The status and conservation of stoneworts (Characeae) in West Gloucestershire (v.c. 34) and North Somerset (v.c. 6)

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ABSTRACT

West Gloucestershire and North Somerset are nationally important for stoneworts and although there are diverse assemblages at some sites, the area is particularly important for the strong populations of several rare species. The most important areas are flooded gravel pits in the River Severn floodplain at Frampton-on-Severn, a complex of dew-ponds and pits created through extraction of strontium in the Wickwar – Yate area and ditches in grazing marshes in the Gordano Valley.

KEYWORDS: *Chara*, *Nitella*, *Nitellopsis*, *Tolypella*, distribution, conservation.

INTRODUCTION

North Somerset (v.c. 6) and West Gloucestershire (v.c. 34) (referred to hereafter as the region) include a number of sites supporting diverse or large populations of stoneworts (charophytes). These sites are mainly very small and discrete and, as discussed further below, the remainder of the region has little in the way of suitable stonewort habitat. Survey and literature reviews by J. A. Moore and R. H. Bailey in the mid-1970s (Moore & Bailey 1986) and by N. F. Stewart (N.F.S.) and R. V. Lansdown (R.V.L.) since the early 1990s have shown that, although some important sites and species appear to have been lost, many of the more important sites and the most vulnerable species still occur and the region can be considered to be of national importance for stoneworts (Stewart 2004).

This article presents an account of the status and distribution of charophytes in the region, supported by a comprehensive list of records. The information presented here is based on compilation of data from the literature, herbarium specimens, the database of the Biological Records Centre, material submitted to N.F.S. for determination, the databases of the Bristol Naturalists Society and Gloucestershire Naturalists Society records held by the M.A.R. and C.K. as well as personal records of all the authors.

CHAROPHYTE HABITAT

The region comprises the Forest of Dean, the lower, tidal part of the River Severn and its historic floodplain, the southern Cotswolds and the coastal plains south through the Mendips and the Somerset Levels to Bridgwater Bay. It overlaps with all or part of the current administrative counties of Somerset, North Somerset, Bath and North-east Somerset, Bristol, South Gloucestershire and Gloucestershire. The landscape is dominated by the hills of the Cotswolds, the Mendips and the Poldens to the east of the River Severn, the Severn Estuary and the Forest of Dean to the west. Much of the region involves the low-lying areas of the Severn Vale and the coastal plain, characterised by pasture and complex field systems with small copses. The hills are broken by a small number of larger rivers, such as the Parrett, the Brue and the Axe in the south and the Little Avon in the north. The former floodplains of the larger rivers have created

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much of the suitable wetland habitat for charophytes, particularly in the Somerset Levels.

Geologically, the region is one of the most varied districts of Britain, for with the exception of the Ordovician, Cretaceous and possibly the Permian, there are surface exposures of every geological formation from the Cambrian to the Jurassic (Kellaway & Welch 1948). The underlying geology has a very strong influence on the distribution of charophytes. One of the reasons for its importance for charophytes is that most of the region is predominantly calcareous, characterised by the inferior oolite of the Cotswolds to the carboniferous limestone of the Mendips, with calcareous clays in the vale of the River Severn (Green *et al*. 1997; Green *et al*. 2000). However, there are also important outcrops of acid strata, in particular the coal measures of the Forest of Dean, with an outlier forming the Bristol Coalfields. Overlying the hard geology, most of the coastal plains are dominated by deep alluvial clays, with occasional surface peat deposits in areas such as the Gordano Valley and parts of the Somerset Levels.

Within the region, areas with wetland habitats suitable for charophytes tend to be fairly discrete and mainly restricted to the lowlands of the Severn Vale and the coastal plains. There are only a few records from the Forest of Dean, the Cotswolds, the Mendips and Poldens, most of which are from anthropogenic habitats, i.e. habitats that have developed as a result of human influence.

The main habitats supporting charophytes in the region are:

- Pools remaining from coal and metal ore extraction in the Forest of Dean.
- Gravel pits and some ditch systems in the Severn Vale north of Sharpness, particularly in the area from Over to Walham and around Frampton-on-Severn.
- Canals, artificial lakes and a few farm ponds on the plateau of the Cotswolds.
- Farm ponds and strontium pits in the Wickwar – Yate area.
- Predominantly artificial water bodies, such as canals and ornamental lakes, in and around urban areas associated with Bristol and Bath.
- The wet pasture and ditches (rhynes or rhines) in the Gordano Valley.
- Large artificial lakes such as Chew Valley Lake and Blagdon Lake.
- Ditches serving as "wet fences", scattered standing water bodies and canals in the Somerset Levels, particularly in areas such as Southlake, Butt, Kenn and Nailsea Moors.
- Dune slacks on the coast between Weston-Super-Mare and Bridgwater.

The more important sites are described in detail below.

IMPORTANT STONEWORT AREAS

NORTH SOMERSET (V.C. 6)

The Somerset Levels

The Somerset levels were formed in a large inlet as the sea receded, allowing development of peat and fen woodland (Green *et al*. 1997). Originally, they would have comprised a vast complex of wetland habitats with smaller dry areas on higher ground. With drainage and cultivation, the wetland habitats have been reduced and are now mainly represented by ditches serving as "wet fences", with isolated wet grassland, pools and fen. Whilst the ditch systems generally do support some important charophyte populations, the most important sites are those where the ditches are associated with wet pasture. In most recent surveys of the aquatic plants of the ditches in the levels, charophytes have not been identified to species level (often being recorded simply as "*Chara* sp.") and there is a need for more informed survey. There are scattered records for *C. contraria*, *C. globularis*, *C. hispida*, *C. virgata*, *C. vulgaris*, *Nitella mucronata* and *N. opaca* as well as old records for *N. translucens*, *Tolypella glomerata* and *T. intricata*. Records are generally rather scattered, with concentrations in the King's Sedgemoor area, Kenn Moor and the Nailsea and Tickenham Moor complex. Two sites currently support important populations of *T. prolifera*: South-lake Moor is an area of wet grassland and grazing marsh on alluvial clays with some peat, where *T. prolifera* has been recorded from around 14 ditch sections. Butt Moor is another clay moor with areas grazing marsh and wet grassland with *T. prolifera* in a number of ditch sections.

The Gordano Valley

The Gordano Valley extends from Avonmouth, south west to just north of Clevedon. It is mainly an area of grazing marsh defined to the north-west and south-east by steep limestone

hills which feed strongly calcareous water into the system. There are charophyte records from four main areas within the valley; ditches in the Portbury area (near Portishead) and three of the moors within what was one continuous wetland complex; Clapton Moor, Weston Moor and Walton Moor. The northern half of the valley has mainly been converted to agriculture and much of Weston Moor has been lost under a refuse tip. However, part of the valley floor is a National Nature Reserve and includes three Avon Wildlife Trust Reserves as well as much being designated as SSSI (Green *et al*. 2000). The arterial drains are nutrient enriched but many lesser ditches have a good aquatic flora, particularly Walton Moor and the remnants of Weston Moor (Stewart 2004). The charophyte flora is still the richest in the region. *Chara hispida*, *C. vulgaris* var. *papillata* and *Tolypella glomerata* were recorded from Portbury between 1887 and 1922 but there are no recent records of charophytes from this area; Both Walton and Weston Moors still support *Chara aculeolata*, *C. globularis*, *C. hispida*, *C. virgata*, *C. vulgaris* and *N. flexilis* agg. but there has been no record of *T. intricata* since 1989. Clapton Moor still supports *C. virgata* and *C. vulgaris* var. *papillata* but appears to have lost *C. contraria*, *C. globularis*, *C. hispida* and *Tolypella glomerata*. In the species accounts, records for all sites within the Gordano Valley have been included under one heading, subdivided only where specific site details are given.

WEST GLOUCESTERSHIRE (V.C. 34)

The Wickwar – Yate Area

This area is situated on the edge of the Severn Floodplain, toward the south of v.c. 34. It contains a much higher than average (Williams *et al*. 1998) number of ponds (over 450 in the 10 km square ST78) and consequently has provided a high proportion of the records of charophytes for v.c. 34. The ponds derive from strontium sulphate extraction, cattle watering and a small amount of quarrying and mining. The area from which the records come can best be defined by a line running from Rangeworthy in the west, through Wickwar to the base of the Cotswold escarpment below Hillesley, then following the base of the escarpment south through Horton to Old Sodbury, west through Chipping Sodbury to Yate and back to Rangeworthy. In the species accounts a number of named sites shown on the Ordnance Survey 1:25,000 Explorer map (No. 167) have been included within this broad area; these include farms such as Cherryrock Farm, Goose Green (although the farm has been lost to development), Hall End Farm and Leech Pool Farm, as well as other features such as the village of Little Sodbury End, Vinney's Lane (running north-westward from Horton), Yate Court and Yate Rocks. The core of the area is characterised by a complex of commons, including; Assley, Hawkesbury, Inglestone, Kingrove and Sodbury Commons. The commons border Lower Woods SSSI/NR which includes the following named sites referred to in charophyte records: Green Trench, Horton Great Trench, Lance Coppice, Lower Woods Lodge, Spoil Coppice and Stonybridge Wood. Lower Woods NR lies mainly on the Lower Lias clays, with exposures of Keuper and Tea Green Marls, It has a long history of human use, including a roman villa nearby just south of Vinney's Lane, as well as historic active management. This historical use has resulted in frequent flooded relict features, such as saw-pits, whilst Horton Great Trench may have been a roman road, was probably a drove road and was still a major highway until at least the 1700s (Gloucester Wildlife Trust 1997).

Celestine (strontium sulphate) occurred in irregular masses in the Keuper Marl; it was largely worked by hand and formerly sent to Germany for use in refining sugar from sugar-beet (Kellaway & Welch 1948). It was also used to give red colours to pyrotechnics, but is now mainly used in ferrite for radios and in glass for TV tubes (A. R. Lansdown pers. comm.). The pits resulting from this work were generally small and fairly deep (often over 2 m deep). Consequently, those which have not been actively infilled for agriculture or development have not been particularly affected by succession and most still hold water. They extend from Little Sodbury, Horton, Wickwar and Yate, to the Inglestone Common area. In addition to these ponds, there are a very large number of dew-ponds mainly located at the junctions of two to three fields, particularly on the margins of the commons. A survey of 368 ponds in ST78 between 1996 and 1999 showed that 127 (35%) had been infilled and 36 (10%) had succeeded to terrestrial habitats. Of the remainder, 84 (23%) were under more than 50% shade and only 17 (5%) were sufficiently poached to provide suitable habitat for charophytes such as *Tolypella intricata* (Stewart & Lansdown 1999b).

During the early 1900s, many of the pits were surveyed by people such as J. W. White,

I. M. Roper and C. I. and N. Y. Sandwith and most of the pre-1994 records derive from this period. However, few records give sufficiently detailed site descriptions for the individual pit to be matched to current water bodies and so it is difficult to assess whether individual populations still occur. The available data would suggest that *Chara vulgaris* (including all three common varieties) and *C. virgata* are as abundant now as they ever have been. Detailed surveys for *T. intricata* mean that although populations vary between years, it appears to be as abundant now as it ever has been. The type locality for the var. *gracillima* of *Nitella mucronata* is in this area, in a strontium pit near Yate Court. The pit appears to have been infilled for development and the plant has not been recorded in the area since the early 1900s. Two other taxa appear to have been lost from the area; both *C. globularis* and *N. opaca* were recorded from a number of sites around Yate in the early part of the twentieth century. The area around Yate extends over part of the Bristol coalfield and formerly supported taxa more typical of acid habitats, such as *Apium inundatum* and *Baldellia ranunculoides* (Green *et al*. 2000). Unfortunately most of the common land and associated wetlands in this area, such as Yate (or Westerleigh) Common, were lost to agriculture during the second World War (Green *et al*. 2000), or to the increasing sprawl of development around Yate and Chipping Sodbury.

Frampton Pools SO7407–7507

Frampton Pools SSSI is a complex of three large and a number of smaller shallow lakes created by gravel extraction, located approximately 1 km from the flood bank of the Severn Estuary. The lake complex was designated an SSSI in 1974 to protect wintering wildfowl and the developing flora. Many of the lakes are fringed by young woodland, which shades the margins, however in places gravel beaches occur leading down from short, sheep-grazed pasture. *Nitellopsis obtusa* occurs in a broad band running parallel to a long gravel beach on the north-western side of a lake with a surface area of approximately 21 ha, which is at least 2 m deep in parts. Associated species included *Ceratophyllum demersum*, *Elodea canadensis*, and *E. nuttallii*. Other aquatic plants in the lake included *Chara globularis*, *C. vulgaris*, *Potamogeton pectinatus*, *P. pusillus* and *Ranunculus circinatus*.

Mendip Reservoirs

The importance of the Mendip Reservoirs has only recently come to light as a result of surveys by University College, London in 2003. Of particular note was the discovery of strong populations of *Nitellopsis obtusa* in both Blagdon Lake and Chew Valley Lake. Undoubtedly there is a need for further exploration of these and other reservoirs in the Mendips. The underlying Carboniferous Limestone results in strongly calcareous water which favours the stoneworts and helps to reduce the effects of nutrient enrichment washed in from the surrounding farmland, although this is still a concern. Stoneworts so far recorded are *N. obtusa*, *Chara contraria*, *C. globularis* and *C. vulgaris* in both Blagdon Lake and Chew Valley Lake, with *C. contraria* and *C. globularis* in Cheddar Reservoir.

CHAROPHYTE CONSERVATION

Stewart (2004) lists six sites within the region as being important for stoneworts. Of these, the Somerset Levels are considered to be of European importance, Frampton Pools, the Gordano Valley, the Wickwar – Yate area (as Inglestone Common area) and Richard's Wood at Over are considered to be of national importance and the Thames and Severn Canal is of local importance. The Mendip reservoirs would also have qualified for inclusion but information was not available at the time of publication. Parts of all these sites, except the Thames and Severn Canal are under some level of protection for various reasons and stoneworts are taken into account in their management.

The Thames and Severn Canal has been out of use since the middle of the twentieth century and is currently succeeding to terrestrial vegetation. However, there are plans to restore parts of the canal and eventually to restore the entire length to navigation. This would comprise the Stroudwater and Thames and Severn Canals, linking the Gloucester and Sharpness Canal at Saul Junction to the Thames at Lechlade. Currently, the future for charophytes in the canal is bleak; but restoration and low-intensity, or no boat use would be extremely beneficial and could restore good populations of all known taxa. Experience from other canal systems, such as the Kennet and Avon Canal, suggests that

restoration to anything more than light boat traffic is likely to lead to a more or less total loss of submerged aquatic vegetation, including charophytes.

The only conservation action taken specifically for charophytes in the region has involved survey and low level monitoring of *Tolypella intricata* and *T. prolifera*. This has led to the development of a reasonable understanding of the ecology of the species and proposals for management, although few of these actions have been implemented to-date (Stewart & Lansdown 1999a and b, Williams & Stewart 2002, Williams *et al*. 2003). Unfortunately, the management plan for Lower Woods (Gloucestershire Wildlife Trust 1997) was produced shortly before detailed information on *T. intricata* became widely available and this species is not mentioned. Subsequently, the Gloucestershire Wildlife Trust has been involved in the development of conservation management plans for the species.

Charophyte taxa such as *C. virgata*, *C. vulgaris* and probably *C. contraria* have the ability to colonise new habitat as it becomes available, whilst at the same time forming a less important part of the flora of established wetland systems. Although some populations of these species in the region have been lost, they are still frequent and in some areas are probably increasing. By contrast, taxa such as *C. aculeolata*, *C. globularis* and *C. hispida* tend only to occur in permanent water bodies. These species are now very local within the region and are vulnerable because of the limited number of small populations. *Nitella translucens* appears to be extinct in the region, as does *Tolypella glomerata* although there are some areas, such as the ditches near Portbury and water bodies on the New Grounds at Slimbridge which could hold populations of the latter and merit survey. *Nitella opaca* is now restricted to a few small populations, however it is likely that this species has been under-recorded in places such as the Forest of Dean and the Somerset Levels.

The impression gained is that some species have undergone significant declines since the early part of the twentieth century. However, this impression must be put in the context of the limited number of surveys carried out by botanists capable of identifying charophytes in the field. Only the Wickwar – Yate area, Southlake Moor, Butt Moor and the Gordano Valley have been subject to intensive survey involving field identification. Records of "*Chara* sp." from a variety of sites throughout the region would suggest that more thorough survey could re-discover a number of populations of stoneworts, while recent finds of species such as *Tolypella prolifera* and *Nitellopsis obtusa* would suggest that some of the re-discoveries are likely to involve species that are of conservation concern.

As a minimum, the steps needed to ensure the conservation of existing populations of charophytes in the region involve regular monitoring surveys of suitable habitat in all sites of European and national importance (*sensu* Stewart 2004). The results of these surveys should be employed to inform decisions on whether or not to intervene with active management for charophytes. In addition, the information gained from surveys should be published and compiled to contribute to the information base on the ecology of these species. Any further development in the Wickwar – Yate area should be subject to environmental impact assessment, giving particular consideration to reducing the loss of waterbodies and remnant common land. The restoration of the Thames and Severn Canal and works undertaken on the Hereford and Gloucester Canal (referred to in the older literature as the Newent Canal) need to be monitored, if nothing else, to record the response of aquatic plants.

SPECIES ACCOUNTS

Apart from the obvious benefits that derive from compilation of botanical data such as enabling assessment of changes in the distribution or status of species and informing conservation action, this article has been prepared to serve two main aims: to enable an assessment of the current status of stoneworts in the two vice counties and to enable the monitoring of trends in individual populations. To some extent, these two aims dictate the format of data presentation. Rather than simple lists of sites with the date and source(s) of the records, we have reproduced as much detail as was available in each original record to increase the chance of relocating individual populations. Thus, for example, although there is doubt about their validity, we have decided to make it clear where material has been identified to varietal level. In the case of *C. vulgaris* to list the named variety against each record was impractical and risked doubling the length of this article we have therefore

separated out all records identified to variety consistently throughout the article.

Records are presented under the species or varietal name following the taxonomy of Bryant *et al*. (2002). To facilitate assessment of the current status of each taxon, sites for which there are records during the last ten years (i.e. since 1994) are listed separately. Where there are post-1994 records for sites where the taxon was recorded before 1994, all records are listed as post 1994. For the same reason, records from the same named site or grid reference are grouped. All material was determined by the recorder unless otherwise stated.

The records are arranged as follows:

- The ten-kilometre square.
- The 6-figure National Grid Reference, where known.
- The location as given by the recorder.
- The date of the record (where available) and any other useful details.
- The initials of the finder e.g. C.I.S. A full list of initials and the names to which they refer is provided in the appendix.
- [det.] indicates that a specimen was identified by someone other than the finder.
- ! indicates that a specimen has been seen by N. F. Stewart and the identification confirmed according to current taxonomy.
- Location of any herbarium specimens (in bold), where relevant.
- Published sources of the record.

Records are listed in chronological order within sites and by the grid reference where more than one record was made in a single year. Any notes added by the authors and in particular, where the site is known but the grid reference was not given by the original recorder, these are given in square bracket []. (BRC) indicates that the only source that we have found for the record is on the Biological Records Centre database at the Centre for Ecology and Hydrology, Monk's Wood.

Synonyms have been included only when they have been used in the two vice counties covered here and do not represent a comprehensive list, for which see Bryant *et al*. (2002).

CHARA L.

Chara aculeolata Kütz. Hedgehog stonewort
Synonyms: *C. pedunculata* Kütz.; *C. hispida* L. forma *polyacantha* (A. Braun) R. D. Wood.

In Britain, *C. aculeolata* is nationally scarce and restricted to a few highly calcareous sites, mainly in England. Within the region it has only been confirmed from Walton and Weston Moors, in the Gordano Valley. Material from Nailsea Moor (only a few kilometres south of Walton Moor) in 1880 was recorded as *C. hispida* var. *polyacantha*, which probably refers to this species; unfortunately it has not been possible to confirm this record. Populations in the Gordano Valley are restricted but appear to be fairly healthy. It may be dependent upon regular ditch or pool maintenance and must be considered vulnerable.

V.C. 6

BEFORE 1994

ST47 [-Nailsea Moor (as *C. hispida* var. *polyacantha*), 1880, A.Le., E.H.R. [det. J.W.W.] (White 1912; Marshall 1914)].

1994 ONWARDS

ST47 - Gordano Valley:

- Walton Moor: 10 September 1903, J.W.W. [det. J.G.] (**BM**!, MANCH!, **NMW**!, **RNG**!, **SLBI**!) (Willis & Jefferies 1959); peat ditch, 10 September 1904, J.W.W. [conf. A.B.] [conf. H. & J.G.] (**BM**!, MANCH!, NMW!, **SLBI**!) (Groves 1905; Willis 1989); ST435727 ditch No. 54, 20 October 2002, N.F.S. *et al*.

- Weston Moor: Weston-in-Gordano, 28 September 1903, J.W.W. [det. J.G.] (**BM**!); rhine, 4 June 1915, C.I.S., [det. J.v.R.]; June 1917, [det. G.O.A.] (**BM**!); ST443731 ditch No. 199, 6 April 1989, N.F.S., S.W., E.J.M. (**SLBI**); ST442733 ditch No. 195, c.1993 (S. Wilson *in litt*.); ST442733 ditch No. 195; ST443731 ditch No. 199; ST442733 ditch No. 195, 20 September 1999, N.F.S. *et al*.; ST444732 ditch No. 198, c.1990 (S. Wilson *in litt*.); ST444732 ditch No. 198, c.1993 (S. Wilson *in litt*.); ST444732 ditch No. 198; ST443731 ditch No. 199, 24 July 1995, S.W. [det. N.F.S.]; ST443731 ditch No. 199; ST445734 Bass Pond, 3 October 2001, N.F.S. *et al*.; 11 June 2002, N.F.S.

Chara aspera Deth. ex Willd. Rough Stonewort

White (1887) originally assigned several records to this species, but he subsequently corrected this, saying "I now know that the plants named *C. aspera* in my earlier book [refers to White 1887] should have been placed

[in *C. hispida*]" (White 1912). The only record from v.c. 6 which may represent this species is recorded as "probably this" from the [Bridgwater and Taunton] canal near Bridgwater, again it has not been possible to confirm this record and this species can not be confidently recorded for v.c. 6.

V.C. 6

BEFORE 1994

[ST23 - "Probably this" canal, near Bridgwater (Marshall 1914)].

Chara contraria Kütz. Opposite Stonewort
Synonyms: *C. vulgaris* var. *contraria* (A. Braun ex Kütz.) J. A. Moore, *C. vulgaris* var. *hispidula* (A. Braun) J. A. Moore

C. contraria is probably under-recorded in the region; all records from v.c. 34 were made since 1994 by R.V.L. and determined by N.F.S. It is likely that before 1994 this species was overlooked for *C. vulgaris*. *C. contraria* appears to be widespread but local with populations in calcareous lakes, flooded gravel pits and ditches. It often grows in relatively shallow water at the edge of the waterbodies, typically dying back as water levels fall in summer, to reappear as a dense sward following the first rains of the autumn. Until recently, it was considered nationally scarce (Stewart & Church 1992), but has recently been shown to be more widespread than previously thought (Stewart 2004) and locally frequent in the Thames catchment and East Anglia.

V.C. 6

BEFORE 1994

ST33 - (As *C. vulgaris* var. *contraria*) ST385301 North Moor, Othery, 1986, D.R. [conf. J.A.M.] (**BM**!).

ST47 - Rhine below Clapton-in-Gordano, 1922, C.I.S. [det. G.R.B.-W.] (White 1923; Willis & Jefferies 1959).

1994 ONWARDS

ST45 - ST436540 rather rare, NW corner of Cheddar Reservoir, 3 October 2001, N.F.S.; ST441537, 18 September 2004, B.G. *et al*. [det. N.F.S.] (**BM**!).

ST55 - ST515596 Blagdon Lake, 19 September 2003, B.G. *et al*. [det. N.F.S.] (**BM**!).

- ST569597 Chew Valley Lake, 20 September 2003, B.G. *et al*. [det. N.F.S.] (**BM**!).

V.C. 34

1994 ONWARDS

SO70 - SO753076 flooded, disused gravel pit, Frampton on Severn, 2 September 1995, R.V.L! [det. N.F.S.].

- SO750090 flooded, disused gravel pit, Saul, 2 September 1995, R.V.L [det. N.F.S.] (**RVL**!).

- SO752092, small pond northeast of main gravel pit, Saul, 2 September 1995, R.V.L! [det. N.F.S.].

ST78 - ST717887 deep quarry pool north of Wickwar, 1995, R.V.L! [det. N.F.S.].

ST80 - ST813015 upper (western), large artificial lake, Woodchester Park, 26 June 1995, R.V.L [det. N.F.S.] (**RVL**!).

ST89 - ST899986 Cherington Park Lake, 1995 R.V.L! [det. N.F.S.].

Chara globularis Thuill. Fragile Stonewort
Synonyms: *C. globularis* Thuill. var. *capillacea* (Thuill.) Zaneveld.; *C. globularis* Thuill. var. *hedwigii* (Agardh. ex Bruzelius) J. A. Moore.

C. globularis is widespread and fairly frequent in Britain. Within the region it was recorded from a wide variety of waterbodies. Some records prior to Groves and Bullock-Webster (1924) probably refer to *C. virgata* which had previously been separated only at varietal level. This particularly applies to records given as var. *capillacea* which H. and J. Groves usually applied to specimens now included in *C. virgata*. Some of the apparent decline may be due to a lack of survey or a lack of identification of charophytes to species level during surveys of the Somerset Levels combined with changes in our understanding of the taxonomy of this and *C. virgata*. However, it does appear to have been genuinely lost from a number of sites and if this loss can be confirmed, measures should be identified which could restore populations.

V.C. 6

BEFORE 1994

ST25 - ST295517 pool, Berrow sand dunes, 26 June 1980, M.V.M. [det. J.A.M.] (**BM**).

ST33 - Bridgwater and Taunton Canal, H.S.T. (Murray 1896).

ST34 - In deep water of excavated scrape, Tealham Moor, 1992, R.S.C. (Willis 1992).

ST44 - Turf pits near Ashcott railway station, c. 1902, C.B., D.F., J.W.W. (Bucknall *et al*. 1903); pits on the peat between Ashcott and Shapwick Stations (as var. *capillacea*) (White 1912; Marshall 1914).

ST46 - Kenn Moor (White 1912; Marshall 1914).

ST47 - Near Clevedon, 1883, W.J. (Groves & Groves 1886; Murray 1896; White 1912).

- Ditches, Clapton Moor, c. 1902, C.B., D.F., J.W.W. (Bucknall *et al*. 1903).

ST76 - In canal basins [Bath] (as *C. hedwigii*) (Murray 1896; White 1912).

1994 ONWARDS

ST33 - Southlake Moor: ST36723054, northern end of ditch No. 78 , 20 July 2000, N.F.S., K.P.; 4 October 2001, N.F.S.; ST36813052, ditch No. 79, 1 October 2002, N.F.S.; ST37043045, ditch No. 99N, 4 October 2001, N.F.S.; ST36903034, ditch No. 137E, 23 October 2001, N.F.S.

ST44 - ST414426 ditch north-west of Westhay Level Peat Works, July 1995, S.G!

ST45 - ST441537 Cheddar Reservoir, 18 September 2004, B.G. *et al*. (**BM**!).

ST47 - ST442736, 1997, R.V.L. (RVL!).

- Gordano Valley:

- Walton Moor: 1902 (as var. *capillacea*) (White 1912; Marshall 1914; Willis & Jefferies 1959); ST432727 ditch (No. 46), 5 m altitude, 4 March 1989, N.F.S., E.J.M. (**SLBI**); ST425725 ditch No. 8; ST426725 ditch No. 11; ST430726 ditch No. 20; ST430726 ditch No. 29, 6 April 1989, N.F.S., S.W., E.J.M.; ST431727 ditch No. 46, 4 March 1989, N.F.S., E.J.M. (Willis 1989); ST428724 ditch No. 19, 20 September 1999, N.F.S. *et al*.; ST433730 S end of ditch No. 97, 20 October 2002, N.F.S *et al*.; ST434733 ditch No. 101, 11 June 2002, N.F.S.

- Weston Moor: ST442735 ditch No. 179; ST443736 ditch No. 180; ST443735 ditch No. 186, 6 April 1989, N.F.S., S.W., E.J.M. [conf. J.A.M. 1989] (**SLBI**) (Willis 1989); ST442735 ditch No. 179, 20 September 1999, N.F.S. *et al*.; ST442737 ditch No. 148, 3 October 2001, N.F.S. *et al*.; ST435731 ditch, 11 June 2002, N.F.S.; ST441737 ditch No. 160–162, 24 February 2004, N.F.S.

ST55 - ST515596 Blagdon Lake, 19 September 2003, B. Goldsmith *et al*. [det. N.F.S.] (**BM**!).

- ST569597 Chew Valley Lake, 20 September 2003, B. Goldsmith *et al*. [det. N.F.S.] (**BM**!).

V.C. 34

BEFORE 1994

SO60 - SO620089 neglected lake, dredged c. 10 years ago, Brock Lane, Parkend, 20 June 1984, M.V.M. [det. J.A.M.] (Bailey & Moore 1985; Moore & Bailey 1986).

SO61 - SO662110 pond, Soudley Brook, Forest of Dean, June 1975, D.N.A., M.J.A., S.C.H. [det. J.A.M.] (Moore & Bailey 1986).

SO90 - Canal, Chalford (Riddelsdell *et al*. 1948).

- Pond, Rudgeway, Alveston, 1925 C.T. (White 1926).

ST68 - Froglane Pit, Coalpit Heath, 1955, G.W.G. [det. G.O.A.] (Sandwith & Sandwith 1956; Moore & Bailey 1986).

ST78 - Wickwar – Yate Area:

- [ST776848] field pond near southwest corner of Bodkin Hazel Wood, nr. Horton, 1952, G.W.G. [det. G.O.A.] (Sandwith & Sandwith 1953; Moore & Bailey 1986 as var. *capillacea*).

- Yate Lower Common in a strontium pit, H.J.R. (Riddelsdell *et al*. 1948).

- Wickwar area, 1920, J.W.W. (**BM**); 1917, J.W.W. (**LSR**) (White 1919; Riddelsdell *et al*. 1948; Moore & Bailey 1986).

- ST108857 strontia pit between Yate Court and Leech Pool Farm, Yate, 15 December 1984, A.J.B. [det. J.A.M.] (Bailey & Moore 1985; Moore & Bailey 1986).

- Barbours Court Farm, Wickwar, 10 December 1990, N.F.S. , M.A.R.K., C.K.

ST89 - near White Horse, Avening, 3 July 1926, H.J.T. (**BM**!).

1994 ONWARDS

SO70 - SO753076 flooded gravel pit, Frampton-on-Severn, 2 September 1995, R.V.L [det. N.F.S.] (**RVL**!).

- SO748076 pond, Frampton on Severn, 1977, A.K. [det. J.A.M.] (Moore & Bailey 1986); SO753076 flooded gravel pit, 2 September 1995, R.V.L. (**RVL**!); SO754077 flooded gravel pit, 1995 R.V.L. (**RVL**!).

- SO733056 ditch, New Grounds, Slimbridge, 29 August 1977, A.K. [det. J.A.M.] (Moore & Bailey 1986); SO720048, 1996 R.V.L.

Chara hispida L. Bristly stonewort

C. hispida is sparsely distributed in Britain, becoming rarer northwards and westwards. It has been recorded from a variety of calcareous habitats in the region, most frequently in the Gordano Valley and Somerset Levels, with other scattered records from ponds and larger waterbodies. In 1996, an unidentified stonewort, probably this species, was recorded from ponds in the National Trust Property at Westbury-on-Severn, but subsequent visits in 1997, 2000 and 2002 have failed to find any stoneworts.

This species appears to have declined throughout the region. In v.c. 6, it has only been recorded since 1994 from the Gordano Valley although before 1994 it was apparently widespread in the Somerset Levels. In v.c. 34, it has never been abundant and has only been recorded from scattered pools in the Forest of Dean. Few of these have been surveyed for charophytes in recent years and it is possible that a reasonably healthy population remains in the area.

V.C. 6

BEFORE 1994

ST33 - Ditch, near Weston Zoyland, Kings Sedge Moor, 23 August 1907, E.S.M. (**BM**!, **CGE**!) (Marshall 1914; 1908).

- Nr. Middlezoy, W.W. (Marshall 1914).

- Nr. Othery, G.R.B.-W. (Marshall 1909; 1914).

- Drain near Sedgemoor Cut, May 1899, G.R.B.-W. (Bullock-Webster 1901).

ST45 - Ditches, Clevedon (White 1887 as *C. aspera*, Murray 1896; White 1912, Marshall 1914).

ST46 - Marsh ditch Kenn Moor, 28 September 1903, J.W.W. (**CGE**!); peaty ditch Kenn Moor 17 September 1904, J.W.W. [det. A.B.] (**BEL**!, **BM**!, **CGE** [det. J.G.]!, **E**!, **NMW**!, **OXF**!, **SLBI**!), 17 September 1904, J.W.W. [det. A.B.] (**CGE** [det. J.G.]!, **NMW**!) (Groves 1905; White 1912, Marshall 1914).

- Ditches Yatton (White 1887 as *C. aspera*; Murray 1896; White 1912; Marshall 1914).

ST47 - Ditches, Portbury (White 1887 as *C aspera*; Murray 1896; White 1912; Marshall 1914 gives recorder as E.G.).

- Nailsea Moor, 4 September 1902, J.W.W. (**CGE**!).

- Gordano Valley:

- peaty ditch Clapton Moor, 28 September 1903, J.W.W. (**CGE**!, **NMW**!, **OXF**!) (White 1920); ditch, peaty meadow, 28 September 1903, J.W.W. [conf. G.R.B.-W.) (**E**!) (White 1912).

ST73 - ST705322 Park Wood, south of Redlynch, August 1984, J.G.K [det. J.A.M.] (BRC).

ST76 - "In the canal" [Bath] (Babington 1834; White 1887; 1912); canal between Bath and Bathampton, 4 July 1956, J.P.M.B. (**BM**).

1994 ONWARDS

ST47 - Gordano Valley:

- Walton Moor: 1867, J.D.H. (**BM**) (White 1887; Murray 1896; White 1912; Marshall 1914); 25 June 1849, C.C.B. (**CGE**!); 13 August 1922 F.G. (**LSR**) (Willis & Jefferies 1959); ST444735 ditches, 7 May 1984, A.L. [det. J.A.M.] (**BM**!); ST430730 ditch (No. 137), 5 m altitude, 4 March 1989, N.F.S., E.J.M. (**SLBI**); ST426725 ditch No. 11; ST428724 ditch No. 19; ST430726 ditch No. 20; ST429725 ditch No. 22; ST430726 ditch No. 29, 6 April 1989, N.F.S., S.W., E.J.M.; ST427725 ditch No. 18/18.1; ST429725 ditch No. 22; ST430726 ditch No. 29, 20 September 1999, N.F.S. *et al*.; ST434733 ditch No. 101, 11 June 2002, N.F.S.; ST434727 ditch No. 53, 20 October 2002, N.F.S *et al*.

- Weston Moor: 1903 G.C.D. (**OXF**!); ST443735 ditch No. 186; ST443731 ditch No. 199, 6 April 1989, N.F.S., S.W., E.J.M.; ST443736 ditch No. 180, 30 June 1989, S.W., O.M., [det. J.A.B.]; ST442735, 1997, R.V.L. (**RVL**!); ST442734 ditch No. 193, 6 June 1999, N.F.S., R.V.L.; ST442735 ditch No. 179; ST442733 ditch No. 195; ST443731 ditch No. 199, 20 September 1999, N.F.S. *et al*.; ST442739 ditch No. 169 [det N.F.S.]; ST443731–ST444732, ditch No. 199, 3 November 1999 A.W!; ST440738 ditch No. 159, 24 February 2004, N.F.S.; ST438736 ditch No. 154/155; ST442738 ditch No. 166–168, 11 June 2002, N.F.S.; ST441734 ditch No. 176; ST441735 ditch No. 176A; ST442735 ditch No. 179, 6 June 1999, N.F.S., R.V.L.; ST441734 ditch No. 184; ST443731 ditch No. 199; ST444732 ditch No. 206; ST445734 Bass Pond, 3 October 2001, N.F.S. *et al*.; ST445734 Bass Pond, 11 June 2002, N.F.S.; ST442734 ditch No. 193, 20 October 2002, N.F.S *et al*.

V.C. 34

BEFORE 1994

SO61 - SO644124 pond near Lightmoor Pond, Ruspidge, 31 August 1977 A.K. [det. J.A.M.] (BRC); Lightmoor Colliery, Ruspidge, 1980, A.O. (Moore & Bailey 1986); SP642122 Lightmoor Pond, October 1980 S.C.H. [det. J.A.M.] (**BM**); 1994 C.W., D.H. (English Nature 1994).

SO71 - [probably this] Water garden ponds, Westbury Court, Westbury-on-Severn,

1973, S.C.H., K.E.L. [det. R.H.B.] (Holland 1974, Moore & Bailey 1986).

1994 ONWARDS

SO61 - Crabtree Colliery, Cinderford, 2 October 1980 A.O. (Bailey & Moore 1985, Moore & Bailey 1986); SP639134, December 1997, R.V.L!

Chara virgata Kütz. Delicate stonewort
Synonym: *C. delicatula* Agardh; *C. globularis* var. *virgata* (Kütz.) R.D. Wood

C. virgata is widespread and frequent throughout Britain, particularly in the west. In the region, it appears to be mainly an early colonizer of new waterbodies, particularly worked strontium pits and farm pools in the Wickwar area and it is possible that it tends to decline after a few years as a result of competition from other charophytes and vascular plants. It is still frequent in ditches in the Gordano Valley where it prefers the more peaty substrates. Whilst many of the pools from which it has been reported have been lost to development or in filled for agriculture in recent years, this is still one of the most frequently recorded charophytes in the region and there is no real evidence of a decline.

Forms with well developed stipulodes and more prominent spine cells have been recorded from Shapwick and the Gordano Valley as *C. delicatula* Desv. var. *barbata* (Ganterer) J. Groves and Bull.-Webst.

V.C. 6

BEFORE 1994

ST43 - Moor ditch below Compton Dundon, 14 July 1891, R.P.M. (as *C. fragilis*) (**BM**!, **MANCH**!) (Murray 1896).

ST44 - Shapwick Moor, 10 May 1899, G.R.B.-W. (**CGE**); Shapwick, 1953, A.J.D. (as *C. delicatula* var. *barbata*), [det. G.O.A.] (Sandwith & Sandwith 1954, Wallace 1954).

- Pond near Shapwick Station, 8 August 1937, J.P.M.B., C.I.S. (**BM**).

ST47 - Nailsea Moor (White 1912 as *C. globularis*, Marshall 1914); 10 September 1921 (as *C. fragilis*) H.S.T., C.I.S. *et al.* (**BM**!).

1994 ONWARDS

ST47 - Gordano Valley: rhines, 1925, [det. J.G.] (White 1926, Willis & Jefferies 1959)

- Walton Moor: ST431731 ditch No. 138, Walton Moor, 5 m altitude, 4 March 1989, N.F.S., E.J.M. (SLBI) (Willis 1989); ST425725 ditch No. 8; ST426725 ditch No. 11 (Willis 1989); ST428724–ST427724, ditch No. 19 (Willis 1989); ST427724–S427725 ditch No. 18/18-1 (Willis 1989); ST429725 ditch No. 22, 6 April 1989, N.F.S., S.W., E.J.M.; ST427725 ditch No. 18/18.1 [det. J.A.B.]; ST428724 ditch No. 19, 29 June 1989, S.W., O.M., [det. J.A.B.]; ST436734 ditch near 107, 30 June 1989, S.W., O.M., [det. J.A.B.]; ST425726 ditch No. 6, 11 March 1992, S.W. [det. J.A.B.] (in J. A. Bryant correspondence file); ST427725 ditch No. 18/18.1, 20 September 1999, N.F.S. *et al.*; ST434727 ditch No. 53; ST435727 ditch No. 54, 20 October 2002, N.F.S. *et al.*

- Weston Moor: Weston-in-Gordano (as *C. delicatula* var. *barbata*), 1903, G.C.D. (**OXF**!) (Groves & Bullock-Webster 1924); ST444735, 7 May 1984, A.L. [det. J.A.M.] (**BM**); ST438734 peaty ditch No. 171, Weston Moor, 5 m altitude, 5 March 1989, N.F.S. (**SLBI**) (Willis 1989); ST443737 ditch No., 147 (Willis 1989); ST442738 ditch No. 167 (Willis 1989); ST443737–ST443738, ditch No. 168 (Willis 1989); ST439734 ditch No. 171N; ST442735 ditch No. 177 (Willis 1989); ST442735, ditch No. 179, 6 April 1989, N.F.S., S.W., E.J.M. (Willis 1989); ST443736 ditch No. 180, 30 June 1989, S.W., O.M., [det. J.A.B.]; ST442734, ditch No. 193, 11 March 1992, S.W. [det. J.A.B.] (in J. A. Bryant correspondence file); ST442736 Weston Moor, 15 May 1997 R.V.L. (**RVL**!); ST441734 ditch No. 176; ST441736 ditch No. 177; ST442735 ditch No. 179; ST443731 ditch No. 199, 6 June 1999, N.F.S., R.V.L.; ST442734 ditch No. 185; ST442733 ditch No. 195; ST444732 ditch No. 206, 20 September 1999, N.F.S. *et al.*; ST441734 ditch No. 184; ST442734 ditch No. 193; ST444732 ditch No. 206; ST445734 Bass Pond, 3 October 2001, N.F.S. *et al.*; ST441737 ditch No. 160–162; ST446733 W of ditch No. 212.1; ST445734 Bass Pond; ST445733 Pool S of Bass Pond, 11 June 2002, N.F.S.; ST442734 ditch No. 193, 20 October 2002, N.F.S. *et al.*; ST438738 ditch No. 121–124; ST441737 ditch No. 160–162, 24 February 2004, N.F.S.

- Ditch, Clapton Moor ST454735, 3 November 1999, A.W!; rare, ditch, Clapton Moor ST460734, 3 October 2001, N.F.S. *et al.*

- ST52503611 Butt Moor, ditch No. 1, 23 July 2003, N.F.S, E.J.M. *et al.*

V.C. 34

BEFORE 1994

SO68 - Wickwar – Yate area: – Pond, Coal Pit Heath, Froglane, 21 September 1910, J.W.W. (**CGE**) (Riddelsdell *et al*. 1948 – as Coalpit Heath is probably this record).

SO6878 - Kingsgate Park, by Stanshawe's Court, Yate, 1978, G.W.G. (Willis 1978, Moore & Bailey 1986).

SO80 - SO8902 Thames and Severn Canal (Riddelsdell *et al*. 1948).

SO90 - SO9002 Thames and Severn Canal (Riddelsdell *et al*. 1948).

ST78 - Wickwar – Yate area: – various times in at least seven ponds, including Goosegreen Farm, nr. Yate [det. H. & J.G.] (White 1912; Riddelsdell *et al*. 1948).

- pond, north east of Lance Coppice, Inglestone Common, 1953, G.W.G. (Moore & Bailey 1986)

- strontia pits, Goose Green, Yate, 1953, G.W.G. (Moore & Bailey 1986)

- standing water on old mineral railway, Froglane, Mayshill, 1954, G.W.G. (Moore & Bailey 1986)

- mill pond, Whitwell Bottom, Lower Kilcot, 1955, G.W.G. (Moore & Bailey 1986)

- pond on the skirt of Yate Lower Common, south of Hall End, 4 June 1917, J.W.W. (as *C. fragilis*) (**RNG**!).

- Yate ST718825, 7 May 1955 H.J.M.B! (**RNG**!).

- pool in an old clay pit between Rangeworthy and Hall End, 16 July 1910 J.W.W. [det. H. & J.G.] (Moss 1911).

ST96 - Gall Pond, Tortworth, A.J.B.

1994 ONWARDS

SO70 - SO750091 flooded gravel pit, Saul, 2 September 1995, R.V.L!

SO80 - SO816015 old pond, Woodchester Park, 28 August 1995 R.V.L.

ST78 - Wickwar – Yate area:

- Yate Court, 1954, (Moore & Bailey 1986); ST710860 Yate Court, 1995, R.V.L!

- ST702884 [Newland's Farm], 14 June 1978 R.H.B., J.A.M. (**BM**) (Willis 1978, Moore & Bailey 1986); ST703883, 10 February 1990 N.F.S., M.A.R.K., C.K.; ST702883, 19 August 1995 R.V.L!; ST702884, 19 August 1995, R.V.L!; ST703883, 19 August 1995 R.V.L.

- ST710859, 19 August 1995, R.V.L!

ST89 - ST870992 Lake, Longford's Mill, near Nailsworth, 9 June 1997, R.V.L.

Chara vulgaris L. Common Stonewort

C. vulgaris is frequent in Britain, particularly in the lowlands. It is the most widespread and frequently recorded stonewort in the region. It occurs in most types of waterbody, even in shallow, still backwaters of flowing rivers. It appears very capable of colonising newly created ponds, particularly in lime-rich areas, tolerating some competition from other charophytes and vascular plants such as *Lemna minor* (Common Duckweed), *Zannichellia palustris* (Horned Pondweed) and *Elodea canadensis* (Canadian Waterweed). Within the region, it probably has the most stable population size of all the stoneworts, colonising new waterbodies as other populations decline and disappear. Although there are fewer records in the region since 1994 than before, this is likely to be mainly due to a lack of survey and, when the abundance of the three common varieties is taken into consideration, there is no evidence to suggest that it is declining.

No detail is given of the status of the varieties of *C. vulgaris*; the varieties tend only to be identified occasionally and almost never on a systematic basis. It is therefore difficult to interpret apparent changes. It is likely that many of the records listed as *C. vulgaris* s.l. refer to *C. vulgaris* var. *vulgaris* however this was not specified on information relating to the record.

V.C. 6

BEFORE 1994

ST23 - Bridgwater, H.S.T. (Murray 1896).

ST2535 - Pond, Brean, 3 August 1882, R.P.M. (BM) (Murray 1896); 16 September 1906, H.S.T. (**BM**).

ST33 - Weston Zoyland, 1907, E.S.M. (Marshall 1908; 1914).

- ST370305 Burrow Mount, 12 July 1987, M.A.R.K., C.K.

ST34 - Near Edington Burtle, 8 June 1835, (possibly also var. *longibracteata* referred to as recorded by W.B.W. in White 1912) T.C. (**BM**) (White 1912; Marshall 1914).

- Ditch, Edington Junction, 23 August 1915, E.S.M. (**BM**).

- Mark Moor, 1915, C.I.S. [det. G.O.A.] (Sandwith & Sandwith 1958).

- Burnham, W.B.W. (White 1912).

ST36 - ST3868 Rhine, Kingston Seymour, 16 April 1981, P.M.W. (**PMW**!).

- ST345610 ditch, north of Weston Airport, Weston-Super-Mare, 1990, J.N!

- ST383638 rhyne near West Hewish, 17 February 1990, M.A.R.K., C.K!

- ST392604 southern side of track near Woolvershill Batch, Banwell, 17 February 1990, M.A.R.K., C.K!

ST43 - King's Sedge Moor, 13 August 1883, R.P.M. (**BM**).

ST44 - ST4145 Tadham Moor, 4 June 1979, M.A.P. (BRC).

- Ditch near Catcott Burtle, 3 August 1937, J.P.M.B., C.I.S. (**BM**).

ST45 - Clevedon, D.F. (Murray 1896; White 1912).

ST46 - Moor ditches, Yatton (White 1912).

- Kenn Moor, 11 October 1953, C.I.S., N.Y.S. [det. G.O.A.] (**BM**) (Sandwith 1962).

ST47 - Nailsea Moor, 1949, C.I.S. [det. G.O.A.] (Wallace 1950); ditch on Nailsea Moor, 27 July 1914, J.W.W. [det. J.G.] (Britton 1918).

ST53 - Kingweston (Murray 1896).

ST56 - Reservoir, Barrow Gurney, 6 October 1933, H.S.T. (**BM**).

- Quarry pool, Hartcliff Rocks, I.M.R. (White 1912; Marshall 1914).

ST63 - Pond, Bruton, September 1936, F.K.M. (**BM**).

ST65 - Old coal canal, Camerton (White 1912).

ST73 - Roadside pond near Penselwood, 20 July 1891 R.P.M. (**BM**) (Murray 1896).

ST76 - "In the canal" Bath (Babington 1834; Murray 1896).

1994 ONWARDS

ST25 - Dune slacks near Berrow (White 1912; Marshall 1914); [ST2952] pond, 20 May 1929, J.E.L. (**BM**); 20 September 1950, C.I.S. (**BM**); Pool west of church, 1992 R.S.C. (Willis 1992).

ST33 - Ditches Southlake Moor: ST36393048, ditch No. 53; ST374302 ditch No. 120, June 1998, R.V.L., S.J.L., K.P., L.W.; ST36243055, ditch No. 1; ST36313057, ditch No. 3; ST36733050, ditch No. 58; ST36913057, ditch No. 61; ST36723054, ditch No. 78, N end; ST37003053, ditch No. 81; ST36813037, ditch No. 95; ST36853038, ditch No. 96; ST36983045, ditch No. 98; ST37043045, ditch No. 99N, 20 July 2000, N.F.S., K.P.; ST36193025, ditch No. 64; ST36333026, ditch No. 85, 26 July 2000, N.F.S., P.W., K.P.; ST36723054, ditch No. 78, N end; ST36983045, ditch No. 98; ST37043045, ditch No. 99N, 4 October 2001, N.F.S.; ST36373030, ditch No. 88; ST36903034, ditch No. 137E; ST36783030, ditch No. 147 23, October 2001, N.F.S.; ST36313027, ditch No. 86; ST37413027, ditch No. 120; ST36903034, ditch No. 137E; ST37062984, ditch No. 194 19, September 2003, N.F.S.

- ST308392 roadside ditch in N. edge of Bridgwater, 26 July 2004, N.F.S.

ST42 - ST483260 trial pit, in Appledoor Quarry, 10 May 2002, M.R.H!

ST44 - Tealham Moor: ST40794520 ditch No. 1, 9 May 2003, N.F.S.; ST40644540 ditch No. 3, 23 February 2004, N.F.S.; ST40504521 ditch No. 6, 23 February 2004, N.F.S.; ST40804520 ditch No. 10, 9 May 2003, N.F.S.; ST40794509 ditch No. 11, 10 June 2004, N.F.S.; ST40644524 ditch No. 12, 9 May 2003, N.F.S.; ST40924505 ditch No. 13, 9 May 2003, N.F.S.; ST41024515 ditch No. 14, 9 May 2003, N.F.S.; ST41084527 ditch No. 15, 9 May 2003, N.F.S.; ST41144520 ditch No. 16, 9 May 2003, N.F.S.

ST47 - Gordano Valley: 1914, C.I.S. [det. G.O.A.].

- Walton Moor: ST430730 ditch No. 137, 4 March 1989, N.F.S., E.J.M.

- Weston Moor: ST439734 ditch No. 171N; ST443736 ditch No. 180, 5 March 1989, N.F.S.; ST441736 ditch No. 177; ST442735 ditch No. 179; ST442737 ditch No. 148; ST442738 ditch No. 166–168; ST443735 ditch No. 186; ST443736 ditch No. 180; ST443737 ditch No. 147, 6 April 1989, N.F.S., S.W., E.J.M.; ST439734 ditch No. 171N; ST443736 ditch No. 180, 30 June 1989, S.W., O.M. [det J.A.B]; ST443731 ditch No. 199, 6 June 1999, N.F.S., R.V.L.; ST445737 ditch No. 191, 3 November 1999, [det N.F.S.]; ST443731 ditch No. 199, 20 September 1999, N.F.S. *et al*.; ST438736 ditch No. 154/155; ST438738 ditch No. 121–124; ST442738 ditch No. 166–168; ST443737 by E end of ditch No. 147; ST444736 ditch No. 192; ST444738 ditch No. 181; ST445734 Bass Pond, 11 June 2002; ST446733 ditch No. W of 212.1, 11 June 2002, N.F.S.; ST438738 ditch No. 121–124, 24 February 2004, N.F.S.

- ST493738 Cattle trough near Downs School, 2002, P.M!

ST53 - Butt Moor: ST52563606 ditch No. 2, 26 July 2000, N.F.S., P.W.; ST52563606

ditch No. 2, 23 October 2001, N.F.S.; ST52623609 ditch No. 3; ST52613600 ditch No. 4; ST52573614 ditch No. 5; ST52673614 ditch No. 6, 10 October 2002, N.F.S.; ST52503611 ditch No. 1; ST52503585 ditch No. 8; ST52563606 ditch No. 2; ST52223608 ditch No. 11; ST52173610 ditch No. 12; ST52213615 ditch No. 13, 23 July 2003, N.F.S., E.J.M. *et al*.; ST52513589 ditch No. 7; ST52463583 ditch No. 9; ST52663563 ditch No. 10, 17 September 2003, N.F.S.

ST55 - ST515596 Blagdon Lake, 19 September 2003, B. Goldsmith *et al*. [det. N.F.S.] (BM!).

ST58 - ST530807 New mitigation ponds, Avonmouth, 1999, V.H!

V.C. 34

BEFORE 1994

SO50 - SO565065 Clearwell Quarry, 27 July 1986, S.H.B, S.C.H. [det. J.A.M.] (BRC).

SO51 - Jugshole Pool, Coleford, 1980, S.C.H., M.J.A. [det. A.O.] (Moore & Bailey 1986).

SO60 - SO612033 lake, Lydney Park, 1980, A.K. [det. J.A.M.] (Moore & Bailey 1986).

- pond in marshy field by River Severn, Poulton Court Farm, Awre, 1988, S.C.H. [det. J.A.M.].

SO61 - Speech House (Riddelsd. *et al*. 1948).

- SO695067 Shallow pools on track, Lennetshill Plantation, Cinderford, 1980, A.O. (Bailey & Moore 1985).

- Shallow calcareous pool and ditch, Crabtree Plantation, Cinderford, 1980, A.O. (Bailey & Moore 1985).

- Soudley valley, H. (Riddelsdell *et al*. 1948); SP662116 Upper Soudley pool, August 1976, S.C.H. [det. J.A.M.] (BRC); 1994 C.W., D.H. (English Nature 1994); 1994, C.W., D.H. (English Nature 1994).

SO70 - SO733056 ditch, New Grounds, Slimbridge, 29 August 1977, A.K. [det. J.A.M.] (BRC).

- Nupend (Riddelsdell *et al*. 1948).

SO71 - Highnam (Riddelsdell *et al*. 1948).

- Arlingham (Riddelsdell *et al*. 1948).

SO72 - Pond near Newent Canal (as *C. hispida*), G.A.O.B. (Riddelsdell *et al*. 1948).

SO80 - Woodchester Park, H.P.R. (Riddelsdell *et al*. 1948).

SO90 - Pool by canal above Chalford, H.P.R. (Riddelsdell *et al*. 1948).

ST57 - Quarry pools, Eastfield, Westbury-on-Trym (White 1887; 1912).

- Ponds, Durdham Down and Shirehampton (White 1912).

ST67 - Brickworks ponds, Shortwood, Mangotsfield, 1955, G.W.G. (Moore & Bailey 1986); 28 October 1964, D.M.-S. [det. S.P.P.] (Moore & Bailey 1985).

- Duchess Ponds, Stapleton (White 1912).

- Ditch, Siston Common, 1882, D.Ha. (White 1887; 1912); 1920 D.Ha. (White 1912).

ST68 - Standing water on old railway, Froglane, Mayshill, 1964, G.W.G. (Moore & Bailey 1986).

- Woodlands, Patchway I.M.R. (Riddelsdell *et al*. 1948).

ST69 - ST633977 newly dug pond north of Hill Pill, 16 November 1986, M.A.R.K., C.K!; ST628973 newly dug pond, Hill Pill, 16 November 1986, M.A.R.K., C.K!

ST75 - [ST7159] canal near Dunkerton (as *C. contraria*), 25 June 1910, C.B., J.W.W. [det. H. & J.G.] (**BM**, **MANCH**! specimen labelled *C. fragilis* probably misprint) (Moss 1911; White 1912; Marshall 1914).

ST78 - Wickwar – Yate area: ST791888 mill pond, Whitewell Bottom, Lower Kilcot (Riddelsdell *et al*. 1948); ST7183, 1910, J.W.W. (**CGE**! - probably the same record, located by C.B. and preserved by J.W.W.); 1953, (Moore & Bailey 1986); 1955, G.W.G. (Moore & Bailey 1986).

ST79 - ST786932 sunny pond, Newark Park Estate, May 1984, M.S., W.L. (Clements *et al*. 1985); ST786932 pond, Newark Park, 16 May 1985, W.L. [det. J.A.M.] (BRC).

ST88 - Ornamental Lake, Westonbirt School, 1984, R.H.B. (Bailey & Moore 1985, Moore & Bailey 1986).

ST89 - Cherington Park Lake (Riddelsdell *et al*. 1948); ST898986, 7 July 1977, R.H.B., J.A.M. [det. J.A.M.] (**BM**) (Moore & Bailey 1986).

- Pond, Midland Fishery, Nailsworth, 2 September 1949, D.F.L. (**BM**) (Moore & Bailey 1986).

- Pond near White Horse, Avening, 3 July 1926, H.J.R. (as *C. fragilis*) (**BM**!) (Riddelsdell *et al*. 1948).

1994 ONWARDS

SO61 - SO639134 Crabtree Colliery, Cinderford, December 1997, R.V.L!

SO70 - Frampton Pools SSSI, 1993, C.W., A.H. (English Nature 1994); Frampton Sailing Lake, 1993, C.W., A.H. (English Nature 1994); SO753076 flooded gravel pit, 1995, R.V.L.

- SO750090 flooded gravel pit, Saul, 1995, R.V.L.

SO72 - SO713266 pond nr. Newent, 31 August 1998, R.V.L.

SO80 - Thames and Severn Canal: SO858042 Brimscombe, 27 July 1997, R.V.L.; SO848051 Stroud, 1997, R.V.L.; SO8104 Ebley, 7 October 2003 R.V.L.

- SO85810203 small, spring-fed pool used by cattle, Black Ditch, edge of Minchinhampton Common, 14 January 2004, D.C.

SO90 - SO967004 abundant in Severn and Thames Canal near Coates, 1997, R.V.L. (**RVL**!)

ST69 - ST674976 pond, Whitcliff Deer Park, near Ham, 1997, M.A.R.K., C.K., B.A.G.

ST78 - Wickwar – Yate area:

- ST710859 Yate Court, 1954, (Moore & Bailey 1986);

- ST716888 margin of deep quarry pool, 1995, R.V.L

- ST703883 pond, Newland's Farm, 1995, R.V.L

- ST757883 pond east of Lance Coppice, 1953, G.W.G. (Moore & Bailey 1986); 1995, R.V.L.; 1996, R.V.L.; 1997, R.V.L.; 1998, R.V.L.; 5 June 1999, N.F.S., R.V.L.

ST79 - ST771939 lake, Tyley Bottom, 1978, R.H.B., J.A.M. [det. J.A.M.] (Moore & Bailey 1986); ornamental lake, Tyley Bottom, 1984, R.H.B., J.A.M. (Bailey & Moore 1985); ST775942 recently dug farm pond, Tyley Bottom, 1996, R.V.L.

ST89 - ST803973 new pond at the top of the stream entering Owlpen Valley, 1997, R.V.L.; newly created pond on site of old dew pond on farm adjacent to Owlpen Manor, 2003, R.W. (supplied by M. Palfrey) [det. M.A.R.K].

- Marl pool, Ruskin Mill, 1 June 1996, J.J.D!

var. *crassicaulis* (Schleich. ex A. Braun) Kütz.

V.C. 6 or 34 (the vice county boundary runs through the middle of the reservoir)

BEFORE 1994

ST77 - Monks Wood Reservoir, Bath, 1928 C.I.S. [det. J.G.] (White 1928).

var. *longibracteata* (Kütz.) J. Groves and Bull.-Webst.

V.C. 6

BEFORE 1994

ST47 - Gordano Valley:

- Walton Moor: ST430730 ditch No. 137, 5 m altitude, 4 March 1989, N.F.S., E.J.M. (**SLBI**).

- Weston Moor: ST445737 3 November 1999, A.W!; ST442738 ditch No. 166–168, 6 April 1989, N.F.S., S.W., E.J.M.; ST442735 ditch No. 179, 6 April 1989, N.F.S., S.W., E.J.M.

ST57 - Pond between Bedminster and Whitchurch, 1882 (White 1887; Murray 1896; White 1912).

1994 onwards

ST33 - Southlake Moor: ST36933040, ditch No. 97 20 July 2000, N.F.S., K.P.

ST44 - Tealham Moor: ST40604551 ditch No. 8; ST40704545 ditch No. 9, 23 February 2004, N.F.S. ; ST40794509 ditch No. 11, 9 May 2003, N.F.S.

- ditch Clapham Moor ST454735, 3 November 1999 A.W!

V.C. 34

BEFORE 1994

SO70 - Frampton on Severn (Riddelsdell *et al*. 1948); SO748071 at edge of Blue Pool, Frampton Pools, 25 June 1976, J.A.M. (Moore & Bailey 1978); SO748076 pond, 29 August 1977, A.K. [det. J.A.M.] (Moore & Bailey 1986).

ST66 - Pond, Bitton, 18 June 1914, I.M.R. [det. J.G.] (**BM**) (Riddelsdell *et al*. 1948).

ST67 - Wickwar – Yate area: Newly dug ditch, Siston Common, 2 October 1962, D.M.-S. [det. S.P.P.] (Bailey & Moore 1985, Moore & Bailey 1986).

ST78 - Wickwar – Yate area:

- Ponds, Little Sodbury End, Sodbury Common, 1953, G.W.G. (Sandwith & Sandwith 1954, Moore & Bailey 1986).

- Inglestone Common, 1953, G.W.G. (Sandwith & Sandwith 1954).

- Horton, 1953, G.W.G. (Sandwith & Sandwith 1954, Moore & Bailey 1986).

1994 ONWARDS

SO80 - SO816015 ornamental lake, Woodchester Park, 28 August 1995, R.V.L.

ST69 - ST638931 rhyne near Duckhole, 1996, R.V.L. (**RVL**).

ST78 - Wickwar – Yate area:

- ST743851, one stem, pond by Vinney's Lane, 5 June 1999, N.F.S., R.V.L.

- ST729835 newly dug ornamental ponds, Yate Golf Course, 1997, R.V.L.

ST89 - ST899986 Cherington Lake, 23 August 1995, R.V.L!

var. *papillata* Wallr. ex A. Braun.

V.C. 6

BEFORE 1994

SO60 - SO695067 [pond in marshy field by R. Severn, Poulton Court Farm, Awre] 4 June 1998, S.C.H. [de. J.A.M.] (J. A. Bryant correspondence file).

ST23 - Clay pit, near Bridgwater, August 1899, G.R.B.-W. (Bullock-Webster 1901, Marshall 1914).

ST44 - Shapwick Moor (White 1912; Marshall 1914).

ST47 - Nailsea Moor, 10 September and 17 September 1904, J.W.W. [det. H. & J.G.] (**BM**, **NMW** recorded as var. *longibracteata*!, **E** det. A.B!) (Roper 1918); ditch, 1914, J.W.W. [det. J.G.] (**BM**) (Britton 1918); 1948, C.I.S. [det. G.O.A.] (Wallace 1950; Sandwith & Sandwith 1950).

- Gordano Valley:

- ST458736 abundant along ditch, Clapton Moor, 3 October 2001, N.F.S. *et al*.

- Ditch between Portbury and Portishead, 1889, (White 1912; Marshall 1914).

- Tickenham Moor (White 1912; Marshall 1914).

ST55 - Blagdon Lake, 1937, H.S.T. (**BM**).

ST56 - Ponds under Dundry Hill, 1886, [probably this specimen collected by] J.W.W. [det. H. & J.G.] (Groves & Groves 1887; White 1912).

ST75 - ponds in Prior Park, nr. Bath (White 1912; Marshall 1914).

1994 onwards

ST33 - ST36863056, ditch No. 60E 26 June 1998, R.V.L., S.J.L., K.P., L.W.

- ST394327 ditch beside drove near Sowy River, 2003, E.J.M. *et al*.

ST47 - ST457737 Clapton Moor, 2003, P.M!

- Gordano Valley:

- Walton Moor, 1901, J.W.W. [det. H. & J.G.] (**CGE**) (White 1912; Marshall 1914); ditch, September 1935, G.O.A. (**BM**) (Sandwith & Sandwith 1958, Willis & Jefferies 1959); ST443736, 1989, S.W. [det. J.A.M.]; ST439734, 1989, S.W. [det. J.A.M.]; ST434733 ditch No. 101, 11 June 2002, N.F.S.

- Weston Moor: ST439735 in a recently cleared peaty ditch No. 171 with some iron ochre, Weston Moor, near Weston in Gordano, 5 m altitude, 5 March 1989, N.F.S., S.W. [conf. J.A.M. 1989] (Willis 1989); ST439734 ditch No. 171N, 6 April 1989 , N.F.S., S.W., E.J.M.; ST442733 ditch No. 195, 20 September 1999, N.F.S. *et al*.

ST55 - ST569597 Chew Valley Lake, 20 September 2003, B. Goldsmith et al. [det. N.F.S.] (**BM**!).

V.C. 34

BEFORE 1994

SO61 - Pond, Cannop, 12 July 1976, [det. J.A.M.] (BRC).

SO70 - SO748071 at edge of Blue Pool, Frampton Pools, 25 June 1976, J.A.M., R.H.B. (Moore & Bailey 1977, Moore & Bailey 1978 as recorded by J.A.M.).

SO80 - Thames and Severn Canal, Brimscombe, 1953, J.E.L. [det. G.O.A.] (Moore & Bailey 1986).

SO90 - Lake, Misarden Park [as Miserden, however this spelling refers to the village], 1977, A.K. (Moore & Bailey 1986).

- Pool by canal above Chalford, H.P.R. (Riddelsdell *et al*. 1948).

ST58 - Water tank, Filton aerodrome, 7 October 1948, D.McC. [det. G.O.A.] (**RNG**!).

ST78 - Wickwar – Yate area:

- Ponds, Little Sodbury End, Sodbury Common, 1953, G.W.G. (Sandwith & Sandwith 1954, Moore & Bailey 1986).

- Kingrove Common, Chipping Sodbury, 1954, G.W.G. (Moore & Bailey 1986).

- Inglestone Common, 1953, G.W.G. (Sandwith & Sandwith 1954)

- Goosegreen Farm, Yate, C.B. (White 1912; Riddelsdell *et al*. 1948).

- ST716817 pool on strontium-rich marl at c. 200 ft., Yate, 1 November 1954, H.J.M.B. [det. G.O.A.,] (**RNG**!).

1994 ONWARDS

SO80 - SO816015 ornamental lake, Woodchester Park, 28 August 1995, R.V.L; 1998 RVL!

ST78 - Wickwar – Yate area:

- Goosegreen Farm, Yate Court, 5 October 1910, J.W.W. (**CGE**); ST709858 strontium pit, 1995, R.V.L. (**RVL**!);

- ST710859 strontium pit, 19 August 1995, R.V.L!; ST708858 strontium pit near Yate Court, 1996 R.V.L. (**RVL**!).

- ST717887 margin of deep quarry pool, The Cliffs, Wickwar, 19 August 1995, R.V.L!

- ST729835 newly dug ornamental ponds, Yate Golf Course, 1997, R.V.L.

- ST757883 pond east of Lance Coppice, 1996, R.V.L. (**RVL**!).

ST79 - ST733967 trout pond, North Nibley, 1996, R.V.L. (**RVL**!).

ST89 - ST899986 Cherington Lake, 23 August 1995, R.V.L!

var. *vulgaris*.

V.C. 6

BEFORE 1994

ST47 - Nailsea Moor, 10 September 1904, J.W.W. [det. H. & J.G.] (as var. *crassicaulis* det. as *C. vulgaris* J.G.) (**BM**!, **E** det. A.B!) (Roper 1918); ST444704 ditches, 25 January 1975, I.F.G. [det. J.A.M.] (BRC).

ST47 - Gordano Valley: ST442735, ditch (No. 179), 6 April 1989, N.F.S., S.W., E.J.M.; ST443735 - ST442734, ditch (No. 186), 6 April 1989, N.F.S., S.W., E.J.M.

- ST431731 ditch (No. 137), Walton Moor, 5 m altitude, 4 March 1989, N.F.S., E.J.M. (SLBI).

- Weston Moor: ST442735 ditch (No. 177), 6 April 1989, N.F.S., S.W.; ST442737–ST443737, (ditch No. 148), 6 April 1989, N.F.S., S.W. (**SLBI**); ST442738 ditch (No. 167), 6 April 1989, N.F.S.; ST438734 peaty ditch (No. 171), 5 m altitude, 5 March 1989, N.F.S. (**SLBI**); ST443736 peaty ditch (No. 180), 5 m altitude, 5 March 1989, N.F.S. (**SLBI**); ST443737 ditch (No., 147), 6 April 1989, N.F.S., S.W.

- Portbury, 24 October 1902, C.B. [det. A.B.] (**BM**); ditch, Portbury Marsh, October 1907, C.B. (**BM**).

ST56 - pond between Bedminster and Whitchurch, 1882 (White 1887; Murray 1896; White 1912).

V.C. 34

BEFORE 1994

ST78 - Goosegreen Farm, Yate, C.B. (White 1912; Riddelsdell *et al*. 1948).

ST79 - ST774948 pond, Cotswold Edge Golf Club, Wotton-under-Edge, 21 January 1985, S.C.H. [det. J.A.M.] (BRC).

1994 ONWARDS

SO80 - SO816015 ornamental lake, Woodchester Park, 28 August 1995, R.V.L; 1998 RVL!

ST78 - ST710859 strontium pit, 19 August 1995, R.V.L!

- ST729835 newly dug ornamental ponds, Yate Golf Course, 1997, R.V.L.

- ST757883 pond east of Lance Coppice, 1996, R.V.L. (RVL!).

ST79 - ST733967 trout pond, North Nibley, 1996, R.V.L. (**RVL**!).

ST89 - ST899986 Cherington Lake, 23 August 1995, R.V.L!

NITELLOPSIS HY.

Nitellopsis obtusa (Desv.) J.Groves Starry stonewort

Red List - Vulnerable.

A large and apparently healthy population of this species was located in a flooded gravel pit on the Frampton Pools SSSI (v.c. 34) in 1995. In 2003, populations were found in Chew Valley Lake and Blagdon Lake (both in v.c. 6), in 2004 a population was found just outside the region, in the Cotswold Water Park and in late 2004 another population was found in a flooded gravel pit in Lincolnshire. These comprise the only known sites in Britain apart from the Norfolk Broads. These discoveries over quite a short period suggest that this species may be a new arrival and be spreading. However, *N. obtusa* tends to be limited to fairly deep water and is therefore only found by people sampling beyond the margins who are aware of the diagnostic features. It is therefore also possible that it has been overlooked.

V.C. 6

1994 ONWARD

ST55 - ST515596 Blagdon Lake, 19 September 2003, B.G. *et al*. [det. N.F.S.] (**BM**!).

- ST569597 Chew Valley Lake, 20 September 2003, B.G. *et al*. [det. N.F.S.] (**BM**!).

V.C. 34

1994 ONWARDS

SO70 - SO753076 Frampton Pools, probably this species, recorded as *Nitella flexilis*, 1993 C.W., A.H. (English Nature 1994); SO753076, September, 1995, R.V.L (**RVL**!); 9 January 1996 R.V.L. (**RVL**!).

NITELLA C. AGARDH.

Nitella mucronata A. Braun (Miguel) Pointed stonewort.

N. mucronata has been recorded from several sites in the region but populations have been found at only two since 1994. It is likely that all of the records refer to var. *gracillima*. The type locality for this variety was in a pool created by strontium extraction near Wickwar (variously “In a small pond nearly six feet deep of clear land water” (Moore & Bailey 1985), “Wickwar area”, “pond near Wickwar” “small deep pond near Rangeworthy” by I. M. Roper). Ponds in the area which probably provided the

type specimen were destroyed for development in late 1996. This species is nationally scarce but seems to have increased in recent years, particularly in renovated canals and it is possible that the var. *gracillima* is not native (Stewart 2004).

V.C. 6

BEFORE 1994

ST43 - ST463394 ditch, Street Heath, 8 June 1975 P.M.W. [det. J.A.M.] (BRC); August 1989 C.F. and J.G.K [det. J.A.M.] (BRC).

V.C. 34

BEFORE 1994

ST78 - ST708855 [north of the Leech Pool], Wickwar area, 1984 A.J.B. [det. J.A.M.] (**BM**).

Nitella mucronata (A. Braun) Miq. var. *gracillima* J. Groves and Bull.-Webst.

V.C. 34

BEFORE 1994

ST69 - Tortworth Lake, Tortworth Estate, 11 February 1990 N.F.S., M.A.R.K., C.K.; ST6991, 1990 RUD! (BRC); ST6992, 1990 RUD! (BRC).

ST78 - Wickwar – Yate area: 11 July 1917, I.M.R. [det. G.O.A.] (**BM**!); 4 June 1917, I.M.R. [det. G.O.A.] (**BM**!); August 1918, I.M.R. [det. G.O.A.] (**BM**!).

- small deep pond near Rangeworthy, 30 April 1917, I.M.R. [det. G.O.A.] (**BM**!, E!) (White 1919; Allen 1950; Moore & Bailey 1985); 4 June 1917, I.M.R. [det. G.O.A.] (**BM**!); pond (old strontium pit) E. of Rangeworthy, 16 May 1917, J.W.W. [det. J.G.] (**BM**!); pool (old strontia pit) east of Rangeworthy, 22 March 1918, J.W.W. [det. J.G.] (**BM**!) (Riddelsdell *et al*. 1948; Moore & Bailey 1986); strontia pit between Yate Court and Leech Pool Farm, Yate, 15 December 1984, A.J.B (Bailey & Moore 1985).

1994 ONWARDS

SO70 - SO783062 (disused) Thames and Severn Canal near Eastington, 1997, R.V.L. (**RVL**!).

SO80 - SO786031 (disused) Thames and Severn Canal, Brimscombe, 1997, R.V.L.

Nitella opaca Dark stonewort

Over the last few decades *N. flexilis* (smooth stonewort) and *N. opaca* were united under one species. Recently *N. opaca* has been reinstated as a species in line with the accepted view elsewhere in Europe (Bryant *et al*. 2002). As fertile material is needed to separate the two species, there are several records which cannot be attributed to either species. In this account, records for which determination to species has not been possible, have been listed here (as *N. flexilis* agg.) under *N. opaca*, because *N. flexilis* s.s. has never been confirmed from either county.

All records are from slow moving or still water in medium to small ponds or from canals. Elsewhere *N. opaca* is frequent, particularly in western Britain, while *N. flexilis* is nationally scarce and is scattered in lowland areas. *N. opaca* appears to have declined significantly in the region, with records since 1994 only from pools in the Forest of Dean, a short length of the Severn and Thames Canal, the Gordano Valley and a marl pool at Ruskin Mill near Nailsworth.

One of the reasons for the lack of recent records from sites in the Wickwar – Yate area is certainly the loss of the less basic commons overlying the coal measures, near Chipping Sodbury and Yate to urban development. The species is unlikely to be found again in this area. A small number of water bodies have been and continue to be, created in association with quarrying and with housing development and it is possible that it will reappear in one of these.

V.C. 6

BEFORE 1994

ST47 - ST453726 ditch, Walton Moor, 1989 S.W. det. J.A.B.

ST55 - Blagdon Lake, 5 September 1933 H.S.T. (**BM**).

ST57 - ST558731 Bristol University Botanic Gardens, 7 May 1984 A.L. [det. J.A.M.] (**BM**).

ST76 - In the canal at Bath, D.H.G (Babington 1834; White 1887; Murray 1896).

- 1918 C.I.S. (White 1920).

1994 ONWARDS

ST47 - Gordano Valley:

- Walton Moor: ST435726 ditch No. 55 [det J.A.B.]; ST436726 ditch No. 56 [det J.A.B.]; ST436727 ditch No. 57, 29 June 1989, S.W., O.M. [det J.A.B.]

V.C. 34

BEFORE 1994

SO61 - SO609125 *N. flexilis* agg. pond with slow stream entering and leaving, Cannop, 9 November 1983, M.V.M. [det. J.A.M.]

(Bailey & Moore 1985, Moore & Bailey 1986).

ST59 - pond, Tidenham Chase, 7 July 1898 J.H.M. (**BM**) (Riddelsdell *et al*. 1948).

ST69 - pond, Berkeley, 1868 J.W.W. [det. H. & J.G.] (White 1912) probably the same record listed as "pond, Berkeley Canal", 1868 (as *Chara flexilis*) G.A.O.B. by Riddelsdell *et al*. (1948).

ST78 - Wickwar – Yate area:

- Yate Common: 30 April 1910, J.W.W. (CGE!); three ponds, C.B. [det. J.W.W.] (**CGE**) (White 1912); south of Hall End, June 1917, I.M.R. (**LSR**) (White 1919); pond, 22 March 1918 J.W.W. [det. H. & J.G.] (**BM**!) (Barton 1919; Riddelsdell *et al*. 1948).

- pond, Little Sodbury End, 1953 G.W.G. (Sandwith & Sandwith 1954, Moore & Bailey 1986).

1994 ONWARDS

SO61 - *N. flexilis* agg. Woorgreens Lake, northeast of the Speech House, 1993, C.W., A.H. (English Nature 1994); 1997, R.V.L.; *N. flexilis* agg. SO631126 pond near Fox's Bridge, near Woorgreens, 1997, R.V.L.; *N. flexilis* agg. SO630128, 31 August 1998, R.V.L!; *N. flexilis* agg. SO631127 Woorgreens Lake, 31 August 1998, R.V.L.

- *N. flexilis* agg. SO639134 Crabtree Colliery, Cinderford, 1997, R.V.L.

SO90 - SO967008 *N. flexilis* agg., Thames and Severn Canal near Coates, 7 July 1977, R.H.B., J.A.M. [det. J.A.M.] (**BM**) (Moore & Bailey 1986); SO967004 abundant in (disused) Severn and Thames Canal near Coates, 1997, R.V.L. (**RVL**!).

ST89 - *N. flexilis* agg., Marl pool, Ruskin Mill, 1996, J.J.D!

Nitella translucens (Persoon) Agardh. Translucent Stonewort

N. translucens has only been recorded from a single site in the region and there, apparently only twice. It tends to occur in the deeper parts of water bodies, rarely being visible from the margins. As such, it is possible that it has been overlooked and it may be under-recorded. Conversely, this species is very much in decline in southern England and has become extinct in several counties and may well be extinct in the region. There are few areas in v.c. 34 which are likely to be suitable, but any ponds or lakes in peaty parts of the Somerset Levels could be suitable.

V.C. 6

BEFORE 1994

ST43 - Ashcott Station, Glastonbury Peat Moors, 18 June 1919 H.P. and C.I.S. (**BM**) (Druce 1920; White 1921); Ashcott, June 1922, H.J.G. (**LSR**).

TOLYPELLA (A. BRAUN) A. BRAUN.

Tolypella glomerata (Desv.) Leonh. Clustered Stonewort

Synonym: *T. nidifica* var. *glomerata*).

T. glomerata is a nationally scarce and decreasing species but is widely scattered throughout Britain. The two records from the region are from disused canals before 1985. Both sites have been surveyed since 1995 and this species now appears to be extinct in both vice counties. It continues to survive in the Cotswold Water Park in Wiltshire, a few kilometres to the east of the site at Coates.

V.C. 6

BEFORE 1994

ST33 - In one of the old clay pits, near Bridgwater, 21 August, 1899 G.R.B.-W. [det. J.G.] (**BM**) (Bullock-Webster 1901; Marshall 1914).

- Drain near Sedgemoor Cut, May 1899, G.R.B.-W. (Bullock-Webster 1901).

ST43 - Ditch, King's Sedge Moor nr. Othery, 8 May 1899, G.R.B.-W. (**BM**) (Marshall 1914; 1909).

ST47 - Rhine near Portbury, 1922, O.V.D. (White 1923).

- ST4573 rhyne on Clapton Moor, February 1922, C.I.S. (**BM**) (White 1923; Willis & Jefferies 1959).

V.C. 34

BEFORE 1994

SO80 - Canal between Bowbridge and Chalford on N. side, 1907, G.A.O.B.; 1922 C.I.S., N.Y.S. (Riddelsdell *et al*. 1948).

SO90 - S0967006 Thames and Severn Canal near Coates, 7 July 1977, R.H.B., J.A.M., det. J.A.M. (**BM**).

Tolypella intricata (Trent. Ex Roth.) Leonh. Tassel Stonewort

Red List Endangered; BAP

This is a rare and declining species in Britain and in recent years, it has only been recorded from a few areas, with the main British populations apparently occurring in the Wickwar area and on Otmoor in Oxfordshire. *T. intricata* is a classic species of disturbed, ephemeral waterbodies.

It is not immediately obvious from the list of records below, but there have been three discrete periods within which *Tolypella intricata* has been recorded in the Wickwar – Yate area: 1917–1918 (5 records), 1952–1955 (11 records) and 1995–2000 (17 records). The first two periods coincide with periods of increased interest in stoneworts due to recent publication of identification guides. There are no data on issues such as grazing and land management in the area for the first two periods, but we have reasonable information for the third. The early 1990s followed the end of the period of low rainfall of the early to mid-1980s and comprised a period with good annual rainfall. Active woodland management had been carried out in Lower Woods NR resulting in poaching of many of the rides, while large numbers of cattle were grazed on the commons, to the extent that the pond to the east of Lance Coppice was usually churned to completely bare mud in the early summer. As a result of this combination of factors, from a single plant found in the pond east of Lance Coppice in 1995, eight sites had growing plants in 1997, with most supporting more than ten plants (although counts of plants have only limited meaning in relation to aquatic annual plants such as this). Since then, a decline in grazing pressure due to a combination of the foot and mouth disease outbreak and falling profits for dairy farming, combined with no significant poaching on the rides in Lower Woods NR, has led to vegetation succession in most of the ponds that previously supported *T. intricata*. Surveys in 2002 and 2004 found plants at only five sites in 2002, two of which were new for the species (Williams *et al*. 2003) and only one plant at one site in 2004.

Outside the Wickwar – Yate area, the prognosis for *T. intricata* is not good. The Hereford and Gloucester Canal was dry and largely full of earth in 1997, although parts were under restoration and the plant may re-appear. There is no sign of the pond near Pitney Wood, although no thorough survey of the area has been carried out. The ditch in which it was recorded in the Gordano Valley has been searched a number of times in recent years and no plants have been found, possibly because the ditch is becoming overgrown. In all these sites, except possibly at Pitney Wood, there is no reason to suppose that the species has disappeared. However without frequent visits we are unlikely to know if and when it does reappear. Similarly, without frequent survey of all sites from which the species has been recorded we are unlikely to gain a better understanding of the dynamics of populations of this species and consequently decisions on the need for management will always be somewhat speculative. The dramatic decline in the number of sites supporting plants certainly appears to be worrying, but we still have insufficient data to know whether the best course is to intervene, with the risk of creating a more or less a permanent obligation to management, or whether it is better to do nothing in the expectation that it normally undergoes a "boom and bust" cycle and that populations will recover naturally.

V.C. 6

BEFORE 1994

ST42 - pond outside Pitney Wood, nr. Langport, 21 March 1907, E.S.M. [det. G.O.A.] (**BM**!, **E**!, **NMW**!) (Druce 1919); pond on northern edge of Pitney Wood, 27 April 1907, E.S.M. [det. J.G.] (**BM**!, **E**!, **NMW**!, **OXF**!) (Riddelsdell 1908, Groves and Bullock-Webster 1924, Marshall 1908 – as "pond outside Pitney Wood").

ST47 - near Bristol 1917, C.I.S. [det. G.O.A.] (**BM**) (Druce 1919) (possibly refers to Weston Moor).

- ST441736 recently cleared peaty ditch (No. 177), Weston Moor, Gordano Valley, 6 April 1989, N.F.S. (Willis 1989) (**SLBI**); ST441736 ditch No. 177, 6 June 1989, N.F.S., S.W., E.J.M.

ST76 - canal at Bath 1918, C.I.S. (White 1920).

1994 ONWARDS

ST44 - Tealham Moor: ST40794509 ditch No. 11, 9 May 2003, N.F.S.

V.C. 34

BEFORE 1994

SO72 - ditches near Newent Canal, (as *Chara vulgaris*) G.A.O.B. (Sandwith 1917; Groves & Bullock-Webster 1920; Riddelsdell *et al*. 1948).

ST78 - Wickwar – Yate area:

- Yate area: In a small muddy pool (a strontium pit) north of Yate Church 25 May 1917 C.I.S. [det. G.O.A.] (**BM** labelled "Yate Common, below Yate Rocks") (White 1919; Sandwith 1917; Druce 1918); Different pond near Yate 1918, C.I.S. [det. G.O.A.] (**BM**) (White 1920; Riddelsdell *et al*. 1948; Moore & Bailey 1986); Yate, 8 November 1918, C.I.S. [det. G.O.A.] (**BM**)

(White 1920; Moore & Bailey 1986); Old strontium pit below Yate Rocks 1917, (Riddelsdell *et al*. 1948 "in Hb. Sandwith"); Old disused strontium digging in the neighbourhood of Yate 25 May 1917, C.I.S. [det. J.G.] (Sandwith 1917; Druce 1918, Riddelsdell *et al*. 1948).

1994 ONWARDS

ST78 - Wickwar – Yate area:

- Little Sodbury and Horton: Pond, Little Sodbury End, Sodbury Common 1954, G.W.G. (Sandwith & Sandwith 1955; Moore & Bailey 1986); Sodbury Common 1954, G.W.G. (Moore & Bailey 1986); Horton 1953 G.W.G. [det. G.O.A.] (Sandwith & Sandwith 1954, Moore & Bailey 1986); Pond nr. Vinney's Lane, Horton 1952 (Sandwith & Sandwith 1953): 1953 G.W.G. [det. G.O.A.] (Sandwith & Sandwith 1954); 1954 G.W.G. [det. G.O.A.] (Sandwith & Sandwith 1954; Wallace 1955; Moore & Bailey 1986). ST743851 pond nr. Vinney's Lane, Horton, 22 February 1999, R.V.L. (Stewart & Lansdown 1999b); 5 June 1999, R.V.L., N.F.S.; 2000 R.V.L.; ST 761871 Poached, grazed and partly shaded pond on eastern edge of Hawkesbury Common, 2002, R.V.L. (Williams *et al*. 2003); pond, Hawkesbury Common, 24 February 2004, N.F.S., R.V.L.

- Inglestone Common: Ponds, 1953, G.W.G. [det. G.O.A.] (Sandwith & Sandwith 1954, Moore & Bailey 1986); two ponds 1954, G.W.G. [det. G.O.A.] (Sandwith & Sandwith 1954, Wallace 1955, Moore & Bailey 1986); 6 May 1955, H.J.M.B. (**RNG**!); ST758884 pond east of Lance Coppice, 21 December 1996, R.V.L. (Stewart & Lansdown 1999); 4 March 1997, R.V.L.; 29 March 1997, R.V.L. (Stewart & Lansdown 1999b) (RVL!); 14 December 1997, R.V.L. (Stewart & Lansdown 1999); 1998 R.V.L.; 5 June 1999 N.F.S., R.V.L.; 24 February 2004, N.F.S., R.V.L.; ST751884 pond north of Spoil Coppice, Inglestone Common, 21 December 1996, R.V.L. (Stewart & Lansdown 1999b).

- Lower Woods NR: ST748883 Pond, track to Lower Woods Lodge, April 1985, A.J.B. [det J.A.M.] (**BM**); ST748883 pond, track to Lower Woods Lodge, Lower Woods NR, Upper Wetmore, 29 March 1997, R.V.L. (Stewart & Lansdown 1999b); ST743864 track, Stonybridge Wood, Lower Woods NR, Upper Wetmore, 19 May 1997, R.V.L. (Stewart & Lansdown 1999b); ST748881 poached pool in Green Trench, south of Spoil Coppice 1999 R.V.L.; Horse's hoof print, Horton Great Trench, Upper Wetmore 1954 G.W.G. [det. G.W.G.] (Moore & Bailey 1986); ST743873–ST741872 series of hollows in Horton Great Trench, Lower Woods NR, Upper Wetmore, 21 December 1997, R.V.L. (Stewart & Lansdown 1999b); 27 February 1999, R.V.L. (Stewart & Lansdown 1999b).

- Assley Common: ST759894 pond east of Withymore Wood, nr. Inglestone, 10 April 1997, R.V.L. (Stewart & Lansdown 1999b).

- ST736895 pond east of Cherryrock Farm, nr. Inglestone, 9 April 1997, R.V.L. (Stewart & Lansdown 1999b) (**RVL**!).

- ST718888 margin of deep quarry pool north of Wickwar, 19 May 1997, R.V.L (Stewart & Lansdown 1999b) (**RVL**!).

Tolypella nidifica (O. Müll.) Leonh. Bird's-nest stonewort

This species was "Alleged to have been detected in old river bed at Sharpness (C.N.F.C. III, 1863, 145 [presumably indicates that it was published in the Proceedings of the Cotteswold Naturalists Field Club]), but doubtless in error" (Riddelsdell *et al*. 1948). The original record was probably given as *Chara nidifica* (although even this is a little late for use of this name). *C. nidifica auct brit.* has tended to be equated with *Tolypella glomerata*, but could also have referred to *Nitella opaca* or *N. flexilis*. Thus, whilst Riddelsdell *et al*. (1948) robustly dismisses this record and it is very unlikely to have been this species, it could have been a *Tolypella* species, particularly *T. glomerata* or *T. intricata* and it may be worth searching this area for suitable habitat for both taxa.

Tolypella prolifera (Ziz. ex A. Braun) Leonh. Great Tassel Stonewort
Red List – Endangered; BAP

Before 1994, *T. prolifera* had been reported from two sites in the region. Survey by the Somerset Rare Plants Group at Southlake Moor resulted in the discovery of an apparently new, healthy population of *T. prolifera*. In contrast to all other British sites for this species, where

populations are normally restricted to one or two ditches, at both sites in the Somerset Levels it has been record from ten ditches. There have apparently been no recent surveys of the gravel pits in the Walham area by botanists familiar with this species. Not only do some of these pits support uncommon aquatic plants, such as *Ceratophyllum submersum*, but there are abundant ditches and small ponds in the area that may be suitable for this species and which merit survey.

V.C. 6

1994 ONWARDS.

ST33 - ST36393048, ditch No. 53; ST36863056, ditch No. 60E, 26 June 1998, R.V.L., S.J.L., K.P., L.W. (Leach *et. al*. 1999); 18 July 2000, N.F.S., K.P. (Williams & Stewart 2002); ST36243055, ditch No. 1; ST36313057, ditch No. 3; ST36773056, ditch No. 30; ST36843057, ditch No. 31; ST36903058, ditch No. 32; ST36863056, ditch No. 60E; ST36913057, ditch No. 61; ST36933040, ditch No. 97: ST36983045, ditch No. 98; ST37043045, ditch No. 99N, 20 July 2000, N.F.S., K.P.; 26 July 2000, N.F.S., K.P., P.W. (Williams & Stewart 2002); 15 August 2000, P.W., J.Bi. (Williams & Stewart 2002); ST36843057, ditch No. 31; ST36333026, ditch No. 85; ST36373030, ditch No. 88; ST36933040, ditch No. 97; ST36983045, ditch No. 98, 26 July 2000, N.F.S., P.W., K.P.; 4 October 2001, N.F.S. (Williams & Stewart 2002); ST36723054, ditch No. 78 N end; ST36813052, ditch No. 79; ST36933040, ditch No. 97; ST36783030, ditch No. 147, 23 October 2001, N.F.S. (Williams & Stewart 2002); ST37413027, ditch No. 120; ST36903034, ditch No. 137E, 19 September 2003, N.F.S.

ST53 - ST5236 in a small ditch surrounded by frogbit, September 1986, J.G.K. Butt Moor (Leach *et. al*. 1999); ST52563606 ditch No. 2, 26 July 2000, N.F.S., P.W. (Williams & Stewart 2002); ST52563606 ditch No. 2, 15 August 2000, P.W., J.Bi. (Williams & Stewart 2002); 23 October 2001, N.F.S. (Williams & Stewart 2002); ST52623609 ditch No. 3; ST52613600 ditch No. 4, 10 October 2002, N.F.S.; ST52503611 ditch No. 1; ST52563606 ditch No. 2; ST52503585 ditch No. 8; ST52223608 ditch No. 11; ST52173610 ditch No. 12; ST52213615 ditch No. 13, 23 July 2003, N.F.S., E.J.M. *et al*.; ST52463583 ditch No. 9; ST52663563 ditch No. 10; ST52223608 ditch No. 11; ST52263640 ditch No. 14, Butt Moor 17 September 2003, N.F.S.

V.C. 34

BEFORE 1994

SO82 - Walham, 4 July 1939, J.F.G.C., N.D.S [det. G.O.A.] (**BM**).

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REFERENCES

ALLEN, G. O. (1950). *Nitella mucronata* Miq. var. *gracillima* Groves and Bull.-Webst. in Warwickshire. *Watsonia* **1**: 364–365.

BABINGTON, C. C. (1834). *Flora Bathonensis*. London.

BAILEY, R. H. & MOORE, J. A. (1985). Gloucestershire charophyte records 3. *Gloucestershire Naturalists Society Journal* **36**: 80–83.

BARTON, W. C. (1919). Report of the Distributor for 1918. *The Botanical Society and Exchange Club of the British Isles, Report for 1918*. **5**: 483–534.

BRITTON, C. E. (1918). Report of the distributor for 1917. *The Botanical Society and Exchange Club of the British Isles, Report for 1917* **5**: 205–262.

BRYANT, J. A., STEWART, N. F. & STACE, C. A. 2002. A checklist of Characeae of the British Isles. *Watsonia* **24**: 203–208.

BUCKNALL, C., FRY, D. & WHITE, J. W. (1903). Notes on Bristol plants. *Journal of Botany, British and Foreign* **41**: 55–56.

BULLOCK-WEBSTER, G. R. (1901). New Characeae records. *Journal of Botany, British and Foreign* **39**: 101–102.
CLEMENTS, D. K., SCRUBY, M. & LUTLEY, W. (1985). *Newark Park, Glos*. Unpublished Report to National Trust, Cirencester.
DANDY, J. E. (1969). *Watsonian Vice-counties of Great Britain*. The Ray Society, London.
DRUCE, G. C. (1918). New county and other records. *The Botanical Society and Exchange Club of the British Isles, report for 1917* **5**: 93–137.
DRUCE, G. C. (1919). New County and other records. *The Botanical Society and Exchange Club of the British Isles, Report for 1918* **5**: 363–412.
DRUCE, G. C. (1920). New County and other records. *The Botanical Society and Exchange Club of the British Isles, Report for 1919* **5**: 635–412.
ENGLISH NATURE (1994). *Open water sites in Gloucestershire September 1993/August 1994*. Unpublished Report for English Nature, Three Counties Team, Malvern.
GLOUCESTERSHIRE WILDLIFE TRUST 1997. Lower Woods S.S.S.I. Nature Reserve: Site management plan 1997–2006. Gloucestershire Wildlife Trust, Gloucester.
GREEN, P. R., GREEN, I. P. & CROUCH, G. A. (1997). *The atlas flora of Somerset*. Published by the authors, Somerset.
GREEN, I. P., HIGGINS, R. J., KITCHEN, C. & KITCHEN, M. A. R. (2000). Wildlife of the Bristol Region: 1. The flora of the Bristol region. Pisces Publications/The Nature Bureau, Newbury, Berkshire.
GROVES, J. (1905). Report for the distributor for 1904. *The Botanical Society and Exchange Club of the British Isles, Report for 1904* **2**: 109–140.
GROVES, J. & BULLOCK-WEBSTER, G. R. (1917). *Nitella mucronata* in Gloucestershire. *Journal of Botany, British and Foreign* **55**: 323–324.
GROVES, J. & BULLOCK-WEBSTER, G. R. (1924). *The British charophyta*. Vol. I. Ray Society, London.
GROVES, J. & GROVES, J. (1886). Notes on the British characeae for 1885. *Journal of Botany, British and Foreign* **24**: 1–4.
GROVES, J. & GROVES, J. (1887). Notes on the British characeae for 1886. *Journal of Botany, British and Foreign* **25**: 146.
GROVES, H. & GROVES, J. (1895). Notes on the British Characeae, 1890–1894. *Journal of Botany, British and Foreign* **33**: 289–292.
HOLLAND, S. C. (1974). Botanical notes and records. *North Gloucestershire Naturalists Society Journal* **25**: 301.
HOLLAND, S. C., CADDICK, H. M. & DUDLEY-SMITH, D. S. (1986). *Supplement to the Flora of Gloucestershire*. Grenfell Publ., Bristol.
KELLAWAY, G. A. & WELCH, F. B. A (1948). *British Regional Geology: Bristol and Gloucester District*. 2nd Ed. HMSO, London.
KENT, D. H. & ALLEN, D. E. (1984). *British and Irish Herbaria*. B.S.B.I., London.
LEACH, S. J., POLLOCK, K. & LANSDOWN, R. V. (1999). *Tolypella prolifera* discovered in N. Somerset (v.c. 6). *B.S.B.I. News* **80**: 28–29.
MARSHALL, E. S. (1908). Somerset plant notes for 1908. *Journal of Botany, British and Foreign* **46**: 252–264.
MARSHALL, E. S. (1909). Somerset plant notes for 1908. *Journal of Botany, British and Foreign* **47**: 255–261.
MARSHALL, E. S. (1914). *A supplement to the flora of Somerset*. Somerset Archaeological and Natural History Society, Taunton.
MOORE, J. A. & BAILEY, R. H. (1977). Gloucestershire charophyte records – 1. Botanical notes and records. *Gloucestershire Naturalists Society Journal* **28**: 343–344.
MOORE, J. A. & BAILEY, R. H. (1986). Charophyta: Characeae, in HOLLAND, S. C., CADDICK, H. M. & DUDLEY-SMITH, D. S. *Supplement to the Flora of Gloucestershire*. Grenfell Publ., Bristol.
MOSS, C. E. (1911). Report for the distributor for 1910. *The Botanical Society and Exchange Club of the British Isles*, Report for 1910 **2**: 537–609.
MURRAY, R. P. (1896). *The flora of Somerset*. Barnicott & Pearce, Taunton.
RIDDELSDELL, H. J. (1908). Report for the distributor for 1907. *The Botanical Society and Exchange Club of the British Isles, Report for 1907* **2**: 266–326.
RIDDELSDELL, H. J., HEDLEY, G. W. & PRICE, W. R. (1948). *Flora of Gloucestershire*. T. Buncle, Arbroath.
ROPER, I. M. (Ed) (1918). *Annual Report of the Watsonian Botanical Exchange Club 1917–1918* **3**: 82–83.
SANDWITH, C. I. (1962). Bristol botany in 1961. *Proceedings of the Bristol Naturalists' Society* **30**: 239–244.
SANDWITH, C. I. (1917). *Tolypella intricata* Leonh. *Journal of Botany, British and foreign*. **55**:195.
SANDWITH, C. I. & SANDWITH, N. Y. (1950). Bristol botany in 1949. *Proceedings of the Bristol Naturalists' Society* **28**: 17–23.
SANDWITH, C. I. & SANDWITH, N. Y. (1953). Bristol botany in 1952. *Proceedings of the Bristol Naturalists' Society* **28**: 305–314.
SANDWITH, C. I. & SANDWITH, N. Y. (1954) Bristol botany in 1953. *Proceedings of the Bristol Naturalists' Society* **28**: 379–386.

SANDWITH, C. I. & SANDWITH, N. Y. (1955). Bristol botany in 1954. *Proceedings of the Bristol Naturalists' Society* **29**:17–24.
SANDWITH, C. I. & SANDWITH, N. Y. (1956). Bristol botany in 1955. *Proceedings of the Bristol Naturalists' Society* **29**: 101–108.
SANDWITH, C. I. & SANDWITH, N. Y. (1958). Bristol botany in 1957. *Proceedings of the Bristol Naturalists' Society* **29**: 343–352.
STEWART, N. F. (1996). Stoneworts – connoisseurs of fresh water. *British Wildlife* **8**: 9 3–99.
STEWART, N. F. (2004). *Important stonewort areas: An assessment of the best areas for stoneworts in the United Kingdom*. Plantlife International, Salisbury, UK.
STEWART, N. F. & CHURCH, J. M. (1992). *Red data Books of Britain and Ireland: Stoneworts*. J.N.C.C./ O.P.W. Peterborough.
STEWART, N. F. & LANSDOWN, R. V. (1999a). *The conservation status of Great Tassel Stonewort (*Tolypella prolifera*) in Britain*. Interim report No. 1. Plantlife Report No. 121. Plantlife, London.
STEWART, N. F. & LANSDOWN, R. V. (1999b). *The conservation status of Tassel Stonewort (*Tolypella intricata*) in Britain*. Interim report No. 1. Plantlife Report No. 122. Plantlife, London.
WALLACE, E. C. (1950). Plant records. *Watsonia* **1**: 124–263.
WALLACE, E. C. (1954). Plant records. *Proceedings of the Botanical Exchange Club and Society for Britain and Ireland*. Report for 1919 **5**: 801–849.
WALLACE, E. C. (1955). Plant records. *Proceedings of the Botanical Society of the British Isles*. **1**: 337.
WHITE, J. W. (1887). *The flora of the Bristol coalfield*. James Fawn & Son, Bristol.
WHITE, J. W. (1912). *The flora of Bristol: Being an account of all the flowering plants, ferns and their allies that have at any time been found in the district of the Bristol Coalfields*. T. Buncle, Arbroath.
WHITE, J. W. (1919). Bristol botany in 1917. *Annual report and proceedings of the Bristol Naturalists' Society*. Series IV. **5**: 39–45.
WHITE, J. W. (1920). Bristol botany in 1918. *Annual report and proceedings of the Bristol Naturalists' Society*. Series IV. **5**: 88–91.
WHITE, J. W. (1921). Bristol botany in 1919. *Annual report and proceedings of the Bristol Naturalists' Society*. Series IV. **5**: 133–137.
WHITE, J. W. (1923). Bristol botany in 1921. *Annual report and proceedings of the Bristol Naturalists' Society*. Series IV. **5**: 173–178.
WHITE, J. W. (1926). Bristol botany in 1925. *Annual report and proceedings of the Bristol Naturalists' Society*. Series IV. **6**: 232–236.
WHITE, J. W. (1928). Bristol botany in 1928. *Annual report and proceedings of the Bristol Naturalists' Society*. Series IV. **7**: 51–55.
WILLIAMS, P., BIGGS, J., BARR, C. J., CUMMINS, C. P., GILLESPIE, M. K., RICH, T. C. G., BAKER, A., BAKER, J., BEESLEY, J., CORFIELD, A., DOBSON, D., CULLING, A. S., FOX, G., HOWARD, D. C., LUURSMA, K., RICH, M., SAMSON, D., SCOTT, W. A., WHITE, R. & WHITFIELD, M. (1996). Lowland pond survey 1996. Pond Action, Unpublished Report to DETR (Contract No. CR0192), London.
WILLIAMS, P., LANSDOWN, R. V., PANKHURST, T. J. & STEWART, N. F. (2003). *The status of tassel stonewort (*Tolypella intricata*) in 2002*. Plantlife Report No. 224. Plantlife, London.
WILLIAMS, P. & STEWART, N. F. (2002). *The conservation status of Great Tassel Stonewort (*Tolypella prolifera*) in Britain 2000–2001*. Plantlife Report No. 215. Plantlife, London.
WILLIS, A. J. (1989). Bristol botany in 1989. *Proceedings of the Bristol Naturalists' Society* **49**: 31–42.
WILLIS, A. J. (1992). Bristol botany in 1992. *Proceedings of the Bristol Naturalists' Society* **52**: 25–35.
WILLIS, A. J. & JEFFERIES, R. L. (1959). The plant ecology of the Gordano Valley. *Proceedings of the Bristol Naturalists' Society* **29**: 469–490.

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THE NUMBER OF 10 KILOMETRE SQUARES WITH RECORDS OF EACH TAXON

Taxon	IUCN	No. 10 km squares v.c. 6		No. 10 km squares v.c. 34	
		pre-1994	post-1994	pre-1994	post-1994
Chara aculeolata	NS	[1]	1		
Chara aspera		[1]			
Chara contraria		2	2		4
Chara globularis		7	4	6	1
Chara hispida		6	1	2	1
Chara virgata		3	1	5	4
Chara vulgaris		16	8	18	9
var. *crassicaulis*		1			
var. *longibracteata*		2	2	4	4
var. *papillata*		7	3	6	4
var. *vulgaris*		3		2	4
Nitellopsis obtusa	VU, BAP		2		1
Nitella mucronata	NS	1		1	
var. *gracillima*				2	2
Nitella opaca		4	1	5	3
Nitella translucens		1			
Tolypella glomerata	NS	3		2	
Tolypella intricata	EN, BAP	3	1	2	1
Tolypella nidifica	*EN, BAP*			*[1]*	
Tolypella prolifera	EN, BAP		2	1	
Total		59[2]	28	56[1]	38

The numbers given represent the total number of 10 kilometre squares from which each taxon has been recorded in each period. Square brackets indicate doubtful records

KEY:
EN - Endangered
VU - Vulnerable
NS - Nationally Scarce
BAP - listed as a Priority Species in the UK Government Biodiversity Action Plan

APPENDIX: INDIVIDUALS REFERRED TO IN THE TEXT

A.B. – A. Bennet
A.H. – A. Harrison
A.J.B. – A. J. Byfield
A.J.D. – A. J Dodd
A.K. – A. Kelham
A.L. – A. Leitch
A.Le. – A. Leipner
A.O. – A. Orange
A.W. – A. Washbrook
B.A.G. – B. A. Grindey
B.G. – B. Goldsmith
C.B. – C. Bucknall
C.C.B. – C. C. Babington
C.F. – C. Furness
C.I.S. – C. I. Sandwith
C.K. – C. Kitchen
C.T. – C. Trapnell
C.W. – C. Walker
D.C. – D. Callaghan
D.F. – D. Fry
D.F.L. – D. F. Leney
D.H. – D. Heaver
D.Ha. – Dr. Hassé
D.H.G. – Dr. H. Gibbes
D.McC. – D. McClintock
D.M.-S. – D. Munro-Smith
D.N.A. – D. A. Allen
D.R. – D. Reid
E.G. – E. Green
E.H.R. – E. H. Read
E.J.M. – E. J. McDonnell
E.S.M. – E. S Marshall
F.G. – F. Gibbons
F.K.M. – F. K. Makins
G.A.O.B. – G. A. O. St. Brody
G.C.D. – G. C. Druce
G.O.A – G. O. Allen
G.R.B.–W. – G. R. Bullock-Webster
G.W.G. – G. W. Garlick
H. – Hanson
H.G. – H. Groves
H.J.M.B. – H. J. M. Bowen
H.J.R. – H. J. Riddelsdell
H.K.A.S. – H. K. Airy Shaw
H.P. – H. Perrycote
H.P.R. – H. P. Reader
H.S.T. – H. S. Thompson
I.F.G. – I. F. Gravestock
I.M.R. – I. M. Roper
J.A.B. – J. A. Bryant (née Moore)
J.A.M. – J. A. Moore (now Bryant)
J.Bi. – J. Biggs
J.D.H. – J. D. Hooker
J.E.L. – J. E. Lousley
J.G. – J. Groves
J.G.K. – J. G. Keylock
J.H.M. – J. H. Morgan
J.J.D. – J. J. Day
J.N. – J. Norton

J.P.M.B. – J. P. M. Brenan
J.v.R. – J. van Raam
J.W.W. – J. W. White
K.E.L. – K. E. Ludbrook
K.P. – K. Pollock
L.B. – Rev. L. Bloomfield
L.W. – L. White
M.A.P. – M. A. Palmer
M.A.R.K. – M. A. R. Kitchen
M.D.C. – M. D. Chitty
M.J.A. – M. J. Allen
M.R.H. – M. R. Hughes
M.S. – M. Scruby
M.V.M. – M. V. Marsden
N.F.S. – N. F. Stewart
N.Y.S. – N. Y. Sandwith
O.M. – O. Mountfield
O.V.D. – O. V. Darbishire
P.M. – P. Millman
P.M.W. – P. M. Wade
P.W. – P. Williams
R.H.B. – R. H. Bailey
R.P.M. – Rev. R. P. Murray
R.S.C. – R. S. Cropper
R.U.D. – Mrs. Ruddle
R.V.L. – R. V. Lansdown
R.W. – R. Wilder
S.C.H. – S. C. Holland
S.H.B. – S. H. Bishop
S.J.L. – S. J. Leach
S.P.P. – S. P. Phillips
S.W. – S. Wilson
T.C. – T. Clarke
V.H. – V. Hack
W.B.W. – W. B. Waterfall
W.J. – W. Joshua
W.L. – W. Lutley
W.R.M. – W. R. McNaib
W.W. – W. Watson