A revised list of nationally scarce bryophytes

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Introduction

The categories 'nationally rare' and 'nationally scarce' have been used for some years in Britain as a way of identifying the most uncommon plants. Nationally rare taxa are those present in 1-15 10-km grid squares and nationally scarce taxa are those present in 16-100 10-km grid squares. For bryophytes the current list (presented at www.jncc.gov.uk) is based on the *Atlas of the bryophytes of Britain and Ireland* (Hill, Preston & Smith, 1992-94), and refers to grid square totals for native or long-established species and subspecies in Britain (v.-c. 1-112) from 1950 onwards.

For vascular plants, at least, nationally rare plants were formerly regarded as synonymous with those on the 'red list' and were treated in Red Data Books (e.g. Perring & Farrell, 1977, 1983). Nationally scarce vascular plants had an equivalent publication (Stewart, Pearman & Preston, 1994). Nowadays, red listing is carried out on the basis of threat rather than rarity, using IUCN threat criteria (Palmer *et al.*, 1997), an approach adopted in part by Wigginton (1999) for vascular plants and Church *et al.* (2001) for bryophytes. I say 'in part' as by and large these authors were only able to assess nationally rare and some nationally scarce plants for inclusion in these works, so that there was an initial filter on rarity followed by an assessment of threat (Palmer, 2006). More recently, all flowering plant taxa were assessed for a thorough revision of the red list[1] (Cheffings & Farrell, 2005), which therefore includes as threatened some widespread but declining species such as *Chrysanthemum segetum* and *Scleranthus annuus*. A similar revision of the bryophyte list is in preparation.

Although 'nationally rare' and 'nationally scarce' species are no longer used for red listing, the categories are still useful in other contexts. In particular, they help highlight the special plants of an area, a rather different concept to that of threatened species. They are routinely included in both vascular plant and bryophyte rare plant registers (e.g. Humphreys & Woods, 2001; Bosanquet & Rhind, 2004) and have been used in local floras to highlight important bryophyte areas (e.g. Wigginton, 1995). They are used in the selection criteria for biological Sites of Special Scientific Interest (Hodgetts, 1992) and are often cited in descriptions of individual nature reserves.

There has clearly been much recording since the 1992-94 *Atlas of the bryophytes of Britain and Ireland*, and the number of bryophyte records in the BBS database at the Biological Records Centre (BRC) has increased from the 770,000 or so on which the *Atlas* maps were based to over 1.1 million at the end of 2005. As a result, some species formerly thought to be nationally scarce are now known from too many 10-km squares

[1] Cheffings & Farrell (2005) also alter the meaning of the term 'red list', using it to include all taxa assessed against IUCN criteria, but the earlier meaning, which restricts the term to threatened species, is retained here.

to qualify for this designation. The BBS Recording and Conservation Committee therefore asked me to revise the list of nationally scarce bryophytes to exclude these species. I have also taken the opportunity to add some species that were formerly thought to be nationally rare but which are now known to occur in more than 15 10-km squares.

The revised list of nationally scarce species is presented as Annex 1 to this paper.

Species to be excluded from the list

The following species were formerly known from 16-100 10-km squares but are now recorded in more than 100 squares. They should therefore be deleted from the list of nationally scarce species. The *Atlas* totals in the following table take into account some corrections to the database since publication; the current total is based on records in the BRC database at the end of 2005.

	Atlas total (10-km squares)	Current total	
		10-km squares	% of *Atlas* total
Hornworts and liverworts			
Anthoceros agrestis	92	115	125
Anthoceros punctatus	92	124	135
Barbilophozia atlantica	80	101	126
Cololejeunea minutissima	99	182	184
Colura calyptrifolia	90	125	139
Diplophyllum obtusifolium	86	117	136
Kurzia sylvatica	90	108	120
Marsupella sprucei	100	111	111
Plagiochila britannica	83	103	124
Porella obtusata	94	107	114
Riccia subbifurca	62	101	163
Mosses			
Brachythecium mildeanum	75	151	201
Bryum donianum	95	129	136
Campylopus gracilis	99	104	105
Didymodon nicholsonii	78	202	259
Kiaeria blyttii	94	109	116
Leucobryum juniperoideum	76	105	138
Microbryum floerkeanum	62	101	163
Orthotrichum sprucei	81	102	126
Rhabdoweisia crenulata	98	103	105
Seligeria calcarea	91	113	124
Seligeria donniana	97	103	106
Tortula protobryoides	98	128	131
Tortula viridifolia	94	109	116

The 11 liverworts represent 13% of the 82 plants on the existing list of nationally scarce taxa and the 13 mosses represent 8% of the 172 moss taxa. The deletions include relatively few species that have been recognised only recently (*Plagiochila britannica* is the obvious example) or that now have more records as recent taxonomic clarifications have been taken into account by the recording community (e.g. *Brachythecium mildeanum*, *Leucobryum juniperoideum*). Many are simply somewhat inconspicuous species that were close to the upper limit for nationally scarce species in the *Atlas*. There is good evidence that *Colura calyptrifolia* has increased in recent years (Bosanquet, 2004) and the same may well be true of *Didymodon nicholsonii* (Bates, 1995).

There are seven species on the list that are still known from fewer than 101 10-km squares, but are so clearly under-recorded that I suggest they should not be treated as nationally scarce. These are listed in the table below.

	Atlas total (10-km squares)	Current total	
		10-km squares	% of *Atlas* total
Mosses			
Bryum pallescens	54	96	178
Racomitrium affine	33	81	245
Racomitrium elongatum	66	87	132
Racomitrium sudeticum	45	82	182
Sphagnum angustifolium	38	58	153
Sphagnum flexuosum	47	98	209
Syntrichia virescens	52	79	152

The number of records of *Bryum pallescens* has increased greatly as its preference for metal-polluted sites has become widely known. *Syntrichia virescens* is also under-recorded, and, like *Didymodon nicholsonii*, appears to be increasing on tarmac paths (Adams, 2005). The *Racomitrium* and *Sphagnum* species are recently recognised segregates and we have not yet got an adequate picture of their distribution in Britain.

Lophozia longiflora has been deleted from the nationally scarce list as it was previously over-recorded and is much rarer than was previously thought.

Additions to the list

Some species were formerly considered to be nationally rare but should now be included in the nationally scarce list. This not only includes species that were formerly known from 15 or fewer 10-km squares, but also several species that were known from more than 15 10-km squares at the time of the *Atlas*, but were labelled 'nationally rare' for other reasons. First, as explained above, 'nationally rare' was then considered synonymous with the 'red list', and so *Acrobolbus wilsonii*, for example, was included because the international importance of the British population outweighed the fact that it had been recorded in more than 15 10-km squares from 1950 onwards. Secondly, several species are on international lists of protected species (Habitats Directive, Bern Convention), and so had to be included in the list irrespective of their frequency in Britain.

	Atlas total (10-km squares)	Current total	
		10-km squares	% of *Atlas* total
Hornworts and liverworts			
Acrobolbus wilsonii	17	26	153
Cephaloziella nicholsonii	14	16	114
Cephaloziella turneri	21	24	114
Fossombronia maritima	11	16	145
Lophozia capitata	12	17	142
Pallavicinia lyellii	16	27	169
Petalophyllum ralfsii	18	29	161
Radula voluta	24	28	117
Riccia huebeneriana	14	22	157
Sphaerocarpos texanus	14	26	186
Mosses			
Andreaea nivalis	15	16	107
Atrichum angustatum	18	17	94
Bryum creberrimum	14	16	114
Bryum dixonii	15	20	133
Bryum warneum	16	16	100
Dicranum bergeri	16	17	106
Dicranum spurium	43	44	102
Didymodon tomaculosus	6	19	317
Ephemerum sessile	16	28	175
Grimmia ovalis	13	37	285
Habrodon perpusillus	15	16	107
Hamatocaulis vernicosus	70	71	101
Myrinia pulvinata	19	23	121
Sphagnum lindbergii	16	17	106
Splachnum vasculosum	19	21	111
Syntrichia princeps	15	16	107
Tortella densa	15	21	140
Tortula wilsonii	20	20	100
Weissia condensa	13	16	123
Weissia rostellata	17	35	206
Weissia squarrosa	10	22	220
Weissia sterilis	26	34	131

Dichodontium flavescens also qualifies for inclusion but it is classed as Data Deficient in the Red Data Book (Church *et al.*, 2001) and should be excluded as under-recorded.

The 10 liverworts added to the nationally scarce list more or less balance the number deleted, but the 22 mosses added greatly outnumber the 13 which are now too frequent to qualify.

Borderline cases

The following species are now known from 91-100 10-km squares. They are retained in the nationally scarce list.

	Atlas total (10-km squares)	Current total	
		10-km squares	% of *Atlas* total
Hornworts and liverworts			
Adelanthus decipiens	98	100	102
Cephalozia catenulata	90	98	109
Haplomitrium hookeri	90	98	109
Nardia geoscyphus	96	99	103
Riccardia incurvata	86	95	110
Scapania aequiloba	86	97	113
Mosses			
Bartramia halleriana	91	96	105
Campylophyllum calcareum	85	99	116
Pohlia lescuriana	70	99	141
Seligeria pusilla	90	99	110

Discussion

This is only a partial revision to the list of nationally scarce species. A complete revision, which might well involve a change to a later cut-off date than 1950 for the 10-km square totals, will doubtless follow the completion of the current BBS project to revise the *Atlas of the bryophytes of Britain and Ireland*. I have not attempted to include species added to the British list since the *Atlas* was published. Some of these will undoubtedly qualify as nationally scarce, but it seems best to allow a period for the accumulation of records before their distribution is assessed.

The *Atlas* database was more or less completed by 1990, so the turnover in species identified in this paper has taken place in the last 15 years. Viewed in this light, it does not appear to be excessive. The deletions correct some obvious anomalies. Bosanquet & Rhind (2004) question the appropriateness of nationally scarce status for at least six species. Five of these are deleted here (*Kurzia sylvatica*, *Brachythecium mildeanum*, *Bryum pallescens*, *Leucobryum juniperoideum* and *Tortula viridifolia*) but the sixth, *Cephalozia pleniceps*, shows an increase from 40 to just 50 10-km squares.

Some of the deletions reflect the increased number of records of arable bryophytes resulting from the BBS Survey of the Bryophytes of Arable Land (SBAL), and it might be argued that this disproportionate attention to one habitat has biased the list. However, the SBAL survey can be regarded as partially correcting previous under-recording of species in a habitat which is much more widespread, but much less studied, than (say) oceanic woodlands.

This revision highlights the essentially arbitrary nature of the nationally scarce category. This

does not, in my view, make the concept any less useful for the purposes outlined above. There must be an argument for defining nationally rare and scarce species as the rarest x% and y% of British bryophytes rather than by absolute numbers of grid squares, although if some taxonomic groups (e.g. charophytes) have a larger proportion of rare species than others this would not be revealed by this method. Other, more sophisticated, methods are available (Gaston, 1994) but there is a lot to be said for simplicity in the definition of these widely used terms.

Acknowledgements

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Annex 1. Revised list of nationally scarce bryophytes.

Hornworts and liverworts

Acrobolbus wilsonii
Adelanthus decipiens
Anastrophyllum donnianum
Anastrophyllum hellerianum
Anthelia juratzkana
Barbilophozia lycopodioides
Bazzania pearsonii
Calypogeia azurea
Calypogeia integristipula
Calypogeia suecica
Cephalozia catenulata
Cephalozia loitlesbergeri
Cephalozia macrostachya
Cephalozia pleniceps
Cephaloziella nicholsonii
Cephaloziella spinigera
Cephaloziella stellulifera
Cephaloziella turneri
Cladopodiella francisci
Cololejeunea rossettiana
Cryptothallus mirabilis
Diplophyllum taxifolium
Eremonotus myriocarpus
Fossombronia angulosa
Fossombronia caespitiformis
Fossombronia foveolata
Fossombronia husnotii

Fossombronia incurva
Fossombronia maritima
Haplomitrium hookeri
Harpanthus flotovianus
Jamesoniella autumnalis
Jungermannia borealis
Jungermannia confertissima
Jungermannia subelliptica
Leiocolea heterocolpos
Leptoscyphus cuneifolius
Lophozia capitata
Lophozia longidens
Lophozia obtusa
Lophozia opacifolia
Marsupella adusta
Marsupella alpina
Marsupella brevissima
Marsupella sphacelata
Marsupella stableri
Mastigophora woodsii
Moerckia blyttii
Moerckia hibernica
Nardia geoscyphus
Odontoschisma elongatum
Pallavicinia lyellii
Pedinophyllum interruptum
Petalophyllum ralfsii
Plagiochila atlantica
Plagiochila carringtonii
Pleurocladula albescens
Porella pinnata
Radula voluta
Riccardia incurvata
Riccia beyrichiana
Riccia cavernosa
Riccia crozalsii
Riccia huebeneriana
Ricciocarpos natans
Scapania aequiloba
Scapania calcicola
Scapania cuspiduligera
Scapania degenii
Scapania lingulata
Scapania nimbosa
Scapania ornithopodioides
Scapania uliginosa
Sphaerocarpos michelii
Sphaerocarpos texanus
Sphenolobopsis pearsonii
Targionia hypophylla
Tetralophozia setiformis
Tritomaria exsecta
Tritomaria polita

Mosses

Abietinella abietina var. *abietina*
Abietinella abietina var. *histricosa*
Aloina ambigua
Aloina brevirostris
Aloina rigida
Amblyodon dealbatus
Amblystegium confervoides
Amblystegium humile
Amphidium lapponicum
Andreaea megistospora
Andreaea mutabilis
Andreaea nivalis
Arctoa fulvella
Atrichum angustatum
Atrichum tenellum
Aulacomnium turgidum
Bartramia halleriana
Brachydontium trichodes
Brachythecium salebrosum
Bryum creberrimum
Bryum canariense
Bryum dixonii
Bryum elegans
Bryum intermedium
Bryum mildeanum
Bryum riparium
Bryum tenuisetum
Bryum torquescens
Bryum warneum
Bryum weigelii
Buxbaumia aphylla
Campyliadelphus elodes
Campylophyllum calcareum
Campylopus pilifer
Campylopus schimperi
Campylopus setifolius
Campylopus shawii
Campylopus subulatus

Campylostelium saxicola
Catoscopium nigritum
Cinclidium stygium
Conardia compacta
Conostomum tetragonum
Coscinodon cribrosus
Cynodontium jenneri
Dicranella crispa
Dicranodontium asperulum
Dicranodontium uncinatum
Dicranoweisia crispula
Dicranum bergeri
Dicranum flagellare
Dicranum polysetum
Dicranum spurium
Didymodon acutus
Didymodon australasiae var. *umbrosus*
Didymodon tomaculosus
Discelium nudum
Distichium inclinatum
Ditrichum lineare
Ditrichum pusillum
Ditrichum zonatum
Drepanocladus sendtneri
Encalypta alpina
Encalypta ciliata
Encalypta rhaptocarpa
Entosthodon muhlenbergii
Ephemerum recurvifolium
Ephemerum sessile
Eurhynchium striatulum
Fissidens limbatus
Fissidens polyphyllus
Fissidens rivularis
Fissidens rufulus
Glyphomitrium daviesii
Grimmia atrata
Grimmia decipiens
Grimmia incurva
Grimmia laevigata
Grimmia lisae
Grimmia longirostris
Grimmia montana
Grimmia orbicularis
Grimmia ovalis
Gymnostomum calcareum
Gymnostomum viridulum
Habrodon perpusillus
Hamatocaulis vernicosus
Hedwigia integrifolia
Herzogiella seligeri
Herzogiella striatella
Hygrohypnum duriusculum
Hylocomiastrum pyrenaicum
Hypnum hamulosum
Hypnum imponens
Isopterygiopsis muelleriana
Kiaeria falcata
Kiaeria glacialis
Kiaeria starkei
Leptobarbula berica
Meesia uliginosa
Mnium thomsonii
Myrinia pulvinata
Myurella julacea
Myurium hochstetteri
Octodiceras fontanum
Oedipodium griffithianum
Oncophorus virens
Orthothecium rufescens
Paraleptodontium recurvifolium
Philonotis arnellii
Philonotis caespitosa
Philonotis rigida
Philonotis seriata
Plagiopus oederianus
Plagiothecium cavifolium
Plagiothecium laetum
Plagiothecium platyphyllum
Platydictya jungermannioides
Platygyrium repens
Platyhypnidium alopecuroides
Pleurochaete squarrosa
Pohlia elongata var. *polymorpha*
Pohlia filum
Pohlia flexuosa
Pohlia lescuriana
Pohlia ludwigii
Pohlia proligera
Polytrichastrum sexangulare
Pottia starkeana
Pottiopsis caespitosa
Pseudobryum cinclidioides
Pseudocalliergon lycopodioides

Pseudocalliergon trifarium
Pseudoleskea patens
Pseudoleskeella catenulata
Pterigynandrum filiforme
Pterygoneurum ovatum
Pylaisia polyantha
Racomitrium canescens
Rhizomnium magnifolium
Rhynchostegiella curviseta
Rhytidium rugosum
Schistidium trichodon
Seligeria acutifolia
Seligeria pusilla
Seligeria trifaria s.l.
Sematophyllum micans
Sphagnum affine
Sphagnum austinii
Sphagnum lindbergii
Sphagnum platyphyllum
Sphagnum pulchrum
Sphagnum subsecundum
Splachnum vasculosum
Syntrichia princeps
Tetraplodon angustatus
Thuidium recognitum
Tomentypnum nitens
Tortella densa
Tortella inclinata
Tortella inflexa
Tortula atrovirens
Tortula canescens
Tortula wilsonii
Trichostomum hibernicum
Ulota calvescens
Ulota coarctata
Weissia condensa
Weissia perssonii
Weissia rostellata
Weissia squarrosa
Weissia sterilis

The Threatened Bryophyte Database: an update

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Since its inception in 2003 (Hodgetts, 2003) the Threatened Bryophyte Database (TBDB) has become an integral part of bryological data collection and dissemination. Many BBS members have kindly and freely contributed records of target species, which are now actively informing bryophyte conservation initiatives. How is this happening? Since the original burst of activity, which involved checking and updating the entire Red Data Book database, I have been keeping the database as up-to-date as possible by adding records as they are sent in, as well as incorporating published records from sources such as the new vice-county records and the 'rare and interesting' column in *Field Bryology*. The advantage of entering records sent directly from recorders is that they often contain much more information than the more synoptic data that usually comprise published records, e.g. information on population size, or a sketch map, or a photograph, all of which can be added to the Recorder 2002 database. This is all useful to conservation workers.

The TBDB is disseminated by sending a copy at intervals to the statutory nature country