records, vc1 and vc): capsules immature 1, 2, 12; dehisced 7.

Plants closely similar to *Pseudotaxiphyllum laetevirens* (Koppe & Düll) Hedenäs have been collected in Draynes Wood, vc2 (DTH 00-13), from a shaded damp crevice of granitic rock in deciduous (mainly Sessile Oak) woodland on a hillside. Hedenäs (1992: 149-150) reported *P. laetevirens* only from Madeira and the Azores; Guerra *et al.* (2001) gave two records from S. Spain. However, some other material from heavily shaded sites in the British Isles (including Cornish specimens) shares most of its characters or is intermediate with *P. elegans*, so that *P. laetevirens* is probably best regarded as a form or synonym of *P. elegans*. 
204.2 *Sematophyllum substrumulosum* (Hampe) E.Britton

Southern-temperate Oceanic element.

*1*: Nark of horizontal part of dead trunk of *Pinus radiata* tree, *ca* 1.5 m above ground; partly shaded, in open area of plantation; Abbey Hill, Tresco, SV8911, 1995, DTH 95-324 (BBSUK, DTH, E) (Holyoak 1996, Blockeel 1997: 46).

*2*: On rotting stump, Par churchyard, St Blazey Gate, SX0553, 2004, JAP 2871 (BBSUK) (Rothero 2005: 42).

Discovered new to Britain in the Isles of Scilly in 1995 (Holyoak 1996), and found on a total of four islands in Scilly and two additional islets by 2003. The plant apparently spreads freely by spores, so it was suggested that it may have colonised the Isles of Scilly naturally, or at least spread freely of its own accord after becoming established within the islands. Its northern range limit elsewhere was then thought to be at Isle d'Oléron on the Atlantic coast of France, but the species is widespread in Mediterranean countries of Europe and in the Azores, Canary Is. and on Madeira (Holyoak 1996). However, a 1964 gathering from Sussex was belatedly reported by Een (2004) and Matcham *et al.* (2005) cited reports of it also from E. Cornwall, Belgium (de Beer & Arts 2000), The Netherlands (van Zanten 2003) and SW. Ireland, to which Bosanquet (2006) has added S. Wales (Pembrokeshire). By 2006 there were two records from vc2 and two from the mainland of vc1. Despite the suggestion by Matcham *et al.* (2005) that it might be an overlooked native in Britain, the evidence seems to imply rapid colonisation of NW. Europe in the past few decades.

The species grows as flat patches (small to rather substantial), creeping on the substrates. By 1996 it had been found by DTH at a total of seven sites in the Isles of Scilly, four on Tresco and three on St Mary's, all in groves of pines. It appeared mainly to occur on or under old *Pinus radiata* (six records) being recorded only once on *P. contorta*, the trees of which are mainly younger. *S. substrumulosum* grew mainly on bark of the pines, on leaning or horizontal trunks (to 1.5 m above ground), low branches, old logs lying on ground, or exposed roots, in lightly or moderately shaded places. One record was from dry peaty soil overlying granitic rock on a bank in shade of pine trees. Close associates were often lacking, but those recorded were *Hypnum cupressiforme* var. *resupinatum*, *Lophocolea bidentata* and *Lophocolea semiteres*.

Several records of small patches made in 2002 and earlier years by RAF differ in being from humic or peaty soil far from any trees (at NW. end of White Island at mouth of small N.-facing hole about 50 feet up from the sea on a N.-facing grassy slope; on Gugh and St Agnes on soil partly shaded by boulders or at burrow entrances on cliff slopes and coastal heaths). DTH made similar finds in April 2003 at the eastern end of St Martin's and on cliffs at Peninnis Head, St Mary's. It is unclear whether these records represent further expansions of the range of the species in Scilly or small, inconspicuous patches that were formerly overlooked. A strong impression gained by DTH is that many of the patches represent initial stages of establishment, presumably from spores or gemmae, that are unlikely to form mature colonies in these apparently unsuitable habitats.

On Cornish mainland, recorded twice on Lizard pen: on sloping stem of Gorse in an open roadside hedgerow, a small patch growing with *Frullania dilatata*, *Hypnum cupressiforme* var. *resupinatum* and lichens in a rather nondescript and ordinary location. Also in small
quantity with *Hypnum andoi* on dead stump of Lawson's Cypress in edge of conifer plantation. Two more recent finds by JAP were in churchyards.

Protonemal gemmae have recently been reported from the species in the wild and in cultivation (J.G. Duckett in Matcham et al. 2005). They are also numerous on the protonemata of a specimen from Scilly (DTH 03-407) that consists of tiny prostrate stems 3-5 mm long surrounded by a small mat of protonema covering the surface of humic soil. A few similar gemmae are also present low on the stems, arising from leaf axils or on the stem surface. The gemmae are uniseriate, cylindrical, translucent, typically of 5 or 6 cells and measuring 109-151 × 25-34 μm, with blunt apical cell, truncate base [of abscission cell] and rather rough surface.

Commonly c.fr.: capsules immature 6, 8, 9; dehiscing 8, 9; dehisced 6, 9.

205.1 *Cryphaea heteromalla* (Hedw.) D.Mohr S12
Mediterranean-Atlantic Suboceanic element.


Notes on its habitats in C&S are as follows. Grows as slender stems appressed to bark when young, maturing to form small patches, short wefts or mixtures with other bryophytes, mainly as epiphyte on bark rich in nutrients and bases. Commonest on Elder; also frequent to common on Ash, Beech, Grey Willow, elms, Hazel, Ivy and Sycamore; other records on Alder, oak spp. (two records one near coast, one inland on Pedunculate Oak), old Gorse stems (three localities); once each on Apple, Blackthorn, Buddleja, *Cortaderia, Cotoneaster integrifolius, Cupressus macrocarpa*, Garden Privet, Hawthorn, *Picea abies* (once, on dead twigs), Rowan, White Willow, Wild Privet. It occurs mostly in sheltered sites with slight shade, avoiding places exposed to severe desiccation. Although some sites are shaded in summer by a deciduous leaf canopy it is scarce on heavily shaded trees e.g. inside woodland.

It grows as a colonist on bare bark (vertical, inclined or horizontal) or among other bryophytes, but cannot compete with really luxuriant growth of pleurocarpous mosses such as *Hypnum andoi* and *Isothecium myosuroides* var. *myosuroides*. Hence it occurs mainly at early or intermediate stages of bryophyte colonisation of bark. On an old Elder at Porkellis Moor young plants were established on four-year old branches, it had begun to fruit on branches seven-years old, whereas on 13-year old branches it had been almost replaced by mats of *Brachythecium rutabulum* and *Kindbergia praelonga*.

Frequent in scrub above sea-cliffs as well as inland, occasionally even on Elders on upper parts of cliffs. Often occurs within reach of the highest floods on riverside trees and in inundation zones beside reservoirs, although within flood-zone of R. Tamar it is generally found higher on the trees than the rarer *Dendrocryphea lamyana*.

Common associates include *Cololejeunea minitissima, Kindbergia praelonga, Frullania dilatata, Hypnum andoi, Hypnum cupressiforme* var. *resupinatum, Metzgeria violacea, Orthotrichum affine, Orthotrichum diaphanum, Orthotrichum pulchellum, Radula*.
complanata, Ulota crispa, Ulota bruchii, Ulota phyllantha, Zygodon conoideus. Others recorded include Brachythecium rutabulum, Leskea polycarpa, Orthotrichum tenellum, Orthotrichum rivulare.

Infrequently on rock or masonry, e.g. on granitic boulders or posts (five records), rocks in walls (three records), slaty boulders (once), serpentine boulders (on heath; in stream), concrete (of a river bridge and of reservoir dam), sloping concrete in a pasture and dumped asbestos-cement roofing sheets.

Commonly cfr; capsules immature 1-12; dehiscing [6] 7-12; dehisced [old 1-6] 7-12.

206.1 Dendrocryphaea lamyana (Mont.) P.Rao


Transfer of this species to the genus Dendrocryphaea follows the revision by Rao (2001: 103).

Grows as small to larger patches (maximum 50 x 30 cm). Young plants grow closely appressed to bark; older taller plants rather stiffly arcuate when dry, but trailing when wet. Notes on its habitat in Cornwall are as follows. Restricted to bark of trees (trunk bases, branch bases, exposed roots) within lower parts of flood-zone of R. Tamar (mainly from 0.5-2.5 m (to 3 m) above summer water-level), growing on nearly horizontal to vertical or overhanging surfaces, mainly in light to moderate shade (also almost unshaded). Commonest phorophytes are Sycamore, Ash and Alder; fewer records on Hazel; one each on Pedunculate Oak, an epiphytic stem of Ivy and dead driftwood trunk of Ash. Its patches are often pure, and it may colonise bark otherwise bare of bryophytes, but also occurs on substrates with complete cover of epiphytic bryophytes. Recorded associates are Amblystegium serpens var. serpens, Sciuro-hypnum plumosum, Bryum capillare, Cinclidotus fontinaloides (in lower sites), Didymodon insulanus, Kindbergia praelonga, Frullania dilatata, Hedera hibernica (sparse), Homalia trichomanoides, Hypnum cupressiforme var. resupinatum, Lejeunea lamacerina, Leskea polycarpa, Metzgeria furcata, Neckera pumila, Radula complanata, Syntrichia latifolia, Ulota phyllantha, Zygodon viridissimus var. viridissimus.

Commonly c.fr. Capsules immature 1, 3, 5 [nearly mature, more so than those of Cryphaea heteromalla growing close by]; dehisced [1, 3, 5 old].

207.1.a Leucodon sciuroides (Hedw.) Schwägr. var. sciuroides

Wide-temperate Eurosiberian element.


*2: Trebetherick, St Minver, 1888, RVT (B) (Paton 1969a: 744).

The only recent record from vc1 was from SW33V, but possibly it was based on the same plants as recorded later as 207.1b.
Recently recorded mainly near R. Tamar and R. Inny, mostly growing within upper parts of flood-zone of rivers. Small patches or extensive mats on bark, growing extensively on bases of large old Ash trees, in smaller amounts on riverside Sycamores and Alders, bit on hedgerow Sycamore branches above flood zone, once on old oak. Grows unshaded to lightly shaded. Also at Ethy, on vertical bark of old Sycamore in parkland (near *Leptodon smithii*, *Syntrichia laevipila*).

Not seen c.fr.

207.1.b **Leucodon sciuroides** var. *morensis* (Schwägr.) De Not.  
Southern-temperate European element.

*2: On tall, unshaded, near-vertical wall of mortared stone beside road, Treviscoe, SW95, 1999, DTH 99-39 (BBSUK, DTH) (Rothero 2000: 58). An old record from vc2 was discounted because no specimen was traced (Paton 1969a: 744).

Four records from Cornwall have the following habitat notes. (1) A single substantial patch on near-vertical, S.-facing, concrete wall of ruin of old china-clay dry, Leswidden, E. of St Just, vc1. The site is unshaded and species growing close by in same habitat include *Grimmia orbicularis*, *G. pulvinata*, *Schistidium crassipilum* and *Homalothecium sericeum*. These plants are large enough in part to qualify as var. *morensis*, with stems up to 30 mm long and nearly 2 mm wide when dry, but the most slender stems on the same patch are smaller and might be classed as var. *sciuroides*. (2) Treviscoe: substantial patches on two tall, unshaded, vertical walls of mortared-stone, one of them at roadside (near *Homalothecium sericeum*). (3) Poundstock: piece fallen from unshaded E.-facing slate roof of Gild House (mediaeval building in churchyard). (4) Cemetery at St Stephen in Brannel (SW95L), on concrete block wall. This gathering matches var. *morensis* in width of the shoots (*ca* 1.5 mm) but only a few exceed 20 mm in length (JAP 2877 in DTH).

Not seen c.fr.

208.1 **Antitrichia curtipendula** (Hedw.) Brid.  
Boreo-temperate European element.

*2: Rough Tor, 1886, HND (BM) (Paton 1969a: 744).

Recent records are from several places high on Rough Tor and Little Rough Tor and as locally common on Brown Willy (all in vc2). Grows as localised patches or mats. Mainly on unshaded edges of nearly flat and horizontal, or gently sloping, granite rocks in short grassland on hillsides. Also locally on Brown Willy among other tall mosses and low phanerogams on slopes and tussocks, common associates being *Hylocomium splendens*, *Pleurozium schreberi* and *Vaccinium myrtillus*.

Not seen c.fr.
209.1 *Pterogonium gracile* (Hedw.) Sm. Mediterranean-Atlantic Suboceanic element.

*2: Treliver, St Wenn, 1871, RVT (B) (Paton 1969a: 744).

Grows as patches or mats, sometimes extensive and often partly intermixed with other bryophytes. Recorded mostly on basic rock, often on steep or vertical faces but sometimes also on horizontal substrates, occasionally where there is a thin layer of accumulated soil or humic detritus. The majority of records were from serpentine of the Lizard pen., but with two from granite, one each from slate and gabbro, and two from bark low on old Ash trees. It occurs variously in open sunny places (e.g. on heathland and coastal slopes), lightly shaded (often by Ash or Sycamore trees), and sometimes in moderate to rather heavy shade of woodland. Most records on rock are from small outcrops or large boulders, with one on boulders in scree, but a few are from rocks in old walls and one from a field gatepost. It apparently shows a preference for humid situations since several of its sites were in or beside streams, one on a tree was in upper part of flood-zone near R. Tamar, and several others were close to coasts.

Associates recorded frequently include *Frullania dilatata*, *Frullania tamarisci*, *Homalothecium sericeum*, *Isothecium myosuroides* var. *myosuroides*, *Neckera complanata*; rarely *Lejeunea mandonii*, *Porella arboris-vitae*


210.2 *Neckera crispa* Hedw. Temperate European element.

*1: Between St Ives and Hayle, 1844, AG (PNZ) (Paton 1969a: 744).
*2: Near Hustyn Mill, St Breock, 1895, RVT (B) (Paton 1969a: 744, given in parentheses because there are no recent records).

No recent records.

210.3 *Neckera pumila* Hedw. Temperate Suboceanic element.


Habitat notes from C&S are as follows. Normally seen only as an epiphyte on bark of varied trees and shrubs, with records from Ash, Beech, Blackthorn, Grey Willow, Elder, Hazel, Sessile Oak, Sycamore and Wild Cherry; three times on *Cotoneaster integrifolius*; once each on *Abies alba*, Gorse and *Hydrangea macrophylla*. In old ornamental gardens colonises range of exotic trees (at Trengwainton seen on *Acer palmatum*, *Magnolia campbellii* and *M. fraseri*; at Trebah on *Cornus kousa*, *Eucryphia glutinosa* and *Pittosporum tenuifolium*). Mainly in groves of trees and woodland, especially old woodland sites on good soils, but also in scrub, old gardens, once in old Grey Willow carr, once in Grey
Willow scrub (a bit seen in hollow of small old quarry on hilltop near Boswarva). Apparently prefers light to moderate shade and rather sheltered sites; recorded up to 2.5 m above the ground, but probably extends higher. Often on thin branches in humid situations as well as on trunks. Frequently on bark within flood-zone of R. Tamar (several times seen associated with Dendrocrysta lamyana). Single atypical record of well grown patch on rock: on almost unshaded corner of a granitic block ca 20 cm above water of a stream.

Frequent associates include Cololejeunea minutissima, Frullania dilatata, Homalothecium sericeum, Hypnum andoi, Hypnum resupinatum, Microlejeunea ulicina, Metzgeria furcata, M. consanguinea, Neckera complanata, Orthotrichum affine, Radula complanata, Ulota bruchii, Ulota crispa, Zygodon conoideus.

Often in rather small quantity, but sometimes forming substantial patches. Commonly with filiform axillary branches (which are sometimes abundant) that presumably serve as propagules. Seen c.fr. four times (few capsules each time): capsules immature 1, dehisced 1, 5, 8.

210.44 Neckera complanata (Hedw.) Huebener
Boreo-temperate European element.

*S12*

*2*: Withiel, 1889, RVT (B) (Paton 1969a: 744).

Often forms substantial patches. Habitat notes from C&S are as follows. Frequently occurs both as an epiphyte and on masonry or rocks, sometimes extending onto firm soil e.g. of steep banks. As epiphyte on wide range of trees and shrubs, including Ash, Beech, Grey Willow, elm, Hazel, oak, Sycamore; single records from Cotoneaster integrifolius bush, Ginkgo biloba (Heligan Gardens) and London Plane. As epiphyte mainly on bases of trunks and larger branches, in light to moderate or rather heavy shade. In variety of groves of trees and woodland types, but principally on better soils. Once on elder in scrub on slope above sea-cliff; once on base of Grey Willow in scrub at edge of sand-dunes.

Frequently on tops and sides of mortared-stone and concrete walls, also church and bridge walls, building ruins, serpentinite crags, boulders, walls and sea-cliffs; also on gabbro rocks; single records on slaty and granitic gravestones, concrete fence-post, granitic boulders, slaty rocks in 'hedges' and a laneside bank. Often in considerable shade on rock or masonry substrates in woodland, but also recorded on unshaded masonry and unshaded or scarcely shaded serpentinite boulders or outcrops.

Common associates include Brachythecium rutabulum, Homalothecium sericeum, Hypnum andoi, Isothecium myosuroides var. myosuroides, Kindbergia praelonga, Metzgeria furcata, Neckera pumila, Rhynchostegiella tenella (on walls), Rhynchostegium confertum, Sciurohypnum populeum, Thamnobryum alopecurum and various lichens. Scarcer associates include Isothecium alopecuroides, Plagiochila asplenioides, Pterogonium gracile.

Vegetative reproduction evidently occurs from filiform branches, that are commonly produced in abundance. Recorded c.fr. 14 times, usually with few capsules but occasionally they are plentiful: capsules immature 1, 3, [4], 10, 12; dehiscing 3; dehisced 2-6, 10.
211.1 *Homalia trichomanoides* (Hedw.) Brid. (syn. *Omalia trichomanoides* auct.). Boreo-temperate Circumpolar element.


Habitat notes from Cornwall are as follows. Grows in variety of mainly well shaded or partly shaded sites that are sheltered and rather humid, often close to streams, rivers, reservoir edges, or ditches. Recorded on moist soil of banks, stream-banks, 'hedges', slaty and gabbro rocks (including large amounts on vertical rock in old quarry), old masonry (walls and concrete), tree bases and sometimes higher on trunks (Grey Willow, Sycamore). Often occurs in large quantities as the dominant bryophyte forming extensive mats on silted bark of riverside trees within lower part of regular flood-zone (on Alder, Ash, Grey Willow, Sycamore). Usually on sloping or vertical substrates, but sometimes on horizontal ones, e.g. of bark. The sites were partly shaded by bushes or well shaded in old quarries, disused railway cutting, on low bank in grove of trees, stream banks in deciduous woodland, once in old wet Grey Willow carr, damp and sheltered roadside banks, base of mortared and concrete walls and ruins of old china clay works, once in shaded hollow inside ruin of mine building. Also sometimes unshaded on river banks. Associates include *Kindbergia praelonga*, *Leskea polycarpa*, *Orthotrichum rivulare*, *Plagiochila asplenioïdes*, *Sanionia uncinata*.

Commonly c.fr.: capsules immature 1, [3 few], 9-12; dehiscing 2, 3, 12; dehisced 1-8, 10, 12.

212.1 *Thamnobryum alopecurum* (Hedw.) Gangulee (syn. *Thamnium alopecurum* (Hedw.) Schimp.). Temperate European element.


The morphology varies considerably with submerged plants and small plants from exposed banks often lacking the usual dendroid habit.

Notes on habitats in C&S are as follows. Often abundant and large on rocks not far above water-level of streams and rivers, mainly but not exclusively in sheltered, shady sites such as in woodland, sometimes in heavy shade (but also in open above N.-facing sea-cliff). Grows on vertical, inclined and horizontal surfaces, and on substrates that include granite, gabbro, serpentinite, slates, concrete and wall-mortar. Usually grows largest where there is spray, e.g. from a waterfall or sluice, and grows on surfaces within the flood-zone at some sites. Also occurs away from water on rocks and masonry, mainly in sheltered, humid places in woodland or at least under trees, including old quarries, rocks and steep soil on shaded Cornish hedges, laneside banks and old walls, on a wall top and in sheltered churchyards. Infrequently found on horizontal soil, but often on sloping, moist, shaded soil on stream banks and other sheltered banks such as on lanesides and those around the northern side of some churches (where it may extend locally onto flat soil among lawn grasses). Single records from low on granitic sea-cliff in crack with trickling water (more often high up on slopes above cliffs), and on horizontal concrete at reservoir edge under Grey Willows.
Commonly on bark of trees and exposed roots low in flood-zones of rivers. Also extends onto tree bases and low branches in some humid sites e.g. in woodlands, the few records including Alder, Ash, Beech, Sycamore, Elder and Grey Willow. Also once in quantity on side of old, fallen, decaying elm trunk near stream.

Frequent associates include *Brachythecium rutabulum*, *Conocephalum conicum*, *Oxyrrhynchium hians*, *Kindbergia praelonga*, *Lophocolea bidentata*, *Plagiomnium undulatum*, *Platypnium riparioides*; also many vascular plants, e.g. *Hedera hibernica*, *Primula vulgaris*, ferns; scarcer associates include: *Cratoneuron filicinum*, *Dumortiera hirsuta*, *Fontinalis squamosa*, *Homalia trichomanoides*, *Pellia endiviifolia*; epiphytes recorded on *Thamnobryum alopecurum* once included *Lejeunea patens*.

Capsules mainly occasional and typically few in number, but apparently frequent and numerous in some sheltered, humid sites; capsules immature 1, 10-12; dehiscing 1, [5], 11, 12; dehisced 1, 3, 4, 10. Literature states ripe in 'autumn', but winter would seem more appropriate.

213.1 *Leptodon smithii* (Hedw.) F.Weber & D.Mohr

Mediterranean-Atlantic Oceanic element.


+1*: On vertical rock of lightly-shaded S.-facing serpentinite crag, NE. of Gwendreath Farm, SW71, 1997, DTH 97-408 (BBSUK, DTH) (Rothero 1999b: 45).

*2*: Trevelva, St Minver, 1891, RVT (B) (Paton 1969a: 744).

Habitat notes for recent records from Cornwall are as follows. NE. of Gwendreath Farm, vc1: on vertical or near-vertical rock low on S.-facing serpentinite crag, lightly shaded by Broom and Blackthorn bushes (associates include *Hypnum cupressiforme* var. *resupinatum*, *Radula lindenbergiana*). Rosteague: in small quantity on vertical mortared-stone wall beside lane, where lightly shaded. W. of Kilkhampton: patches on steeply sloping to vertical bark of trunks of old Ash trees (two) and very large old coppiced Sycamores (four), in open and moderately shaded in sheltered valley. Ethy: vertical bark of old Sycamore in parkland (near *Leucodon sciuroides* var. *sciuroides*, *Syntrichia laevipila*). Also recorded on Beech trunks in parkland at Ethy by FRo and SD. Not seen c.fr.

214.1.a *Isothecium myosuroides* Brid. var. *myosuroides* S12

Boreo-temperate Suboceanic element.


*2*: Withiel, before 1907, RVT (B) (Paton 1969a: 750).

Habitat notes from C&S are as follows. Common as epiphyte, mainly on lower parts of trunks, where often forms extensive sheets and locally dominant in many Cornish woodlands and in old Grey Willow carrs. This species along with *Hypnum andoi*, *Hypnum cupressiforme* var. *resupinatum* and *Metzgeria furcata* are the most shade-tolerant of the common epiphytes. Where it is abundant on trees, *I. myosuroides* mainly occurs lower on
trunks than *Hypnum andoi* or *Hypnum cupressiforme var. resupinatum*. Recorded on Alder, Ash, Beech, Grey Willow, Elder, Hazel, oaks, Sycamore, but probably tolerates almost all types of tree. Extends into upper part of flood-zone beside R. Tamar and on boulders near some other rivers and reservoir edges.

On granite and slate rocks in old quarries and on their spoil, on laneside banks (extending onto firm soil at some localities), on walls, on steep rocks in 'hedges' (where extending also on to firm steep soil substrates), on boulders in heaths and acid grassland, about tors, upper part of exposed sea-cliffs. Abundant on steep and vertical granitic rocks of crags and boulders in deciduous woodland, in open and in shade, often forming extensive patches. Extends onto firm soil substrates on laneside banks. Also on gabbro boulders near coast. An unusual record of plenty on cast-iron of old pipe above river bank, lightly shaded by trees. Common associates include *Kindbergia praelonga*, *Hypnum andoi*, *Hypnum cupressiforme var. resupinatum*, *Thuidium tamariscinum*, also *Diplophyllum albicans*, *Frullania tamarisci*.

Commonly c.fr.: capsules immature 1-3 (4), 7-12; dehiscing 1-3 [4], 10-12; dehisced 1-5, 7-10, 12.

214.2 *Isothecium alopecuroides* (Lam. ex Dubois) Isov. 12 (syn. *I. myurum* Brid.). Boreo-temperate European element.

*1*: Trevaylor, Penzance, 1865, WC (PNZ) (Paton 1969a: 749).

Often forms substantial pure patches. Habitat notes from Cornwall are as follows. With other mosses on steep face of shaded serpentine and slaty rocks in old 'hedges'. On shaded serpentine rocks in woodland, some on near vertical faces. On stone wall of ruined building in old mine area, shaded by scrub and Sycamore tree. On old mortared walls e.g. around church car park, of bridge parapet in open woodland, of ruins in disused china clay works, part shaded. On granitic and gabbro boulders in and at edges of groves of deciduous trees, e.g. near stream and part shaded. On soil of side of shaded 'hedge' in deciduous woodland near stream. On granitic rocks of laneside and other 'hedges', slightly shaded. On slaty rock in shade in disused railway cutting. Low on tree trunks (Ash, Beech, oak, Sycamore) in deciduous woodlands, in groves of trees and on scattered trees e.g. near water and beside lanes. Extends into upper parts of flood-zone beside R. Tamar. Associates include *Hypnum andoi*, *Isothecium myosuroides var. myosuroides*, *Lejeunea lamacerina* (growing on the *Isothecium*), *Neckera complanata*.

Frequently c.fr.: capsules immature 1, 8, 11; dehiscing 1, 10; dehisced 1-7.

214.3 *Isothecium holtii* Kindb. LS 2 Temperate Oceanic element.


Habitat notes from Cornwall are as follows. Patches, often extensive, on tops and sides of granitic boulders mainly within 0.5-1.0 m above normal water-level of rivers, almost unshaded to partly shaded by deciduous woodlands. Often in pure patches, associates
include *Hyocium armoricum*, *Racomitrium aciculare*, *Thamnobryum alopecurum*. Beside R. Tamar on near-horizontal hard slaty rocks high in flood-zone, lightly shaded by deciduous trees.

Occasionally c.fr.: capsules immature 12, dehiscing 2.

216.3 *Anomodon viticulosus* (Hedw.) Hook. & Taylor
Boreo-temperate Circumpolar element.


Grows in patches, often extensive (suggesting long-established presence). Habitat notes from Cornwall are as follows. A basiphile, occurring mainly on old, steep to vertical, mortared or dry-stone walls, in slight to rather heavy shade, e.g. on laneside banks, church, outside walls of churchyard, on bridge abutments near stream, beside a lane in woodland. Also on slaty rock in an old quarry shaded in deciduous woodland. Associates recorded include *Cirriphyllum crassinervium*, *Radula complanata s. l.*

Two records as epiphyte in open deciduous woodland near R. Tamar, in large patches on trunk of large old oak tree (from near ground to at least 5 m above it) and near ground on old rotted stump. Associates as epiphyte were *Homalia trichomanoides*, *Zygodon viridissimus* var. *viridissimus*. Single record on bark of old Ash tree high within inundation zone by R. Tamar.

Not seen c.fr. in Cornwall by DTH.
COASTAL INFLUENCES ON BRYOPHYTE DISTRIBUTION

Paton (1969a: 677) commented that 'although long stretches of the coast are rather dull bryologically, there are many areas where interesting plants can be found'. Indeed, some of the best known bryophyte rarities in Cornwall are known mainly or entirely from coastal sites, including Cyclodictyon laetevirens, several Fossombronia and Riccia spp. and Tortula wilsonii. Systematic recording of tetrads since 1993 has nevertheless revealed that numerous other bryophyte species are unaccountably scarce in coastal tetrads (e.g. Microlejeunea ulicina, Orthotrichum pulchellum, Pogonatum aloides, Polytrichastrum formosum). In fact, some pairs of closely related common species differ markedly in their frequency in coastal habitats. Examples include Metzgeria furcata, Orthotrichum diaphanum and Ulota phyllantha which are common within 1 km of coasts whereas M. consanguinea, O. affine and U. bruchii are notably scarce in the same zone. Overall though, it appears that the coasts have reduced numbers of bryophyte species. Thus, exposed coastal tetrads in West Cornwall have a mean total of 53.7 taxa compared to means of 79.2 in less exposed coastal tetrads and 93.3 and 83.0 in tetrads furthest inland (Table 2). Admittedly the reduced land area available in the exposed coastal tetrads must have some influence, but prolonged searching there does not yield longer species lists.

Species distribution in relation to the proximity of the coast was analysed in detail in order to quantify the differences between species and seek clues as to the factors causing the differences. The data analysed was restricted to that from West Cornwall and the Isles of Scilly, covering almost all of vice-county 1 (west of the National Grid easting 18), because the author obtained almost complete coverage of tetrads through personal recording in this region. Only data from 1993-2010 was used, since the allocation of older records to tetrads was often imprecise. Search times recorded during the author's fieldwork also show that, overall, consistent amounts of time were spent examining coastal, near-coastal and inland tetrads. 33,961 records were available from 283 tetrads, a total reducing to 21,401 records when duplicates at tetrad level were removed.

1:25,000 scale Ordnance Survey maps were used to assign each tetrad to a Tetrad group according to the distance to the sea from the nearest land (above HWST level) within the tetrad (Table 2). The coastal tetrads were further subdivided into those having all the land within 1.0 km of the sea (Tetrad group A: ‘exposed coastal tetrads’) and those having some land >1.0 km from the sea (group B). A Microsoft Excel spreadsheet was used to (i) sort records for each taxon into Tetrad groups, (ii) count records within each Tetrad group, and (iii) express occurrence as a percentage of tetrads occupied in each Tetrad group, the resulting data being presented in Table 2. Rare taxa (recorded from <16 tetrads) were excluded from the analyses because many of their distribution patterns are unlikely to be statistically significant. Alien species established mainly or entirely on the Isles of Scilly (Lophocolea bispinosa, L. semiteres, Riccia crystallina, Sematophyllum substrumulosum) were also excluded.

Species were assigned to categories of coastal tolerance using definitions set out in Table 1. The range of categories used extends from 'obligate halophyte', through 'highly coast-tolerant' to 'highly intolerant of coasts'. Problems arose in assigning some species to these categories. Most of the problematical species had too few tetrad records for confidence that their allocation was statistically justified (marked † in Table 2). Some species with more numerous records were at or close to the boundaries between categories within a continuum.
(e.g. Neckera complanata could almost equally well be placed as 'intolerant of coasts' or as showing 'low or moderate tolerance of coasts'). Some species occurring mainly or entirely on sand dunes showed an obvious and easily explicable deficit of records far inland (marked ‡ in Table 2), so not all criteria could be used for these. A few other species appeared to qualify for different categories depending on the weight given to different criteria (e.g. Pohlia annotina has some coastal records, despite an overall distribution of tetrad frequencies implying it is intolerant of coasts; possibly more than one ecotype is involved). Finally, five species listed at the end of Table 2 have 'data too irregularly distributed to categorise'; these all have rather small numbers of tetrad records and they include two strict metallophytes.

Nevertheless, many species can be assigned with some confidence to a particular category, with evidence from different criteria appearing congruent. For example, Grimmia lisa has only 18 tetrad records, with 4 of them in exposed coastal sites and 8 more close to coasts, implying high coast tolerance. Direct observations confirm this species occurs on coastal slopes with very high levels of exposure to salt-spray, e.g. at Sennen and near Kynance Cove on the Lizard.

The numbers of taxa in each category are as follows:

- **obligate halophyte**: 1 (Schistidium maritimum)
- **strongly halophytic**: 1 (Tortella flavovirens; with Hennediella heimii not analysed because it has too few records)
- **weakly halophytic**: 9 (with additional rare species similarly limited)
- **highly coast tolerant**: 64
- **low or moderate coast tolerance**: 94
- **intolerant of coasts**: 22
- **highly intolerant of coasts**: 29
- **data too irregularly distributed to categorise species**: 5

The number of taxa in each category is dictated to some extent by the breadth of definition of the categories themselves, with 'intolerant of coasts', for example, being more narrowly defined than 'low or moderate coast tolerance'. However, it is clear that many species show patterns of distribution affected by proximity to the coast.

There are of course many environmental factors likely to affect bryophytes that vary in more or less systematic ways in relation to distance from the coast. On average, coastal tetrads are likely to have higher windspeeds, higher humidity, higher annual insolation (less cloud cover on average), slightly higher mean annual temperatures, less frequent frosts and lower average rainfall than inland tetrads. They are also more likely to have basic or alluvial soils, but the principal rock types in West Cornwall occur on the coasts as well as inland and man-made masonry substrates are almost ubiquitous.

It might be expected that certain bryophyte habitat types would be uncommon or lacking near the coasts, but scrutiny of the species data suggests this is unimportant. The size of tetrads is sufficient to often allow rocky streams (with Hygrohypnum ochraceum, Platypnium riparioides), acidic peaty mires (with Sphagnum denticulatum, S. subnitens), large trees (with Cololejeunea minutissima, Ulota phyllantha), flushes, and arable fields (with Anthoceros punctatus, Bryum violaceum) all to reach those tetrads on the coast. Also, many 'woodland species' occur abundantly here in open coastal habitats,
notably *Mnium hornum* on Cornish cliffs and *Dicranum majus* in coastal heathland on the Isles of Scilly. Hence absence or localisation of the main habitat types does not explain most of the abundance or scarcity of species in coastal areas.

Patterns of bryophyte distribution judged in relation to coastal proximity are likely to often have multiple and complex causes. It is also reasonable to expect that some or even many widespread bryophyte species may have ecotypes with different physiological tolerances occurring in different parts of the region, although relevant data are scarce. Nevertheless, exposure to sea-salt is likely to be a significant variable affecting bryophyte distribution, since only three bryophyte species of the region are strong or obligate halophytes. Furthermore, bryophyte species numbers are conspicuously reduced in coastal sites exposed to Atlantic gales, as on the small spray-washed island of Annet (34 hectares; maximum elevation 19 m ASL) in the south-west of the Isles of Scilly, which has a total recorded bryoflora of only 14 species. Overall, it seems likely that salt tolerance is one of the most important factors determining bryophyte distribution near coasts in Scilly and W. Cornwall. Table 3 relates data on coastal tolerance of bryophytes (from Table 2) to observational data on species occurrence in saline coastal sites in the same region, showing there is at least a general correlation.

Detailed studies by Malloch (1971, 1972) showed that the primary factor in determining zonation of the (phanerogam) vegetation on and above the cliffs at the Lizard pen. and Land's End pen. is the intensity of salt deposition. The percentage representation of maritime species within each plant community ('nodule') was found to be very closely correlated with the mean sodium-organic ratio of the soils (Malloch 1972: 109-110). The same author noted that direct effects of salt deposition on woody plants can be observed after summer gales up to 2-3 km inland, consisting of a blackening and withering of leaves and young shoots on their windward side (Malloch 1972: 111).

Sea-salt spray regularly extends far inland during gales. During 16 years of residence in Tuckingmill (near Camborne) windows of the author's house 3.7 km inland of the Atlantic coast at 105 m altitude were coated with dried sea-salt several times every winter. Malloch (1972: 106) found strong correlations between Na deposition on the Lizard peninsula and the number of days with wind speeds greater than 14 m s\(^{-1}\) (roughly equivalent to gale force).

Systematic measurements on the Lizard pen. obtained over a period of more than two years revealed mean Na deposition (from sea-salt, expressed as kg ha\(^{-1}\) day\(^{-1}\)) of 4.92 at 50 m from the west coast, 1.15 at 100 m inland, 0.54 at 500 m, then 0.14 to 0.16 at 3.1 to 9.7 km inland of the west coast (Malloch 1972: 107). However, the lack of difference between his measurements from 3.1 to 9.7 km inland of the west coast may be misleading since most of those localities are much closer to the south coast of the peninsula and hence exposed to salt carried inland by southerly winds. Edwards & Claxton (1964) found that in coastal areas near Aberystwyth Na deposition at 1.6 km from the coast (mean 0.57 kg ha\(^{-1}\) day\(^{-1}\)) was significantly higher than at 3.2, 4.8 or 6.4 km (with means of 0.41, 0.43 and 0.39 kg ha\(^{-1}\) day\(^{-1}\), respectively).

There are reasons to expect that epiphytes on vertical bark may be more exposed to sea-salt spray than bryophytes growing on horizontal surfaces. Edwards & Claxton (1964) gave values of sodium chloride deposited on a hawthorn hedge and grassland during gales. The
windward top of the hedge received 623 \( \mu g \) NaCl cm\(^{-2} \) whereas the grassland received 26 \( \mu g \) NaCl cm\(^{-2} \), illustrating the effect of a hedge projecting above the level of the surroundings. White & Turner (1970) showed that the catch of various cations including Na on vertically held discs at right angles to air flow was very much higher above the tree canopy than within it, and that smooth young oak twigs are more efficient at catching Na than older rougher twigs. Hence it may not be coincidental that a disproportionate number of bryophyte epiphytes appear in the lists of bryophyte species intolerant or highly intolerant of coasts in W. Cornwall: Cryptaea heteromalla, Metzgeria violacea, Microlejeunea ulicina, Neckera pumila, Orthotrichum affine, O. pulchellum, O. tenellum, Ulota bruchii, U. crispa, Zygodon conoideus. Their apparent intolerance is not explicable merely in terms of lack of trees and bushes within the coastal zone, since Cololejeunea minutissima, Frullania dilata, Orthotrichum diaphanum, Ulota phyllantha and Zygodon viridissimus var. viridissimus all find plenty of bark substrates within the coastal zone.

The absence from the Isles of Scilly or great rarity there (*) of at least some bryophyte species which are common on the 'mainland' of West Cornwall is in accordance with their intolerance of coasts (notably Dicranella schreberiana, Didymodon richmondii, Homalia trichomanoides, Hookeria lucens, Hylocomium splendens, Metzgeria violacea*, Orthotrichum affine*, O. pulchellum, Plagiommium undulatum, Pleuroziunm schreberi, Pogonatum urnigerum, Pohlia nutans, Racemitrium lanuginosum, Ulota bruchii*, U. crispa). Intolerance of sea-salt spray may explain their scarcity or absence in Scilly, as otherwise suitable habitats appear to exist. On the other hand, other absentees from Scilly or rarities there (*) may be better explained by lack of suitable habitat, e.g. scarcity of basic open soil may limit or prevent occurrence of Cratoneuron filicinum and Dicranella varia*, while the virtual absence of streams excludes Fontinalis antipyretica and Hygrohypnum ochraceum.

The literature gives the impression that very few bryophytes show any tolerance of salinity. For example, Hill et al. (2007: 26) give the Ellenberg indicator value for salt tolerance of British and Irish bryophytes as S=0 (i.e. Absent from saline sites; if in coastal situations, only accidental and non-persistent if subject to saline spray or water) for 1013 taxa (96% of the total flora). This will only be true if 'sarine sites' are defined as those with persistent year-round salinity with salt concentrations commonly approaching those of sea water. Otherwise, it is contradicted by the persistent, regular occurrence of at least 75 bryophyte species (see above) on exposed coastal slopes in Cornwall and the Isles of Scilly that regularly receive salt spray.

Much more study is undoubtledly needed to understand patterns of bryophyte distribution in relation to coastal influences. Rather than the relatively crude tetrad data analysed here, data on occurrences of individual populations of species in relation to exposed and sheltered coasts would allow much more precise study. Physiological studies or measurements of salinity tolerances exist for very few bryophytes (Bates 1975, 1976, 2000; Bates & Brown 1974; Brown 1982). Even fewer studies have compared coastal and inland populations to see if different ecotypes show differing salinity tolerances. However, comparisons of the effect of seawater misting of inland and dune populations of Polytrichum commune, Aulacomnium palustre and Ceratodon purpureus by Boerner & Forman (1975) found that only C. purpureus showed any tolerance to salt spray and then only when periodically watered with non-saline solutions. The Cornish data show C. purpureus as highly coast-tolerant (it often grows on exposed cliff tops) whereas P. commune is highly intolerant of
coasts (and never found in exposed coastal sites). *A. palustre* has too few tetrad data for detailed analysis, but it completely lacks records from exposed coasts. More investigation is needed of bryophyte tolerance of intermittent salt spray. The Ellenberg value of S=0 noted above is apparently a crude measure that conceals significant variability in salinity responses which may affect the distribution patterns of many bryophyte species in coastal regions.
TABLE 1. Definitions of coast-tolerance categories.

The definitions rely on patterns of distribution judged from the tetrad records. Data set out in Table 2 were used to assign species on the basis of percentages of tetrads occupied at differing distances from the coast (ranging from exposed coastal tetrads designated as Tetrad group A to tetrads more than 5 km from the sea designated as Tetrad group G). % = percentage occurrence in Tetrad group.

obligate halophyte: %A>%B; 0% in C-G;

strongly halophytic: %A>%B; <11% in any of C-D; 0% in E-G;

weakly halophytic: %A>% in any of B-G or %A+%B > % in any of C-G;

highly coast-tolerant: % in A >0.7% in B; %A+%B not << twice mean % of C-G;

low or moderate coast tolerance: % in A >0.3 but < 0.7 % in B and % in B not < mean % in C-G;

intolerant of coasts: % in A > 0.15 but <0.50 of % in B and % in B usually < mean % for C to G;

highly intolerant of coasts: % in A from 0 to < 0.15 of % in B, usually % in B < or << mean % for C to G;

data too irregularly distributed to categorise species.
TABLE 2. Data on distribution of bryophyte taxa in West Cornwall in relation to distance from the sea.

Taxa are assigned to categories of decreasing coast-tolerance defined in Table 1. Within each category they are listed alphabetically. Notes: † allocation to category tentative because data are few; ‡ often or mainly occurring on sand dunes.

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<th>Tetrad groups:</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<td>maximum distance from sea (km)</td>
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<td>ca 4-5</td>
<td>ca 5-7</td>
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<td>76.2</td>
<td>79.1</td>
<td>75.4</td>
<td>93.3</td>
<td>83.0</td>
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</table>

obligate halophyte:

*Schistidium maritimum*
percent. of tetrads 71.2 31.9 0 0 0 0 0 0

strongly halophytic:

*Tortella flavovirens*
percent. of tetrads 92.3 72.2 10.0 2.9 0 0 0 0

weakly halophytic:

*Amblystegium serpens* var. *salinum*†
percent. of tetrads 4 14 1 1 0 0 0 0

*Archidium alternifolium*
percent. of tetrads 31 30 7 9 5 8 9

*Cephaloziella divaricata*
percent. of tetrads 36.5 20.8 15.0 14.7 3.7 29.0 22.2

*Cephaloziella hampeana*
percent. of tetrads 6 10 0 2 0 4 3

*Frullania microphylla*†
percent. of tetrads 7 8 0 0 0 0 0 0

*Riccia crozalii*
percent. of tetrads 8 11 1 0 0 0 0 0

*Tortula atrovirens*
percent. of tetrads 6 13 0 0 0 0 0 0

*Tortula viridifolia*
percent. of tetrads 24 18 1 0 0 0 0 0

*Weissia perssonii*
percent. of tetrads 9 10 0 0 0 0 0 0

highly coast-tolerant:

*Amblystegium serpens* var. *serpens*
percent. of tetrads 31 59 36 33 23 31 25

*Anthoceros punctatus*†
percent. of tetrads 9.6 5.6 2.5 11.8 0 9.7 7.4
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<th>Percent of Tetrads</th>
<th>Percent of Tetrads</th>
<th>Percent of Tetrads</th>
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</table>
TABLE 3. Comparison of coast tolerance and salt-tolerance categories.

The definitions of coast tolerance categories are set out in Table 1 and taxa are assigned to these categories in Table 2. Generalised salt-tolerance categories given here are based on direct observation of occurrence in saline sites in Cornwall and the Isles of Scilly, i.e. association with halophytic phanerogams and lichens, or evident exposure of occupied locations to sea spray.

**obligate halophyte**: found only in obviously saline places;

**strongly halophytic**: found almost entirely (>99% of records) in obviously saline places;

**weakly halophytic**: recorded often (>25% of records) in obviously saline places;

**highly coast-tolerant**: some records in obviously saline places;

**low or moderate coast tolerance**: few or no records in obviously saline places;

**intolerant of coasts**: rarely or never seen in exposed coastal sites;

**highly intolerant of coasts**: never seen in exposed coastal sites.
ANALYSIS OF CHANGES IN BRYOPHYTE DISTRIBUTION

The detailed data for much of the county resulting from Mrs Paton's work in the 1960s allows fuller assessment of changes in its bryophyte flora over the past 30-40 years than is possible for any other British county. Indeed, no comparable data exist for anywhere else in the world with an equally rich bryoflora. There is now much cause for concern over loss of floristic diversity in Britain and much of western Europe resulting from agricultural intensification, urbanisation and other changes, with global climatic warming also being seen as an increasing threat to biodiversity. The opportunity is therefore taken to analyse the changes in the bryophyte flora of Cornwall and Scilly from the 1960s to the years around 2000, as well as to establish the best possible baseline for judging future changes. This chapter therefore considers the changing bryophyte flora. It attempts to decide which are the decreasing species, the increasing species and introductions, and to measure the extent of changes due to loss and degradation of different habitats.

Detailed records of bryophyte distribution over much of Cornwall and the Isles of Scilly (C&S) were obtained (mainly) from 1959-1968 by Mrs Jean Paton, and again from 1993-2010 by the present author. The existence of these two sets of data provides an almost unique opportunity to investigate changes in the bryophyte flora over the period of nearly 40 years between surveys.

Data on occurrence in tetrads from the two periods have therefore been compared systematically: for 1950-1992 (using a total of 33,943 different 'Old records'), and 1993-2010 (based on 48,532 different 'Recent records'). Table 4 gives the total numbers of Old and Recent records used for each taxon, along with those for Very old records (1791-1949). Table 5 gives indexes of change for each taxon, intended to take account of the larger number of Recent than of Old records. The change index was calculated as: \( C = (B \times 0.6994 - A) \times 100/A \) (where \( C = \) change index, \( B = \) number of tetrads with Recent records, \( A = \) number of tetrads with Old records). Thus an 'average bryophyte' would show 0% change (\( C = 0\% \)), a taxon that has become locally extinct would show \( C = -100\% \), whereas a taxon recorded from twice as many tetrads by Recent records than by Old records would show \( C = +39.88\% \).

Taxonomic changes tend to complicate some of the comparisons, but allowance for these has been made by comparing 'aggregate species' of similar taxonomic composition. Thus, Old records of *Ditrichum flexuosum s. l.* are compared with those for *D. gracile*, since *D. flexuosum s. str.* is unknown in C&S. On the other hand, old records of *Schistidium apocarpum s. l.* are compared with the combined modern records for *S. apocarpum s. str.* and *S. crassipilum*, since there are few Old data for the modern segregate species (and no related species of this group are known in C&S).

A small increase has occurred in the total number of taxa recognised in Recent than in Old Records, but the effects of this on the change index are small since mainly uncommon species have been 'split' and the number of additional alien species becoming established since the 1960s is small and all of those have remained rare. Of course, removal (as duplicates) of Old records of taxa that are now synonymised with others (e.g. *Lophocolea cuspidata* now included in *L. bidentata*; var. *lammersiana* now included in *Cephalozia bicuspidata*; var. *stokesii* now included in *Kindbergia praelonga*) does nothing to affect the change indexes.
The change indexes are of little value for rare species. This is mainly because almost all rarities have been deliberately sought after during both Recent and Old periods of fieldwork, commonly involving prolonged targeted searches and deliberately revisiting old localities. Hence, down-scaling the Recent tetrad totals by a factor of 0.6994 is usually inappropriate (and would result in taxa persisting at a single locality receiving a misleading change index of \( C = -30.06\% \)). Small changes in the tetrad counts also tend to result in large differences in change indexes (e.g. a new discovery in a second tetrad gives \( C = +39.88\% \)). Table 5 therefore lists rare species (those with fewer than ten Recent and Old records) separately. The species accounts should be consulted for full details of status changes of these rarities, which are usually understood in greater depth than can be conveyed by a simple change index.

Several of the changes revealed by the change indexes are not surprising, especially with species that show increases. The expanding ranges of the aliens *Campylopus introflexus* (+329\%) and more recently of *Lophocolea bispinosa* (+329\%) have already attracted the attention of bryologists in Cornwall. Similarly, increased frequency and range expansions have been noticed for the native species *Cololejeunea minutissima* (+220\%), *Colura calyptrifolia* (+235\%) and *Didymodon nicholsonii* (+3624\%), although the last of these may have been somewhat overlooked in the past like other rather nondescript species of *Didymodon*. However, large increases of other species have attracted little or no attention, notably of *Zygodon conoideus* (+169\%), *Didymodon vinealis* (+265\%, but perhaps sometimes overlooked earlier), *Didymodon sinuosus* (+299\%), *Cephalozia integerrima* (+389\%) and *Orthotrichum cupulatum* (+774\%). Decreases have attracted even less attention, although the extinction of *Splachnum ampullaceum* (-100\%) had not passed unnoticed. Very large declines are also apparent in *Fissidens curvatus* (-92\%), *Jungermannia pumila* (-90\%), *Bryum archangelicum* (-89\%), *Frullania teneriffae* (-87\%), *Drepanoclados sendtneri* (-86\%), *Weissia rutilans* (-85\%), *Leiocolea turbinata* (-85\%), *Breutelia chrysocoma* (-85\%), *Rhabdoweisia fugax* (-85\%), *Solenostoma hyalinum* (-84\%), *Warnstorfia fluitans* (-84\%), *Racomitrium aquaticum* (-82\%) and *Hygroamblystegium fluviatile* (-82\%). In fact, excluding rarities, 93 taxa (nearly 15\% of the total recorded bryoflora) show decreases of more than 50\%, whereas 49 taxa show increases of >50\%.

The change indexes therefore reveal a surprisingly dynamic bryoflora at tetrad scale over the 30-40 year timescale studied. Nevertheless, it is reassuring that a majority of species have change indexes within 30\% above or below zero, and some common and characteristic species are within 5\% of zero change (*Calypogeia arguta, Campylopus flexuosus, Dicranum scoparium, Eurhynchium striatum, Hypnum jutlandicum, Neckera complanata, Thuidium tamariscinum*), despite presence of many gaps in their tetrad ranges which might have shown changes.

Before analysing patterns of increase or decrease of species in different habitats, it is necessary to consider possible systematic biases in the methodology of data collection. In particular, it is necessary to consider the possibility of data being collected in systematically different ways for Old and Recent records. This investigation of likely biases is made easier because nearly all of the Old records were collected by Mrs Paton and a large majority of the Recent records were collected by the present author (DTH). Since 1993, days of fieldwork together and many detailed discussions have pointed out both differences and similarities in the way data was collected during each period of time. Besides the obvious
bryophyte habitats in woodland, on heathland, on rocky tors, in Sphagnum-rich mires, on sand dunes and on sea-cliffs, we have both spent large amounts of time examining metalliferous mine-spoil, quarries, arable fields (especially stubbles), churchyards, reservoir inundation zones and countless more mundane places in roadside verges, floristically poor grassland, tarmac edges of lanes and in car parks. We have both visited most of the localities in the county already known for rare bryophytes and many of those known for rare vascular plants, as well as visiting every hectad and making repeated trips to the Isles of Scilly.

The following are thought to be the more significant differences in our coverage:

1. Liverworts and hornworts were expertly recorded by Mrs Paton throughout her fieldwork. Indeed, she was the British Bryological Society Recorder of Hepatics throughout the period when she was most active in Cornwall. In contrast, DTH recorded only mosses in 1993-4, starting to identify liverworts with assistance from Mrs Paton in 1995. Parts of vc1 in which liverworts were not recorded during 1993-4 were all subsequently revisited to record them, but there is no doubt that liverworts were less well covered than mosses for several more years. A tendency for many of the scarcer liverworts to have change indexes showing decline may result in part from this bias, although marked increases of some such as Cephaloziella integerrima, Cololejeunea minutissima and Microlejeunea ulicina show it is far from universal. Overall, excluding rarities, liverworts and hornworts have mean C = -16.92% (n = 102), so this bias does not have a large effect.

2. Mrs Paton's fieldwork tended to focus on moist or wet habitats rich in liverworts. Dry calcareous walls and concrete received less attention, so mosses such as Grimmia pulvinata, Schistidium apocarpum s. l. and some Pottiaceae tended to accumulate relatively few records (so they show artificially high change indexes). The proportion of time spent searching for epiphytes may also have been less than during the recent fieldwork.

3. Mrs Paton visited a larger proportion of localities (tetrads) in vc2, working from a home-base in Truro and later Probus, whereas DTH covered vc1 more intensively from a base near Camborne. The relative scarcity of recent records of e.g. Porella platyphylla may result partly from lack of recent recording within parts of its range in vc2.

4. Mrs Paton was mainly concerned to accumulate hectad records for the first national bryophyte atlas (Hill et al. 1991-1994). The goal was therefore to find as many species as possible in each hectad, rather than to record every locality (or tetrad) fully. Hence some of the commonest species may have been left unrecorded after the first few sites were visited in each hectad, perhaps resulting in artificially high change indexes for some of them (e.g. Kindbergia praelonga 21%, Isothecium myosuroides 27%, Ulota phyllantha 31%, Bryum argenteum 42%, Bryum capillare 52%). However, mean C for all species with more than 200 Old hectad records was +10.29% (n = 52), so this bias did not have a large effect overall.

Change indexes were analysed for species from different habitat types, excluding rarities. Most species were assigned to a habitat type (distinguished by letters A to M in Table 5) where all or a large proportion of the records in C&S were made (see species accounts). Species occurring across a wide range of habitats (e.g. Kindbergia praelonga) or characteristic of only a peculiar specialised habitat (e.g. Nowellia curvifolia on rotting wood; Schistidium maritimum on coastal rocks) were not assigned or analysed. Mean Change indexes were then calculated using data from all species assigned to the habitat type, with results as follows:

A Soil in arable fields and gardens; mean C = +30.80%
(after exclusion of *Dicranella staphylina*, which was incompletely recorded among the Old records because it was not named until 1969)

**B** Open coastal cliffs, cliff tops and slopes (mainly on soil); mean $C = -49.46\%$

(after exclusion of *Fossombronia incurva*, which was probably overlooked in C&S prior to its first record in 1972; it also often occurs inland)

**C** Coastal sand, mainly on dunes; mean $C = +5.15\%$

**D** Woodland; mean $C = -12.55\%$

**E** Epiphytes; mean $C = +53.27\%$

**F** Base-poor rock; mean $C = -46.78\%$

**G** Basic masonry (e.g. walls or concrete); mean $C = +115.91\%$

**H** Acidic mires; mean $C = -38.22\%$

**I** Basic flushes and mires; mean $C = -60.40\%$

**J** Aquatic, near-aquatic and inundation-zone habitats; mean $C = -15.78\%$

**K** Other basic habitats; mean $C = +9.29\%$

**L** Other acidic habitats; mean $C = +8.36\%$

**M** Metallophytes associated with old copper mines; mean $C = +78.30\%$

(but most of the increase was contributed by just three species showing large increases: *Cephaloziella integrerrima*, *Bryum pallescens* and *Hymenostylium recurvirostrum*).

Overall, there appears to have been little change in the extent of ranges of bryophyte species characteristic of coastal sand, woodland, aquatic habitats, or of varied assortments of both basic and acidic habitats. Apparent increases in epiphytic bryophyte species and especially those of basic masonry are likely to result mainly from increased recording effort in those habitat types, as discussed under (2) above. The same may apply to bryophytes of soil in arable fields and gardens, where small mosses may have been somewhat under-recorded in the Old records.

The apparent increase in metallophytes is likely to be an artefact resulting from a massive targeted recording effort with Recent records, with ca 120 disused mine sites in Cornwall being surveyed in detail with funding from English Nature (e.g. Holyoak 2000). Furthermore, much of the increase in the mean Change index for the habitat type is due to large increases shown by just three species, as noted above. The true picture is likely to have involved losses rather than gains of populations of most metallophyte bryophytes, as more metalliferous mine spoil has been shaded by scrub and saplings or lost to development over the past four decades than has been created or newly exposed.

Losses of bryophytes of mire habitats (averaging -38.22\% for acidic mires, -60.40\% for basic mires and flushes) are certainly genuine. Substantial recording of bryophytes of *Sphagnum*-rich mires was funded by English Nature from 1997-2005 (Holyoak, unpublished reports). Of 47 areas of mire vegetation surveyed in detail, damage was recorded due to recent drainage (affecting 2 mires from 1999-2003, including a SSSI), over-grazing or poaching associated with high stocking levels (9 mires), under-grazing or cessation of grazing (all or part of 8 mires; leading to development of tall *Molinia* and eventually scrub or woodland), nutrient-enrichment (5 mires). Between the 1960s and 1997 mires had also been lost to afforestation with conifers and creation of reservoirs. The greatest losses of mires appear to have occurred away from the main heathland areas on Bodmin Moor, especially affecting small mires and flushes in farmland landscapes overlying Devonian slates, which included more basic flushes than exist on the granite of
Bodmin Moor. Even the wet heath areas overlying serpentinite on protected land on the Lizard Peninsula have suffered, largely from under-grazing or fires.

Losses of bryophytes from open coastal cliffs, cliff tops and slopes, mainly of plants growing on soil, also appear to be genuine. Several rarities which were not included in calculation of the mean Change index also appear to have declined in these habitats (*Phascum cuspidatum* var. *piliferum*, *Riccia bifurca*, *R. nigrella*), while decline of *Tortula cuneifolia* began long before the 1960s. Even since 1993 there has been a conspicuous increase in scrub and other tall vegetation on and above coastal cliffs, as a continuing response to cessation of grazing decades ago.

Finally, the mean Change index implies a considerable decrease has occurred in bryophytes of base-poor rock (-46.78%), mainly granite, a habitat that has been well searched since 1992. Inspection of tetrad maps for some of the declining species (*Andreaea rothii*, *Racomitrium aquaticum*, *R. fasciculare*) shows they have suffered a much greater decline in vc1 and lowland parts of vc2 than on the uplands of Bodmin Moor. However, Bodmin Moor may now have lost its populations of *Grimmia ramondii* and it apparently lost *Ulota hutchinsiae* before the 1960s. Also, a sustained long term decline since the nineteenth century is evident throughout Cornwall for a few rupestral species (*Grimmia decipiens*, *G. laevigata*). It is tempting to attribute the recent losses of acidophilous rupestral mosses from lowland areas of Cornwall to pollution, possibly air-borne, since little else seems to have changed. Historically, parts of Cornwall undoubtedly suffered serious atmospheric pollution from mine chimneys, but it virtually escaped the sulphur dioxide pollution that affected much of central and eastern England, causing extensive losses of epiphytic lichens (e.g. Hawksworth & Rose 1976, Gilbert 2000) and bryophytes (Bates *et al.* 1997). There are now concerns that nitrogen-based pollutants are increasing, originating e.g. from fertilisers, dairying and vehicle emissions. Mitchell *et al.* (2004) demonstrated that increased nitrogen has a detrimental effect on growth of epiphytic bryophytes, but there is little information for saxicolous species (cf. Farmer *et al.* 1992). Further investigation is needed to assess whether nitrogen or other pollutants is involved in the decline of saxicolous bryophytes in Cornwall.
### TABLE 4. Total numbers of different hectad records for Cornwall and Isles of Scilly in each age class.

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TABLE 5. Change indexes for bryophytes of Cornwall and Isles of Scilly (see text). Rare taxa (fewer than 10 Recent and Old records) are listed in the lower part of the table.

Taxa are given in ascending order of Change index, then descending order of count of Old records. Change indexes marked † are thought to be misleading because of differences in recording activity (see species accounts). The habitat code letters following the taxon name correspond to the groups of species discussed in the text.

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