

Until recently, the bryophyte flora of the south Wales limestone coast had received minimal attention. However, as **Sam Bosanquet** describes, recent detailed surveys in this area have revealed new data for four *Red Data Book* species and *Bryum funckii*.

Carboniferous Limestone forms much of the coast of south Wales, between Southerndown in the Vale of Glamorgan (v.c. 41) and Linney Head in Pembrokeshire (v.c. 45). In many places this is overlain by sand dunes or cut through by estuaries, so the actual area of exposed limestone supporting calcareous grassland is relatively limited. The longest exposures are on the Gower Peninsula in Glamorgan and the Castlemartin Peninsula in Pembrokeshire, which have 25 and 12 km of continuous limestone, respectively. The bryophytes of these limestone exposures were looked at in reasonable detail by BBS members between the 1950s and 1980s. Gower was covered by A.J.E. Smith when he was based in Swansea in the early 1960s (Smith, 1964a) and was visited by the 1963 spring meeting (Smith, 1964b); the BBS looked at sections of the Pembrokeshire limestone in 1958 (Swinscow, 1959) and 1980 (Perry, 1981). These visits revealed the presence

of three species that are included in the updated *Red Data Book* (RDB; JNCC website: www.jncc.gov.uk) on Gower – *Cephaloziella calyculata*, *Entosthodon pulchellus* and *Weissia levieri* – and one, *E. pulchellus*, in Pembrokeshire.

More recently, the only coverage the limestone bryophytes have received has been during casual visits by BBS members, a survey of Stackpole NNR by Alan Orange, and annual Field Studies Council visits to Stackpole by Martha Newton and her course attendees. Since 2000, the author has spent many hours recording in Pembrokeshire, during which time the limestone coast received something more like the attention it deserved. Species that were thought to be restricted to one or two sites in v.c. 45, such as *Protobryum bryoides*, have proved to be more widespread, whilst other more restricted taxa have had their population sizes assessed for the first time. A visit to Lydstep Head (v.c. 45) in 2001 revealed *Southbya tophacea*, previously known in south Wales only from Triassic Limestone in the Vale of Glamorgan;

Red Data Book bryophytes on the south Wales limestone coast

Cephaloziella calyculata was added to the v.c. 45 list in 2004; and *Entosthodon pulchellus* was re-found in Pembrokeshire during a survey of Stackpole in 2006. Meanwhile, Gower went almost unrecorded as it was perceived as falling into the category of 'areas without a resident bryologist that were well covered in the past' and therefore didn't need attention.

Recent surveys as part of the Countryside Council for Wales' ongoing programme of lower-plant site dossier production have assessed the bryological richness of four SSSIs on the south Wales limestone coast. This has involved visits to areas with tricky access, such as the MOD range at Castlemartin and stretches of the Gower coast with very limited parking, as well as former honeypots like Stackpole and Rhossili. Documentation with a GPS and digital camera has given our first real indication of the status of the rare and scarce bryophytes on the sites: replacing statements like '*Funaria pulchella* Very rare. 48: soil on cliffs near Overton, 1961,

△ The south Gower coast at Port Eynon.
Sam Bosanquet

Smith (NMW). 58: S-facing limestone outcrop, Nicholaston Woods, 1967, Perry (Hb. Perry).'⁷ (Perry, 1994) with a series of precisely localized colony descriptions.

Four species in the revised RDB have been recorded on the south Wales limestone coast, together with one species that is listed as Near Threatened. This article aims to provide information on each.

Species accounts

Bryum funckii (*B. kunzei*) (Near-Threatened) is probably the most difficult to identify of the species involved, although well-grown shoots have characteristically imbricate leaves with reflexed apiculae. The *Atlas* (Hill *et al.*, 1994) shows a series of records on the coastal limestone of north Wales, so its discovery on Gower (v.c.

41) was to be expected, despite the lack of *Atlas* records from south Wales. Two populations are located in Mewslade and a third near Rhossili; two of these are mixed with *Weissia levieri*. All three are on thin soil overlying limestone rocks, with other associates including *Pottia recta*, *Tortula lanceola*, *Trichostomum brachydontium* and *Weissia controversa* var. *crispata*. All of the colonies are small, with a 5×2 cm patch being the largest recorded.

▽ Upper left, *Bryum funckii*; upper right *B. funckii* habitat. Lower left, *Cephaloziella calyculata*; lower right, *C. calyculata* habitat. Sam Bosanquet



Cephaloziella calyculata (RDB Vulnerable) is reasonably distinctive, at least by the standards of its genus. Well-grown colonies form small patches a few millimetres across, composed of rather flat-backed, mid-green shoots, often tipped with very pale green gemmae. The shoots appear wider than those of *C. divaricata* and can be provisionally assigned to *C. calyculata* in the field, especially if the very distinctive bract tubes are seen. The first Welsh record came from Gower (v.c. 41), where the BBS found *C. calyculata* at Rhossili in 1963. The species still occurs there, albeit in rather small quantity, on vertical soil



△ Left, *Entosthodon pulchellus*; right *E. pulchellus* habitat. Sam Bosanquet

in steep, calcareous turf south-west of Tears Point, as well as in similar habitats at Mewslade and Pwll-du Head. The Pwll-du colony is over 10 km east of Rhossili, and it seems likely that intervening colonies have been missed.

There is a larger population, composed of at least 30 patches and numerous scattered shoots, on a steep, calcareous slope below a limestone outcrop on the north-east side of St Govan's Head in Pembrokeshire; *Fossombronina husnotii* is a prominent associate here. Similar ground is occupied on the north-east side of Stackpole Head, 3 km away, but the other three Pembrokeshire colonies are in damp hollows in cliff-top heathland, albeit with *Trichostomum brachydontium* and *T. crispulum*, indicating calcareous influences. Humid calcareous slopes on south-western coastal limestone seem to be the favoured habitat of *C. calyculata* in Wales, whereas colonies in Cornwall are on mine-waste and serpentine (Hill *et al.*, 1991). Re-examination of the limestone in Somerset, where there is a 1988 record by Ron Porley, or Devon may produce further colonies, although *C. baumgartneri* seems to replace *C. calyculata* once Dorset is reached.

Entosthodon pulchellus (RDB Vulnerable) grows in greater abundance than the other four rare bryophytes and may not actually have declined enough to justify its RDB status. Gower (v.c. 41) is the south Wales heartland of *E. pulchellus*, and 19 separate colonies have been recorded in 2008 on the 5 km stretch of coast between Rhossili and Overton, with another cluster of

three colonies 10 km to the east at Pwll-du Head (the intervening coast has not been visited in 2008). Colonies varied in size from two or three patches to several tens of patches and supported from six to over 150 sporophytes each; a total of over 1,500 sporophytes was counted. The largest Pembrokeshire (v.c. 45) colony of *E. pulchellus* is on a cliff overlooking Blucks Pool, a bay at the western end of the Castlemartin Peninsula, where there are at least eight patches supporting over 200 sporophytes. Other smaller Pembrokeshire colonies occur in two places on Stackpole NNR and two on Lydstep Head.

The habitat of *E. pulchellus* is relatively distinctive and suggests that it is a somewhat mobile plant. It grows on sparsely vegetated, light soil, with little or no evidence of clay, on limestone ledges or steep, stony banks. Colonies are usually composed of several discrete patches of 10 to 20 plants, although larger ones can include low turfs of a few hundred shoots. Many of the sites appear disturbed and have very sparse vascular cover, although the disturbance may be just the result of drying and wetting causing the soil to 'heave'. Exposed situations are avoided, so the upper reaches of coastal valleys (called Slades on Gower) are favoured. *Reboulia hemisphaerica*, *Riccia sorocarpa*, *Trichostomum brachydontium* and *Weissia controversa* var. *crispata* are typical associates.

Southbya tophacea (RDB Vulnerable) grows in similar situations to *Cephaloziella calyculata* in

Pembrokeshire (v.c. 45), but appears to be absent from Gower (v.c. 41) despite the presence of apparently suitable ground. One of the Pembrokeshire colonies, on steep, lime-rich soil below the cliffs on the north side of Lydstep Head, supports many hundreds of plants, whilst the other, on the north-east side of Stackpole Head, holds just eight patches. Unfortunately, invasion by *Cotoneaster* sp. threatens part of the Lydstep colony, although occasional trampling of a fisherman's path helps to keep conditions suitably open. The Stackpole Head colony has *Fossombronia husnotii* as an associate, as well as *Dicranella varia* and *Trichostomum crispulum* shared by both sites.

Weissia levieri (RDB Endangered) is restricted in Wales to the coast between Worm's Head and Port Eynon, Gower (v.c. 41), steadfastly avoiding the Pembrokeshire limestone. Its only other known British site is Brean Down in Somerset. Smith (1964a) gives a vague 'in several places in turf on cliffs between Port Eynon Point and Rhossili', which suggests he knew too many sites to warrant individual listing. The complete lack of subsequent Gower records, except for a patch found at Port Eynon Point by the author and Graham Motley in 2001, made conservation evaluation of British *W. levieri* very difficult.

Seven colonies of *W. levieri* were located in 2008, and there is no doubt that more would have been seen if one day of the survey had not been so dry that separation of *W. levieri* from *W. longifolia* became almost impossible. Although not emphasized by Smith (2004), the plane leaf margins of *W. levieri* are the quickest distinction from *W. longifolia* in the field, because the latter's var. *angustifolia*, which grows on the south Wales limestone, has strongly inrolled margins. Most *W. levieri* was found in sparsely vegetated, stony, south-facing, sloping turf below limestone

outcrops, although two colonies occupied thin soil on limestone ledges. *Pleurochaete squarrosa*, *Trichostomum brachydonium* and *Weissia controversa* var. *crispata* were its most regular companions. All colonies had plentiful unripe sporophytes in January 2008, and examination of two tufts revealed old, dehisced capsules. One colony had *W. longifolia* growing less than 30 cm from *W. levieri*, and the precise difference in ecological needs of the two species is unclear.

Other species

As well as these rare species, the coastal limestone on Gower and in Pembrokeshire supports a good number of other scarce or declining plants, including strong populations of *Bryum canariense*, *Eurhynchium striatulum*, *Grimmia orbicularis*, *Pleurochaete squarrosa*, *Reboulia hemisphaerica* and *Tortula lanceola*, and scattered colonies of *Encalypta vulgaris*, *Fossombronia husnotii*, *Phascum cuspidatum* var. *piliferum* and *Weissia longifolia* var. *angustifolia*. *Weissia controversa* var. *crispata* is ever-present on limestone outcrops, often forming distinctive dense cushions that look very different from typical var. *controversa*. *Entosthodon muhlenbergii* was recorded just once on Gower and is clearly more typical of inland limestone in Wales than its congener *E. pulchellus*. Two rather mysterious taxa – *Dicranella* specimens with leaf characters of *D. howei* and *Pottia* specimens with spores and peristomes of *P. commutata* – await further examination.

Conclusions

The limestone coast of south Wales is of significant conservation value for its bryophytes. Along with the Somerset limestone, it is the headquarters of *Weissia levieri* in Britain, and is a significant stronghold for *Cephaloziella calyculata*



△ Upper left, *Southbya tophacea*; upper right *S. tophacea* habitat. Lower left, *Weissia levieri*; lower right, *W. levieri* habitat. Sam Bosanquet

and *Entosthodon pulchellus*. The main difference from Somerset is the absence of *Cheilothela chloropus* from Wales: this distinctive species has eluded searches so far, but could conceivably be present on one of the many unexplored sections of the Gower coast. None of the five species discussed above is abundant on any site, but the two RDB mosses and two RDB liverworts are represented by strong populations. Only the least threatened of the five, *Bryum funckii*, is present in small quantity, although it may have been somewhat overlooked.

Sam D.S. Bosanquet

Countryside Council for Wales, Llanion House, Llanion Park, Pembroke Dock (e s.bosanquet@ccw.gov.uk)

References

- Hill, M.O., Preston, C.D. & Smith, A.J.E. (1991). *Atlas of the Bryophytes of Britain and Ireland. Volume 1. Liverworts (Hepaticae and Anthocerotae)*. Harley Books, Colchester.
- Hill, M.O., Preston, C.D. & Smith, A.J.E. (1994). *Atlas of the Bryophytes of Britain and Ireland. Volume 3. Mosses (Diplolepideae)*. Harley Books, Colchester.
- Perry, A.R. (1981). The spring meeting, 1980, Pembrokeshire. *Bulletin of the British Bryological Society* 37, 2–6.
- Perry, A.R. (1994). Mosses, liverworts and hornworts. In *Flora of Glamorgan*. Edited by A.E. Wade, Q.O.N. Kay & R.G. Ellis. London: HMSO.
- Smith, A.J.E. (1964a). A bryophyte flora of Glamorgan. *Transactions of the British Bryological Society* 4, 539–596.
- Smith, A.J.E. (1964b). The annual meeting, 1963. *Transactions of the British Bryological Society* 4, 748–750.
- Smith, A.J.E. (2004). *The Moss Flora of Britain and Ireland*, 2nd edn. Cambridge: Cambridge University Press.
- Swinscow, T.D.V. (1959). The annual meeting, 1958. *Transactions of the British Bryological Society* 1959, 641–643.