National Vegetation Classification mapping of Cemlyn Bay Shingle Bar

Final Report (August 2018)

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Inland edge of vegetated shingle bar
June 2018

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1. INTRODUCTION

This survey was commissioned by Royal Haskoning DHV on behalf of Horizon Nuclear Power in response to a comment made by Natural Resources Wales (NRW) as part of the Shadow Habitats Regulations Assessment for the Wylfa Newydd Project. NRW's comment related to potential effects of atmospheric nitrogen and acidity deposition on the vegetation of the shingle bar at Cemlyn Bay. Due to the age of the existing available data, the previous vegetation survey (Sneddon & Randall, 1993a) potentially no longer represents the current vegetation present on the shingle bar. NRW requested that a re-survey of the vegetation should be undertaken to confirm the continued presence/distribution of the vegetation communities and bring it into line with current NVC classification.

2 METHODS

2.1 Field survey

The survey was carried out on 24 June 2018. A section at the back of the bar opposite the lagoon islands was not surveyed due to presence of nesting terns. In all cases a quadrat sample area of $4m^2$ was used as the standard recording unit. In the wider bands of vegetation a square, 2m x 2m, was marked out, whilst in narrow bands of vegetation, especially along the margin of the lagoon, an area 1m x 4m was surveyed. All species of vascular plant and bryophyte in the quadrat were listed and assigned cover values; using visual estimates of percentage cover.

The positions of the quadrats were recorded using a Garmin 60CSx, which is accurate to c.3m, and plotted onto 1:2500 maps. Boundaries between different stands of vegetation were also recorded and marked on maps in the field; the widths of some of the more narrow stands were also measured. GPS data for quadrat locations and stand boundaries were subsequently uploaded into Mapinfo software. The species data were entered into an Excel spreadsheet.

2.2 NVC allocations

For allocation of quadrats to units of the NVC the individual quadrat records were run through the MATCH program (Malloch 1990) which calculates a Czekanowski co-efficient of similarity between the field data and units of the NVC. The data were also run through a classification program (TWINSPAN, using the JUICE software program) which groups most similar quadrats together. Endgroups were then run through the MATCH software and the allocation of quadrats to the resulting groups compared against the individual match allocations. Final groupings were made based on the presence of preferential community species for the closest matching communities. A synoptic table is presented illustrating the floristic variation between the communities.

2.3 NVC maps

The NVC community boundaries were digitised using Mapinfo and a colour coded map produced. Quadrat locations are also plotted onto the map.

3. RESULTS

3.1 The species record.

The species data are presented in Appendix 1 (Cemlyn2018_Speciesmatrix_mk2).

One work sheet presents the quadrat data in numerical sequence, whilst another orders them according to their NVC allocations. A synoptic table is presented which demonstrates the floristic variation between the different stands of vegetation mapped (Table 1). In this table each species is expressed as its percentage frequency of occurrence within that group of quadrats. The species are grouped to illustrate those that are diagnostic/preferential to the different communities.

Table 1. Synoptic table for six vegetation units mapped (MC6 was represented by a single quadrat and the data for that is in the Appendix table).
Numerical values are percentage frequency of occurrence of each species within each NVC unit.

NVC Unit	**SD1**	**SD1/MC9**	**MC9b**	**MG1**	**MC8**	**SM16**
Number of samples	6	4	5	3	3	6
Mean species/sample	3.5	10.5	13.4	14.0	9.7	9.5
Crambe maritima	83	75	.	.	.	.
Silene vulgaris maritima	50	25	.	.	67	.
Glaucium flavum	17	.	.	.	.	17
Plantago lanceolata	17	100	100	67	33	.
Festuca rubra	33	100	100	100	67	100
Sonchus arvensis	33	50	60	67	33	33
Beta vulgaris maritima	50	50	80	.	.	.
Crepis capillaris	17	25	80	33	33	.
Rumex crispus	33	75	20	67	.	33
Hypochoeris radicata	.	50	20	.	.	.
Heracleum sphondylium	.	25	.	.	.	.
Poa pratensis	.	25	80	67	67	50
Arrhenatherum elatius	17	75	20	100	.	.
Holcus lanatus	.	75	80	100	33	17
Daucus carota	.	50	100	100	33	.
Lotus corniculatus	.	25	40	.	33	17
Senecio jacobaea	.	75	80	33	33	.
Taraxacum officinale agg.	.	25	60	33	33	.
Didymodum insulata	.	25	.	.	33	.
Dactylis glomerata	.	.	80	100	67	.
Hieracium sp	.	.	20	.	33	.
Sedum anglicum	.	.	20	.	33	.
Homalothecium lutescens	.	.	20	.	33	.
Digitalis purpurea	.	.	20	.	.	.
Aira praecox	.	.	20	.	.	.
Ammophila arenaria	.	.	20	.	.	.
Matricaria maritima	.	.	20	.	.	17
Glechoma hederacea	.	.	20	.	.	.
Jasione montana	.	.	20	.	.	.
Scilla verna	.	.	20	.	.	.
Sonchus oleraceus	.	.	40	.	.	.
Trifolium dubium	.	.	20	.	.	.

NVC Unit	SD1	SD1/MC9	MC9b	MG1	MC8	SM16
Cirsium arvense	.	.	.	67	.	.
Cirsium vulgare	.	.	.	33	.	.
Cochlearia danica	.	25	40	.	67	.
Kindbergia praelongum	.	25	20	.	100	.
Trifolium repens	.	25	20	.	100	67
Armeria maritima	.	25	.	.	100	67
Cerastium fontanum	.	.	.	.	67	.
Plantago coronopus	.	.	.	.	67	.
Bromus hordeaceus	.	.	.	.	33	.
Anthyllis vulneraria	.	.	.	.	33	.
Sagina procumbens	.	.	.	.	33	.
Brachythecium albicans	.	.	.	.	33	.
Plantago maritima	.	.	.	.	67	83
Juncus gerardi	.	.	.	.	33	100
Agrostis stolonifera	.	.	.	.	.	50
Triglochin maritimum	.	.	.	.	.	67
Glaux maritima	.	.	.	.	.	50
Elymus repens	.	.	.	.	.	33
Spergularia media	.	.	.	.	.	33
Lolium perenne	.	.	.	.	.	33
Puccinellia maritima	.	.	.	.	.	33
Carex extensa	.	.	.	.	.	17
Aster tripolium	.	.	.	.	.	17
Atriplex prostrata	.	.	.	.	.	17

There was a clear gradient across the 28 quadrats from damp, saltmarsh vegetation along the lagoon margin through maritime grassland on the back of the bar, grading to species poor vegetation on the shingle ridge at the seaward margin. However, many quadrats were not good fits to their closest community and some appeared intermediate between different community types.

3.2 NVC map and Area statements

The NVC communities are presented as Figure 1. A copy of this to scale is supplied as a pdf file.

The areas of each community mapped are presented in Table 2.

The area adjacent to the lagoon at the NW end of the spit was not surveyed due to nesting terns on the lagoon islands.

Figure 1. Map of communities. Crosses with numbers are quadrats. Letters denote subcommunities within a community.

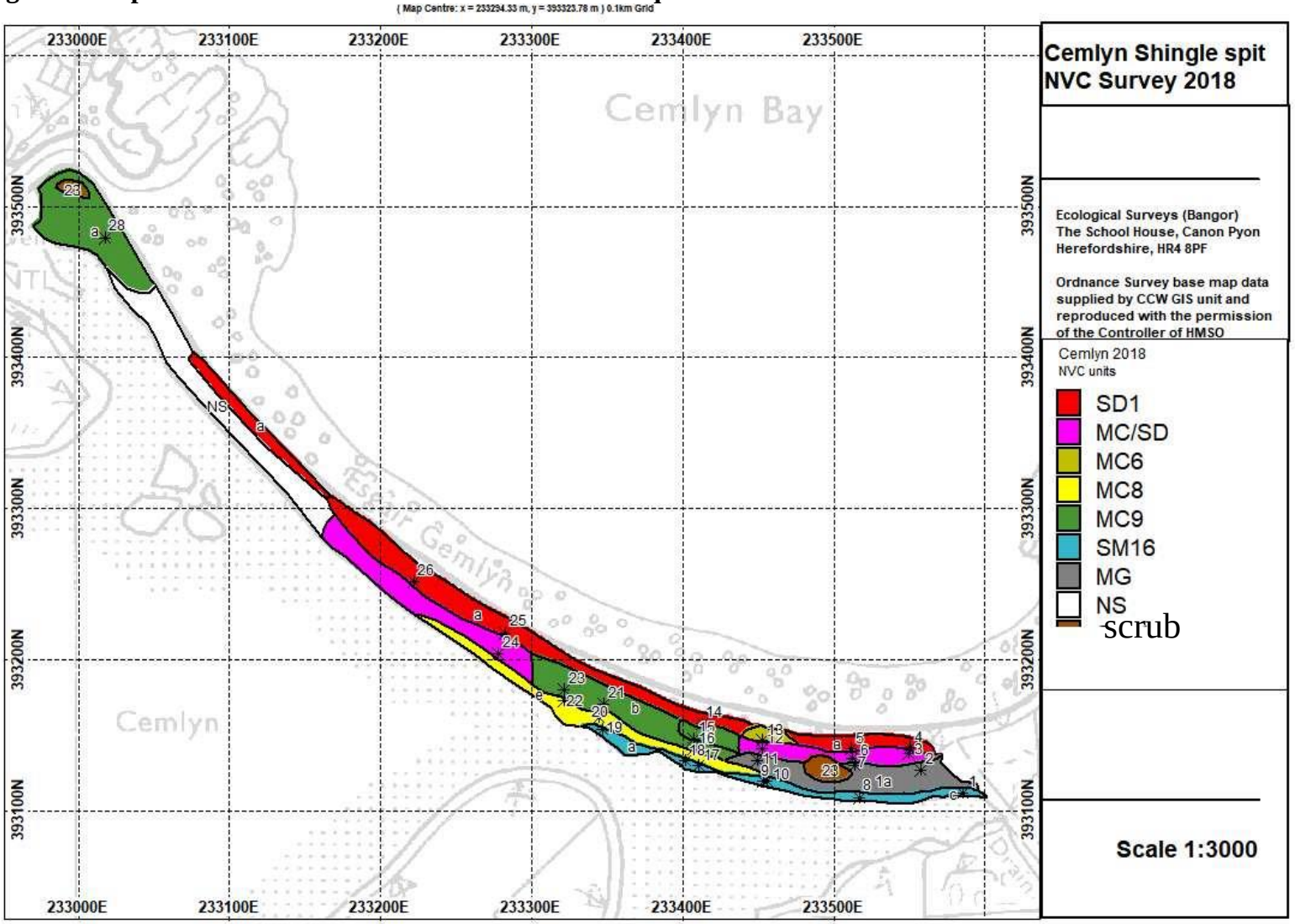

Table 2. Area of individual vegetation units (ha).

Class		Area (ha)
SD1a	Rumex crispus-Glaucium flavum community. Typical subcommunity.	0.521
MC9/SD1	Stands intermediate between MC9 and SD1	0.336
MC6	*Atriplex prostrata-Beta vulgaris* seabird community	0.027
MC8e	*Festuca rubra-Armeria maritima* grassland, *Plantago coronopus* subcommunity.	0.181
MC9b	*Festuca rubra-Holcus lanatus* grassland; *Dactylis glomerata* subcommunity.	0.536
	SM16; *Festuca rubra* saltmarsh community	
SM16a	a *Puccinellia maritima* subcommunity	0.051
SM16c	*c. Festuca rubra-Glaux maritima* subcommunity.	0.090
MG1a	*Arrhenatherum elatius* grassland; *Festuca rubra* subcommunity	0.218
W23	*Ulex europaeus-Rubus fruticosus* scrub	0.054
NS	Not surveyed	0.296

3.3 Individual community descriptions.

3.3.1 SD1*: Rumex crispus-Glaucium flavum* community.

The constancy table for the six quadrats assigned to this community were not a very good fit to the unit as defined in the NVC, scoring equally for the two recognised subcommunities. In general the high frequency of *Crambe maritima* and absence of *Lathyrus japonicus* suggests that the Cemlyn stands are best placed in the Typical subcommunity (SD1a). However, the fit is still poor with very low occurrence of *Glaucium*, which was only noted in a single location at the western end of ridge, also *Rumex crispus* is less frequent than would be expected in these stands whilst *Festuca rubra* is more frequent. Despite these discrepancies there is no other community that the stands come close to.

3.3.2 SD1/MC9. Stands apparently intermediate between SD1 *Rumex crispus-Glaucium flavum* and MC9; *Festuca rubra-Holcus lanatus* grassland.

Areas just inland from the SD1a are best seen as transitional to MC9. They are too species-rich for SD1 but have constant *Crambe maritima* and frequent *Silene vulgaris*. The sward is not closed, and many of the characteristic MC9 species are sparse, or absent, including *Rumex acetosa, Dactylis glomerata, Senecio jacobea*. The high frequencies of *Arrhenatherum elatius* and *Holcus lanatus* place these stands closer to the SD1b subcommunity.

3.3.3 MC9b. *Festuca rubra-Holcus lanatus* grassland; *Dactylis glomerata* subcommunity.

Lacking *Crambe maritima* and *Silene vulgaris* with only occassional *Rumex crispus*, these are grass-dominated stands with abundant *Festuca rubra, Poa pratensis*, *Holcus lanatus* and *Dactylis glomerata*. *Beta maritima* remains frequent as does *Plantago lanceolata* and *Daucus carota* is constant. Although the fit is not good, it is generally better than the alternative sand dune communities given the absence of *Ammophila arenaria*. In comparison with the NVC tables, the Cemlyn stands have lower than expected frequencies of *Armeria maritima* and *Scilla verna* and lack *Rumex acetosa.* Some of the mapped boundaries at the SE of the ridge represent structural rather than floristic variations.

3.3.4 MG1a. *Arrhenatherum elatius* grassland; *Festuca rubra* subcommunity

Scoring equally for SD9 and MG1, these stands were previously mapped as SD7c but they lack *Ammophila arenaria*. In comparison with the NVC table for MG1a, the Cemlyn stands have higher than expected frequencies of *Daucus carota, Sonchus arvensis*, *Cirsium arvense* and *Rumex crispus*, possibly reflecting the maritime location. This is a common community of unmanaged sites.

3.3.5 MC8e*; Festuca rubra-Armeria maritima* grassland, *Plantago coronopus* subcommunity.

Generally more open stands compared to the MC9, with shorter vegetation this vegetation occurred along the path at the back of the shingle ridge. An area of MC8 was noted in the 1993 report but the extent of the present stand appears to be smaller, and is confined to the level area close to the lagoon.

The stands lack *Agrostis stolonifera* and have higher than expected frequencies of *Silene maritima, Trifolium repens, Cerastium fontanum, Dactylis glomerata* and *Cochlearia danica.*

3.3.6 SM16; *Festuca rubra* saltmarsh community.

SM16a *Puccinellia maritima* subcommunity and SM16c; *Festuca rubra-Glaux maritima* subcommunity.

Occupying the opposite end of the TWINSPAN analysis to the SD1 quadrats are a group of quadrats characterised by constant *Juncus gerardi* and *Plantago maritima.* Often only 2m wide, the vegetation is very short and the community extends for c300 m along the lagoon margin.

Definition of subcommunities is not easy given the small number of samples available; however it seems possible that the *Puccinellia* subcommunity occurs at the western end of the strip whilst most of the remainder is closer to the *Festuca rubra-Glaux* subcommunity.

The stands lack *Leontodon autumnalis* and *Carex distans* and are characterised by an unusually high frequency of *Poa pratensis, Rumex crispus* and *Sonchus arvensis.* Lack of grazing might be affecting the sward composition; as SM16 is usually a community of grazing marshes, its presence at Cemlyn may be attributed to a combination of saline influence from the lagoon and some grazing pressure from the waterfowl using the lagoon.

3.3.7 MC6; *Atriplex prostrata-Beta vulgaris* seabird community.

A single quadrat was recorded in this vegetation near the eastern end of the shingle ridge. In the 1993 survey this community was reported to be extensive near the lagoon to the west of the site. Unfortunately this area was not accessible during the 2018 survey so the full extent of the community is unclear.

4. COMPARISON WITH THE SURVEY OF SNEDDON AND RANDALL (1993).

Since there are no quadrat data presented in the 1993 report, comparison has to be based on the general descriptive text provided in the individual site account (Sneddon and Randall 1993a,b). A table in that report also allows for an approximate translation of categories mapped in 1993 into units of the current NVC classification - though the translation is not perfect.

The 2018 survey appears to have recognised a greater number of bands of distinctive vegetation across the ridge when compared to the 1993 survey. There is general agreement in the extent of the saltmarsh vegetation along the lagoon edge and of the SD1 along the ridge but the intermediate stands of vegetation differ in their extent and allocation to NVC. To what extent this is a genuine change or different interpretation is unclear given the lack of species data from 1993.

Apart from the SD1 community, no other dune communities were recorded in the 2018 survey though the 1993 survey appeared to recognise both SD7 (*Ammophila arenaria - Festuca rubra* dune vegetation) and SD8 (*Festuca rubra-Galium verum* fixed dune grassland). The NW end of the lagoon was not surveyed due to nesting terns so the exact extent of the ruderal MC6 is unknown. . Since this area was behind the ridge it was not visible from the accessible area, and therefore not possible to assess its floristic composition.

In 1993 the shingle ridge vegetation widening in the central zone of the ridge and in places the *Rumex-Crambe* community was noted as being colonised by other local associates. To quote Sneddon and Randall "Within this general *Rumex-Crambe* community, typical of pure shingle sites, there are areas where other associates become locally important and this has led to a shift in classification designation, but when viewed at a local level it is clear that these should be considered sub-groups of the original community. This is clearly illustrated in quadrats which contain *Silene uniflora* in association with *Rumex* and *Crambe."* These more species-rich SD1 areas of Sneddon and Randall may relate to the SD1/MC9 transitional community mapped in the present exercise, which does extend almost to the lagoon edge in the central area of the ridge. If this is the case it would appear that the extent of SD1 has expanded at the eastern end of the ridge, replacing areas mapped previously as SD7c, and in the centre of the site replacing areas of MC6 and MC8.

Where the bar was wider, Sneddon and Randall noted that the pioneer vegetation gave way to grassland communities. At the SE where there was a sand capping over the shingle, SD8a had been mapped where the grassland was dominated by *Festuca rubra, Elymus repens, Dactylis glomerata* and *Holcus lanatus* with some herbs including *Plantago lanceolata, Galium verum* and *Taraxacum officinale.* This then graded to the NW into less diverse *Festuca rubra-Holcus lanatus* grassland with *Arrhenatherum elatius, Poa pratensis* and *Plantago lanceolata*, though curiously this was translated to SD7c the 1993 report, despite the apparent lack of *Ammophila arenaria*. In the present survey, the rank vegetation at the SE has been

classified as MG1 since it lacks any maritime elements in its species composition. Moving west, this grades through MC9b/SD1 transitional vegetation in to MC9b.

Further north and west, the species poor, grass-dominated, vegetation was replaced by more open vegetation with *Festuca rubra* and *Armeria maritima* in an area mapped as MC8 in 1993. This seems to relate to the area of MC8 mapped in 2018, though the present stands lack the *Beta maritima* which was a feature of the 1993 survey.

Further west a more pioneer vegetation with *Rumex crispus* and *Tripleurospermum maritimum* was noted in 1993 which translated to MC6 of the NVC. This area was not surveyed during the 2018 survey due to the presence of nesting birds.

The 1993 survey also noted a narrow, c. 2m wide, strip of salt marsh vegetation along the edge of the lagoon which translates to the SM16, *Festuca rubra-Agrostis stolonifera-Glaux maritima* community. This is consistent with the band of SM16 mapped in the current survey which extends from the SE end of the inward edge of the bar for about one third of its length.

Finally, small areas of gorse scrub, referable to W23; *Ulex europaeus-Rubus fruticosus* scrub, occur in the extreme NW and towards the SE of the ridge. Generally associated with stands of MC9 and MG1 rank grassland there appears to have been little change in the extent of these areas of scrub since the 1993 survey.

In the absence of detailed floristic records from 1993 it is hard to judge whether the condition of the vegetation has changed substantially over the intervening years. In general, much of the vegetation at the eastern end of the ridge is very bulky and species poor, with little apparent maritime influence. Greater diversity is evident along the sides of the paths that run between the saltmarsh and the steeper slope of the ridge suggesting some level of disturbance might favour colonisation or persistence of the lower growing maritime species; including *Cochlearia, Armeria maritima, Plantago coronopus, Anthyllis vulneraria.*

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Appendix 1 Species data
See attached file: Cemlyn2018_speciesmatrix_mk2.xls