Bryophyte Survey
Brownslade and Linney Burrows
Castlemartin Cliffs and Dunes SSSI

Client: **Landmarc**

Survey Date: **December 2021 – January 2022**

Author: **Matt Sutton**

Executive Summary

A population of Petalwort (*Petalophyllum ralfsii*) has been known from Brownslade since 1950 and is a notified SAC feature. However, the wider assemblage of dune bryophytes has only recently been determined as a qualifying SSSI feature (Sutton, 2021), although Bosanquet (2012) highlighted additional species of local interest. The current survey was required to fully characterise the 'Dune and Slack' assemblage, and to provide information on the distribution and population sizes of component species.

Petallophyllum ralfsii, although not subjected to SAC monitoring protocols, was found to be widespread and locally abundant on the part of the site formerly quarried for sand. It was also present in two unmodified areas to the east. The population size was estimated to still be in the low tens of thousands. 'Hot-spots' where petalwort was recorded at high densities were noted in three slacks. Although the vegetation in many slacks is less open than is considered ideal for the species, it persists in reasonable numbers here.

Two new species were added to the dune assemblage. The Nationally Rare *Bryum dyffrynense* was found in small quantity in two slacks, where it is dependent on the maintenance of open, wet sand areas. The Nationally Scarce *Distichium inclinatum* was found in tightly-grazed damp slack area, not previously modified by sand extraction. It was also recorded on a dune face above the beach.

Several local rarities were also recorded, including several new to the site and one new to the county. Brownslade and Linney Burrows now rank 4th in the list of Welsh dune systems qualifying for their bryophyte interest. In addition to the 'Dune and Slack Assemblage', the populations of *Petalophyllum ralfsii*, *Bryum dyffynense* and *Didymodon acutus* independently qualify as SSSI features.

Much of the site is currently in good condition for these notable bryophytes. Current levels of grazing and military disturbance are beneficial. Some additional intervention may periodically be required to re-start vegetation development within the former sand extraction areas. This could entail some light scraping of surface vegetation and sand, followed by transport to a receptor site on the nearby National Trust dune-restoration project at Gupton Farm.

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1. Introduction

Matt Sutton of Wyndrush Wild was contracted to survey bryophytes at Brownslade and Linney Burrows. A population of Petalwort (*Petalophyllum ralfsii*) has been known from Brownslade since 1950 and is a notified SAC feature. However, the wider assemblage of dune bryophytes has only recently been determined as a qualifying SSSI feature (Sutton, 2021), although Bosanquet (2012) highlighted additional species of local interest. He commented that 'At present, the dune bryophyte flora at Brownslade Burrows is far more limited than the system's size, abundant flushing, and large Petalwort population might suggest, and it lacks some of the dune specialists recorded elsewhere in south Wales, such as *Amblyodon dealbatus*, *Campyliadelphus elodes*, *Moerckia flotoviana* and *Riccardia incurvata*. The presence of *Preissia quadrata* and *Didymodon ferrugineus*, both of which were recorded new to the site in 2012 and had previously been reported from 1 and 2 Pembrokeshire sites respectively, gives hope that further scarce species might persist in small quantity or could colonise as the sand quarries mature'.

The current survey was required to fully characterise the 'Dune and Slack' assemblage, and to provide information on the distribution and population sizes of component species.

2. Desk Exercise

The Pembrokeshire Rare Bryophyte Register (Sutton, in prep) incorporates records of all qualifying assemblage species and local rarities, extracted from the British Bryological Society (BBS) database for the county. This is uploaded to a QField app on the author's phone, enabling navigation to the location for each species in the field.

The exception is for Petalwort records, which are too numerous at the site to have been individually captured in the BBS database. Mapped locations for petalwort derived from a 2018 NRW surveillance visit were included in the tender specification, and these were uploaded to a ViewRanger app on the author's phone. Further details contained in the filenote for this visit, together with the population information contained in Wilkinson et al (2011), were not obtained until after the fieldwork was completed over the Christmas shut-down period.

3. Survey Details

Survey was carried out by Matt Sutton over 5 days between 12/12/2021 and 1/1/2022. Weather generally was mild and dull, with recent rain keeping bryophytes in a moist state for all or most of the day. Thorough 'hands and knees' searches were made in various locations across the dune slacks identified in Wilkinson et al (2011), together with some not mapped there. A general search was also made in a sample of more mobile and foredune areas, with a view to locating areas suitable for some rare *Bryum* species of such habitats. Samples were

taken for microscopic identification where necessary, and some critical specimens were also examined by Tom Ottley, county bryophyte recorder for Ceredigion. The two new species of moss for the county were confirmed by Sharon Pilkington, the national recorder.

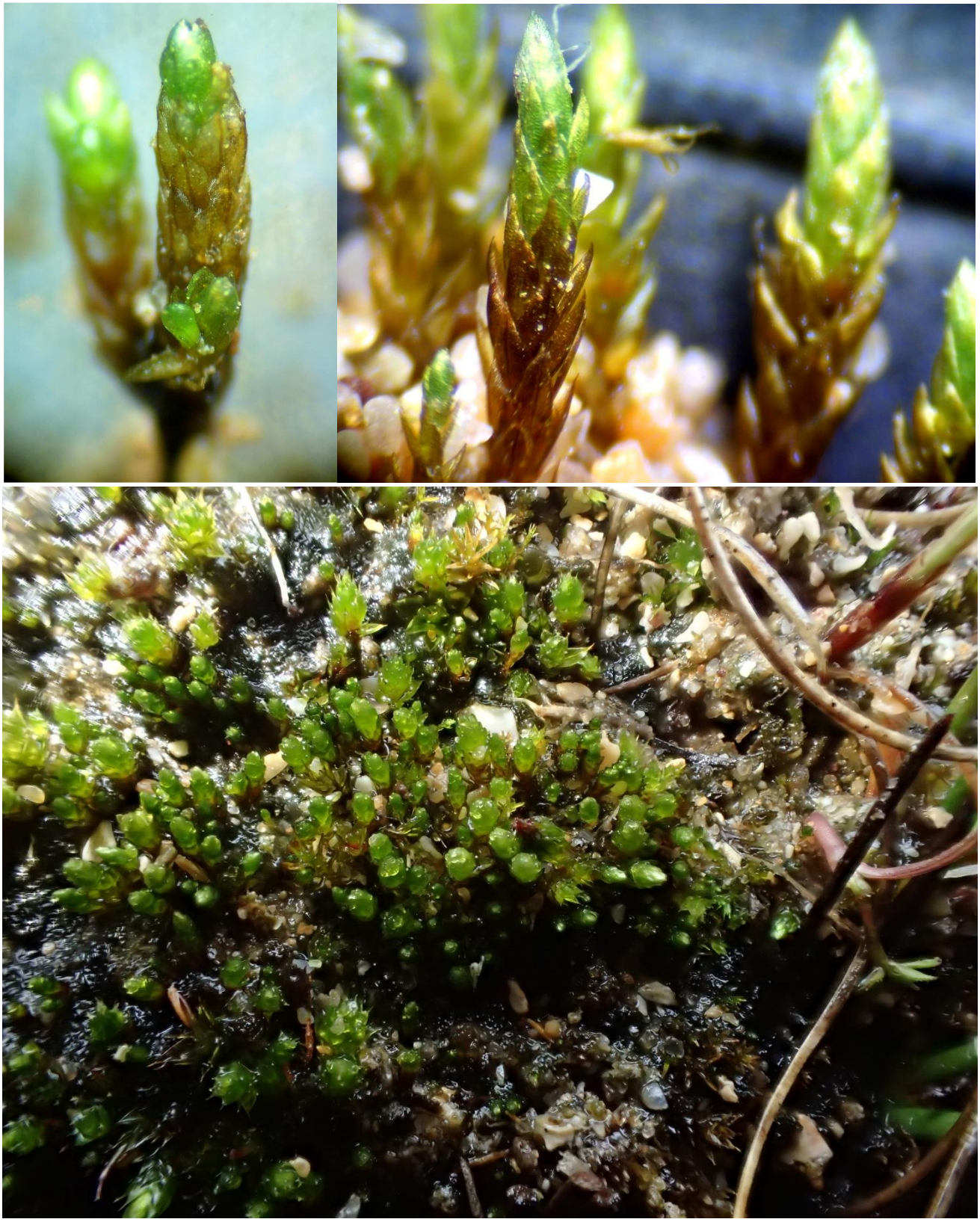
4. Slack Labelling

Map 4.1: Slack Numbering

The slack labelling system introduced by Wilkinson et al (2011) has been adopted for the current survey, although the inclusion of six areas not recognised by that survey has necessitated the definition of some additional slacks.

5. Dune and Slack Assemblage Species

5.1 Dyffryn Bryum (*Bryum dyffrynense*)



Bryum dyffrynense shoots

This Nationally Rare species is classed as Near Threatened in the UK Red List (Hodgetts, 2011) and Vulnerable in the Welsh Red List (Bosanquet & Dines, 2010). The type locality for the species is Morfa Dyffryn in north Wales, and it is also recorded from Newborough Warren. There were no previous records from Pembrokeshire or elsewhere in south Wales.

This survey discovered small patches in two locations in Slack J (illustrated below), and one location in Slack I.

Bryum dyffrynense locations in Slack J: (top) J1a (specimen in BBSUK herbarium); (bottom-left) J2a (bottom-right) J2b

Table 1: Bryum dyffrynense sub-populations

Sub-population	Grid Reference	Size
J1a	SR8954798421	Small patch of 100+ shoots, <10x10cm
J1b	SR8954798424	A few scattered shoots
J2a	SR8950198524	A few scattered shoots
J2b	SR8950198526	Small patch of <50 shoots
I1	SR8969298480	A few scattered shoots
O1	SR8954998359	2 shoots (not collected, unconfirmed)

Map 5.1: Bryum dyffrynense locations

All sub-populations were at the margins of areas of particularly open, wet sand. Two small patches in the northern part of Slack J were only a couple of metres apart so have been classed as one sub-population J2; both patches were beside vehicle tracks across an area of wet sand. Sub-population J1 in the main part of Slack J comprises a patch (J1a) on the edge of a hummock, alongside an extensive area of open, wet sand with sparse *Agrostis stolonifera*. In addition, a few shoots are scattered through this *Agrostis* on the northern side of the hummock, two or three metres to the north. A couple of possible shoots of this species were also noted on an open, wet sand area to the north of Slack O, at SR8954998359.

The habitat here is very typical for the species. It is a colonist on damp, partly-bare calcareous sand, usually in dune slacks. It is intolerant of shading and disappears as successional

processes develop a closed cover. It may be a new colonist at Brownslade but could equally have been overlooked in recent years. Brownslade was roughly equidistant between the known populations near Hayle in north Cornwall, and Morfa Dyffryn; a small population was subsequently found by this author (January 2022) on the C9 Range at Pendine Burrows, part of Laugharne and Pendine Burrows SSSI.

This is a critical and recently described species, and the common, closely related *Bryum dichotomum* is abundant here, often around the *Bryum dyffrynense*. Provisional field identification of the latter came through the tall shoots with closely overlapping leaves, but microscopic identification was needed to confirm the reddish nerve ending below the apex, brown auricles, large bulbils (present on all samples) and tall branched shoots.

As the only known population of a Nationally Rare species in the Area of Search, this should be considered an Independently Qualifying Feature in addition to being a member of the dune bryophyte assemblage. It is due to be listed as ‘Data Deficient’ in the revised UK Red List (Callaghan, pers. comm.).

5.2 Petalwort (*Petalophyllum ralfsii*)

Petalophyllum with Didymodon acutus in Slack Eii

There has been concern (Wilkinson, 2018), that this independently qualifying SSSI and SAC feature is declining as a result of successional processes underway in the former sand-extraction areas of Brownslade Burrows. Sand extraction only ceased here in 1999, and the first full survey by David Holyoak (2002) would have caught the population at a time when habitat conditions were ideal for the liverwort across a large area. However, his estimate of hundreds of thousands of plants has been questioned (Bosanquet, 2012) and it may be that the population was only ever in the tens of thousands.

The current survey recorded *Petalophyllum* wherever it was encountered. This was usually done by taking a grid reference of sub-metre accuracy using a geode, and counting the number of thalli in an approximate 1m radius around that point. Where 'hot-spots' were encountered, sample counts were made in only a few points within that area. Although notes were made and photos taken in a sample of sub-populations in each slack, no information was routinely collected on the condition of vegetation and the percentage of bare ground.

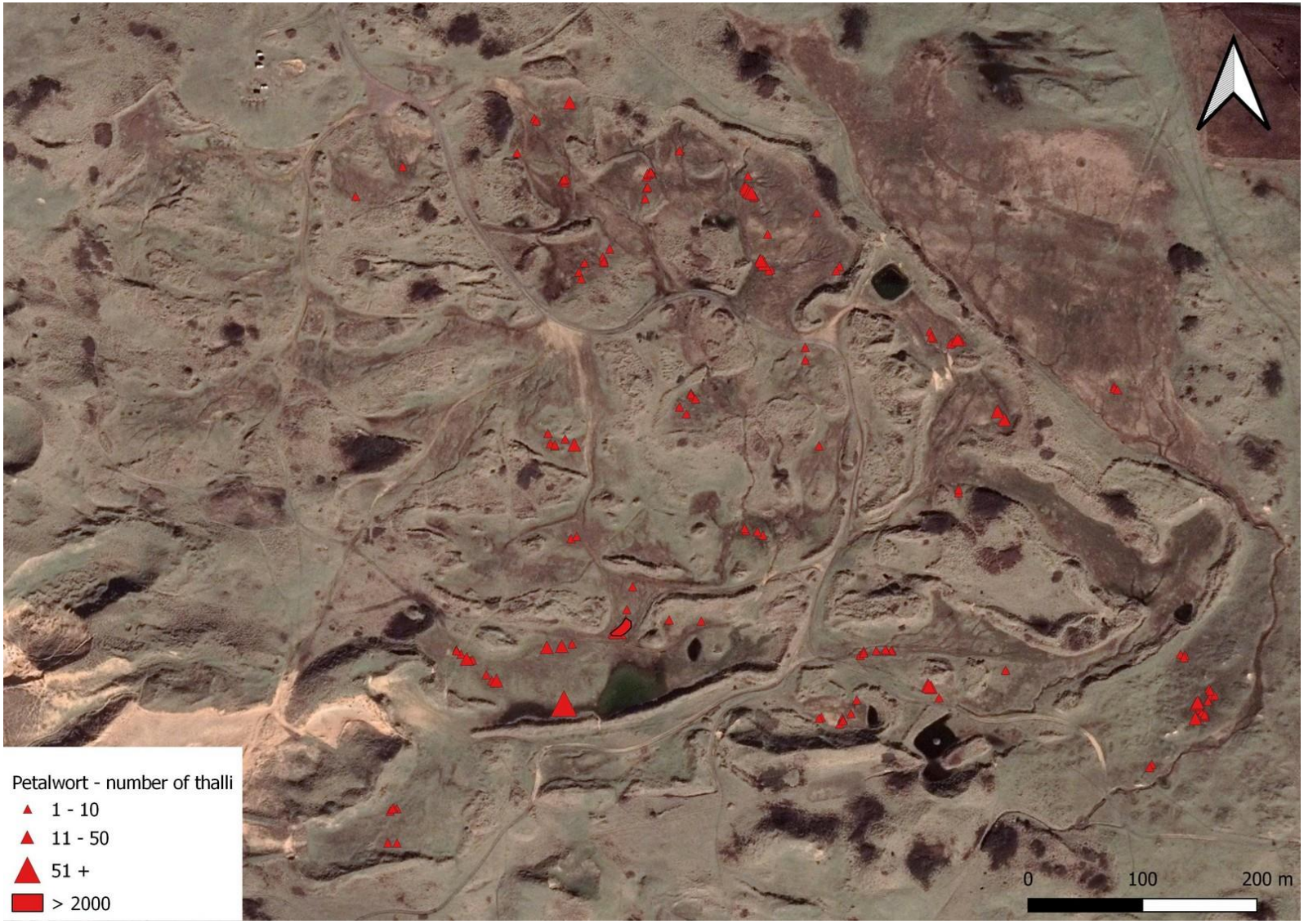
It was not intended for this contract to follow a SAC monitoring specification, and the SAC monitoring report was not available prior to fieldwork. However, it is broadly possible to retrospectively interpret the data collected in a SAC monitoring framework.

Presence in 17 slacks was confirmed. Several of these were in slacks which had not previously been defined as such by Wilkinson et al (2011). Slack O, for example, was only created a year or two before that survey. Slack R is an area out-with the former sand extraction area.

The current survey found 'hot-spots' where 50+ thalli per $1m^2$ were recorded in Slacks Eii, Hii and I. There may have been three separate 'hot-spots' in each of these slacks, but the survey technique used (a 1m radius rather than square) does not allow this to be confirmed. The objective for lower density hot-spots of 10+ thalli in $1m^2$ of Category 1 would perhaps have been met in Slacks I, J and K.

The number of individual thallii counted totalled just under 1000, and two large sub-populations were each estimated to have a minimum of 1000 thalli each. This total of 3000 thalli is based only on a sample of the population, and a conservative estimate of the true figure would be at least three times this high. This suggests then that the population is still in the (low) tens of thousands.

The current survey also noted some sub-populations in various areas which are likely to have been classed as Category 3 habitat. Although harder to find in such situations, it can grow under a 'canopy' of sedges or other vascular plants, as long as there is damp sandy soil below. Holyoak (2006) suggests that petalwort can grow over large areas in very thin low cover of grasses and herbs, and also notes that petalwort can tolerate increased shading in countries with higher heat and sunshine. This raises the possibility that apparently sub-optimal habitats in the UK may become more suitable with climate change. Sutton (2020b) found strong and previously overlooked sub-populations under grass on Laugharne and Pendine Burrows SSSI.



Map 5.2: Petalophyllum Records, Brownslade Burrows 2022

Differing vegetation types with Petalophyllum thalli: below Carex flacca in Slack G (top); on freshly windblown sand in Slack J (bottom-left); on closed vegetation in slack R (bottom-left)

5.3 Pointed Beard-moss (*Didymodon actus*)

The yellowish-green shoots, often swept to one side, are typical of Didymodon acutus s.s

The taxonomy surrounding this species was confused until recently, and records from Pembrokeshire prior to 2020 are referred to *Didymodon acutus* sensu lato – an aggregate species which includes the more widespread *Didymodon icmadophilus*. The latter segregate is the dominant one across the limestone tracks on Range West, but the current survey has confirmed that most or all of the dune populations are *Didymodon acutus* sensu stricto. This is Nationally Rare – other confirmed records come from the south-west of England, and Pendine Range in Carmarthenshire.

Bosanquet (2008) recorded the aggregate species as locally abundant in the '*Fulgensia* protection area' in the southern part of Brownslade and gave a handful of other grid references around here.

The current survey recorded *Didymodon acutus* in numerous locations. It was particularly abundant in slack L, where it is a dominant species over sparsely-vegetated broken sandstone. In sandier areas, it is locally abundant in dry or moist ground, often alongside *Trichostomum crispulum* in carpets of acrocarpous mosses. It is locally-frequent on disturbed sandy track edges. It was also recorded in a patch of tufaceous soft-cliff on the dune front (where *D. validus* was considered). The population here appears to be the largest in the UK.

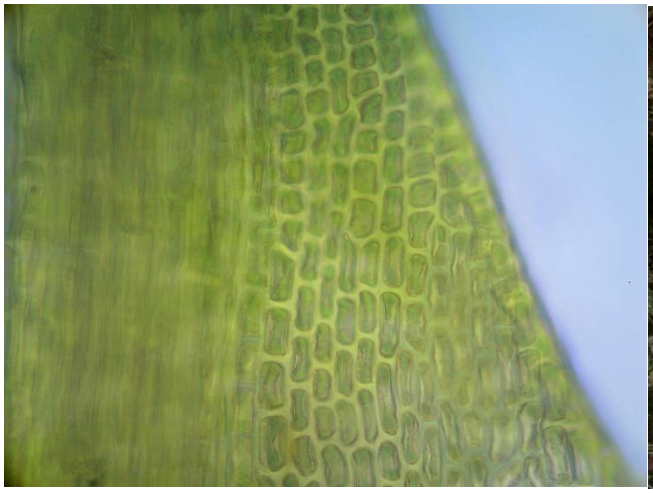

(left and right): Didymodon actus is particularly abundant over stony ground in Slack L

5.4 Inclined Distichium (*Distichium inclinatum*)

A *Distichium* was found in Slack R by Sutton (2021), but the lack of fruits precluded identification at that time. The Nationally Scarce *Distichium inclinatum* was the only species previously recorded from the county (from an old railway bridge near Puncheston), but *D. capillaceum* is sometimes also recorded from dunes, where it can look very similar. The former species is the only one listed by Bosanquet (2019) as a qualifying species of the dune and slack assemblage.

The population in this slack was located during the current survey, where it was found to be patchily abundant across a small area of compacted, damp ground with closed but very short-grazed vegetation. A second very small population was found on tufa-coated sand and clay above a sandstone outcrop on the frontal dune edge, alongside *Didymodon tophaceus* and *Eucladium verticillatum*.

Neither population was fruiting, although a sample from the slack contained a single developing seta. However, German literature (Maier, 1998) and a Czech key (Novotny, 2004) indicate that the two species can be separated on the shape and pattern of the leaf cells near the ‘shoulder’, with *D. inclinatum* having rectangular cells arranged in more-or-less vertical rows, whilst *D. capillaceum* has irregular, ‘worm-shaped’ cells. On this basis, the Brownslade sample is clearly *D. inclinatum*, as the photo below demonstrates.




(left) *Distichium inclinatum* leaf ‘shoulder’; (right) *Distichium* location on dune front

Distichium inclinatum is frequent in a small area of this un-quarried slack

5.5 Luisier's Tufa-moss (*Gymnostomum viridulum*)

Gymnostomum viridulum forms short-leaved patches, here mixed with larger Trichostomum crispulum

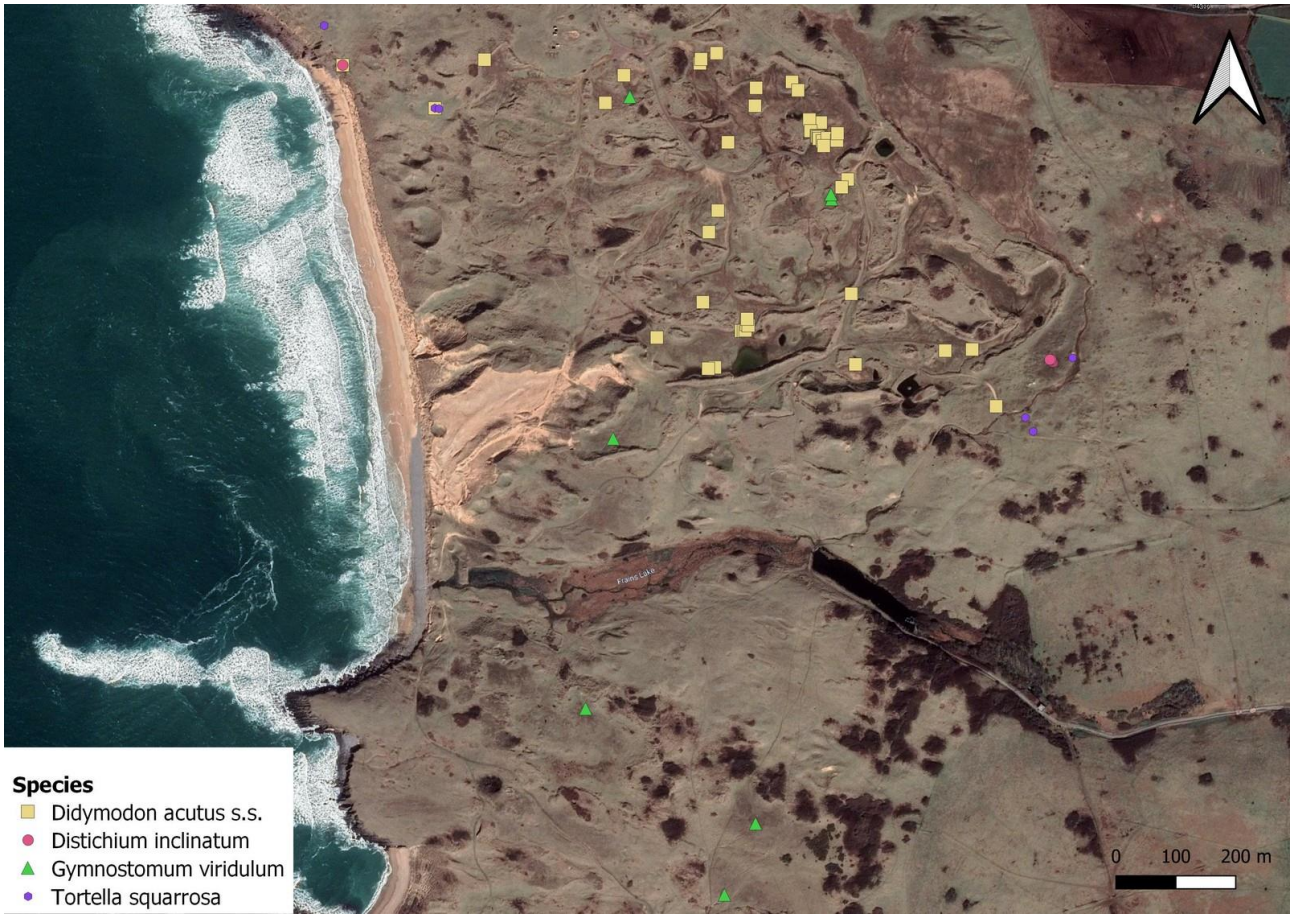
Bosanquet (2008) describes this Nationally Scarce moss as growing in remarkable profusion on damp sand in Linney and Brownslade Burrows; he suggested that the population here is greater than in all other Pembrokeshire sites combined.

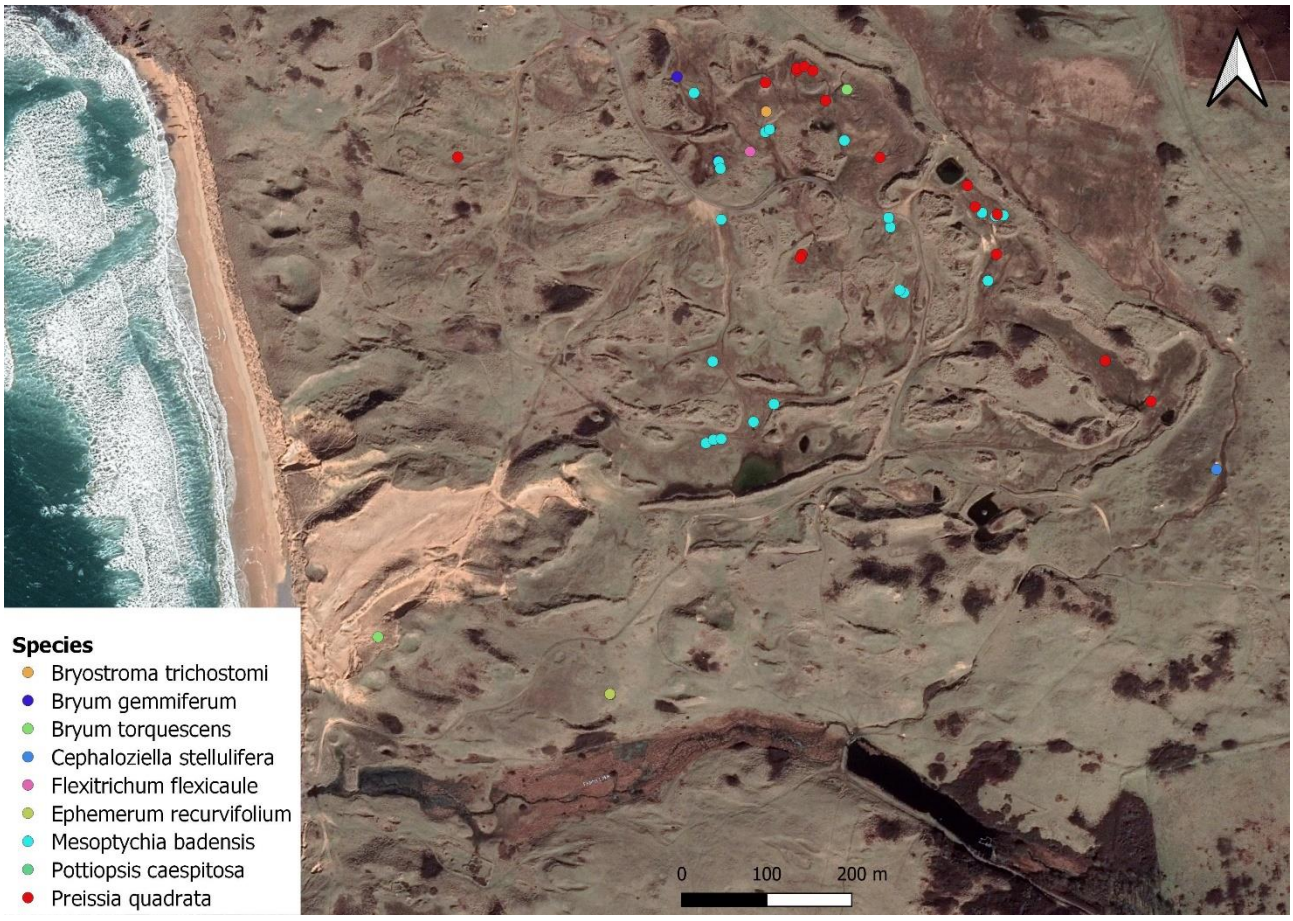
The current survey found small patches in a few places on both dune systems (map 3???), but nowhere could it be described as abundant. Although it is a tiny moss and easy to overlook when saturated or in poor light, it seems apparent that it has declined significantly over the last 12 years. The same successional factors which are thought to have caused a decline in *Petalophyllum* are presumably responsible. *Gymnostomum viridulum* is perhaps more vulnerable, as, unlike *Petalophyllum*, it is restricted to bare patches and does not grow on carpets of other acrocarpous mosses.

5.6 Side-fruited Crisp-moss (*Tortella squarrosa*)

Tortella squarrosa forms bright yellow-green patches in dry dunes

This Nationally Scarce moss, formerly known as *Pleurochaete squarrosa*, is yellow-green and has a distinctive frizzy appearance when dry. Bosanquet (2008) describes it as only very locally-frequent on the dunes here, and contrasts its scarcity on the Range with its abundance at Stackpole. It was rarely encountered during the current survey, but the focus on the wetter slack areas meant that areas of dry dune suited to this species were not generally searched. There is no reason to suspect a decline, and grazing levels remain well-suited to the fixed dune grassland areas.





(top) Map 5.3: Qualifying Assemblage Species; (bottom) Map 5.4: Other Notable Species

6. Other Notable Bryophytes

6.1 Tight-tufted Threadmoss (*Bryum creberrimum*)

This Nationally Rare species is known from a variety of disturbed habitats in addition to dunes, and as a result is not classed as a member of the dune and slack assemblage by either Bosanquet et al (2018) or Bosanquet (2019). Although not recorded from Pembrokeshire, a specimen from Stackpole Warren (Sutton, 2019) may have been this species, but there was not enough fruiting material available for the *Bryum* referee, David Holyoak, to draw a firm conclusion and *Bryum pallescens* was not ruled out.

A small amount of fruiting material was collected from Slack J during the current survey, and keyed to *Bryum creberrimum*. Tom Ottley agreed with the determination, but there may again be insufficient material to provide a voucher specimen. It has been sent to David Holyoak, who will not be able to examine it until March. As with most *Bryums*, targeted survey in late summer would be required to collect sufficient fruiting material for accurate identification.

6.2 Twisting Threadmoss (*Bryum torquescens*)

This Nationally Scarce species has proved to be more widespread on limestone outcrops and dunes in south Pembrokeshire than the two records listed in Bosanquet (2010) suggested. Sutton (in prep.) lists 14 records from 5 sites, and it has been recorded from both Castlemartin Range west and east.

The current survey found two new sub-populations in Brownslade Burrows. It is frequent in a small area of fixed dune grassland on the upper slope of Slack I, and abundant amongst marram in an area of mobile dune to the south of the ‘dune-notch’ recently created behind the beach to funnel sand inland. Both populations were confirmed by dissection of inflorescences; the common look-alike *Bryum capillare* was also noted in several places.

Bryum torquescens (right) and location in mobile dune (left)

6.3 Round-fruited Pottia (*Pottiopsis caespitosa*)

This Nationally Scarce calcicole, only otherwise know in Wales from the Great Orme, was discovered new to Pembrokeshire on Castlemartin Range West (Sutton, 2021). The four sub-populations recorded were mostly on limestone track edges, and therefore contributed to the 'Open Calcareous Ground' assemblage, but one was recorded on sheep paths across two areas of Linney Burrows. The Atlas (Blockeel et al, 2014) indicates that it is primarily a plant of trampled chalk grassland, but notes that it is recorded from calcareous sand in north Cornwall.

The current survey recorded a single fruiting shoot close to one of the previous records on Linney Burrows – on the edge of area of broken stony ground. No plants were found on the main slack area to the west, and the path across here was less trampled than previously.

This area of broken stony ground on Linney Burrows supports a small population of Pottiopsis caespitosa on sheep-paths on its southern edge.

6.4 Heath Threadwort (*Cephaloziella stellulifera*)

Although Nationally Scarce, Sutton (2021) found this to be the most widespread of several of this group of diminutive liverworts on Castlemartin Range. Although most occurrences were on open limestone ground, it was also recorded in small quantity on Linney Burrows. The current survey recorded putative specimens of this species in open dune turf in Slack R, but this was not confirmed through dissection of inflorescences.

6.5 Scarce Notchwort (*Mesoptychia badensis*)

This small liverwort with bi-lobed leaves, previously known as *Leiocolea badensis*, is locally rare. It was not known in the county until recently, with the first record from Stackpole Warren in 2019 (Sutton, 2020). It was subsequently recorded on Lydstep Head.

The current survey found it to be locally-frequent in several slacks including Slacks A I, J, P (Map 5.4 above). The more widespread *Leiocolea turbinata* is also present on the site, although not recorded from the dunes by Bosanquet (2008). It appears to prefer the open ground in the unquarried fen area.

Mesoptychia badensis on wet sand

6.6 Strap-leaved Earthmoss (*Ephemerum recurvifolium*)

Ephemerum recurvifolium patch (left) and location on bank near Fulgensia zone (right)

The two Pembrokeshire populations found by Sam Bosanquet, including one on Range West, were the first recorded in south Wales (Bosanquet, 2010). Although still locally scarce, it has proved to be more frequent in the south of the county, with strong populations on Range West and Bottom Meadow Quarry, West Williamston as well as records from three other sites (Sutton, in prep.).

The current survey found a small fruiting patch on a low limestone bank to the east of the '*Fulgensia* protection zone'. This represents the first record for the dune system.

6.7 Narrow Mushroom-headed Liverwort (*Preissia quadrata*)

Preissia is locally frequent in seepage areas and channel sides, for example in Slack J

The population of *Preissia* here, first recorded in 2011 (Bosanquet, 2012), remains the only one known in the county. The current survey found it to be locally frequent alongside channels in Slack J, as well as on damp sand around a tufaceous seepage area on the northern edge.

Further sub-populations were found in a small area of open ground in Slack P, and on a channel side in dunes south-west of slack L (Map 5.4 above). The population in the fen appears to be restricted to the western edge, where heavy poaching here may be affecting it.

6.8 Small-bud Bryum (*Bryum gemmiferum*)

A locally-scarce species, recorded from six sites in the county including a working sand quarry and depot as well as the dune systems of Brownslade, Broomhill and Kilpaison. Although the largest population in the county (Bosanquet, 2010), that at Brownslade is not particularly extensive and the current survey only recorded it from a few locations on open, wet sand in Slack J.

6.9 Bendy Ditrichum (*Flexitrichum flexicaule*)

A new species for the county. This moss is similar to, but much scarcer than, *Flexitrichum* (*Ditrichum) gracile* which is widespread on the site. It was found in small quantity on a dry edge of Slack J.

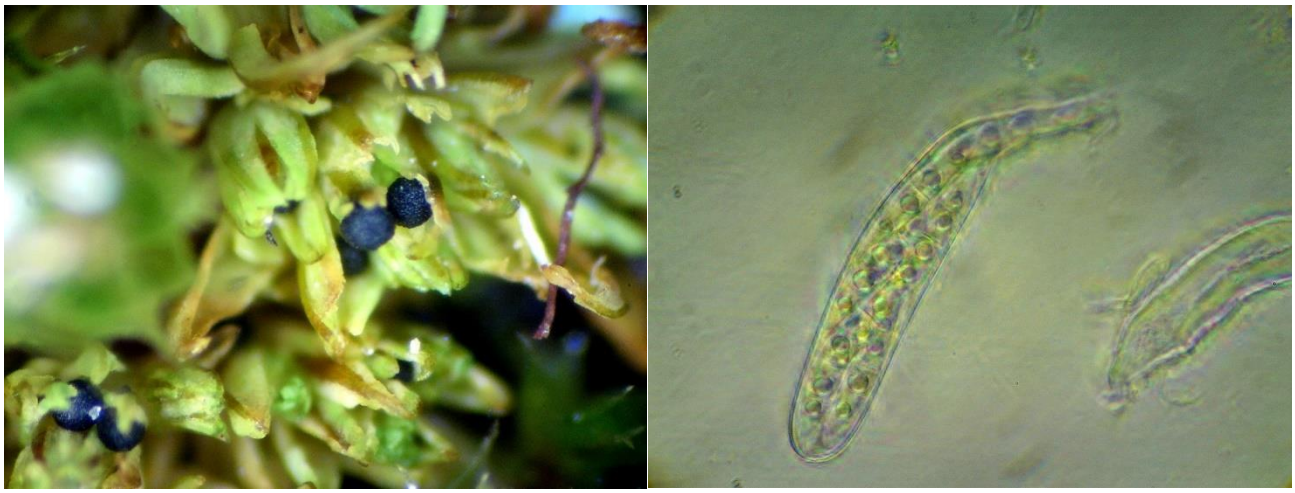
6.10 Rusty Beardmoss (*Didymodon ferrugineus*)

A locally-scarce species, previously recorded in small quantity from the fen area at Brownslade (Bosanquet, 2012) and Slack R (Sutton, 2021). Currently known from a total of five sites in the county. No additional records were made during the current survey. The fen location was visited, but winter cattle-grazing here is causing excessive poaching and reducing the habitat quality.

Poached fen at the Didymodon ferrugineus location

7. Incidental Records

Bryostroma trichostomi, a bryophilous fungus found on the shoots of *Trichostomum crispulum*, was seen in Slack J. It appears as tiny black balls on the leaves. NBN atlas shows two other UK records, one of which is near Swansea. 6 thalli of ***Fulgensia fulgens*** were seen at SR8933397927 in compacted turf in Slack G, from where it is presumably well recorded.



Bryostroma trichostomi with ascopores

8. Revised Conservation Assessment

The two newly recorded species, together with an assessment of *Didymodon acutus* s.s. as Nationally Rare, doubles the score for the Dune and Slack assemblage. The new total of 24 moves Brownslade and Linney Burrows from 9th to 4th in the ranking of Welsh dune system, and comfortably above the threshold score of 12 required for SSSI notification.

Species	Assemblage Score
Bryum dyffrynense	6
Didymodon acutus (sensu stricto)	6
Petalophyllum ralfsii	3
Distichium inclinatum	3
Gymnostomum viridulum	3
Tortella squarrosa	3
	Total 24

Three of these assemblage species can be classed as Independently Qualifying: *Bryum dyffynense*, *Petalophyllum ralfsii* and *Didymodon acutus*.

9. Management Actions for Bryophytes

The management activity which has shaped the bryophyte assemblage more than any other has been past sand extraction. This has encouraged several rare species of open, wet sand, but may have impacted on others (such as *Distichium inclinatum*). It is now over 20 years since the last sand was extracted. Aerial photography and evidence from previous surveys indicates a predictable vegetation succession, with higher plants increasing in cover. The disturbance from military activities, combined with grazing, has held back this succession in places. It is these areas which currently hold the greatest number of notable species.

With a dune mobilisation exercise recently carried out on the foredunes, coupled to increasing severity of storm winds, there is presumably likely to be a greater degree of sand deposition in these 'slacks'. Evidence of recent deposition of fresh sand was noted, for example in the northern corner of Slack J. Although petalwort was growing on this fresh sand, 'infilling' of slacks with sand would perhaps be less beneficial to the notable bryophytes than further removal of sand. An idealised management regime would seek to periodically remove sand from in or around the former sand extraction area, to maintain freshly-exposed sand at a suitable height in relation to the water-table. If this were to be carried out, a shallow depth of sand would be stripped from the surface in carefully selected locations. The nearby dune restoration project on NT land at Gupton Farm could make an ideal receptor site, as the field involved currently lacks a typical dune topography. A range of higher plant, bryophyte and fungal propagules would also be transferred to the site.

The current levels of disturbance from military activities seem ideal across much of the site. Very locally, heavily rutted areas, such as that pictured below-left, have been created by a recent tank training exercise. They may have caused too much 'uplifting' of turf to be suitable for colonisation by notable dune bryophytes, but will presumably be eroded or trampled back to a more level surface. Alternatively, such areas could be suitable for trialling sand removal and translocation. The surface topography pictured below-right is more suited to bryophytes.

(left) Recent tank disturbance in Slack B, with petalwort location in foreground; (right) Slack Q, recently created (circa. 2010) and already well colonised by petalwort.

The current sheep-grazing across the main dune system, including the former sand-extraction areas, seems suitable. The large number of sheep present in December were moved off before the end of the year, perhaps preventing excessive trampling. Slack R, outside of the former sand extraction area, is part of a management unit with the fen area. The latter is over-grazed by out-wintered cattle, but the slack itself is dry enough to cope with the trampling.

10. Recommendations for Future Monitoring

10.1 *Petalophyllum*

As the SAC monitoring protocols were not followed during this survey, no informed comments can be offered. However, it should be noted that there are more slack areas containing the species than the 18 described in Wilkinson et al (2011), and the target distribution of presence in 12 out of 18 slacks should perhaps be adjusted to reflect this. The distribution map generated by the current survey, including identification of new 'hot-spots', should be used to inform the next round of SAC monitoring.

10.2 *Bryum dyffrynense*

As a critical species, any direct monitoring of this species would need to be done by a highly competent bryologist. The similar and common *Bryum dichotomum* is present alongside at each location. Field separation is difficult even when surveyors have familiarity with the species, and regular sampling to confirm identification would not be advisable. The sub-populations located during the current survey are sufficiently few and limited in extent that monitoring should aim to be comprehensive rather than sample-based. Further survey for rare *Bryum* species, in late summer when most are fruiting, would be desirable.

10.3 *Didymodon acutus*

In contrast to the known distribution given in Bosanquet (2008), the species is now known to be widespread and often abundant across the slacks and elsewhere on the dunes. The population in Slack L is particularly large, and could act as a focus for sample-based monitoring. However, periodic visits by a competent bryologist should be sufficient to confirm the maintenance of a large population.

10.4 Other Assemblage Species

Demonstrating the continued presence of all of the assemblage species should be a pre-requisite for monitoring. Beyond this, it is debatable whether the resource requirement for sampling abundance and distribution will be available, particularly as there are three other bryophyte assemblages on the SSSI. If the condition assessments of all three independently qualifying species are favourable, and the presence of all other assemblage species confirmed, this could perhaps be considered sufficient information to class the Dune and Slack Assemblage feature as Favourable.

11. References

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