

Balloonwort, *Sphaerocarpos* spp. A liverwort found in two stubble fields in north Worcestershire.

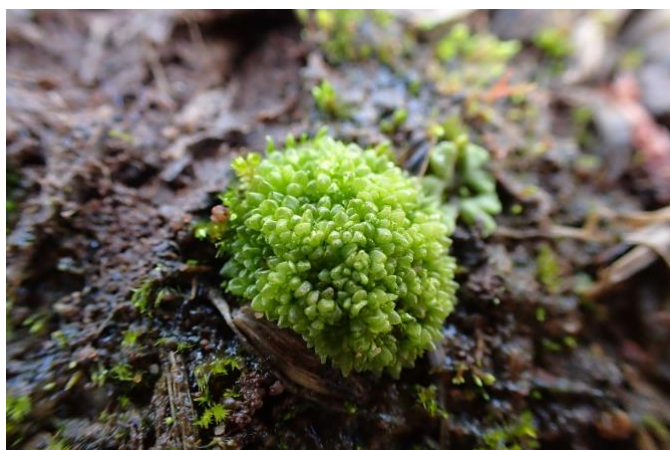
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Introduction

Whilst out on a winter walk, the pale green rosettes of the liverwort *Sphaerocarpos*, growing in amongst stubble, attracted the attention of Brett Westwood. This distinctive liverwort is a small and delicate winter ephemeral, germinating in the autumn and senescing in early spring. There are two known species of *Sphaerocarpos* represented in the British Isles: these are *Sphaerocarpos michelii* Micheli's Balloonwort and *S. texanus* Texas Balloonwort. Both *Sphaerocarpos* have a restricted distribution and the species have only been found at three sites in VC37. A return visit was required to confirm the precise identification of these rare plants.

Background

Sphaerocarpos plants grow to 20mm in diameter and have a rosette-like thallus which bears densely packed balloon-like structures (hence its common name of Balloonwort) that surrounds the sexual organs and spore bodies (01).



01. *Sphaerocarpos* spp.

Both *Sphaerocarpos michelii* and *S. texanus* are highly characteristic of arable fields and are only rarely found in other surroundings (Paton 2009). *Sphaerocarpos* species seem to be characteristic of well drained, sandy soil: the species does not tend to grow on soils with finer particles that retain greater moisture at and near the surface of the ground. Normal habitats are neglected corners of gardens, plant nurseries and in arable fields, especially fields of bulbs, flowers and vegetable and cereal stubble (Atherton, Bosanquet, & Lawley 2010). *S. michelii* and *S. texanus* are morphologically indistinguishable and can only be distinguished from each other by microscopical examination of their mature spores. The capsules are hidden in the female structures, and need to be collected ripe for identification: consequently many plants cannot be identified specifically because capsules are lacking or immature (Atherton et al. 2010).

Data provided by The National Biodiversity Network Gateway (assessed 03/03/18) and the British Bryological Society (Carrick 2004) show that both *S. michelii* and *S. texanus* has been recorded in low numbers at three sites in VC37: Redmarley D'Abitot (1910, 1916 & 2004); and in a rhubarb field at Holt Fleet (2003, 2004). In addition, *S. michelii* was recorded at Lineholt Common in 2014.

Sites

The two unploughed stubble fields are located in north Worcestershire, approximately 1.9kms apart. The two fields were in different land ownership and management.

Field 1 was a large arable field of approximately 6.3ha. The substrate was freely draining with slightly acid loamy soils (<http://magic.defra.gov.uk/MagicMap.aspx>). The field was level in the north and west, sloping gradually to the east and south. The crop was of over-wintering wheat stubble. A public right of way crossed the field from north-west to the south. Currently land on both sides of the footpath is subject to the same continued cultivation management practices (personal communication with the farmer) although an aerial photo dated 1945 shown on Google Earth suggests that the 3ha of land to the west and south of the footpath was historically managed differently to the land to the east of the footpath.

Field 2 was part of an extensive arable field with a public right of way running within and adjacent to the south-east boundary. The substrate was freely draining with slightly acid sandy soils (<http://magic.defra.gov.uk/MagicMap.aspx>). The field was on south-east facing sloping ground. The crop was over-wintering wheat stubble.

Method

The aim of the return visit was for an informal walk to record the bryophyte flora present as could be seen from the public rights of way and in particular to verify the presence of *Sphaerocarpos* species in the fields. No systematic recording was undertaken within either field and the entire land within the two fields was not walked. Field 1 was surveyed in greater detail than Field 2. The time spent on each field was not recorded but it is estimated that on the day, approximately 60 minutes was spent randomly walking over the first field and 30 minutes spent randomly walking adjacent to the south-east boundary and public right of way in Field 2. During the survey walk, Mr Needs the farmer of Field 1 joined us and gave us valuable information on the crop management of the field across the years: the crops vary year by year i.e. some years wheat, other years potatoes etc.

The return visit was undertaken in February: this is a time of year when the bryophytes were large enough for most of them to be identified. The bryologists present were the vice-county recorders Ann Hill (VC37) and Mark Lawley (VCS40, 43, 47). Bryophytes were identified where possible in the field. Small amounts of material were randomly collected by both bryologists for microscopic examination.

Results

A rich and diverse assemblage of bryophytes was found growing over the soil surface within both the stubble fields.

Field 1: Bryophytes were the dominant component within the stubble remains. Bryophyte and bare ground cover varied across the field but on average was about 40%: nettles, cleavers, chickweed and vigorous grasses were no more than rare. On higher ground, in the south-west corner, grass out-competed the bryophytes. A total of eighteen bryophytes (13 mosses and 5 liverworts) were recorded in Field 1 (02).



02. Field 1.

The bryophyte assemblage included a high proportion of *Sphaerocarpos* species (species were undetermined on the day) and the liverworts *Riccia glauca* Glaucous Crystalwort and *R. sorocarpa* Common Crystalwort, that formed neat small semi-hemispherical rosettes. Also present was a suite of bryophytes that included the acrocarpous mosses *Barbula convoluta* var. *convoluta*, *B. convoluta* var. *sardoa*, *Bryum argenteum* Silver-moss, *B. dichotomum* Bicoloured Bryum, *B. ruderale* Pea Bryum, *B. rubens* Crimson-tuber Thread-moss, *Dicranella schreberiana* Schreber's Forklet-moss, *D. staphylina* Field Forklet-moss, *Phascum cuspidatum* var. *cuspidatum* Cuspidate Earth-moss, *Tortula truncata* Common Pottia and *Trichodon cylindricus* Cylindric Ditrichum. Cover abundance (determined by eye) was estimated to be 30+ *Sphaerocarpos* in every 1m² distributed across the majority of the 3ha of land to the west and south of the footpath but excluding the water-filled depressions and areas used for storage of hay bales. No *Sphaerocarpos* species were found on arable land to the east of the footpath.

Field 2: Herbaceous cover in Field 2 was higher than in Field 1. Bryophyte and bare ground cover varied across the field but on average was at least 20%. A variety of liverworts and both acrocarpous and pleurocarpous mosses was found over the soil surface within vegetation dominated by annual weedy vegetation and small ephemerals (03).



03. Field 2.

A total of eighteen bryophytes (13 mosses and 5 liverworts) was recorded in Field 2. Cover abundance was estimated to be <15 *Sphaerocarpos* colonies in every 1m² distributed.

Twenty six packets of undetermined *Sphaerocarpos* material were taken from Field 1 and 10 packets from Field 2. Microscopical examination of the mature *Sphaerocarpos* spores confirmed that both *Sphaerocarpos michelii* and *S. texanus* were present in both fields although *S. texanus* was more prevalent, especially in Field 1, see Table 1.

Table 1: Number of *Sphaerocarpos* species in sample packets collected in two arable fields.

Species	Sample Packets	
	Field 1	Field 2
<i>Sphaerocarpos michelii</i>	6	2
<i>Sphaerocarpos texanus</i>	19	3
Undetermined	1	5

The mosses and liverworts were fairly evenly spread throughout the field. A total of 24 bryophytes (18 mosses and 6 liverworts) were recorded during the day. The species present in each field were listed and are shown in Table 2

Table 2: Moss and liverwort species recorded in two arable fields in February in Worcestershire by Ann Hill and Mark Lawley.

Taxon Name	Common Name	Field 1	Field 2
LIVERWORTS			
<i>Lunularia cruciata</i>	Crescent-cup Liverwort		1
<i>Marchantia polymorpha</i> subsp. <i>ruderalis</i>	Common Liverwort	1	
<i>Riccia glauca</i>	Glaucous Crystalwort	1	1
<i>Riccia sorocarpa</i>	Common Crystalwort	1	1
<i>Sphaerocarpos michelii</i>	Micheli's Balloonwort	1	1
<i>Sphaerocarpos texanus</i>	Texas Balloonwort	1	1
MOSESSES			
<i>Barbula convoluta</i> var. <i>convoluta</i>		1	1
<i>Barbula convoluta</i> var. <i>sardoa</i>		1	
<i>Brachythecium rutabulum</i>	Rough-stalked Feather-moss		1
<i>Bryum argenteum</i>	Silver-moss	1	
<i>Bryum dichotomum</i>	Bicoloured Bryum	1	1
<i>Bryum klinggraeffii</i>	Raspberry Bryum		1
<i>Bryum rubens</i>	Crimson-tuber Thread-moss	1	1
<i>Bryum ruderale</i>	Pea Bryum	1	
<i>Bryum violaceum</i>	Pill Bryum		1
<i>Ceratodon purpureus</i>	Redshank	1	1
<i>Dicranella schreberiana</i>	Schreber's Forklet-moss	1	
<i>Dicranella staphylina</i>	Field Forklet-moss	1	
<i>Funaria hygrometrica</i>	Common Cord-moss	1	1
<i>Kindbergia praelonga</i>	Common Feather-moss		1
<i>Phascum cuspidatum</i> var. <i>cuspidatum</i>	Cuspidate Earth-moss	1	1
<i>Pseudocrossidium hornschiuchianum</i>	Hornschiuch's Beard-moss		1
<i>Tortula truncata</i>	Common Pottia	1	1
<i>Trichodon cylindricus</i>	Cylindric Ditrichum	1	1

Discussion

Knowledge of the distribution of arable bryophytes lags behind that of bryophytes of many other habitats, and we have almost no information on their occurrence in the county. This chance find of both *Sphaerocarpos michelii* and *S. texanus* is remarkable: it is even more remarkable because *Sphaerocarpos* is such a difficult species to survey as plants with ripe spores can only be found for short periods of the year and appear to be more frequent in some years than others (Church, Hodgetts, Preston & Stewart 2004). *Sphaerocarpos* is more-or-less restricted to south-east England (with the exception of the Isles of Scilly) from the Wash west to Dorset, and south Wales. *S. texanus* is the rarer species and has been found in only 15 hectads (10km x 10km) since 1990, compared with only 10 additional ones from the period 1960-1989: it is therefore, listed as **Vulnerable** in Britain (Church, Hodgetts, Preston & Stewart 2004). A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium term future (JNCC 2010). *S. texanus* is a Red Data List taxa and a UK Biodiversity Action Plan priority species for conservation. There are more records for *S. michelii*, though it too may be declining. Both species are included on the Revised List of Nationally Scarce Bryophytes (Pescott 2016).

The bryophyte assemblage in the two arable fields best matched the *Dicranella staphylina-Riccia glauca* arable field assemblage as described by Preston, Hill, Porley & Bosanquet (2010). This is

considered to be the most species-rich arable bryophyte community according to Preston *et al.* (2010) and is concentrated on acidic soils in northern and western Britain and in Ireland. Although no systematic bryophyte survey was undertaken the results suggest a very high density of *Sphaerocarpos* species in the two fields, especially in the 3ha of land to the west and south of the footpath in Field 1. It was interesting to note the absence of *Sphaerocarpos* species from arable land to the east of the footpath in Field 1. Whilst land on both sides of the footpath receives the same present day management, historically the two parts of the field have received different management. This suggests that survival of the arable bryophyte community present and especially the *Sphaerocarpos* species is linked closely to the management of the land.

Farmland is a transient habitat subjected to regular disturbance, and arable bryophytes are well adapted to such a regime. All arable bryophytes require open conditions with regular disturbance (*i.e.* part of a cultivation regime), low or no competition and preferably little or no herbicide or fertilizer treatments. The over-wintered stubble found in the two fields is the ideal arable bryophyte habitat, allowing mosses and liverworts to germinate and complete their life-cycle with minimum competition from other plants. Hopefully, for the benefit of both *Sphaerocarpos michelii* and *S. texanus*, both fields will continue to remain in stubble over-winter for many years to come.

Acknowledgements

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Images

01. *Sphaerocarpos* spp
02. Field 1
03. Field 2.