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Natural Resources Wales

The status and distribution of the Strandline Beetle *Eurynebria complanata* on Whiteford Burrows, Cefn Sidan, Laugharne & Pendine Burrows and Frainslake Sands, Castlemartin in 2016

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NRW Evidence Report No. 189

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Yn ddiweddar, dosbarthwyd Chwilen y Traeth (y Strandline Beetle neu'r *Eurynebria complanata)* i fod yn rhywogaeth dan fygythiad wedi i'w niferoedd ostwng yn y DU a chyfyngir ef yn awr i rai traethau yn unig ym Mae Caerfyrddin. Hyd yn oed yma, nodwyd y gallai'r boblogaeth fod yn beryglus o isel. Mae'r chwilen yn fesurydd o iechyd cymunedau'r arfordiroedd sy'n cynnwys amryw o rywogaethau y gallai, yn debyg i'r chwilen fod dan warchae. Prif fwriad yr astudiaeth oedd gwneud arolwg o leoliadau yn Ne Cymru yn 2016 er mwyn nodi statws cyfredol yr *E. complanata* a hysbysu'r modd y dylai'r cynefinoedd arfordirol gael eu rheoli. Aethpwyd yn ôl i rai safleoedd er mwyn nodi newidiadau tymhorol a newidiadau dros dro.

Daethpwyd o hyd i Chwilen yr Arfordir mewn pedwar safle yn unig, pob un ohonynt ym Mae Caerfyrddin gyda'r niferoedd mwyaf o 328 oedolyn ym mis Mehefin yn Whiteford Burrows, 211 oedolyn yng Nghefn Sidan, Pembre, 288 oedolyn yn Nhalacharn - Pentywyn ac un oedolyn yn Broughton sy'n rhoi cyfanswm Cymreig o 828 chwilen. O ran tirwedd, dangosodd canlyniadau'r astudiaeth mai allan o 27.5km o draeth, a ffurfiwyd gan dair prif uned ym Mae Caerfyrddin, dim ond 17km (h.y. 62%) oedd yn cynnig amodau ffafriol ar gyfer yr *E. complanata* yn 2016. Efallai, gan gofio natur gyfnewidiol y cynefinoedd, dyma'r hyn y gellir ei ddisgwyl gan ardal eang o draeth. Ymddengys felly fod y bae yn darparu cynefin cyson a phwysig i'r rhywogaeth a dylid sicrhau bod cynnal hyn yn flaenoriaeth hollbwysig. Mae'n debygol fod cyfyngiadau milwrol wedi effeithio ar boblogaethau Pwynt Tywyn (Cefn Sidan) a Thalacharn – Pentywyn ac mae'r lleihad yn Whiteford yn awgrymu eu bod yn agored i niwed, er gwaethaf poblogaeth gref 2016.

Gwelwyd bod twyni tywod yn cefnogi'r poblogaethau iachaf o'r *E. complanata*. Mae'r cymunedau NVC cysylltiedig - SD2 ac SD4 yn fesuryddion da o safonau cynefinoedd da ac mae'r traethau sy'n cynnig amodau tebyg yn darparu'r cynefinoedd gorau ar gyfer yr *E. complanata*. Mae twyni sefydlog ag iddynt lystyfiant SD6 a thraethau SD2 a SD4 gerllaw hefyd yn gynefinoedd i'r *E. complanata*, ond mewn niferoedd llai.

Canfuwyd bod 64% ohonynt yn llochesu mewn eitemau pren a 24% ohonynt mewn plastig. Mae hyn mewn gwrthgyferbyniad llwyr i'r hyn a ganfuwyd mewn astudiaethau cynt. Mae traethau graean yn anaddas ar gyfer y cyfnod datblygiad cynnar ond yn bwysig ar gyfer oedolion, yn enwedig yn ystod cyfnodau lle mae'r gweddillion sydd ar y traeth yn brin. Disgwylir i'r poblogaethau presennol o *E. complanata* fod yn ddigon mawr i alluogi ail-gytrefu i ddigwydd yn naturiol ym Mae Caerfyrddin gyda thraethau Gorllewin y Gŵyr a Phembre mewn safleoedd gwych i fanteisio o unrhyw weithgaredd cychwynnol. Gall mesurau gynnwys annog agweddau cyfrifol (ac o bosib defnyddio defnyddwyr y traethau i blismona) a darparu llochesu ychwanegol (lle'n briodol) ar bob safle.

Mae'n hollbwysig i sicrhau a chadw poblogaethau o'r Chwilen Arfordirol yng Nghefn Sidan, Talacharn-Pentywyn a Whiteford er mwyn sicrhau bod y chwilen yn parhau i fod yn rhywogaeth yn y DU. Bydd gofyn rhoi stop ar symud gweddillion o'r traeth yn Whiteford Burrows. Gwneir argymhelliad y dylid hybu ail-gytrefu yn Broughton Burrows drwy ddarparu llochesau ychwanegol a hysbysu'r cyhoedd o bwysigrwydd y chwilen.

2. Executive Summary

The Strandline Beetle *Eurynebria complanata* was recently classified as Endangered following a decline that has led to an apparent retreat in its GB range to a few beaches in Carmarthen Bay. Even here, recent counts have indicated that the population might be at a critically low level. The beetle is an indicator of the health of strandline communities, which include a range of rare and scarce species likely to be similarly threatened. The main aim of this study was to survey sites in South Wales in 2016 in order to determine the current status of *E. complanata* and inform management of strandline habitats. Repeat visits to key sites were undertaken to assess spatial and temporal changes.

Strandline Beetle was found at just four sites, all in Carmarthen Bay, with peak counts in June of 328 adults on Whiteford Burrows, 211 adults on Cefn Sidan, 288 adults on Laugharne-Pendine Burrows and one adult on Broughton Burrows, providing a total Welsh count of 828 beetles. At a landscape scale, the results of the study found that of the 27.5km of beach, made up by the three main occupied beach units in Carmarthen Bay, only 17km (i.e. 62%) were considered as being in favourable condition for *E. complanata* in 2016. Perhaps, given the dynamic nature of the habitat, this is what might be expected for such expansive areas of mobile beach. Therefore, it would appear that the bay currently provides a stable stronghold and maintaining population viability should be an urgent conservation priority. Military restrictions are likely to have been instrumental in preventing excessive loss of beach debris at Tywyn Point (Cefn Sidan) and Laugharne-Pendine Burrows, whilst the comparative scarcity of debris at Whiteford suggests there is a higher level of vulnerability, despite the presence of a strong population during 2016.

It was found that accreting dunes supported the healthiest populations of *E. complanata*. The associated NVC communities of SD2 and SD4 provide very useful indicators of good habitat quality and those beaches with wider profiles of these communities invariably provided the best habitat for *E. complanata*. Stable dune fronts, typically characterised by SD6 vegetation were also occupied by *E. complanata*, but in lower numbers and always with good SD2 and SD4 beach sections nearby.

Wooden items made up 64% of refuges used by adult beetles, with plastics making up 24%. This is in contrast to the few previous studies suggesting that the species is probably more dependent on niches provided by beach items rather than item types. Beaches dominated by shingle ridges would appear to be unsuitable for the larval stages, but may be important for adults, especially during periods when beach debris is scarce. Extant populations of *E. complanata* are likely to be sufficiently large and fluid enough to enable natural recolonisation to occur with Carmarthen Bay, with the beaches of West Gower and Pembrey Burrows being particularly well placed to benefit from remedial action. Measures might include the provision of interpretation to encourage a responsible attitude (and possibly self-policing) amongst beach users; and the provision of supplementary refuges (where necessary) appropriate to each site.

It is critical to maintain populations of Strandline Beetle on Cefn Sidan, Laugharne-Pendine Burrows and Whiteford Burrows in favourable condition in order to safeguard the beetle as a UK species. This will require a cessation of debris removal on Whiteford Burrows. It is recommended that colonisation of Broughton Burrows should be encouraged by providing additional refuges and informing the public as to the importance of the beetle.

3. Introduction

3.1. Background information

The context and rationale for this study was provided by the detailed background section of project brief supplied by Dr. Mike Howe, Invertebrate Ecologist for Natural Resources Wales (NRW) on 18th May 2016, reproduced below:

> *"Background*
> *The Strandline Beetle or Beachcomber* Eurynebria complanata *is one of the UK's most distinctive and attractive ground beetles. Recently classified as Endangered (Telfer, 2016), the beetle has always had a restricted distribution in the UK, with most records being confined to both sides of the Severn Estuary – Bristol Channel. It was last recorded in England from Braunton Burrows in 2002 and recent searches there have failed to locate any specimens. In Wales,* E. complanata *has been found on fourteen dune systems, from Merthyr Mawr Warren to Brownslade & Linney Burrows on the Castlemartin peninsula (Table A). However, the beetle has been seen at only five sites over the last 15 years – Brownslade & Linney Burrows (Frainslake Sands), Merthyr Mawr Warren, Pembrey Burrows, Stackpole Warren and Whiteford Burrows. Recently, strong populations have been confined to Frainslake Sands on Brownslade Burrows and to Whiteford Burrows (Table B). In 2015, adults were only found at Pembrey Burrows (a singleton) and Whiteford Burrows (15). Whilst regular monitoring by Ministry of Defence staff and others at Frainslake Sands indicates that adult numbers can fluctuate markedly from one year to the next (Table B), the lack of any sightings at its most important UK locality in 2014 and 2015 and the lack of a high count since 2005 is worrying.*
>
> *The beetle is primarily associated with strandlines on sandy beaches backed by coastal dunes. Adults are nocturnal and feed predominantly upon sand hoppers (talitrid amphipods), although beetle and fly larvae may also be eaten (King & Stabins, 1971; Stabins & King, 1966). During the day, they shelter under large debris such as driftwood and artificial flotsam within 3 to 15m of the dune frontage. Adults emerge at the end of May and can be found in most months until January, although peak numbers occur in June and August to September. Mating has been observed from early September to late November, with females laying eggs singly in holes in the sand above the strandline up to 3mm in depth. Larvae begin to emerge in October and can be found until the following March. It is likely that most beetles over-winter as larvae or pupae, with a small proportion over-wintering as adults. Although over-wintering sites are unknown, it has been suggested that adults (or perhaps larvae) move inland into dune areas during the winter months (Hyman & Parsons, 1992). If this is the case, then steep frontal dune faces on actively-eroding dunes may prove to be a significant barrier to successful dispersal.*
>
> *Whilst the exact causes of decline are unknown, beach-cleaning operations have been implicated in the loss of an English population and there is some anecdotal evidence of impacts at Welsh localities, and the removal or burning of driftwood for beach barbeques could also be a threat. However, none of these explains the lack of recent records from Frainslake Sands where strandlines are left mostly intact. Recent losses may be a consequence of severe winter storms which remove over-wintering sites within the frontal dunes. Gibbs (2008) suggested that the loss of pioneer dunes to a steeper dune frontage at Frainslake Sands had reduced the availability of suitable habitat, with most of the few beetles seen in 2007 being confined to areas of the strandline backed by low frontal dunes. During the 2013-14 winter storms, the*

frontal dunes at Frainslake retreated by up to 5m, whilst those at Pembrey retreated by more than 20m in places, leaving high, steep dune faces.

Gibbs (2008) developed a conservation objective for E. complanata within Castlemartin Range SSSI based on the number of adults and on habitat quality (Table C), concluding that the population was in unfavourable condition."

Table A: Dune systems in Wales which have supported the Strandline Beetle. The maximum count ever recorded on the site is given (where available), with the year of the record in brackets. Sites with 2015 records are highlighted in red.

Dune system	VC	Grid Reference	Max. count (year)	Year of last record
Merthyr Mawr Warren	41	SS8576	56 (1995)	2002
Kenfig Burrows	41	SS7881		1996
Crymlyn Burrows	41	SS7092	80 (pre-1861)	1999
Penmaen Burrows	41	SS5388		1992
Nicholaston & Oxwich Burrows	41	SS5087	196 (1966)	1986
Horton Dunes	41	SS4685		1981
Llangennith & Broughton Burrows	41	SS4192	21 (1964)	1981
Whiteford Burrows	41	SS4394	137 (2005)	2015
Pembrey Burrows	44	SS4298	9 (1987)	2015
Laugharne & Pendine Burrows	44	SN2807	87 (1964)	1990
Tenby Burrows	45	SS19		1829
Stackpole Warren	45	SR9995		2000
Brownslade & Linney Burrows	45	SR8898	341 (2000)	2013
Broomhill Burrows	45	SM8800		1997

Table B: Peak annual counts of adult Strandline Beetle at the two key Welsh dune systems. Counts at Frainslake Sands are undertaken systematically by the MoD whilst those at Whiteford Burrows refer to ad hoc records.

Year	Frainslake Sands	Whiteford Burrows
1997	314	-
1998	156	-
1999	198	27
2000	341	34
2001	26	123
2002	45	43
2003	21	30
2004	202	53
2005	270	137
2006	30	-
2007	17	16
2008	1	6
2009	5	1
2010	6	-
2011	2	2
2012	11	5
2013	3	2
2014	0	-
2015	0	15

Table C: Conservation Objective for *Eurynebria complanata* on Castlemartin Range SSSI.

Conservation Objective (for when the feature is in favourable condition)	***To maintain the Strandline Beetle Eurynebria complanata on Frainslake Sands in favourable condition where***
Species abundance: Lower limit	*During each reporting cycle, at least one count records 100 or more adults on Frainslake Sands between the end of August and the end of September.*
Refuge abundance: Lower limit	*Within 20 metres of the base of the dunes there are at least 100 items of strandline debris with dimensions greater than 5cm x 30cm lying on fine sand.* ***and:*** *At least 5 items of strandline debris lying on fine sand within 20 metres of the base of the dunes have dimensions greater than 30cm x 60cm.*
Habitat extent: Lower limit	*Along the beach there should be at least 500 metres where fine sand at least 10 metres wide backs onto dune habitats.* ***and:*** *at least 100 metres of broad sandy beach backs onto pioneer dunes with an angle of slope 30 degrees or less (this figure may be revised in the light of future research).*
Definition of suitable Eurynebria complanata habitat	*At Frainslake Sands, numerous items of strandline debris at least 5cm x 30 cm as well as many much larger objects >30cmx60cm; these debris must be laying on fine sand (not rocks or cobbles); be surrounded by extensive areas of gently shelving sandy beach and, especially, ready access via easily negotiated slopes to pioneer dunes with plenty of bare sand amongst the marram.*

3.2. Status

Eurynebria complanata is a native, monospecific genus in Britain, though the species *complanata* was formerly listed as *Nebria complanata* by Pope (1977). *E. complanata* is listed as Endangered based on International Union for Conservation of Nature (IUCN) criteria (Telfer, 2016). It has also been updated from Nationally Scarce (Hyman & Parsons, 1992) to Nationally Rare (Telfer, 2016), based primarily on evidence of a long-term decline and contraction of range. Telfer also gives an estimated British AOO of 48 km^2.

3.3 Objectives

The objective of the current survey was to determine the current status and distribution of the Strandline Beetle and identify and threats to remaining populations.

4. Methods

From May to September 2016, bimonthly counts were undertaken at two key sites, Whiteford Burrows and Cefn Sidan, the latter being the single beach unit that extends from Pembrey Burrows in the south-east to Tywyn Burrows in the north-west. Additionally, spring and autumn visits were made to Laugharne Burrows & Pendine Burrows. These two sites combine to form a single large beach unit, as shown in Figure 1. Surveys of these sites were undertaken by the author, with the exception of the autumn visit to Laugharne & Pendine, which was carried out by Christian Owen. Survey dates for these sites are given in Table 1. An additional Whiteford visit was carried out by Mike Howe on 26th September.

Visits to other sites where the beetle has been recorded in recent years, most notably Frainslake Sands, were undertaken by NRW (Paul Culyer & Mike Howe), MoD (Lynne Houlston) and National Park (Graham Clarke) personnel.

Table 1: 2016 survey dates at study sites.

		Whiteford Burrows	Cefn Sidan	[a]Laugharne & [b]Pendine	[a]Freshwater & [b]Frainslake
May	1st visit				[a]26th & [b]30th
June	1st visit	6th	7th, 10th & 17th	[a]19th & [b]21st	
	2nd visit	23rd	24th & 30th		
July	1st visit	13th	no count		
	2nd visit	31st	26th		
August	1st visit	8th	13th		
	2nd visit	1st Sept	27th & 30th		
September	1st visit	15th	16th		
	2nd visit	23rd	27th	[a]17th & a&b24th	[b]10th & [a]30th
	Additional visit	26th			

Additional systematic and ad hoc searches were also made during 2016 at a number of other beaches within the species' historic range in South Wales, mostly during June when adult numbers were likely to have been at their highest. The personnel undertaking these surveys are listed below. Supplementary records were also provided by a number of other casual observations, details of which appear in Appendix 1. These additional sites are listed below (along with the approximate percentage of the strandline searched) together with the survey date and surveyor. All locations that were searched are shown yellow in Figure 1, with potential habitat that was not surveyed shown white.

Site name	Survey date	Surveyor
Broad Haven, Stackpole	25th August 2016	Mike Howe
Broad Haven, Stackpole	29th September 2016	Mike Howe
Barafundle (100%)	20th June 2016	Paul Culyer
Tenby (100%)	16th June 2016	Paul Culyer
Morfa Uchaf (100%)	17th June 2016	Barry Stewart
Rhossili (40%)	6th November 2016	Barry Stewart
Port Eynon (100%)	17th August 2016	Barry Stewart
Oxwich (20%)	8th June 2016	Nick Edwards
Oxwich-Nicholaston (100%)	23rd June 2016	Barry Stewart
Oxwich-Nicholaston (100%)	27th September 2016	Mike Howe
Blackpill-Singleton (51%)	27th June 2016	Barry Stewart
Crymlyn Burrows (100%)	16th June 2016	Ben Sampson
Baglan Burrows (100%)	13th June 2016	Barry Stewart
Little Warren	not searched	
Port Talbot Docks	not searched	
Margam Sands	not searched	
Kenfig Burrows (20%)	11th June 2016	David G. Carrington
Kenfig Burrows (+25%)	15th June 2016	David G. Carrington
Merthyr Mawr (23%)	6th June 2016	Duncan Ludlow
Merthyr Mawr (90%)	16th June 2016	Duncan Ludlow

Searches involved walking along the strandline of each dune system and turning over potential refugia to look for sheltering adult *E. complanata*. Potential refugia generally included all beach items with dimensions > 20cm x 10cm. The number of beetles observed was recorded and all localities mapped to 8-figure grid references. Other data recorded included refuge type, shore type (eroding/accreting), distance from the nearest vegetation and the NVC community represented. A qualitative assessment was made of the availability of strandline refugia at each site, together with photographs to provide a visual record of the refuges used and strandline condition.

Associated and incidental fauna was recorded at all sites where practical. Identification used relevant identification keys as listed in the Reference section. All incidental observations are listed in Appendix 2 and a systematic summary of associated fauna is provided at Appendix 3.

Dialogue and feedback was established early on during the survey with the NRW Project Manager, Dr. Mike Howe. Close liaison with local NRW staff, MoD and County Council staff ensured permissions and site visits were arranged in accordance with site restrictions. Most importantly, this included safety briefings provided by MoD staff prior to visits before accessing Tywyn Point, and Laugharne-Pendine Burrows. Dialogue with various other parties also resulted in assistance with supplementary searches of potential habitats outside the remit of the project brief.

Figure 1: All sites within the study area identified as providing potential habitat for *Eurynebria complanata*. Sites surveyed during 2016 are shown yellow, those that were not visited are shown white.

5. Results

5.1. Counts

Beach strandlines fronting the three large dune systems within Carmarthen Bay were each found to support sizeable populations of *E. complanata.* The survey returned bimonthly totals as shown in Table 2 and plotted in Figure 2.1. These results reveal that June was by far the most productive month for recording, with numbers (or possibly detection rates) quickly dropping, so that by mid-summer, adult beetles proved to be hard to find resulting in low counts. The progression into autumn showed a slight increase in count totals and first copulation was recorded towards the end of October. Other than a singleton recorded in the northern extreme of Broughton Bay (i.e. immediately adjacent to Whiteford), the beetle was not found at any other site in 2016.

Table 2: Bimonthly counts of *E. complanata* at all sites, June to September 2016.

	Whiteford	Cefn Sidan	Laugharne - Pendine	Totals
Early June	328	211	288	827
Late June	51	118	no count	169
Early July	91	no count	no count	91
Late July	32	15	no count	47
Early August	21	23	no count	43
Late August	20	36	no count	56
Early September	41	23	no count	64
Late September[1]	48	21	20	89
Late September[2]	24			

Figure 2.1: Bimonthly counts of *E. complanata* at all sites, June to September 2016.

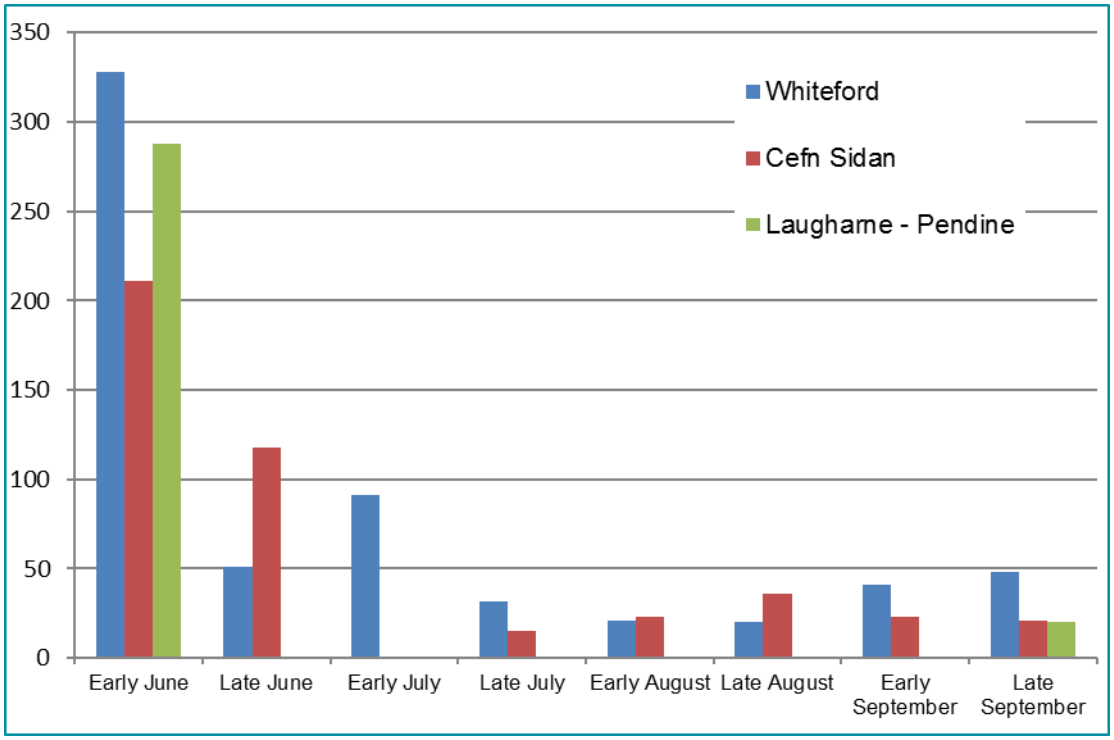


Figure 2.2: Relative frequency of refuge types used by *E. complanata* at all sites, June to September 2016.

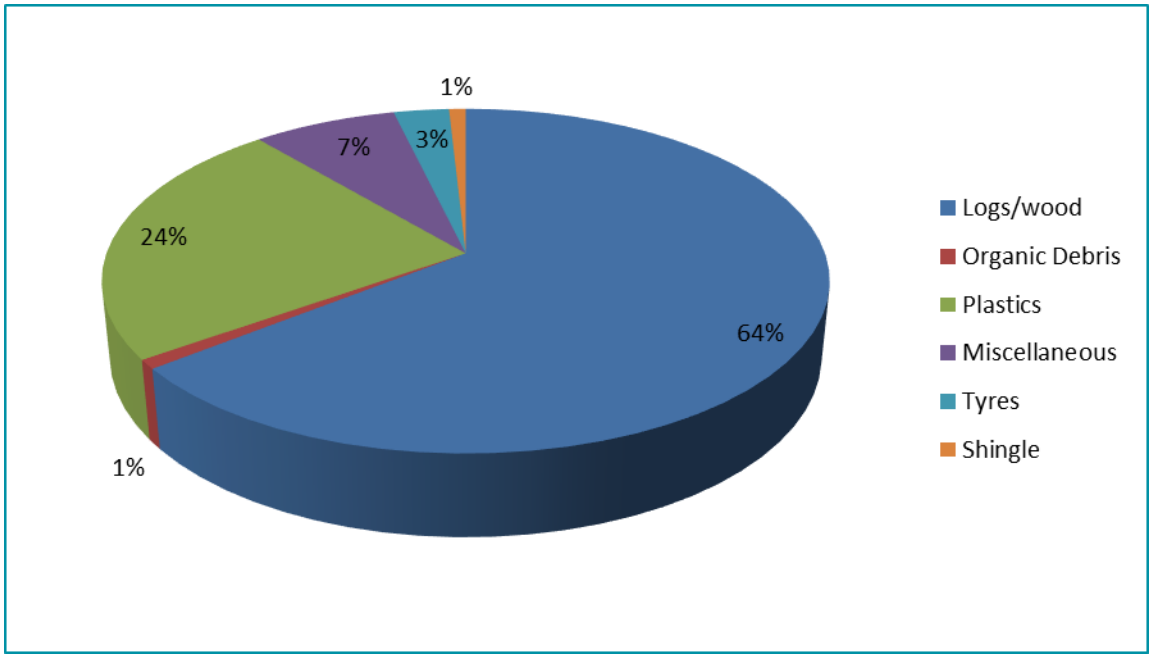
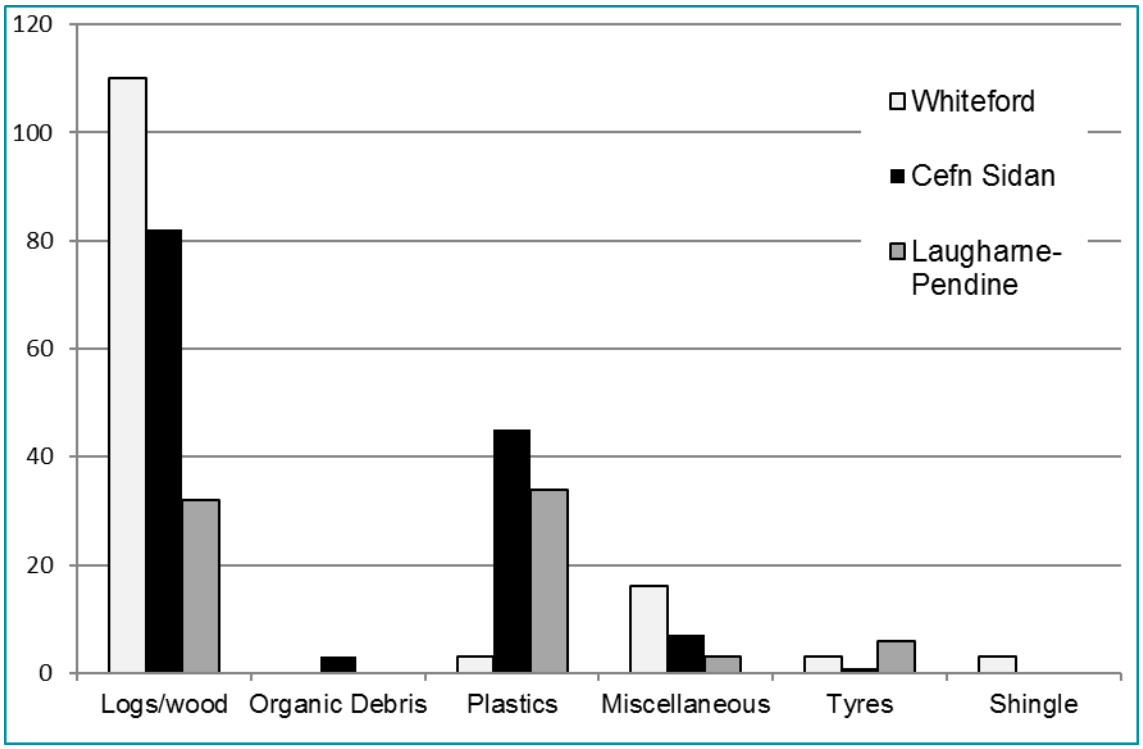


Figure 2.3: Counts of refuge types used by *E. complanata* at all sites, June to September 2016.



5.2. Distribution

The full distribution and relative abundance of *E. complanata* recorded during the 2016 survey period is shown in Figure 3, with more detailed distribution and temporal patterns for each of the three beach units shown in Figures 4 to 15. These maps show that at the 9.8km long Pendine-Laugharne Burrows, beetles were distributed at low density, but at frequent intervals along 8.7km of strandline habitat. At Cefn Sidan, the distribution of *E. complanata* was highly concentrated along a 2.9km stretch of strandline at Tywyn Point, with scattered, possibly wandering, individuals noted along the remaining 9.6km of beach, with a small cluster at the Pembrey Burrows end of the beach. At Whiteford, *E. complanata* was recorded at frequent intervals along the full 4.6km strandline although, with limited refuges, the distribution pattern was more clumped than the other two sites. Elsewhere, the only record was a singleton noted at Broughton Burrows, a site more-or-less contiguous with Whiteford.

5.3. Habitat Preferences

As illustrated in Figure 2a, items of wood (examples of which are shown in Photos 5, 9, 22 & 23) accounted for 64% of refuges used by *E. complanata* during the study. The bulk of this material was natural driftwood, although planks, boards and even bird boxes were used by beetles to shelter beneath. Plastics were the next most frequent type of refuge used (e.g. Photos 1, 2, 11, 13 & 16), these producing 24% of the total. Regardless of type, preferred items were generally large objects lying on the sand in such a manner that provided *E. complanata* with easy access to tight cram points into which beetles could wedge themselves. The situations in which beetles were found sheltering would indicate that *E. complanata* prefers to avoid digging into the sand and it was rare to encounter adult beetles under suitable items that lacked access points to recesses. The requirement for easy access under driftwood was considered to be a potentially limiting factor, though the apparent

disappearance of beetles during the summer period suggests a burying strategy may be employed under certain conditions, such as when high winds mobilise sand resulting in refuges becoming partially buried and often covering access points (Photos 4 & 14). The rapid drop in numbers after the initial emergence-feeding phase led to speculation that beetles may become less active in mid-summer and enter a phase of diapause, supported by an increase in numbers in late summer. Despite considerable effort being put into locating beetles in the dunes backing strandlines in mid-summer, none were recorded away from typical refuge situations.

In addition to wood and plastic, other items accounting for the remaining 12% of refuges recorded included organic debris (primarily fucoids), nylon rope, breeze blocks (Photo 6), peat blocks (washed.out from submerged forests, Photo 7), roof felt, foam cushions (Photo 10), polystyrene, steel cylinders, tyres (Photos 8, 15 & 23), motor boat seats and shingle (Photo 9). Of these, it is possible that shingle is under-represented as a refuge for *E. complanata*, particularly at sites such as Whiteford where refuges are limited. At this site, a shingle ridge along the dune frontage extends for almost 2km. This is a very difficult and time-consuming substrate to search, but nevertheless was shown to be occupied along the full length.

The wide selection of materials used by *E. complanata* indicates that the beetle is almost certainly more dependent upon niches provided by beach items rather than item type. Photographs shown in Appendix 4 give an indication of the range of refuges used by *E. complanata*. Whilst the majority of observations were of adult beetles encountered sheltering in tight cram-points between sand at beach level and large objects resting on the sand, aggregations were occasionally encountered where beetles had climbed to access cracks and fissures in large logs or plastic items, some as high as 60cm above beach level.

Figure 3: Distribution of *E. complanata* at all sites, June to September 2016. Bracketed figures give (total number of visits : totalled individuals).

5.4. Whiteford Burrows NNR

The distribution and relative abundance (using weighted dots) of *E. complanata* recorded along the strandline at Whiteford Burrows NNR during 2016 is shown below, firstly for the whole study period in Figure 4, followed by the monthly sequence in Figures 5 to 8.

Figure 4: Distribution based on all eight visits during the period June to September 2016.

Figure 5 & 6: Distribution in June & July 2016.

Figure 7 & 8: Distribution in August & September 2016.

5.5. Cefn Sidan (Pembrey – Tywyn)

The distribution and relative abundance (using weighted dots) of *E. complanata* recorded along the strandline at Cefn Sidan during 2016 is shown below, firstly for the whole study period in Figure 9, followed by the monthly sequence in Figures 10 to 13 showing the monthly distribution pattern zoomed in on Tywyn Point.

Figure 9: Distribution based on all seven visits during the period June to September 2016.

Figures 10 & 11: Distribution in June & July 2016.

Figures 12 & 13: Distribution in August & September 2016.

5.6. Pendine-Laugharne Burrows

The distribution and relative abundance (using weighted dots) of *E. complanata* recorded along the strandline at Pendine-Laugharne Burrows during spring and autumn 2016 are shown in Figures 14 and 15.

Figure 14: Distribution in June 2016.

Figure 15: Distribution in October 2016.

5.7. Strandline Vegetation

Whilst *E. complanata* does not appear to be directly associated with strandline vegetation, proximity details of the National Vegetation Classification (NVC) communities represented at refuge sites provide a good understanding of the beach types used by the species and what physical processes are in place. Figure 16 shows that *E. complanata* was found on strandlines backed by four NVC communities:

- SD2 *Honkenya peploides - Cakile maritima* strandline community
- SD4 *Elymus farctus* ssp. *boreo-atlanticus* foredune community
- SD6 *Ammophila arenaria* mobile dune community
- SD18 *Hippophae rhamnoides* dune scrub

SD2 is a pioneer community typically found on actively-accreting systems and is important in the development of embryo dunes. Representative examples are shown by Photos 14, 15, 18 & 19 in Appendix 4. The highest proportion of *E. complanata* records was found on strandlines backed by this community, indicating accreting dune fronts provide ideal conditions for *E. complanata*. Associated with SD2 vegetation, which is often sparse, other factors such as adequate refuges, healthy amphipod populations and fucoid deposits, all need to be in place for a site's potential to be optimised. Given the highly mobile nature of *E. complanata* habitats, the larger more dynamic dune systems are far more likely to provide habitat continuity, an attribute which is likely to be of greatest importance during periods of

extreme climatic stress. SD2 vegetation can be used as a key indicator of beaches that are likely to be in favourable condition for *E. complanata* as the vegetation requires frequent organic input in the form of strandline deposits. Consequently, SD2 beaches, in addition to having more frequent deposition of beach debris, also support a high density of prey species and invariably provide good access to higher dune refuge sites. The extent of SD2 vegetation was not accurately measured during the study but approximated to a combined total of 10.5km (38%) on all three occupied beaches (based on estimated values shown in Table 3).

SD4 (Photos 16 & 22) appeared to be more characteristic of accreting dune sections that received lower inputs of organic matter, with stands of Sand Couch *Elytrigia juncea* subsp. *boreoatlantica* accumulating wind-blown sand, typically resulting in the formation of low dune ridges. Stands of this community were typically less extensive from front to back than those of SD2 and were often backed by steeper dunes with SD6 vegetation, as exemplified by Photo 3. As with SD2, the community was also closely associated with important sections of strandline habitat supporting *E. complanata* and the extent of SD4 approximated to a combined total of 5.8km (21%) on all three occupied beaches (based on estimated values shown in Table 3).

SD6 vegetation was characteristically established on both static and eroding dune fronts where Marram *Ammophila arenaria* was dominant. These areas typically receive little organic input and are subjected to periodic tidal inundation. The often steep and eroded frontage of these sections, with typical examples shown by Photos 3, 9 & 21, provide a much more hazardous environment for *E. complanata* with lower levels of strandline deposits resulting in depleted prey and refuges, hence significantly fewer occupied refuges were recorded. The extent of SD6 vegetation approximated to a combined total of 5.6km (20%) on all three occupied beaches (based on estimated values shown in Table 3).

Figure 16: Frequency of NVC communities represented at *E. complanata* refuge sites.

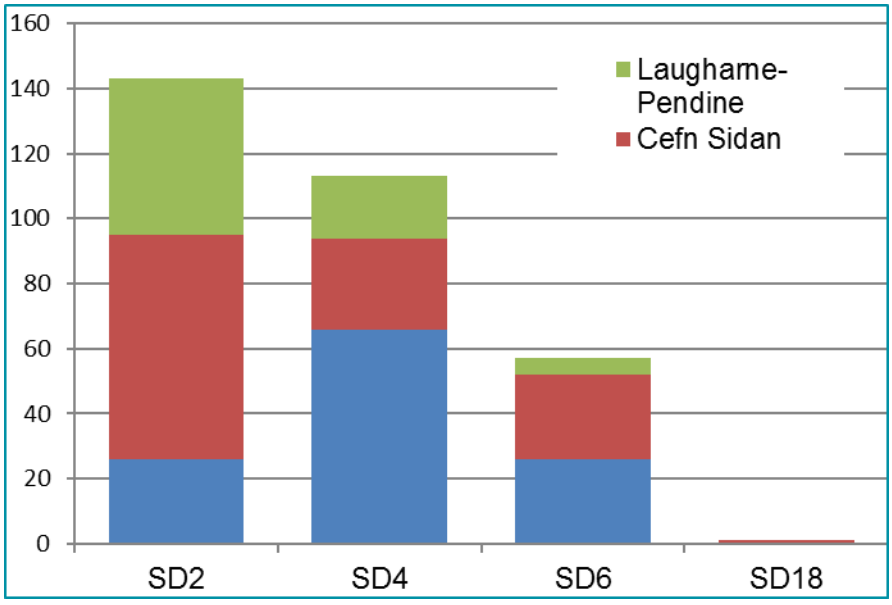


Table 3: Estimated extent (km of beach length) of NVC communities on beaches occupied by *E. complanata*.

	Whiteford	Cefn Sidan	Laugharne-Pendine	All sites
SD2	1.5	6	3	10.5
SD4	1.3	2	2.5	5.8
SD6	2	1.8	1.8	5.6
SD18	0	3.8	0.3	4.1
Shingle	1.9	0	>2	>4
Total extent of each community	4.8	13.6	7.6	26
Total length of beach	5	12.5	10	27.5

SD18 communities, comprising large stands of mature Sea-buckthorn *Hippophae rhamnoides*, were largely recorded as associated with strandline habitat on the front edge of eroding dune cliffs. Most sections had little in the way on pioneer vegetation below them, the main exception being towards the eastern end of Laugharne Burrows where a fairly broad belt of SD2 vegetation was well-established. As with eroding SD6 communities, the steep and eroded frontage of these sections presents a hazardous environment for *E. complanata* and the very low incidence of observations indicate sections of beach dominated by eroding Sea-buckthorn are of limited value. This is clearly illustrated in Figure 9 and Photo 21 which shows the lack of observations in the long, central beach section at Cefn Sidan, which is entirely dominated by Sea-buckthorn that is being eroded. The extent of SD18 vegetation approximated to a combined total of 4.1km (15%) on all three occupied beaches (based on estimated values shown in Table 3).

5.8. Associated Fauna

A wide range of additional taxa were found to share strandline habitats with *E. complanata*. Whilst no systematic recording was undertaken that allows a quantitative analysis of diurnal refuge associates, the notes in Appendix 3 provide an account of observations from the main taxonomic groups, each taxonomic division summary headed by phylum (capitals), class (underlined) and order where appropriate (bold). All additional faunal records are also provided in Appendix 2.

Talitrids are described as being the main prey of *E. complanata* (King & Stabins, 1971) and were found to be abundant wherever *E. complanata* was recorded. The family is made up of detritivores that are largely reliant on deposits of marine algae (primarily fucoids) and avoid desiccation by seeking refuge under beach debris including accumulations of macro-algae, shells and flotsam. No attempts were made to routinely identify the species occurring on the strandlines of the study sites, but random sampling together with previous studies by Llewellyn (1996) at the same sites indicate *Talitrus saltator, Orchestia gammarellus* and *Talorchestia deshayesii* are the most abundant talitrids.

5.9. Photographs

Photographic records were made of a large number of locations where *E. complanata* was recorded, and general shots were taken to show the habitat characteristics of most sites visited. Digital images with retained meta-data have been provided electronically for reference and are labelled with the record reference number, so that they can be cross-referenced with the record details in Appendix 1. Appendix 4 provides examples of strandline profiles and refugia at key sites. All these photographs and more from selected sites have been stored and made available for online viewing at the following locations:

- Pendine Burrows: https://goo.gl/photos/r6aZhgeBEkABwJpa9
- Laugharne Burrows: https://goo.gl/photos/RbUitVT5BtZgqBak8
- Ferryside: https://goo.gl/photos/SbfXUEtacbd23zER6
- Cefn Sidan: https://goo.gl/photos/553C1oqoNmmi1LWd8
- Whiteford: https://goo.gl/photos/x4iszqAwrkHxBN5a7
- Broughton: https://goo.gl/photos/d48RsUqsdCd6LVPz8
- Baglan Burrows: https://goo.gl/photos/buVwNtVy6ob4w7Dr9

6. Discussion

6.1. Impacts on Sand Dunes in South Wales

The natural processes of erosion and accretion are essential for maintaining the vitality of plant and animal communities found along strandlines. These processes are often cyclical, with sequences that can take decades or even centuries to run. Sites that provide a continuity of sequences are usually large with elements of complexity provided by river mouths and/or headlands. Carmarthen Bay, though not unscathed by man, still supports a chain of closely-connected and extensive beaches that are highly dynamic, and this is most probably a key reason why the Strandline Beetle persists here. By way of contrast, the natural processes on dune systems further east on the South Wales coast would appear to be more constrained and fragmented by development and geology; the smaller systems to the west being naturally constrained by geology.

The sands in Carmarthen Bay are comprised of Devensian till and outwash material laid down by glacial processes in Carmarthen Bay and whose sands were subsequently re-worked by wave and drift action. Morgan (1991) highlighted that deposition at Tywyn Point was continuing and also particularly on "the Nose" of Pembrey Burrows, which has since expanded even further, so that it now cuts across the entrance to Pembrey Harbour. Ill-informed attempts to stabilise sand dunes in Carmarthen Bay included the construction of defensive structures and perhaps most damaging, the planting of Sea-buckthorn, which is now the target of an ongoing eradication project.

There has been much debate about the link between offshore sand dredging and losses of sand from the beaches of South Wales, sparked by headlines such as '*Wales' beaches are vanishing*'. Brampton (2010) states that a large number of studies have concluded that the impacts of dredging are localised and causes no coastal impact, with no evidence of infill of the dredged depressions or drawdown of sand from the beaches of South Wales are a result of dredging. Studies by Pye & Blott (2012, 2014) indicate natural processes such channel movements, wind direction/strength and changes in sea level are the fundamental drivers

responsible for the transport of coastal sand. The role of extreme weather events has also been implicated with sand loss, but regardless of the causes, it is clear that a reduction in sand reduces the extent and frequency of accretion, which in turn has an adverse impact upon *E. complanata.*

6.2. Habitat Condition on Occupied Sites

Pendine-Laugharne Burrows

Previous records show that *E. complanata* was last reported in 1990, with a peak count of 87 in 1964 (Howe, 2016). This unbroken 10km beach, with extensive sections of accreting dunes, has a moderately high frequency of large items of beach debris distributed along much of its length, which away from the eastern and western ends appeared to be largely left undisturbed due to military restrictions. There are wide belts of embryo dunes and, due to limited human disturbance, these sections probably represent the least modified embryo dune systems in the bay. The presence of a shingle ridge along much of Pendine Burrows could be a beneficial attribute, although the importance of this feature is not fully understood. Evidence was obtained that indicated wood removal and beach fires are fairly frequent activities at the Ginst Point, i.e. the eastern end of the beach, practices that probably resulted in a few larger aggregations of *E. complanata* being discovered under plastic in this area. Despite these somewhat restricted impacts, the lengthy mid-section of beach was found to support a comparatively even distribution of small numbers of beetles and it was concluded that 70-80% of the beach was in favourable condition for *E. complanata.*

Cefn Sidan (Pembrey – Tywyn Burrows)

Previous records show that *E. complanata* was last reported in 2015, with a peak count of 9 in 1987 (Howe, 2016), although Ian Morgan (pers. comm.) reports having seen double figures regularly at this site during the 1970-80's. This is another unbroken beach, which at 12.5km long is the longest unit in Carmarthen Bay, but has very contrasting sections of foredune structure and vegetation. Essentially, accreting dunes were well represented at Tywyn Point and the rapidly accreting 'nose' at Pembrey Burrows. There was evidence of significant recent storm damage and salt-water inundation of the dunes at the Pembrey Burrows end which, when combined with unregulated burning of wood and high visitor pressure via the country park, combine to explain the relative paucity of records from this section. Conversely, the Tywyn Burrows end of Cefn Sidan was found to display all the key attributes required by *E. complanata,* namely a moderately high frequency of large items distributed along an approximately 3km long accreting beach, a significant part of which is sheltered from prevailing winds. Protection from disturbance due to military restrictions means there is little removal of beach debris and no beach fires. Anecdotal evidence indicates that this end of the beach has a relatively stable, short embryo dune formation/erosion cycle. An abundance of sheltered strandline debris, behind the hook of Tywyn Point (Photo 20), marks the point where *E. complanata* habitat gives way to saltmarsh.

The central 5km of dune front at Cefn Sidan has been eroding for a number of years despite the construction of artificial groins. The groins at the Tywyn Point MoD beach entry point were found to have trapped excessive quantities of beach debris on the southern side (Photo 13). *E. complanata* was present in this massed material, but was difficult to find, making it impossible to determine the importance of aggregated debris. The profile of an eroded, steep

dune wall, topped with Sea-buckthorn, which is regularly battered during storm tides (Photo 21), provides very limited opportunities for *E. complanata*.

In summary, other than an unusually large aggregation of beetles discovered under a plastic bin (in an area where there was other beach debris available, Photos 1 & 2), a relatively even distribution of small numbers at the western end indicated that 25% of Cefn Sidan beach was found to be in favourable condition for *E. complanata.*

Whiteford Burrows

Previous records show that *E. complanata* was last reported in 2015, with a peak count of 137 in 2005 (Howe, 2016). Whiteford is a comparatively convolute 5km beach, with accreting and eroding sections providing contrasting sections of foredune structure and vegetation. Approximately 3km of accreting dunes were represented along the southern bulge and at the north-east spit, both being features which have expanded appreciably over the last 10 years or more. Erosion was particularly evident on the western side of the main spit, along which a shingle ridge was exposed at the toe of the eroding dune face for almost a 2km length (Photo 9). Intensive searching revealed that *E. complanata* occupied much of this ridge. Whilst the results suggest adults occurred at low density in this habitat, detection rates are likely to have been significantly lower due to the abundance of shelter opportunities amongst the stones. As with other sites, the accreting sections supported the largest proportion of the population. Unregulated burning of wood and removal (Photo 23) of beach timber pose a significant threat at this site and refuge items steadily disappeared off the beach during the study period. Even early on in the season (when beetle numbers were at their highest), the relatively small number of suitable refuge items probably resulted in unusually high aggregations being recorded. Overall, the somewhat thinly distributed refugia produced a more clumped distribution pattern when compared to the occupied sections at Cefn Sidan and Laugharne-Pendine, but all strandline habitats at Whiteford were occupied and were considered to be in a condition favourable for *E. complanata*. It is possible there is a fine line between favourable and unfavourable status at this site and further reduction of beach debris could place habitats at Whiteford closer to that line. Measures to ensure the strandlines continue to provide appropriate refugia should be seen as key to maintaining a viable population of *E. complanata* at this site.

Broughton Burrows

Previous records show that *E. complanata* was last reported in 1990, with a peak count of 21 in 1964 (Howe, 2016). Only the northern half of this 1.6km beach was found to be accreting, the south-western section eroding and with sea defences *in situ*. With plastics presumably removed as part of beach cleaning operations and virtually all wood being either being burned or removed on what is a very popular tourist beach, virtually no potential refuge items were found. Against the odds, in the very north of the site, a single *E. complanata* was noted under a log (which had disappeared two weeks later), most likely a wanderer from Whiteford. The impact insufficient beach debris has on what was otherwise apparently suitable habitat, which lies adjacent to the burgeoning population at Whiteford, provides clear evidence that collection of strandline material can be a primary cause of localised extinction. Broughton presents an ideal opportunity to test the effectiveness of conservation measures to encourage ‘natural’ recolonisation by *E. complanata*, by means of raising awareness, provision of artificial refugia and/or ensuring natural refugia are left *in situ*.

6.3. Carmarthen Bay at a Landscape Scale

The results of the study indicate that of the 27.5km of beach made up by the three large beach units in Carmarthen Bay, only 17km (i.e. 62%) were considered as being in favourable condition for *E. complanata* in 2016. Perhaps, given the dynamic nature of the habitat, this is what might be expected for such expansive areas of mobile beach. Therefore, it would appear that the bay currently provides a stable stronghold for a species that has become extinct at most, if not all, other British stations. Maintaining this viability should be a high conservation priority to safeguard *E. complanata* from extinction in the UK. Military restrictions are likely to have been instrumental in preventing excessive loss of beach debris at Tywyn Point and Laugharne-Pendine Burrows, whilst the comparative scarcity of material at Whiteford (resulting in unusually large aggregations) suggests there is a very high level of vulnerability at this site, despite the presence of a strong population during 2016.

6.4. Habitat Condition on other sites

Freshwater West (SM883000)

A 1.3km beach where *E. complanata* was last recorded in 1997. Paul Culyer carried out a survey on 26th May 2016 and, in addition to returning a zero count for *E. complanata,* reported a lack of any suitable debris on the beach (Photo 26) commenting: *"The wood is all burnt on fires and the plastic is collected as part of beach cleans. I think there was less than a dozen suitable items in 1km of beach... A large storm beach of cobbles has built up between the embryo dunes and the strandline. Often the strandline is on the storm beach rather than the sand."* The site is in unfavourable condition for *E. complanata*.

Frainslake (SR889981)

A 1.9km beach regularly surveyed for *E. complanata* by the MoD since 1997, with numbers frequently in the hundreds up to 2005, thereafter showing a steady decline and last recorded in 2013 (Howe, 2016). In 2016, searches of the entire beach were carried out by Lynne Houlston on 30th May and Graham Clarke on 10th September, both sessions returning zero counts of *E. complanata*. LH recorded debris items turned over during the first visits were plastic (59), natural wood (178), manufactured wood (73) and other (15), commenting that there seemed a lot more wood on the beach than usual, but that a lot of sand had been removed revealing the peat forest and a lot of pebbles lower down the beach. GC reported that during the second visit there was little suitable material on the beach, with debris turned being natural wood (118), manufactured wood (45), plastic (9) and other (3). Excessive erosion following extreme storm events has been implicated as the primary reason that this site is currently in unfavourable condition for *E. complanata*, although this may not explain the steady decline after 2005.

Broad Haven, Stackpole (SR977940)

A 0.4km beach where *E. complanata* was last recorded in 2000. The site was searched in August and September 2016 by Mike Howe but no beetles were found. There is little strandline here and any woody debris is quickly removed for beach fires as witnessed during the August search. The site is in unfavourable condition for the beetle (Paul Culyer & Mike Howe, pers. comm.).

Barafundle (SR990950)

Not listed as a former site by Howe (2016) but the whole strandline was searched on 20th June 2016 by Paul Culyer who reported "*Very sparse strandline and very little debris. 5cm x*

30cm Wood 1. Larger debris 6. No manmade material as the beach is regularly cleaned." (Photo 25). The site is in unfavourable condition for the beetle.

Tenby Burrows (SS125993)

A 1.8km beach, but with historical records only of *E. complanata*, last recorded in 1829. The entire strandline was searched on 16th June 2016 by Paul Culyer who reported "*Walked the whole length of the beach from Penally to Tenby. Start time 12.25pm (HT 15.36). From SS 12183 98705 to SN 13111 00016. Distance 1600m. Very little debris on the beach. 5cm x 30cm Wood 3, manmade 2. larger debris wood 8, manmade 1. Most of the wood material shows signs of being burnt. A number of fire sites along the dunes*." Photo 27 shows a steep profile at the beach top in front of an eroded dune cliff. The site is in unfavourable condition for *E. complanata.*

Morfa Uchaf (SN370118)

A 0.15km sandy beach from which there is a historical record. All the beach was searched on 17th June 2016 by the author, the habitat being considered to be suitable condition for *E. complanata* as there was an abundance of drift wood and other debris, but its very restricted size and isolated location suggests that it is only ever likely to be occupied during population booms.

Llangennith Burrows / Rhossili beach (SS410911)

There records from the 1960s (King & Stabins, 1971). 40% of this 4.5km beach was searched on 6th November 2016 by the author. The beach is backed by a raised platform overlain by wind-blown sand which forms a steep sand-cliff that is best developed in the northern part of the bay. Spring tides regularly wash the cliff base and prevent the establishment of embryo dunes. There is a shingle ridge exposed at the top of the beach which runs almost the full length. The site is largely considered to be unsuitable for *E. complanata* although it offers habitat that might facilitate natural population expansion to sites in South Gower.

Port Eynon (SS472853)

The full length of this 1.4km long beach, which incorporates Horton Dunes, was searched on 17th August 2016 by the author. No accreting dune element was noted and erosion of sand from the bay over the last 10 years or more has exposed a shingle ridge which protects the stabilised dunes from erosion. Beach debris was minimal having been cleared or burnt, the few larger immovable items of wood also being burnt. The site is in unfavourable condition for *E. complanata.*

Oxwich-Nicholaston Burrows (SS513875)

A 3km length of beach, 20% of which was searched on 8th June 2016 by Nick Edwards followed by complete searches on 23rd June 2016 by the author and on 27th September by Mike Howe. As with other South Gower beaches a shingle ridge is exposed, which protects the stabilised dune system that lies behind (Photo 18). The steep upper beach profile prevents an accreting dune element from developing and there is a lack of beach debris due to beach cleaning and burning of wood by beachgoers, with only a few large immovable items (also largely burnt) *in situ* (Photo 17). The site is in unfavourable condition for *E. complanata*.

The loss of the beetle from this system is particularly poignant, given that the only UK studies on the ecology of *E. complanata* were made here in the 1960's (King & Stabins, 1971; Stabins & King, 1966).

Blackpill-Singleton (SS619904)

A 3.7km beach with a few small sections with accreting dune at Blackpill and near Swansea Guild Hall. 51% of the beach was searched on 27th June 2016 by the author but very little suitable timber and virtually no plastic was found. Furthermore, almost every bit of wood encountered showed evidence of attempted burning (Photo 19). The site is in unfavourable condition for *E. complanata*.

Crymlyn Burrows (SS714926)

The full length of this 2.1km beach was searched on 16th June 2016 by Ben Sampson. There is cyclical erosion at accretion at the eastern end of this system, though the general shape of the burrows has not changed markedly in the last 20 years. During his visit BSa reported "*Lots of driftwood and flotsam, habitat in apparently good condition, especially at eastern end of beach, middle section eroded with steep sand cliff and little strandline debris*". The beetle was last recorded here in 1999.

Baglan Burrows (SS721921)

A 3.0km beach along which a full search was carried out on 13th June 2016 by the author. The habitats mirror those recorded at Crymlyn Burrows and the site shows a similar cyclical pattern of erosion at accretion at the western end, with little overall change in shape over the last two decades, although the site is more dynamic than the dunes on the west side of the Neath river mouth. Approximately 1km of beach was considered to be in favourable condition at Witford Point (Photo 12) with lots of drift wood, large plastic items and other suitable refugia on an actively accreting system.

Little Warren (SS749889)

Not surveyed in 2016, but visits in recent years show this site is stable with a hard engineered frontage. A small amount of accretion occurs in front of this but, being only 0.4km and in an urbanised area where drift wood is almost certainly burned, it is likely to be in an unfavourable condition for *E. complanata*.

Port Talbot Docks (SS755878)

Not surveyed in 2016 but this 0.4km long, largely shingle beach has been visited several times in recent years by the author. Being sheltered by the breakwater, only minimal erosion-accretion processes take place and despite there being good quantities of beach debris which are left undisturbed, the dominance of shingle probably makes the site unsuitable for *E. complanata*.

Margam Sands (SS761871 to SS778836)

Not surveyed in 2016 but visits by the author in recent years have revealed this 2km long beach provides an abundance of beach debris, but lacks accreting dunes. The entire beach is backed by industrial reinforcements except for the 0.8km section by the Kenfig river mouth. All sections show an exposed shingle ridge at the dune/cliff base which is pounded during storms. Other than the immediate area by the river mouth, the site is considered to be in unfavourable condition for *E. complanata*.

Kenfig Burrows (SS778834 to SS789801)

A 3.6km beach with only a small section of accreting dune at the Kenfig river mouth. 20% of the dune front, along the rejuvenation area, was searched on 11th June 2016 with an additional 25+%, from Kenfig river mouth to rejuvenation area, searched on 15th June 2016 by David Carrington and volunteers. Methodical searching of abundant refugia in these areas failed to return any observations of *E. complanata*. As with most of the dunes in this section of the Bristol Channel, a beach profile of stable dunes fronted by a wave-pounded shingle ridge would appear to provide unfavourable conditions for *E. complanata*.

Merthyr Mawr (SS837769 to SS863759)

A 3km section of dunes fronted by a shingle ridge (Photo 28), though lacking any significant accreting dune elements. 23% of the beach, starting at the Ogmore river mouth and heading north-west, was searched on 6th June 2016 by Duncan Ludlow. A follow up search by DL covering 90% of beach and also the saltmarsh from the river mouth to the ephemeral stream was undertaken on 16th June 2016. The beach profile of Merthyr Mawr is very similar to that at Kenfig Burrows, with stable dunes fronted by a wave-pounded shingle ridge, providing conditions that would appear to be unfavourable for *E. complanata* despite an abundance of ideal beach debris.

6.5. Habitat Preference

The results show that accreting dunes supported the healthiest populations of *E. complanata*. The associated NVC communities of SD2 (typically with Sea Rocket (Photo 15), Sea Spurge, Sea Sandwort and Prickly Saltwort well represented) and SD4 (Sand Couch-dominated) provide very useful indicators of good habitat quality and those beaches with wider profiles of these communities invariably provided the best habitat for *E. complanata*. Stable dune fronts, typically characterised by SD6 (Marram-dominated) vegetation were also occupied by *E. complanta*, but in lower numbers and always with good SD2 and SD4 beach sections nearby. Likewise, eroding dunes represented by SD6 and SD18 (Sea-buckthorn-dominated) communities were only occupied where better habitats were in close proximity and it seems likely that beetles had wandered into these areas rather than having bred there. As indicated by Gibbs (2008), steep dune faces and other obstacles may be a limiting factor at some sites. However, this is likely to be more contributory than fundamental as such sites are invariably stable or eroding and as the beetle is fully winged it should be capable of overcoming such obstacles.

A clear preference for beach debris on or immediately above the active strandline was shown by adult beetles. 84% of refuges recorded were on open beaches, with an average value of 7.4m (n=314, st.dev.=17.4m) down-beach from the nearest vegetation. The most extreme values recorded were 30m into the dunes and 150m below the dune edge. These results show a similar pattern to those of Gibbs (2008) who found that *E. complanata* sheltered under debris between 3 and 15m from the dunes.

Results from this study found that wooden items made up 64% (n=224) of refuges and plastics only 24% (n=82). This is in contrast to the findings by Gibbs (2008) who reported a clear preference for large plastic items being used as refuges by *E. complanata* at Frainslake, with wooden items being found to be of less importance. It seems unlikely that observer bias is responsible for this discrepancy as survey methods employed will have been similar and it is more plausible that refuge availability explains the differences between the

results. In 2016, a wide range of other miscellaneous items were used by *E. complanata* accounting for the remaining 12% of refuges, suggesting that that the species is probably more dependent on niches provided by beach items rather than the item types.

The requirement for easy access under driftwood was considered to be a potentially limiting factor, although the apparent disappearance of beetles during the summer period suggests a burying strategy may be employed under certain conditions, such as periods of high winds when sand becomes highly mobile and covers refuges (Photo 4). During these periods many refuges became seemingly unsuitable as access points were frequently buried.

Beaches dominated by shingle ridges would appear to be unsuitable for the larval stages, but may be important for adults, especially during periods when beach debris is scarce. At Whiteford for example, it was found that adults occupied the shingle ridge in small numbers (e.g. Photo 9), particularly where strandline debris was limited. Comparative counts are not possible on shingle as these will have been masked by the difficulty in sampling this substrate. It is possible that beaches which provide a combination of shingle and accreting sand may be better equipped for maintaining viable populations, especially at sites where beach debris is routinely removed and/or burned.

6.6. Impact of Survey upon *E. complanata*

Regular and repeated survey visits are considered to have resulted in a small increase in mortality rate. Turning over lightweight items was not considered problematic, but the turning of larger items was found to result in a small number of animals being squashed when bulky items were returned to their original positions, despite great care being taken. When exposed to daylight, *E. complanata* initiates one of two responses: the commonest is an instinctive dash directly towards the nearest shade (invariably the contact point on the sand of the object being lifted); alternatively they freeze for a period, but eventually make dash to the nearest shade or large object. In situations where only one or two individuals were involved, it was easier to ensure that the beetles were not harmed. However, when large aggregations were encountered under heavy objects that were difficult to handle and control (particularly large logs), the majority of beetles dashed for the contact or pivot point. Under such circumstances, it was often extremely difficult to respond quick enough to guarantee that the replacement of the log did not result in injury to or death of individuals. Consequently in circumstances where it was thought replacing the object back in its original position would risk harming individuals, the item was rolled onto fresh sand. However, even employing this strategy would not always guarantee beetles were free from harm, as aggregations move rapidly and constantly try to cram into the gap between the object and the sand at the contact point. Given that the strandline fauna occupies a highly dynamic niche, the risks associated with modifying the positions of the refuges were lower than those with attempting to replace them in their original positions. Very large logs and other bulky items that could not be comfortably handled were generally left *in situ* where it was judged moving them might result in harming beetles and some aggregations will have gone unrecorded.

Another potential adverse impact of the survey was that the news of large aggregations of *E. complanata* being found quickly spread through social media. Given the limited number of items at Whiteford, this undoubtedly added to the amount of times logs were turned, increasing the associated risks. Whilst this is unlikely to have had a significant adverse impact on the population, it is an issue worth highlighting and considering controlling for

future surveys. Suggestions were made that *E. complanata* would be the ideal subject for a Citizen science project, given its distinctiveness and ease of locating. However, there is a high risk that overzealous recording could do more harm than good for the reasons discussed above.

6.7. Hazardous Strandline Debris

One instance of *E. complanata* having expired after being trapped inside a plastic container was recorded, with two of eight adults being dead, the others being liberated. A mass gathering of 50+ individuals inside a wheel looked like they may have been trapped (Harris, 2016 on Flickr) highlighting the possibility of mass mortality.

6.8. Strandline Management

One of the main issues considered responsible for localised extinctions at many sites is the removal of beach debris used as refuges by *E. complanata*. Beach fires, the collection of driftwood and beach cleaning operations that remove larger items of plastic, tyres, rope, etc. have undoubtedly had a cumulative adverse impact at many sites. These actions are likely to reduce the viability of populations making them highly vulnerable and susceptible to extinction during extreme weather events.

It would appear that the extant populations of *E. complanata* in Carmarthen Bay are sufficiently large and fluid enough to enable natural recolonisation to occur, with beaches of West Gower and Pembrey Burrows being particularly well placed to benefit from remedial action. Two simple and affordable measures to reverse the decline include:1) the provision of interpretation to encourage a responsible attitude, and possibly self-policing, amongst beach users; and 2) the provision of supplementary beach furniture (where necessary) that is neither collectable nor burnable. Trials by Duncan Ludlow at Merthyr Mawr involved placing wooden boards onto the sand, weighted down by rocks on each corner. Each board had a laminated sheet stuck to it with an image of a Strandline Beetle, highlighting its vulnerability and an explanation of why beach debris is important for its well-being. This method, if refined to increase the durability of the materials used and with interpretation appropriate to the site where deployed, could provide a simple, low-cost solution to firstly safeguard the beetle at vulnerable sections of extant sites, and secondly to assist recovery at adjacent sites such as Broughton Burrows. A range of designs should be trialled before rolling out a more extensive programme.

SACs allow bye-laws to be established and consideration should be given to preventing damaging activities, specifically banning driftwood collection and burning. Also, as the gathering of material such as driftwood is a PDO under the SSSI legislation, provision of interpretation should be considered to make people aware that it is an unlawful activity and contact details provided to encourage the reporting of incidents.

Mechanised beach cleaning, which is invariably focussed on strandlines, is known to be highly detrimental to invertebrate communities. For example, Willmot & Smith (2003) demonstrated that mechanical beach cleaning effectively destroyed the habitats of whole populations of amphipods and other invertebrates and that following sediment disturbance, recolonisation was slow. Similarly Llewellyn & Shackley (1996) reported dramatic reductions of invertebrates on beaches in South Wales that were mechanically cleaned, the principal

group affected being amphipods, the main prey of *E. complanata*. Thankfully mechanical beach cleaning no longer takes place at sites where *E. complanata* is found.

Ongoing systematic clearance of Sea-buckthorn at Cefn Sidan has the potential to deliver benefits for *E. complanata* in the future, as it should help restore natural beach processes to a greater length of beach than currently exists. The eastwards expansion of the Tywyn Point population would not only help to boost and consolidate numbers at the Pembrey end of the beach but also would greatly increase the chances of genetic mixing with the population on Whiteford.

6.9. Natural Recolonisation v Reintroduction

E. complanata would initially seem to be a suitable candidate for reintroduction, with adults being sufficiently abundant and easy to collect for redistribution to suitable beaches where the species formerly occurred. But, are the chances of natural colonisation significantly likely enough to mean such measures aren't necessary? No documentation was found prior to the survey to indicate if *E. complanata* was capable of flight, so when a few specimens were found dead, trapped in a plastic tub, it presented an opportunity to inspect the hindwings. All three examples examined were found to be fully winged, as shown in Photo 24. It is not clear how readily *E. complanata* takes flight, but the fact the species is capable of doing so suggests natural dispersal is likely to take place. Given that the species occupies a highly dynamic environment that is in constant state of flux, it seems reasonable to assume it is well adapted to recolonising cyclically transient habitats. Conservation efforts would therefore seem to be better focussed on restoring habitat condition at adjacent sites, although it would be worth considering reintroduction to larger sites that are remote from Carmarthen Bay. Unless natural re-establishment occurs at former sites in West Glamorgan and Carmarthenshire, the chances of natural recolonisation at former sites further afield, such as those in East Glamorgan, Pembrokeshire, and on the English side of the Bristol Channel, would seem low. It would seem sensible that only where favourable conditions become established and look set for persist for a period of five years or more, should consideration be given to assessing a site's potential for translocation for a remote translocation project.

6.10. Awareness Raising

A short presentation was given at a conservation meeting held at the offices at Pembrey Air Weapons Range (AWR) on 12 October 2016. A synopsis of the survey findings was given highlighting the importance of the population at Tywyn Point and other sites in Carmarthen Bay. Those in attendance included representative of Sea Trust, Butterfly Conservation, Carmarthen Bay & Estuaries EMS Officer, NRW, CADW, Landmarc, Carmarthenshire County Council, Pryce Ecologists as-well-as the AWR.

7. Conclusion

The review by Howe (2016), together with results of this study, provide compelling evidence that the Strandline Beetle is now restricted to just three key sites in the UK, all within Carmarthen Bay.

The causes of the decline in range of *E. complanata* are not fully understood, but a reduction in active, accreting dune systems is likely to be a key factor. Pressure on populations at

remaining sites is caused by the collection and burning of strandline debris (principally items such as logs and plastics >20cm x10cm), which renders sites as being in unfavourable condition as the beetles have nowhere to take refuge. To safeguard these highly vulnerable populations, it is therefore critical to maintain favourable habitat conditions at remaining sites. This will require the provision of additional refugia and site interpretation to prevent the removal of debris, particularly at Whiteford Burrows and the eastern end of Cefn Sidan at Pembrey Burrows, where refugia are routinely removed and/or burned.

A singleton on Broughton Burrows probably represents a dispersing individual from adjacent Whiteford Burrows but suggests that sympathetic management may allow a population to establish if supplementary refugia are provided.

The species has not been found at Frainslake, where it was last seen in 2013 after a 10 year period of decline. It would appear beach processes have altered the structure of strandline habitats at this and other sites in South Wales where *E. complanata* was formerly known.

A few sites within the former range of *E. complanata*, but which do no support the species were found to be in suitable condition, notably Crymlyn Burrows and Baglan Burrows. Where it is believed favourable conditions are likely to be maintained for a period of years, future translocations may be considered as an appropriate measure to help safeguard the UK population.

8. Recommendations

Larger-scale intervention measures detailed by Pye & Blott (2012), aimed at dune rejuvenation, may provide the only solution for restoring favourable conditions at many sites where the accreting systems required by *E. complanata* have been lost. The main aim of such measures, if they are to be beneficial for *E. complanata*, would be the (re)development of active embryo dunes by restoring the processes that encourage accretion.

At sites where beach processes continue to produce the formation of embryo dunes, most importantly the three remaining beaches in Carmarthen Bay that still support *E. complanata*, the critical habitat management issue is controlling the amount of larger strandline debris. Simple measures, such as restricting the removal of suitable refuge material during beach-cleaning operations on Cefn Sidan and Laugharne-Pendine Burrows, and providing and maintaining artificial refugia on Whiteford Burrows and Pembrey Burrows, are likely to be fundamental in preventing further localised extinctions of *E. complanata*.

The most cost effective option for providing artificial refugia would be to use conifer logs from the forested areas within the dunes. This ties in with recommendations proposed by Pye & Blott (2012) for tree felling and stump removal to help restore sand mobility in the near-frontal dunes. Specifications for articial refugia are as follows:

- Logs and/or tree stumps should be of a size that prevents them being carried by hand (logs approximately the size of a railway sleeper [≈2.5m x 0.4m dia.]).
- Each log/stump should have 20+ oblique and randomly orientated, 5cm to 10cm deep saw-slits. These should be cut on all sides so that some are exposed whichever way the log/stump sits on the beach.

- Initially it is proposed that each 1km section of accreting beach identified at Figure 17 should have a minimum of five logs/stumps, each positioned at 50m intervals within the most suitable section of each 1km beach unit.
- Logs should be positioned loosely around the highest spring tide strandline, such as the toe of a steep dune face, or at the interface of the lowest dune vegetation and the open beach.
- Two logs from each cluster of five should be tethered by a sturdy rope to a fence post driven deep into the beach, to reduce the risk of all logs being lost on extreme tides.
- It is likely some logs will become buried or washed away and a contingency for raising logs from the sand and/or providing replacements should be made.
- The requirement for supplementary refugia should be monitored and reviewed annually in April, so that where logs are required they can be placed prior to the emergence of adult beetles in May. Note the critical period for logs on the beach is late May to the end of October.

Figure 17: Sites identified as currently requiring supplementary refugia to safeguard extant populations of *E. complanata*.

Notification at beach entry points explaining the importance of the logs on the beach will hopefully act as a deterrent to logs and naturally stranded beach debris being routinely collected/burned, whilst also raising awareness of the importance of strandline debris. An example of what a notice might include is given here.

> *THIS BEACH IS 1 OF ONLY 3 BEACHES REMAINING IN BRITAIN WHERE THE STRANDLINE BEETLE SURVIVES. THEY HIDE UNDER WOOD ON THE BEACH AND HAVE DISAPPEARED FROM BEACHES WHERE WOOD IS REMOVED OR BURNED. ADDITIONAL LOGS HAVE BEEN PLACED ON THIS BEACH AND WE REQUEST THAT FIRES DO NOT USE WOOD COLLECTED FROM THE BEACH. PLEASE REPORT ANY INCIDENTS TO.....*

This message could be reinforced if a stock of weatherproof car-sticker sized labels can be produced. These can be pinned to placed logs and the best natural refuges that get washed up. Each label should carry a message such as:

RARE BEETLE
HABITAT
DO NOT REMOVE
FROM BEACH
OR BURN'.

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11. Appendices

Appendix 1. 2016 observations of *E. complanata*.

Column headers

Ref# Record reference number
Count Number of *Eurynebria complanata* under refuge
DV Distance of refuge from edge of nearest vegetation (m):
+ve values: distance from front edge of dune vegetation
-ve values: distance behind front edge of dune vegetation
Recorder

DG	David Gibbs
RH	Rik Harris
IKM	Ian K. Morgan
CO	Christian Owen
BS	Barry Stewart

Ref #	Date	Site	Grid Ref	Count	Refuge	NVC	DV (m)	Recorder
1	06-Jun-16	Whiteford	SS43649460	1	log	SD4	1.5	BS
2	06-Jun-16	Whiteford	SS43669460	41	logs	SD4	1.0	BS
3	06-Jun-16	Whiteford	SS43819468	7	log/fine drift	SD4	-1.0	BS
4	06-Jun-16	Whiteford	SS43849471	3	log	SD4	-1.5	BS
5	06-Jun-16	Whiteford	SS43859471	4	log	SD4	-0.5	BS
6	06-Jun-16	Whiteford	SS43939479	22	large log	SD4	3.0	BS
7	06-Jun-16	Whiteford	SS43949479	8	log	SD4	0.0	BS
8	06-Jun-16	Whiteford	SS44089493	14	log seat	SD4	3.0	BS
9	06-Jun-16	Whiteford	SS44149501	3	large log	SD4	2.0	BS
10	06-Jun-16	Whiteford	SS44319525	1	log	SD6	2.5	BS
11	06-Jun-16	Whiteford	SS44379539	1	log	SD6	6.0	BS
12	06-Jun-16	Whiteford	SS44389541	5	large log	SD6	4.0	BS
13	06-Jun-16	Whiteford	SS44469559	12	log	SD6	4.0	BS
14	06-Jun-16	Whiteford	SS44489567	5	log	SD4	8.0	BS
15	06-Jun-16	Whiteford	SS44589613	3	log	SD6	5.0	BS
16	06-Jun-16	Whiteford	SS44969645	1	log	SD4	0.0	BS
17	06-Jun-16	Whiteford	SS45009643	2	log	SD4	60.0	BS
18	06-Jun-16	Whiteford	SS45159627	26	large log	SD4	0.0	BS
19	06-Jun-16	Whiteford	SS45309624	11	log	SD4	-1.5	BS
20	06-Jun-16	Whiteford	SS43609460	29	logs	SD4	14.0	BS
21	06-Jun-16	Whiteford	SS43559459	6	sofa cushion	SD4	9.0	BS
22	06-Jun-16	Whiteford	SS43519459	5	log	SD4	15.0	BS
23	06-Jun-16	Whiteford	SS43429456	22	log	SD4	7.0	BS
24	06-Jun-16	Whiteford	SS43409456	1	stick	SD4	-8.0	BS
25	06-Jun-16	Whiteford	SS43389454	1	log	SD4	-4.0	BS
26	06-Jun-16	Whiteford	SS43369454	4	stick	SD4	-1.0	BS
27	06-Jun-16	Whiteford	SS43289454	6	log	SD4	19.0	BS
28	06-Jun-16	Whiteford	SS43279452	3	logs	SD4	7.0	BS
29	06-Jun-16	Whiteford	SS43199448	10	log	SD4	0.5	BS
30	06-Jun-16	Whiteford	SS43079438	1	log	SD4	10.0	BS
31	06-Jun-16	Whiteford	SS43069437	10	logs	SD4	5.0	BS
32	06-Jun-16	Whiteford	SS43049434	4	stick	SD4	2.0	BS
33	06-Jun-16	Whiteford	SS42989427	1	log	SD4	4.0	BS
34	06-Jun-16	Whiteford	SS42979425	29	log	SD4	3.0	BS
35	06-Jun-16	Whiteford	SS42969423	9	log	SD4	14.0	BS

36	06-Jun-16	Whiteford	SS42979423	17	log	SD4	13.0	BS
37	07-Jun-16	Cefn Sidan	SS42319883	1	log	SD2	8.0	BS
38	07-Jun-16	Cefn Sidan	SS43529973	1	plastic	SD4	9.0	BS
39	07-Jun-16	Cefn Sidan	SN38760113	1	log	SD18	1.0	BS
40	09-Jun-16	Broughton	SS42759396	1	log	SD4	32.0	BS
41	10-Jun-16	Cefn Sidan	SN36210639	5	log	SD6	40.0	BS
42	10-Jun-16	Cefn Sidan	SN36240638	18	log	SD6	40.0	BS
43	10-Jun-16	Cefn Sidan	SN36270637	1	roof felt	SD6	40.0	BS
44	10-Jun-16	Cefn Sidan	SN36300637	1	log	SD4	35.0	BS
45	10-Jun-16	Cefn Sidan	SN36330636	3	log	SD4	35.0	BS
46	10-Jun-16	Cefn Sidan	SN36370636	10	log	SD4	35.0	BS
47	10-Jun-16	Cefn Sidan	SN36450629	1	log	SD6	120.0	BS
48	10-Jun-16	Cefn Sidan	SN36310630	1	log	SD4	17.0	BS
49	10-Jun-16	Cefn Sidan	SN36330633	1	log	SD4	18.0	BS
50	10-Jun-16	Cefn Sidan	SN36250635	1	logs	SD6	25.0	BS
51	10-Jun-16	Cefn Sidan	SN36100637	8	bird box	SD6	28.0	BS
52	10-Jun-16	Cefn Sidan	SN36100636	1	log	SD6	5.0	BS
53	10-Jun-16	Cefn Sidan	SN36040637	1	log	SD6	11.0	BS
54	10-Jun-16	Cefn Sidan	SN36020636	1	log	SD6	15.0	BS
55	10-Jun-16	Cefn Sidan	SN36010635	2	bird box	SD6	9.0	BS
56	10-Jun-16	Cefn Sidan	SN35980632	1	log	SD6	13.0	BS
57	10-Jun-16	Cefn Sidan	SN35980631	4	plastic	SD6	10.0	BS
58	10-Jun-16	Cefn Sidan	SN35970631	8	plastic	SD6	9.0	BS
59	10-Jun-16	Cefn Sidan	SN35930620	2	log	SD4	17.0	BS
60	10-Jun-16	Cefn Sidan	SN35920618	9	log	SD4	21.0	BS
61	10-Jun-16	Cefn Sidan	SN35920617	3	log	SD4	20.0	BS
62	10-Jun-16	Cefn Sidan	SN35910613	14	bin lid	SD4	27.0	BS
63	10-Jun-16	Cefn Sidan	SN35900612	1	log	SD4	28.0	BS
64	10-Jun-16	Cefn Sidan	SN35900609	27	plastic	SD4	18.0	BS
65	10-Jun-16	Cefn Sidan	SN35910588	1	log	SD4	8.0	BS
66	10-Jun-16	Cefn Sidan	SN35920583	1	log	SD4	35.0	BS
67	10-Jun-16	Cefn Sidan	SN35890580	1	plastic	SD4	40.0	BS
68	10-Jun-16	Cefn Sidan	SN35900576	1	plastic	SD4	40.0	BS
69	10-Jun-16	Cefn Sidan	SN35900571	2	log	SD4	40.0	BS
70	10-Jun-16	Cefn Sidan	SN35920565	1	debris	SD4	35.0	BS
71	10-Jun-16	Cefn Sidan	SN35920562	1	log	SD4	45.0	BS
72	10-Jun-16	Cefn Sidan	SN35930554	1	debris	SD2	40.0	BS
73	10-Jun-16	Cefn Sidan	SN35960540	1	debris	SD2	35.0	BS
74	10-Jun-16	Cefn Sidan	SN35960536	3	plastic	SD2	45.0	BS
75	10-Jun-16	Cefn Sidan	SN36360445	4	plastic	SD2	2.0	BS
76	10-Jun-16	Cefn Sidan	SN36360448	1	plastic	SD2	0.0	BS
77	10-Jun-16	Cefn Sidan	SN36350448	1	plastic	SD4	-2.0	BS
78	10-Jun-16	Cefn Sidan	SN36330454	1	plastic	SD2	0.0	BS
79	10-Jun-16	Cefn Sidan	SN36280460	4	log	SD2	16.0	BS
80	10-Jun-16	Cefn Sidan	SN36260465	3	plastic	SD2	5.0	BS
81	10-Jun-16	Cefn Sidan	SN36220476	1	log	SD2	9.0	BS
82	10-Jun-16	Cefn Sidan	SN36190478	1	log	SD2	17.0	BS
83	10-Jun-16	Cefn Sidan	SN36140494	1	log	SD2	-3.0	BS
84	10-Jun-16	Cefn Sidan	SN36080497	1	cuttlefish	SD2	45.0	BS
85	10-Jun-16	Cefn Sidan	SN36110489	3	pallet	SD2	45.0	BS
86	10-Jun-16	Cefn Sidan	SN36110488	1	log	SD2	45.0	BS
87	10-Jun-16	Cefn Sidan	SN36130485	9	Henry vacuum	SD2	40.0	BS
88	10-Jun-16	Cefn Sidan	SN36170477	1	log	SD2	40.0	BS
89	10-Jun-16	Cefn Sidan	SN36170472	1	log	SD2	35.0	BS
90	10-Jun-16	Cefn Sidan	SN36210467	2	log	SD2	45.0	BS

91	10-Jun-16	Cefn Sidan	SN36220464	4	log	SD2	45.0	BS
92	10-Jun-16	Cefn Sidan	SN36260457	2	log	SD2	45.0	BS
93	17-Jun-16	Cefn Sidan	SN36040523	1	plastic	SD2	0.0	BS
94	17-Jun-16	Cefn Sidan	SN36070510	4	log	SD2	12.0	BS
95	17-Jun-16	Cefn Sidan	SN36090510	10	log	SD2	-6.0	BS
96	17-Jun-16	Cefn Sidan	SN36120498	2	log	SD2	4.0	BS
97	17-Jun-16	Cefn Sidan	SN36130497	1	bucket	SD2	2.0	BS
98	17-Jun-16	Cefn Sidan	SN36150494	1	log	SD2	-7.0	BS
99	17-Jun-16	Cefn Sidan	SN36500418	8	large log	SD2	6.0	BS
100	17-Jun-16	Cefn Sidan	SN36560410	3	large log	SD2	4.0	BS
101	19-Jun-16	Laugharne Burrows	SN30460698	7	log	SD2	6.0	BS
102	19-Jun-16	Laugharne Burrows	SN30470699	4	plastic	SD2	-0.5	BS
103	19-Jun-16	Laugharne Burrows	SN30470698	8	tyre	SD2	4.0	BS
104	19-Jun-16	Laugharne Burrows	SN30470698	1	log	SD2	4.0	BS
105	19-Jun-16	Laugharne Burrows	SN30530699	10	plastic	SD2	3.0	BS
106	19-Jun-16	Laugharne Burrows	SN30600701	1	plastic	SD2	5.0	BS
107	19-Jun-16	Laugharne Burrows	SN30610701	4	log	SD2	2.5	BS
108	19-Jun-16	Laugharne Burrows	SN30620701	1	pallet	SD2	4.0	BS
109	19-Jun-16	Laugharne Burrows	SN30650701	3	plastic	SD2	5.0	BS
110	19-Jun-16	Laugharne Burrows	SN30770703	2	logs	SD2	5.0	BS
111	19-Jun-16	Laugharne Burrows	SN30980703	2	log	SD2	4.0	BS
112	19-Jun-16	Laugharne Burrows	SN31380705	2	stump	SD2	12.0	BS
113	19-Jun-16	Laugharne Burrows	SN31430706	9	tyre	SD2	14.0	BS
114	19-Jun-16	Laugharne Burrows	SN31460705	1	tyre	SD2	15.0	BS
115	19-Jun-16	Laugharne Burrows	SN31470706	1	tyre	SD4	12.0	BS
116	19-Jun-16	Laugharne Burrows	SN31570708	2	log cluster	SD4	7.0	BS
117	19-Jun-16	Laugharne Burrows	SN31650709	1	stump	SD4	6.0	BS
118	19-Jun-16	Laugharne Burrows	SN31770713	1	stump	SD4	1.0	BS
119	19-Jun-16	Laugharne Burrows	SN31840716	1	log	SD4	-3.0	BS
120	19-Jun-16	Laugharne Burrows	SN31890716	2	raft	SD4	1.0	BS
121	19-Jun-16	Laugharne Burrows	SN31920718	1	log	SD4	-3.0	BS
122	19-Jun-16	Laugharne Burrows	SN31960718	2	log	SD4	5.0	BS
123	19-Jun-16	Laugharne Burrows	SN32150728	2	beach tepee	SD4	5.0	BS
124	19-Jun-16	Laugharne Burrows	SN32180731	2	plastic	SD2	0.0	BS
125	19-Jun-16	Laugharne Burrows	SN32280735	33	plastic	SD4	22.0	BS
126	19-Jun-16	Laugharne Burrows	SN32510755	4	bin lid	SD4	35.0	BS
127	19-Jun-16	Laugharne Burrows	SN32550761	1	log	SD4	45.0	BS
128	19-Jun-16	Laugharne Burrows	SN32540773	1	peat block	SD2	-3.0	BS
129	21-Jun-16	Pendine Burrows	SN29770687	7	plastic	SD4	-1.0	BS
130	21-Jun-16	Pendine Burrows	SN29690686	1	log	SD4	-1.0	BS
131	21-Jun-16	Pendine Burrows	SN29510686	1	plastic	SD4	-2.0	BS
132	21-Jun-16	Pendine Burrows	SN29430683	3	plastic	SD4	-2.0	BS
133	21-Jun-16	Pendine Burrows	SN29230685	3	plastic	SD2	-2.0	BS
134	21-Jun-16	Pendine Burrows	SN29150684	1	log	SD2	2.0	BS
135	21-Jun-16	Pendine Burrows	SN29130685	8	plastic	SD2	2.0	BS
136	21-Jun-16	Pendine Burrows	SN29000686	1	log	SD2	-1.0	BS
137	21-Jun-16	Pendine Burrows	SN28960685	1	tyre	SD2	6.0	BS
138	21-Jun-16	Pendine Burrows	SN28870686	3	plastic	SD2	-1.5	BS
139	21-Jun-16	Pendine Burrows	SN28820684	3	plastic	SD2	30.0	BS
140	21-Jun-16	Pendine Burrows	SN28780686	1	log	SD2	3.0	BS
141	21-Jun-16	Pendine Burrows	SN28570689	3	plastic	SD2	-1.0	BS
142	21-Jun-16	Pendine Burrows	SN28570689	2	log	SD2	0.0	BS
143	21-Jun-16	Pendine Burrows	SN28540689	1	plastic	SD2	-5.0	BS
144	21-Jun-16	Pendine Burrows	SN28440690	1	log	SD4	0.0	BS
145	21-Jun-16	Pendine Burrows	SN28310691	3	plastic	SD2	-0.5	BS

146	21-Jun-16	Pendine Burrows	SN28020695	1	log	SD2	0.0	BS
147	21-Jun-16	Pendine Burrows	SN27880698	1	log	SD4	-1.0	BS
148	21-Jun-16	Pendine Burrows	SN27640705	3	plastic	SD2	-3.0	BS
149	21-Jun-16	Pendine Burrows	SN27630705	1	plastic	SD2	1.0	BS
150	21-Jun-16	Pendine Burrows	SN27600705	7	plastic	SD4	-1.0	BS
151	21-Jun-16	Pendine Burrows	SN27300713	4	plastic	SD2	1.5	BS
152	21-Jun-16	Pendine Burrows	SN27090717	1	log	SD2	4.0	BS
153	21-Jun-16	Pendine Burrows	SN27020719	16	plastic	SD2	3.0	BS
154	21-Jun-16	Pendine Burrows	SN27010720	8	steel cylinder	SD2	0.5	BS
155	21-Jun-16	Pendine Burrows	SN26970721	2	tyre	SD2	2.0	BS
156	21-Jun-16	Pendine Burrows	SN26880722	5	stump	SD2	5.0	BS
157	21-Jun-16	Pendine Burrows	SN26890721	31	log (split)	SD2	4.0	BS
158	21-Jun-16	Pendine Burrows	SN26770724	1	plastic	SD2	4.0	BS
159	21-Jun-16	Pendine Burrows	SN26770724	7	log	SD2	1.0	BS
160	21-Jun-16	Pendine Burrows	SN26670727	1	buoy	SD2	3.0	BS
161	21-Jun-16	Pendine Burrows	SN26580728	1	log	SD2	35.0	BS
162	21-Jun-16	Pendine Burrows	SN26560729	7	plastic	SD2	6.0	BS
163	21-Jun-16	Pendine Burrows	SN26490731	12	plastic	SD2	20.0	BS
164	21-Jun-16	Pendine Burrows	SN26390735	1	log	SD2	2.0	BS
165	21-Jun-16	Pendine Burrows	SN26390733	1	plastic	SD2	12.0	BS
166	21-Jun-16	Pendine Burrows	SN26330735	5	plastic	SD2	10.0	BS
167	21-Jun-16	Pendine Burrows	SN26180739	9	wooden board	SD2	1.5	BS
168	21-Jun-16	Pendine Burrows	SN26150740	1	log	SD6	20.0	BS
169	21-Jun-16	Pendine Burrows	SN26000743	4	plastic	SD6	6.0	BS
170	21-Jun-16	Pendine Burrows	SN25470755	3	plastic	SD6	4.0	BS
171	21-Jun-16	Pendine Burrows	SN25140762	1	plastic	SD6	7.0	BS
172	21-Jun-16	Pendine Burrows	SN24360777	2	log	SD6	4.0	BS
173	23-Jun-16	Whiteford	SS42839403	1	foam	SD4	40.0	BS
174	23-Jun-16	Whiteford	SS43019435	1	log	SD4	30.0	BS
175	23-Jun-16	Whiteford	SS43069437	2	log	SD4	4.0	BS
176	23-Jun-16	Whiteford	SS43069442	2	breeze block	SD4	35.0	BS
177	23-Jun-16	Whiteford	SS43429456	2	log	SD4	6.0	BS
178	23-Jun-16	Whiteford	SS43549459	2	sofa cushion	SD4	3.0	BS
179	23-Jun-16	Whiteford	SS43549459	1	board	SD4	4.0	BS
180	23-Jun-16	Whiteford	SS43609460	3	log jumble	SD4	15.0	BS
181	23-Jun-16	Whiteford	SS43669461	3	log jumble	SD4	1.0	BS
182	23-Jun-16	Whiteford	SS43819469	1	log	SD4	-1.0	BS
183	23-Jun-16	Whiteford	SS43859471	1	log	SD4	-1.0	BS
184	23-Jun-16	Whiteford	SS43909475	1	log	SD4	-1.0	BS
185	23-Jun-16	Whiteford	SS43949479	1	log	SD4	-1.0	BS
186	23-Jun-16	Whiteford	SS44089493	6	log seat	SD4	-4.0	BS
187	23-Jun-16	Whiteford	SS44319526	1	burnt log	SD6	2.0	BS
188	23-Jun-16	Whiteford	SS44349534	1	log	SD6	3.0	BS
189	23-Jun-16	Whiteford	SS44459559	1	log	SD6	-4.0	BS
190	23-Jun-16	Whiteford	SS44519581	1	log	SD6	1.0	BS
191	23-Jun-16	Whiteford	SS45029637	2	plastic	SD6	5.0	BS
192	23-Jun-16	Whiteford	SS45159627	2	log	SD2	2.0	BS
193	23-Jun-16	Whiteford	SS45189626	4	log	SD2	-1.0	BS
194	23-Jun-16	Whiteford	SS45249626	5	peat block	SD2	2.0	BS
195	23-Jun-16	Whiteford	SS45279624	2	log	SD2	-4.0	BS
196	23-Jun-16	Whiteford	SS45459626	2	logs	SD2	-3.0	BS
197	23-Jun-16	Whiteford	SS45679631	3	peat block	SD2	-1.0	BS
198	24-Jun-16	Cefn Sidan	SN36150635	2	plastic	SD6	4.0	BS, IKM
199	24-Jun-16	Cefn Sidan	SN36190635	82	plastic	SD6	-1.0	BS, IKM
200	24-Jun-16	Cefn Sidan	SN36270633	12	plastic	SD4	-1.0	BS, IKM

201	24-Jun-16	Cefn Sidan	SN36320629	9	log	SD2	50.0	BS, IKM
202	24-Jun-16	Cefn Sidan	SN36060521	1	plastic	SD2	-2.0	BS, IKM
203	24-Jun-16	Cefn Sidan	SN36090510	5	log	SD2	-7.0	BS, IKM
204	24-Jun-16	Cefn Sidan	SN36080508	1	plastic	SD2	7.0	BS, IKM
205	24-Jun-16	Cefn Sidan	SN36140495	1	log	SD2	-2.0	BS, IKM
206	24-Jun-16	Cefn Sidan	SN36150494	1	log	SD2	-8.0	BS, IKM
207	24-Jun-16	Cefn Sidan	SN36290464	1	plastic	SD2	-10.0	BS, IKM
208	24-Jun-16	Cefn Sidan	SN36310455	1	plastic	SD2	-5.0	BS, IKM
209	30-Jun-16	Cefn Sidan	SS43499969	1	plastic	SD4	2.0	BS
210	30-Jun-16	Cefn Sidan	SS43499971	1	log	SD4	0.0	BS
211	18-Jun-16	Whiteford	SS43609460	84	tyre & logs	SD4	14.0	RH
212	13-Jul-16	Whiteford	SS43709463	1	log	SD4	2.0	BS
213	13-Jul-16	Whiteford	SS43939479	3	log	SD4	3.0	BS
214	13-Jul-16	Whiteford	SS45149627	2	log	SD4	0.0	BS
215	13-Jul-16	Whiteford	SS45289624	1	peat block	SD2	2.0	BS
216	26-Jul-16	Cefn Sidan	SN36190635	9	plastic	SD6	-1.0	BS
217	26-Jul-16	Cefn Sidan	SN36270633	1	plastic	SD4	-1.0	BS
218	26-Jul-16	Cefn Sidan	SN35910613	2	bin lid	SD4	27.0	BS
219	26-Jul-16	Cefn Sidan	SN35940604	1	log	SD2	-8.0	BS
220	26-Jul-16	Cefn Sidan	SN36070510	1	log	SD2	12.0	BS
221	26-Jul-16	Cefn Sidan	SN36160496	1	log	SD2	-25.0	BS
222	31-Jul-16	Whiteford	SS45309624	1	log	SD2	-25.0	BS
223	31-Jul-16	Whiteford	SS45709630	6	tyre	SD2	4.0	BS
224	31-Jul-16	Whiteford	SS44609626	9	log	SD6	3.0	BS
225	31-Jul-16	Whiteford	SS44589609	1	shingle	SD6	1.0	BS
226	31-Jul-16	Whiteford	SS44559596	2	log	SD6	4.0	BS
227	31-Jul-16	Whiteford	SS44529585	3	log	SD6	0.0	BS
228	31-Jul-16	Whiteford	SS43669461	4	log cluster	SD4	0.0	BS
229	31-Jul-16	Whiteford	SS43549458	3	board	SD4	6.0	BS
230	31-Jul-16	Whiteford	SS43529458	1	log cluster	SD4	4.0	BS
231	31-Jul-16	Whiteford	SS43379454	1	log	SD4	2.0	BS
232	31-Jul-16	Whiteford	SS43079437	1	log	SD4	3.0	BS
233	08-Aug-16	Whiteford	SS45909629	1	log	SD2	150.0	BS
234	08-Aug-16	Whiteford	SS45709630	2	tyre	SD2	4.0	BS
235	08-Aug-16	Whiteford	SS45529629	5	boat seats	SD2	23.0	BS
236	08-Aug-16	Whiteford	SS45309624	2	log	SD2	-25.0	BS
237	08-Aug-16	Whiteford	SS44949648	1	log	SD2	5.0	BS
238	08-Aug-16	Whiteford	SS44769658	1	log	SD6	1.0	BS
239	08-Aug-16	Whiteford	SS44609626	3	log	SD6	3.0	BS
240	08-Aug-16	Whiteford	SS44509575	1	log	SD6	1.0	BS
241	08-Aug-16	Whiteford	SS44319526	1	burnt log	SD6	2.0	BS
242	08-Aug-16	Whiteford	SS43669461	2	log jumble	SD4	1.0	BS
243	08-Aug-16	Whiteford	SS43549459	1	sofa cushion	SD4	3.0	BS
244	08-Aug-16	Whiteford	SS43139443	1	log	SD4	6.0	BS
245	13-Aug-16	Cefn Sidan	SN36140636	1	log	SD6	6.0	BS
246	13-Aug-16	Cefn Sidan	SN36200635	10	plastic bin	SD6	-1.0	BS
247	13-Aug-16	Cefn Sidan	SN36230633	1	log	SD6	2.0	BS
248	13-Aug-16	Cefn Sidan	SN36270633	3	plastic	SD4	-1.0	BS
249	13-Aug-16	Cefn Sidan	SN35940615	1	plastic	SD4	-8.0	BS
250	13-Aug-16	Cefn Sidan	SN35930591	1	log	SD4	-5.0	BS
251	13-Aug-16	Cefn Sidan	SN36060521	1	plastic	SD2	-2.0	BS
252	13-Aug-16	Cefn Sidan	SN36150499	2	log	SD2	-20.0	BS
253	13-Aug-16	Cefn Sidan	SN36360446	1	log	SD2	-5.0	BS
254	13-Aug-16	Cefn Sidan	SN36390442	1	log	SD2	-15.0	BS
255	13-Aug-16	Cefn Sidan	SN36590406	1	log jumble	SD2	-1.0	BS

256	30-Aug-16	Cefn Sidan	SN36100635	2	log	SD6	3.0	BS
257	30-Aug-16	Cefn Sidan	SN36140635	1	log	SD6	2.0	BS
258	30-Aug-16	Cefn Sidan	SN36160636	1	fishing net	SD6	1.5	BS
259	30-Aug-16	Cefn Sidan	SN36200635	15	plastic bin	SD6	-1.0	BS
260	30-Aug-16	Cefn Sidan	SN35930609	1	log	SD2	-4.0	BS
261	30-Aug-16	Cefn Sidan	SN35940581	2	plastic	SD2	1.0	BS
262	30-Aug-16	Cefn Sidan	SN36090510	4	log	SD2	-7.0	BS
263	30-Aug-16	Cefn Sidan	SN36150494	1	log	SD2	-8.0	BS
264	30-Aug-16	Cefn Sidan	SN36000540	1	log	SD2	0.0	BS
265	30-Aug-16	Cefn Sidan	SN36000542	1	log	SD2	-2.0	BS
266	30-Aug-16	Cefn Sidan	SN35980546	1	log	SD2	0.0	BS
267	30-Aug-16	Cefn Sidan	SN35970552	1	log	SD2	1.0	BS
268	30-Aug-16	Cefn Sidan	SN35940567	1	log	SD2	0.0	BS
269	30-Aug-16	Cefn Sidan	SN36280465	1	log	SD2	0.0	BS
270	30-Aug-16	Cefn Sidan	SN36360448	2	plastic	SD2	1.0	BS
271	27-Aug-16	Cefn Sidan	SS41989879	1	plastic	SD2	-2.0	BS
272	01-Sep-16	Whiteford	SS43079437	1	log	SD4	1.0	BS
273	01-Sep-16	Whiteford	SS43209447	1	log	SD4	-2.0	BS
274	01-Sep-16	Whiteford	SS43419454	1	log	SD4	-2.0	BS
275	01-Sep-16	Whiteford	SS43669461	3	log jumble	SD4	1.0	BS
276	01-Sep-16	Whiteford	SS44499569	1	log	SD6	-1.0	BS
277	01-Sep-16	Whiteford	SS44529585	1	log	SD6	0.0	BS
278	01-Sep-16	Whiteford	SS44559598	1	shingle	SD6	2.0	BS
279	01-Sep-16	Whiteford	SS44659648	1	log	SD6	5.0	BS
280	01-Sep-16	Whiteford	SS44799657	1	log	SD6	2.0	BS
281	01-Sep-16	Whiteford	SS45199622	1	log	SD2	-25.0	BS
282	01-Sep-16	Whiteford	SS45529628	8	boat seats	SD2	20.0	BS
283	15-Sep-16	Whiteford	SS43079437	1	log	SD4	1.0	BS
284	15-Sep-16	Whiteford	SS43099439	1	log	SD4	1.0	BS
285	15-Sep-16	Whiteford	SS43359454	1	log cluster	SD4	0.0	BS
286	15-Sep-16	Whiteford	SS43419454	2	log	SD4	-2.0	BS
287	15-Sep-16	Whiteford	SS43669461	1	log	SD4	1.0	BS
288	15-Sep-16	Whiteford	SS44549590	1	shingle	SD6	2.0	BS
289	15-Sep-16	Whiteford	SS44609626	2	log	SD6	3.0	BS
290	15-Sep-16	Whiteford	SS44749658	1	log	SD6	1.0	BS
291	15-Sep-16	Whiteford	SS44959647	12	log	SD2	3.0	BS
292	15-Sep-16	Whiteford	SS44969646	2	log	SD2	0.0	BS
293	15-Sep-16	Whiteford	SS45049636	2	log	SD2	3.0	BS
294	15-Sep-16	Whiteford	SS45109629	4	plastic	SD2	0.0	BS
295	15-Sep-16	Whiteford	SS45109631	1	log	SD2	6.0	BS
296	15-Sep-16	Whiteford	SS45119628	3	log cluster	SD2	-30.0	BS
297	15-Sep-16	Whiteford	SS45179626	1	log	SD2	-10.0	BS
298	15-Sep-16	Whiteford	SS45279624	1	log	SD2	-4.0	BS
299	15-Sep-16	Whiteford	SS45319624	1	rope	SD2	-4.0	BS
300	15-Sep-16	Whiteford	SS45529628	3	boat seats	SD2	3.0	BS
301	16-Sep-16	Cefn Sidan	SN36100635	2	log	SD6	4.0	BS
302	16-Sep-16	Cefn Sidan	SN36120637	7	bird box	SD6	4.0	BS
303	16-Sep-16	Cefn Sidan	SN36200635	2	plastic bin	SD6	-1.0	BS
304	16-Sep-16	Cefn Sidan	SN36300630	1	log	SD2	-15.0	BS
305	16-Sep-16	Cefn Sidan	SN36320628	1	log	SD2	-15.0	BS
306	16-Sep-16	Cefn Sidan	SN35940620	1	log	SD2	-2.0	BS
307	16-Sep-16	Cefn Sidan	SN35920596	1	plastic	SD2	0.0	BS
308	16-Sep-16	Cefn Sidan	SN35950564	1	log	SD2	-1.0	BS
309	16-Sep-16	Cefn Sidan	SN35960559	1	log	SD2	-4.0	BS
310	16-Sep-16	Cefn Sidan	SN36000543	2	plastic drum	SD2	2.0	BS

311	16-Sep-16	Cefn Sidan	SN36100506	1	plastic	SD2	-5.0	BS
312	16-Sep-16	Cefn Sidan	SN36220478	1	log	SD2	4.0	BS
313	16-Sep-16	Cefn Sidan	SN36250475	1	log	SD2	-6.0	BS
314	16-Sep-16	Cefn Sidan	SN36490420	1	log	SD2	1.0	BS
315	23-Sep-16	Whiteford	SS45119626	2	log	SD2	-30.0	BS
316	23-Sep-16	Whiteford	SS45159628	2	peat block	SD2	4.0	BS
317	23-Sep-16	Whiteford	SS45229628	2	log	SD2	-5.0	BS
318	23-Sep-16	Whiteford	SS45289624	8	log	SD2	-8.0	BS
319	23-Sep-16	Whiteford	SS45419625	1	log	SD2	0.0	BS
320	23-Sep-16	Whiteford	SS45529628	1	boat seats	SD2	2.0	BS
321	23-Sep-16	Whiteford	SS45539628	5	canvas	SD2	0.0	BS
322	23-Sep-16	Whiteford	SS45619629	1	log	SD2	-4.0	BS
323	23-Sep-16	Whiteford	SS45119629	1	lump of tar	SD2	0.0	BS
324	23-Sep-16	Whiteford	SS45069632	1	log	SD2	0.0	BS
325	23-Sep-16	Whiteford	SS45039637	11	log	SD2	3.0	BS
326	23-Sep-16	Whiteford	SS44969647	3	log	SD2	0.0	BS
327	23-Sep-16	Whiteford	SS44959647	2	log	SD2	2.0	BS
328	23-Sep-16	Whiteford	SS44549594	1	log	SD6	1.0	BS
329	23-Sep-16	Whiteford	SS44079493	1	log	SD4	0.0	BS
330	23-Sep-16	Whiteford	SS43939479	1	log	SD4	1.0	BS
331	23-Sep-16	Whiteford	SS43359454	1	log cluster	SD4	0.0	BS
332	23-Sep-16	Whiteford	SS42999424	4	plastic	SD4	-8.0	BS
333	17-Sep-16	Laugharne Burrows	SN32340743	2	plastic	SD4	n/r	DG
334	17-Sep-16	Laugharne Burrows	SN31890722	1	plastic	SD4	n/r	DG
335	17-Sep-16	Laugharne Burrows	SN32220734	1	plastic	SD4	n/r	DG
336	17-Sep-16	Laugharne Burrows	SN32140730	2	plastic	SD4	n/r	DG
337	17-Sep-16	Laugharne Burrows	SN32070727	1	plastic	SD4	n/r	DG
338	17-Sep-16	Laugharne Burrows	SN32290739	1	plastic	SD4	n/r	DG
339	25-Sep-16	Pendine Burrows	SN26550731	1	Plank	SD4	3.0	CO
340	25-Sep-16	Pendine Burrows	SN26770725	1	Buoy	SD4	0.0	CO
341	25-Sep-16	Pendine Burrows	SN27550709	1	Foam	SD4	0.0	CO
342	25-Sep-16	Pendine Burrows	SN28220694	1	Polystyrene	SD4	0.0	CO
343	25-Sep-16	Pendine Burrows	SN28440691	2	Plastic	SD4	0.0	CO
344	25-Sep-16	Pendine Burrows	SN30350698	1	Plastic	SD4	0.0	CO
345	25-Sep-16	Laugharne Burrows	SN30730705	1x	Body board	SD4	0.0	CO
346	27-Sep-16	Cefn Sidan	SN36010633	1	plastic	SD6	6.0	BS
347	27-Sep-16	Cefn Sidan	SN36100635	1	log	SD6	5.0	BS
348	27-Sep-16	Cefn Sidan	SN36100636	6	log	SD6	4.0	BS
349	27-Sep-16	Cefn Sidan	SN36140635	1	bird box	SD6	5.0	BS
350	27-Sep-16	Cefn Sidan	SN36310629	2	synthetic board	SD2	15.0	BS
351	27-Sep-16	Cefn Sidan	SN36320629	1	log	SD2	16.0	BS
352	27-Sep-16	Cefn Sidan	SN35930584	1	log	SD2	-15.0	BS
353	27-Sep-16	Cefn Sidan	SN35900548	1	log	SD2	-18.0	BS
354	27-Sep-16	Cefn Sidan	SN35930530	1	plastic	SD2	-10.0	BS
355	27-Sep-16	Cefn Sidan	SN35940521	1	log	SD2	-3.0	BS
356	27-Sep-16	Cefn Sidan	SN36620402	1	tyre	SD2	0.0	BS
357	27-Sep-16	Cefn Sidan	SN36500420	1	plastic	SD2	-4.0	BS
358	27-Sep-16	Cefn Sidan	SN36250472	1	bucket	SD2	-20.0	BS
359	27-Sep-16	Cefn Sidan	SN36160493	1	plastic	SD2	-18.0	BS
360	27-Sep-16	Cefn Sidan	SN36080509	1	plastic	SD2	0.0	BS
361	25-Sep-16	Laugharne Burrows	SN31480709	2	Black bucket	SD4	1.0	CO
362	25-Sep-16	Laugharne Burrows	SN31820717	2	Plank	SD4	2.0	CO
363	25-Sep-16	Laugharne Burrows	SN31820717	1	Blue bucket	SD4	1.0	CO

Appendix 2. 2016 records of fauna associated with *E. complanata*.

Order	Taxon	Status	Site Name	Gridref	VC	#	Start Date	Recorder
Ulvales	*Enteromorpha sp.*	None	Tywyn Burrows	SN3506	44	f	27-Sep-16	BS
Fucales	*Fucus serratus*	None	Tywyn Burrows	SN3506	44	lf	27-Sep-16	BS
Fucales	*Fucus vesiculosus*	None	Tywyn Burrows	SN3506	44	o	27-Sep-16	BS
Fucales	*Himanthalia elongata*	None	Tywyn Burrows	SN3506	44	f	27-Sep-16	BS
Anthomedusae	*Velella velella*	None	Whiteford Burrows	SS445958	41	3	08-Aug-16	BS
Rhizostomae	*Rhizostoma octopus*	None	Whiteford Burrows	SS445958	41	f	08-Aug-16	BS
Rhizostomae	*Rhizostoma octopus*	None	Cefn Sidan	SN3505	44	50	16-Sep-16	BS
Rhizostomae	*Rhizostoma octopus*	None	Cefn Sidan	SN3603	44	40	16-Sep-16	BS
Rhizostomae	*Rhizostoma octopus*	None	Cefn Sidan	SN3606	44	20	16-Sep-16	BS
Rhizostomae	*Rhizostoma octopus*	None	Tywyn Burrows	SN3604	44	40	16-Sep-16	BS
Rhizostomae	*Rhizostoma octopus*	None	Tywyn Burrows	SN3506	44	30	16-Sep-16	BS
Rhizostomae	*Rhizostoma octopus*	None	Tywyn Burrows	SN3506	44	50	27-Sep-16	BS
Spatangoida	*Echinocardium cordatum*	None	Tywyn Burrows	SN3506	44	r	27-Sep-16	BS
Pendunculata	*Lepas anatifera*	None	Cefn Sidan	SN359056	44	p	30-Aug-16	BS
Pendunculata	*Lepas anatifera*	None	Tywyn Burrows	SN3506	44	r	27-Sep-16	BS
Amphipoda	*Talitrus saltator*	None	Tywyn Burrows	SN3506	44	r	27-Sep-16	BS
Amphipoda	*Talorchestia deshayesii*	None	Tywyn Burrows	SN3506	44	r	27-Sep-16	BS
Isopoda	*Ligia oceanica*	None	Tywyn Burrows	SN361063	44	1	30-Aug-16	BS
Isopoda	*Oniscus asellus*	None	Tywyn Burrows	SN363062	44	p	24-Jun-16	BS, IKM
Isopoda	*Armadillidium album*	None	Cefn Sidan	SS434997	44	lf	07-Jun-16	BS
Isopoda	*Armadillidium album*	None	Whiteford Burrows	SS438946	41	50	23-Jun-16	BS
Isopoda	*Armadillidium album*	None	Tywyn Burrows	SN363062	44	p	24-Jun-16	BS, IKM
Isopoda	*Armadillidium album*	None	Whiteford Burrows	SS430944	41	2	23-Sep-16	BS
Isopoda	*Armadillidium album*		Pendine Burrows	SN27070718	44	p	25-Sep-16	CO

Isopoda	*Armadillidium vulgare*	None	Nicholaston Burrows	SS518877	41	p	23-Jun-16	BS
Isopoda	*Armadillidium vulgare*	None	Tywyn Burrows	SN361063	44	p	24-Jun-16	BS, IKM
Isopoda	*Armadillidium vulgare*	None	Pendine Burrows	SN25220761	44	p	25-Sep-16	CO
Isopoda	*Porcellio scaber*	None	Pendine Burrows	SN287068	44	p	21-Jun-16	BS
Isopoda	*Porcellio scaber*	None	Pendine Burrows	SN300069	44	p	21-Jun-16	BS
Isopoda	*Porcellio scaber*	None	Pendine Burrows	SN286068	44	p	21-Jun-16	BS
Isopoda	*Porcellio scaber*	None	Pendine Burrows	SN269072	44	p	21-Jun-16	BS
Isopoda	*Porcellio scaber*	None	Pendine Burrows	SN292068	44	p	21-Jun-16	BS
Isopoda	*Porcellio scaber*	None	Nicholaston Burrows	SS517877	41	p	23-Jun-16	BS
Isopoda	*Porcellio scaber*	None	Whiteford Burrows	SS436946	41	p	23-Jun-16	BS
Isopoda	*Porcellio scaber*	None	Whiteford Burrows	SS449964	41	p	23-Jun-16	BS
Isopoda	*Porcellio scaber*	None	Tywyn Burrows	SN361063	44	p	24-Jun-16	BS, IKM
Isopoda	*Porcellio scaber*	None	Blackpill	SS618903	41	p	27-Jun-16	BS
Isopoda	*Porcellionides cingendus*	None	Pendine Burrows	SN25220761	44	p	25-Sep-16	CO
Decapoda	*Cancer pagurus*	None	Whiteford Burrows	SS439947	41	p	23-Sep-16	BS
Decapoda	*Corystes cassivelaunus*	None	Tywyn Burrows	SN3506	44	r	27-Sep-16	BS
Decapoda	*Carcinus maenas*	None	Whiteford Burrows	SS443952	41	1	23-Jun-16	BS
Decapoda	*Carcinus maenas*	None	Tywyn Burrows	SN3506	44	r	27-Sep-16	BS
Glomerida	*Glomeris marginata*	None	Pendine Burrows	SN287068	44	p	21-Jun-16	BS
Julida	*Ommatoiulus sabulosus*	None	Pendine Burrows	SN296068	44	p	21-Jun-16	BS
Julida	*Ommatoiulus sabulosus*	None	Pendine Burrows	SN265072	44	p	21-Jun-16	BS
Julida	*Ommatoiulus sabulosus*	None	Pendine Burrows	SN300069	44	p	21-Jun-16	BS
Julida	*Ommatoiulus sabulosus*	None	Pendine Burrows	SN289068	44	p	21-Jun-16	BS
Julida	*Ommatoiulus sabulosus*	None	Pendine Burrows	SN274070	44	p	21-Jun-16	BS
Julida	*Ommatoiulus sabulosus*	None	Pendine Burrows	SN269072	44	p	21-Jun-16	BS
Julida	*Ommatoiulus sabulosus*	None	Whiteford Burrows	SS439947	41	p	23-Jun-16	BS
Julida	*Ommatoiulus sabulosus*	None	Cefn Sidan	SN365041	44	p	24-Jun-16	BS, IKM

Julida	*Ommatoiulus sabulosus*	None	Cefn Sidan	SN361049	44	p	24-Jun-16	BS, IKM
Julida	*Ommatoiulus sabulosus*	None	Tywyn Burrows	SN362063	44	p	24-Jun-16	BS, IKM
Julida	*Ommatoiulus sabulosus*	None	Tywyn Burrows	SN361063	44	p	24-Jun-16	BS, IKM
Julida	*Ommatoiulus sabulosus*	None	Pendine Burrows	SN25220761	44	p	25-Sep-16	CO
Julida	*Tachypodoiulus niger*	None	Cefn Sidan	SN363045	44	p	24-Jun-16	BS, IKM
Julida	*Cylindroiulus punctatus*	None	Tywyn Burrows	SN362062	44	p	24-Jun-16	BS, IKM
Julida	*Cylindroiulus latestriatus*	None	Pendine Burrows	SN25220761	44	p	25-Sep-16	CO
Lithobiomorpha	*Lithobius forficatus*	None	Cefn Sidan	SN363045	44	p	24-Jun-16	BS, IKM
Lithobiomorpha	*Lithobius melanops*	None	Tywyn Burrows	SN362062	44	p	24-Jun-16	BS, IKM
Araneae	*Arctosa perita*	None	Pendine Burrows	SN296068	44	p	21-Jun-16	BS
Araneae	*Arctosa perita*	None	Pendine Burrows	SN278069	44	p	21-Jun-16	BS
Araneae	*Arctosa perita*	None	Pendine Burrows	SN265072	44	p	21-Jun-16	BS
Araneae	*Arctosa perita*	None	Pendine Burrows	SN300069	44	p	21-Jun-16	BS
Araneae	*Arctosa perita*	None	Pendine Burrows	SN289068	44	p	21-Jun-16	BS
Araneae	*Arctosa perita*	None	Pendine Burrows	SN295068	44	p	21-Jun-16	BS
Araneae	*Arctosa perita*	None	Pendine Burrows	SN286068	44	p	21-Jun-16	BS
Araneae	*Arctosa perita*	None	Pendine Burrows	SN274070	44	p	21-Jun-16	BS
Araneae	*Arctosa perita*	None	Pendine Burrows	SN292068	44	p	21-Jun-16	BS
Araneae	*Arctosa perita*	None	Cefn Sidan	SN365041	44	1	24-Jun-16	BS, IKM
Araneae	*Arctosa perita*	None	Cefn Sidan	SN361049	44	1	24-Jun-16	BS, IKM
Araneae	*Arctosa perita*	None	Tywyn Burrows	SN363062	44	1	24-Jun-16	BS, IKM
Opiliones	*Phalangium opilio*	None	Cefn Sidan	SS422988	44	2	07-Jun-16	BS
Opiliones	*Phalangium opilio*	None	Cefn Sidan	SS423988	44	1	07-Jun-16	BS
Opiliones	*Phalangium opilio*	None	Cefn Sidan	SN364042	44	2	24-Jun-16	BS, IKM
Opiliones	*Phalangium opilio*	None	Blackpill	SS618903	41	p	27-Jun-16	BS
Orthoptera	*Myrmeleotettix maculatus*	None	Whiteford Burrows	SS426937	41	1	09-Jun-16	BS
Dermaptera	*Forficula auricularia*	None	Tywyn Burrows	SN361063	44	p	24-Jun-16	BS, IKM

Dermaptera	*Forficula auricularia*	None	Blackpill	SS618903	41	p	27-Jun-16	BS
Hemiptera	*Beosus maritimus*	Local	Cefn Sidan	SN387011	44	1	24-Jun-16	BS, IKM
Hemiptera	*Eurygaster testudinaria*	Local	Tywyn Burrows	SN366046	44	1	24-Jun-16	BS, IKM
Hemiptera	*Dicranocephalus agilis*	Nb	Whiteford Burrows	SS451962	41	1	23-Jun-16	BS
Lepidoptera	*Plutella xylostella*	Migrant	Whiteford Burrows	SS448960	41	3	06-Jun-16	BS
Lepidoptera	*Plutella xylostella*	Migrant	Whiteford Burrows	SS452959	41	1	06-Jun-16	BS
Lepidoptera	*Plutella xylostella*	Migrant	Whiteford Burrows	SS426937	41	3	09-Jun-16	BS
Lepidoptera	*Aproaerema anthyllidella*	Local	Whiteford Burrows	SS448960	41	p	06-Jun-16	BS
Lepidoptera	*Celypha lacunana*	Common	Tywyn Burrows	SN366046	44	1	24-Jun-16	BS, IKM
Lepidoptera	*Pieris rapae*	None	Singleton dunes	SS622909	41	2	27-Jun-16	BS
Lepidoptera	*Pieris rapae*	None	Whiteford Burrows	SS454962	41	1	31-Jul-16	BS
Lepidoptera	*Pararge aegeria*	None	Whiteford Burrows	SS448960	41	1	06-Jun-16	BS
Lepidoptera	*Maniola jurtina*	None	Singleton dunes	SS624911	41	2	27-Jun-16	BS
Lepidoptera	*Maniola jurtina*	None	Singleton dunes	SS622909	41	1	27-Jun-16	BS
Lepidoptera	*Maniola jurtina*	None	Whiteford Burrows	SS454961	41	1	31-Jul-16	BS
Lepidoptera	*Maniola jurtina*	None	Whiteford Burrows	SS454962	41	2	31-Jul-16	BS
Lepidoptera	*Vanessa atalanta*	Migrant	Whiteford Burrows	SS445960	41	1	06-Jun-16	BS
Lepidoptera	*Vanessa cardui*	Migrant	Whiteford Burrows	SS444957	41	1	06-Jun-16	BS
Lepidoptera	*Vanessa cardui*	Migrant	Morfa Uchaf	SN370118	44	1	17-Jun-16	BS
Lepidoptera	*Polyommatus icarus*	None	Whiteford Burrows	SS448960	41	15	06-Jun-16	BS
Lepidoptera	*Catoptria pinella*	Common	Tywyn Burrows	SN360055	44	1	24-Jun-16	BS, IKM
Lepidoptera	*Malacosoma neustria*	Common	Pendine Burrows	SN294068	44	1	21-Jun-16	BS
Lepidoptera	*Malacosoma neustria*	Common	Pendine Burrows	SN292068	44	1	21-Jun-16	BS
Lepidoptera	*Autographa gamma*	Migrant	Whiteford Burrows	SS454962	41	1	31-Jul-16	BS
Lepidoptera	*Autographa gamma*	Migrant	Whiteford Burrows	SS445947	41	2	15-Sep-16	BS
Lepidoptera	*Sideridis turbida*	Nb	Whiteford Burrows	SS439948	41	1	23-Jun-16	BS
Lepidoptera	*Mythimna litoralis*	Nb	Whiteford Burrows	SS428940	41	1	13-Jul-16	BS

Lepidoptera	*Agrotis ripae*	Nb	Cefn Sidan	SS435997	44	1	07-Jun-16	BS
Lepidoptera	*Agrotis ripae*	Nb	Tywyn Burrows	SN359060	44	1	11-Jun-16	BS
Lepidoptera	*Agrotis ripae*	Nb	Cefn Sidan	SN364042	44	1	17-Jun-16	BS
Lepidoptera	*Agrotis ripae*	Nb	Laugharne Burrows	SN305069	44	1	19-Jun-16	BS
Lepidoptera	*Agrotis ripae*	Nb	Laugharne Burrows	SN313070	44	1	19-Jun-16	BS
Lepidoptera	*Agrotis ripae*	Nb	Pendine Burrows	SN287068	44	1	21-Jun-16	BS
Lepidoptera	*Agrotis ripae*	Nb	Pendine Burrows	SN291068	44	1	21-Jun-16	BS
Lepidoptera	*Agrotis ripae*	Nb	Cefn Sidan	SN363045	44	2	24-Jun-16	BS, IKM
Coleoptera	*Colymbetes fuscus*	None	Baglan Burrows	SS725927	41	1	13-Jun-16	BS
Coleoptera	*Colymbetes fuscus*	None	Laugharne Burrows	SN304069	44	1	19-Jun-16	BS
Coleoptera	*Leistus spinibarbis*	None	Cefn Sidan	SN365041	44	1	27-Sep-16	BS
Coleoptera	*Leistus fulvibarbis*	None	Tywyn Burrows	SN363062	44	1	24-Jun-16	BS, IKM
Coleoptera	*Leistus terminatus*	None	Tywyn Burrows	SN363062	44	1	24-Jun-16	BS, IKM
Coleoptera	*Nebria brevicollis*	None	Whiteford Burrows	SS434943	41	3	23-Jun-16	BS
Coleoptera	*Nebria salina*	None	Tywyn Burrows	SN363062	44	30	24-Jun-16	BS, IKM
Coleoptera	*Nebria salina*	None	Tywyn Burrows	SN361063	44	9	27-Sep-16	BS
Coleoptera	*Nebria salina*	None	Whiteford Burrows	SS430944	41	1	23-Sep-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS457963	41	6	23-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Cefn Sidan	SS434998	44	1	07-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Cefn Sidan	SS423988	44	1	07-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Cefn Sidan	SS434997	44	2	07-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS429941	41	3	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS428940	41	3	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS435945	41	3	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS436946	41	11	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS456963	41	3	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS443952	41	9	06-Jun-16	BS

Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS453962	41	4	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS441950	41	3	23-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS451962	41	5	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS451962	41	5	23-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS444955	41	7	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS444956	41	2	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS434945	41	5	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS450964	41	2	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS444957	41	6	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS445960	41	30	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS429942	41	8	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS439947	41	5	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS438947	41	8	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS440949	41	3	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS443953	41	8	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS430943	41	6	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS434945	41	4	23-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS444957	41	1	23-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS439947	41	1	23-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS439948	41	3	23-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS440949	41	3	23-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS433945	41	2	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS431944	41	15	06-Jun-16	BS
Coleoptera	*Cicindela maritima*	Nb	Whiteford Burrows	SS432945	41	4	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Baglan Burrows	SS725927	41	3	13-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Baglan Burrows	SS725915	41	1	13-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS454961	41	2	31-Jul-16	BS

Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS455962	41	1	31-Jul-16	BS
Coleoptera	*Broscus cephalotes*	None	Blackpill	SS619905	41	1	27-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Blackpill	SS618903	41	5	27-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Blackpill	SS619904	41	3	27-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Broughton Borrows	SS425934	41	1	09-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Broughton Borrows	SS423932	41	3	09-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN363044	44	6	11-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN360050	44	2	11-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN358059	44	1	11-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN361048	44	2	11-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN359054	44	5	11-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN362046	44	7	11-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN359058	44	1	11-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN361049	44	26	11-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN364042	44	8	17-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN360052	44	5	17-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN376024	44	1	17-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN365041	44	3	17-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN360050	44	5	17-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN360051	44	8	17-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN361049	44	16	17-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN359055	44	8	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN364042	44	6	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN360052	44	3	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN365041	44	11	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN360050	44	1	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN360051	44	3	24-Jun-16	BS, IKM

Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN359058	44	1	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN361049	44	18	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN359056	44	1	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN361047	44	11	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SS430993	44	5	07-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SS434996	44	2	07-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SS435997	44	3	07-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SS430994	44	2	07-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SS434998	44	1	07-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SS428992	44	1	07-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SS422988	44	14	07-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SS424996	44	7	07-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SS423988	44	10	07-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SS434997	44	8	07-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SS421987	44	15	07-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN387011	44	1	07-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Cefn Sidan	SN387011	44	2	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS429941	41	1	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS428940	41	2	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS428940	41	3	13-Jul-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS428940	41	1	23-Sep-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN319071	44	11	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN315070	44	3	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN325075	44	2	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN325078	44	2	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN317071	44	4	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN307070	44	12	19-Jun-16	BS

Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN325077	44	3	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN304069	44	15	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN305069	44	17	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN316070	44	9	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN321072	44	3	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN321073	44	12	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN306070	44	25	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN314070	44	20	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN313070	44	6	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN309070	44	8	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN322073	44	8	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Laugharne Burrows	SN318071	44	7	19-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS426937	41	1	09-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Nicholaston Burrows	SS518877	41	6	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Nicholaston Burrows	SS517877	41	2	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Oxwich Burrows	SS513875	41	4	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Oxwich Burrows	SS513876	41	1	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Oxwich Burrows	SS505869	41	1	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Oxwich Burrows	SS514876	41	1	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Oxwich Burrows	SS512875	41	1	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Oxwich Burrows	SS514877	41	2	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN287068	44	3	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN281069	44	3	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN251076	44	2	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN298068	44	3	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN260074	44	2	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN296068	44	7	21-Jun-16	BS

Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN280069	44	11	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN288068	44	4	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN267072	44	2	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN263073	44	16	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN294068	44	6	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN278069	44	3	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN290068	44	7	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN270071	44	9	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN265072	44	12	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN291068	44	3	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN261074	44	8	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN289068	44	3	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN295068	44	11	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN277070	44	17	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN264073	44	3	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN270072	44	8	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN273071	44	13	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN266072	44	8	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN286068	44	2	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN276070	44	35	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN285068	44	3	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN274070	44	15	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN269072	44	6	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN268072	44	10	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN292068	44	20	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN254075	44	1	21-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Pendine Burrows	SN25220761	44	p	25-Sep-16	CO

Coleoptera	*Broscus cephalotes*	None	Singleton dunes	SS623910	41	1	27-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS435945	41	1	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS435945	41	2	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS435945	41	31	31-Jul-16	BS
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN359061	44	1	11-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN362063	44	1	11-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN359063	44	1	11-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN364063	44	2	11-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN361063	44	1	11-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN359061	44	1	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN362063	44	9	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN362062	44	3	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN363062	44	9	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN363063	44	2	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN360063	44	1	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN360053	44	3	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN359062	44	2	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN359060	44	9	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN361063	44	1	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN360055	44	3	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN360054	44	4	24-Jun-16	BS, IKM
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN360063	44	1	27-Sep-16	BS
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN360063	44	1	27-Sep-16	BS
Coleoptera	*Broscus cephalotes*	None	Tywyn Burrows	SN361063	44	6	27-Sep-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS436946	41	12	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS436946	41	11	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS456963	41	5	23-Jun-16	BS

Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS441950	41	1	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS441950	41	2	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS451962	41	1	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS451962	41	5	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS452962	41	3	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS444955	41	2	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS438946	41	3	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS444956	41	1	23-Sep-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS434945	41	3	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS450964	41	1	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS429942	41	7	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS439947	41	3	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS438947	41	1	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS443953	41	2	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS430943	41	3	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS434945	41	9	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS440948	41	6	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS432944	41	2	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS429942	41	4	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS439947	41	9	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS438947	41	3	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS439948	41	7	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS440949	41	1	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS449964	41	2	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS430943	41	18	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS434945	41	2	13-Jul-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS454962	41	7	31-Jul-16	BS

Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS433945	41	2	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS431944	41	5	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS432945	41	2	06-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Whiteford Burrows	SS450963	41	1	23-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Baglan Burrows	SS720923	41	14	13-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Baglan Burrows	SS721920	41	9	13-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Baglan Burrows	SS720922	41	6	13-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Baglan Burrows	SS720922	41	6	13-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Baglan Burrows	SS724916	41	2	13-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Baglan Burrows	SS724926	41	1	13-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Baglan Burrows	SS721925	41	9	13-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Baglan Burrows	SS721924	41	10	13-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Baglan Burrows	SS720924	41	32	13-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Baglan Burrows	SS720921	41	8	13-Jun-16	BS
Coleoptera	*Broscus cephalotes*	None	Baglan Burrows	SS722925	41	16	13-Jun-16	BS
Coleoptera	*Trechus rubens*	Nb	Tywyn Burrows	SN363062	44	1	24-Jun-16	BS, IKM
Coleoptera	*Bembidion pallidipenne*	Nb	Whiteford Burrows	SS429940	41	6	23-Jun-16	BS
Coleoptera	*Bembidion pallidipenne*	Nb	Whiteford Burrows	SS444955	41	1	23-Jun-16	BS
Coleoptera	*Bembidion pallidipenne*	Nb	Whiteford Burrows	SS438946	41	8	23-Jun-16	BS
Coleoptera	*Bembidion tetracolum*	None	Laugharne Burrows	SN304069	44	1	19-Jun-16	BS
Coleoptera	*Bembidion tetracolum*	None	Pendine Burrows	SN292068	44	1	21-Jun-16	BS
Coleoptera	*Pogonus chalceus*	None	Whiteford Burrows	SS454961	41	2	31-Jul-16	BS
Coleoptera	*Pogonus chalceus*	None	Cefn Sidan	SN364042	44	1	24-Jun-16	BS, IKM
Coleoptera	*Pogonus chalceus*	None	Cefn Sidan	SN387011	44	3	24-Jun-16	BS, IKM
Coleoptera	*Pogonus chalceus*	None	Whiteford Burrows	SS428940	41	1	13-Jul-16	BS
Coleoptera	*Pogonus chalceus*	None	Whiteford Burrows	SS428940	41	3	23-Sep-16	BS
Coleoptera	*Pogonus chalceus*	None	Pendine Burrows	SN270072	44	1	21-Jun-16	BS

Coleoptera	*Pogonus chalceus*	None	Pendine Burrows	SN266072	44	1	21-Jun-16	BS
Coleoptera	*Pogonus chalceus*	None	Pendine Burrows	SN292068	44	1	21-Jun-16	BS
Coleoptera	*Pogonus chalceus*	None	Whiteford Burrows	SS442951	41	1	13-Jul-16	BS
Coleoptera	*Pogonus chalceus*	None	Whiteford Burrows	SS438947	41	2	23-Jun-16	BS
Coleoptera	*Pogonus chalceus*	None	Whiteford Burrows	SS440949	41	1	23-Jun-16	BS
Coleoptera	*Pogonus chalceus*	None	Whiteford Burrows	SS430943	41	6	23-Jun-16	BS
Coleoptera	*Pogonus chalceus*	None	Whiteford Burrows	SS430943	41	3	13-Jul-16	BS
Coleoptera	*Pogonus chalceus*	None	Whiteford Burrows	SS430944	41	2	23-Sep-16	BS
Coleoptera	*Calathus rotundicollis*	None	Tywyn Burrows	SN362063	44	1	30-Aug-16	BS
Coleoptera	*Calathus rotundicollis*	None	Tywyn Burrows	SN362063	44	1	16-Sep-16	BS
Coleoptera	*Calathus rotundicollis*	None	Tywyn Burrows	SN363062	44	2	16-Sep-16	BS
Coleoptera	*Calathus erratus*	None	Whiteford Burrows	SS454961	41	1	31-Jul-16	BS
Coleoptera	*Calathus erratus*	None	Tywyn Burrows	SN362063	44	1	30-Aug-16	BS
Coleoptera	*Calathus erratus*	None	Whiteford Burrows	SS454962	41	1	31-Jul-16	BS
Coleoptera	*Calathus erratus*	None	Whiteford Burrows	SS434945	41	1	31-Jul-16	BS
Coleoptera	*Calathus fuscipes*	None	Whiteford Burrows	SS433945	41	1	13-Jul-16	BS
Coleoptera	*Calathus mollis*	None	Baglan Burrows	SS726924	41	1	13-Jun-16	BS
Coleoptera	*Calathus mollis*	None	Cefn Sidan	SN364042	44	1	17-Jun-16	BS
Coleoptera	*Calathus mollis*	None	Cefn Sidan	SN364042	44	2	24-Jun-16	BS, IKM
Coleoptera	*Calathus mollis*	None	Tywyn Burrows	SN363062	44	5	24-Jun-16	BS, IKM
Coleoptera	*Calathus mollis*	None	Tywyn Burrows	SN362063	44	1	30-Aug-16	BS
Coleoptera	*Calathus mollis*	None	Whiteford Burrows	SS451962	41	1	23-Sep-16	BS
Coleoptera	*Calathus mollis*	None	Whiteford Burrows	SS454962	41	1	31-Jul-16	BS
Coleoptera	*Agonum fuliginosum*	None	Cefn Sidan	SN368037	44	1	17-Jun-16	BS
Coleoptera	*Agonum fuliginosum*	None	Cefn Sidan	SN376024	44	1	17-Jun-16	BS
Coleoptera	*Agonum emarginatum*	None	Whiteford Burrows	SS432941	41	1	23-Sep-16	BS
Coleoptera	*Amara lucida*	Nb	Whiteford Burrows	SS434945	41	1	13-Jul-16	BS

Coleoptera	*Harpalus anxius*	None	Whiteford Burrows	SS454962	41	2	31-Jul-16	BS
Coleoptera	*Harpalus anxius*	None	Whiteford Burrows	SS434945	41	1	31-Jul-16	BS
Coleoptera	*Harpalus neglectus*	None	Baglan Burrows	SS720923	41	1	13-Jun-16	BS
Coleoptera	*Harpalus neglectus*	None	Baglan Burrows	SS721925	41	1	13-Jun-16	BS
Coleoptera	*Harpalus tardus*	None	Tywyn Burrows	SN363062	44	1	16-Sep-16	BS
Coleoptera	*Dicheirotrichus gustavii*	None	Cefn Sidan	SN375024	44	5	17-Jun-16	BS
Coleoptera	*Dicheirotrichus gustavii*	None	Whiteford Burrows	SS428940	41	1	13-Jul-16	BS
Coleoptera	*Dicheirotrichus gustavii*	None	Morfa Uchaf	SN370118	44	1	17-Jun-16	BS
Coleoptera	*Dicheirotrichus gustavii*	None	Pendine Burrows	SN292068	44	1	21-Jun-16	BS
Coleoptera	*Dicheirotrichus gustavii*	None	Tywyn Burrows	SN364062	44	3	24-Jun-16	BS, IKM
Coleoptera	*Dicheirotrichus gustavii*	None	Tywyn Burrows	SN362063	44	1	24-Jun-16	BS, IKM
Coleoptera	*Dicheirotrichus gustavii*	None	Tywyn Burrows	SN359063	44	1	24-Jun-16	BS, IKM
Coleoptera	*Dicheirotrichus gustavii*	None	Tywyn Burrows	SN364063	44	1	24-Jun-16	BS, IKM
Coleoptera	*Dicheirotrichus gustavii*	None	Tywyn Burrows	SN360063	44	3	24-Jun-16	BS, IKM
Coleoptera	*Dicheirotrichus gustavii*	None	Whiteford Burrows	SS442951	41	2	13-Jul-16	BS
Coleoptera	*Dicheirotrichus gustavii*	None	Whiteford Burrows	SS432944	41	1	23-Jun-16	BS
Coleoptera	*Dicheirotrichus gustavii*	None	Whiteford Burrows	SS430943	41	2	23-Jun-16	BS
Coleoptera	*Dicheirotrichus gustavii*	None	Whiteford Burrows	SS433945	41	3	13-Jul-16	BS
Coleoptera	*Syntomus foveatus*	None	Whiteford Burrows	SS430943	41	1	23-Jun-16	BS
Coleoptera	*Hypocaccus rugiceps*	Na	Whiteford Burrows	SS429941	41	1	23-Jun-16	BS
Coleoptera	*Hypocaccus dimidiatus*	Nb	Cefn Sidan	SN360052	44	2	24-Jun-16	BS, IKM
Coleoptera	*Hypocaccus dimidiatus*	Nb	Cefn Sidan	SN359057	44	1	24-Jun-16	BS, IKM
Coleoptera	*Hypocaccus dimidiatus*	Nb	Cefn Sidan	SN360051	44	1	24-Jun-16	BS, IKM
Coleoptera	*Hypocaccus dimidiatus*	Nb	Whiteford Burrows	SS429941	41	3	23-Jun-16	BS
Coleoptera	*Hypocaccus dimidiatus*	Nb	Tywyn Burrows	SN360053	44	1	24-Jun-16	BS, IKM
Coleoptera	*Hypocaccus dimidiatus*	Nb	Whiteford Burrows	SS439947	41	1	23-Jun-16	BS
Coleoptera	*Dorcus parallelipipedus*	None	Baglan Burrows	SS725927	41	1	13-Jun-16	BS

Coleoptera	*Dorcus parallelipipedus*	None	Tywyn Burrows	SN363063	44	1	27-Sep-16	BS
Coleoptera	*Onthophagus joannae*	None	Whiteford Burrows	SS439947	41	7	23-Jun-16	BS
Coleoptera	*Onthophagus joannae*	None	Whiteford Burrows	SS453960	41	15	31-Jul-16	BS
Coleoptera	*Onthophagus nuchicornis*	Na	Whiteford Burrows	SS439947	41	1	23-Jun-16	BS
Coleoptera	*Onthophagus nuchicornis*	Na	Whiteford Burrows	SS453960	41	30	31-Jul-16	BS
Coleoptera	*Onthophagus similis*	None	Whiteford Burrows	SS453960	41	5	31-Jul-16	BS
Coleoptera	*Aegialia arenaria*	None	Whiteford Burrows	SS454961	41	1	31-Jul-16	BS
Coleoptera	*Aegialia arenaria*	None	Cefn Sidan	SN360052	44	1	24-Jun-16	BS, IKM
Coleoptera	*Aegialia arenaria*	None	Cefn Sidan	SN359056	44	p	30-Aug-16	BS
Coleoptera	*Aegialia arenaria*	None	Whiteford Burrows	SS429941	41	4	23-Sep-16	BS
Coleoptera	*Aegialia arenaria*	None	Whiteford Burrows	SS428940	41	2	23-Sep-16	BS
Coleoptera	*Aegialia arenaria*	None	Pendine Burrows	SN280069	44	3	21-Jun-16	BS
Coleoptera	*Aegialia arenaria*	None	Pendine Burrows	SN263073	44	1	21-Jun-16	BS
Coleoptera	*Aegialia arenaria*	None	Pendine Burrows	SN294068	44	4	21-Jun-16	BS
Coleoptera	*Aegialia arenaria*	None	Pendine Burrows	SN278069	44	5	21-Jun-16	BS
Coleoptera	*Aegialia arenaria*	None	Pendine Burrows	SN289068	44	2	21-Jun-16	BS
Coleoptera	*Aegialia arenaria*	None	Pendine Burrows	SN292068	44	1	21-Jun-16	BS
Coleoptera	*Aegialia arenaria*	None	Tywyn Burrows	SN361063	44	p	30-Aug-16	BS
Coleoptera	*Aegialia arenaria*	None	Tywyn Burrows	SN361063	44	8	27-Sep-16	BS
Coleoptera	*Aegialia arenaria*	None	Whiteford Burrows	SS442951	41	2	13-Jul-16	BS
Coleoptera	*Aegialia arenaria*	None	Whiteford Burrows	SS439947	41	1	23-Jun-16	BS
Coleoptera	*Aphodius sordidus*	Na	Whiteford Burrows	SS445947	41	1	15-Sep-16	BS
Coleoptera	*Serica brunnea*	None	Tywyn Burrows	SN359063	44	1	11-Jun-16	BS
Coleoptera	*Anomala dubia*	None	Whiteford Burrows	SS454961	41	2	31-Jul-16	BS
Coleoptera	*Anomala dubia*	None	Blackpill	SS618903	41	2	27-Jun-16	BS
Coleoptera	*Anomala dubia*	None	Whiteford Burrows	SS429940	41	1	23-Jun-16	BS
Coleoptera	*Anomala dubia*	None	Whiteford Burrows	SS428940	41	2	13-Jul-16	BS

Coleoptera	*Anomala dubia*	None	Nicholaston Burrows	SS518877	41	1	23-Jun-16	BS
Coleoptera	*Anomala dubia*	None	Nicholaston Burrows	SS521877	41	2	23-Jun-16	BS
Coleoptera	*Anomala dubia*	None	Oxwich Burrows	SS513875	41	5	23-Jun-16	BS
Coleoptera	*Anomala dubia*	None	Oxwich Burrows	SS513876	41	2	23-Jun-16	BS
Coleoptera	*Anomala dubia*	None	Oxwich Burrows	SS509872	41	1	23-Jun-16	BS
Coleoptera	*Anomala dubia*	None	Oxwich Burrows	SS514877	41	3	23-Jun-16	BS
Coleoptera	*Anomala dubia*	None	Singleton dunes	SS624911	41	1	27-Jun-16	BS
Coleoptera	*Anomala dubia*	None	Whiteford Burrows	SS433945	41	1	13-Jul-16	BS
Coleoptera	*Dryops luridus*	None	Whiteford Burrows	SS429940	41	5	23-Jun-16	BS
Coleoptera	*Agrypnus murinus*	None	Pendine Burrows	SN300069	44	1	21-Jun-16	BS
Coleoptera	*Agrypnus murinus*	None	Pendine Burrows	SN273071	44	1	21-Jun-16	BS
Coleoptera	*Agrypnus murinus*	None	Tywyn Burrows	SN363062	44	1	24-Jun-16	BS, IKM
Coleoptera	*Agrypnus murinus*	None	Tywyn Burrows	SN359062	44	1	24-Jun-16	BS, IKM
Coleoptera	*Agrypnus murinus*	None	Tywyn Burrows	SN361063	44	1	24-Jun-16	BS, IKM
Coleoptera	*Agrypnus murinus*	None	Whiteford Burrows	SS442951	41	1	13-Jul-16	BS
Coleoptera	*Prosternon tessellatum*	None	Tywyn Burrows	SN363062	44	1	24-Jun-16	BS, IKM
Coleoptera	*Stenagostus rhombeus*	None	Tywyn Burrows	SN362063	44	1	24-Jun-16	BS, IKM
Coleoptera	*Lampyris noctiluca*	None	Broughton Borrows	SS423932	41	1	09-Jun-16	BS
Coleoptera	*Lampyris noctiluca*	None	Whiteford Burrows	SS429942	41	1	06-Jun-16	BS
Coleoptera	*Xanthomus pallidus*	Nb	Whiteford Burrows	SS430943	41	1	13-Jul-16	BS
Coleoptera	*Cteniopus sulphureus*	None	Blackpill	SS62099080	41	1	27-Jun-16	BS
Coleoptera	*Cteniopus sulphureus*	None	Whiteford Burrows	SS428940	41	1	13-Jul-16	BS
Coleoptera	*Phaleria cadaverina*	None	Cefn Sidan	SN376024	44	1	17-Jun-16	BS
Coleoptera	*Phaleria cadaverina*	None	Whiteford Burrows	SS430943	41	2	13-Jul-16	BS
Coleoptera	*Nacerdes melanura*	None	Cefn Sidan	SN364042	44	2	17-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Cefn Sidan	SN365041	44	1	17-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Cefn Sidan	SN359055	44	1	24-Jun-16	BS, IKM

Coleoptera	*Nacerdes melanura*	None	Cefn Sidan	SN364042	44	1	24-Jun-16	BS, IKM
Coleoptera	*Nacerdes melanura*	None	Cefn Sidan	SN360052	44	2	24-Jun-16	BS, IKM
Coleoptera	*Nacerdes melanura*	None	Cefn Sidan	SN365041	44	5	24-Jun-16	BS, IKM
Coleoptera	*Nacerdes melanura*	None	Cefn Sidan	SN363045	44	8	24-Jun-16	BS, IKM
Coleoptera	*Nacerdes melanura*	None	Cefn Sidan	SN360050	44	1	24-Jun-16	BS, IKM
Coleoptera	*Nacerdes melanura*	None	Cefn Sidan	SN360051	44	1	24-Jun-16	BS, IKM
Coleoptera	*Nacerdes melanura*	None	Cefn Sidan	SN361049	44	1	24-Jun-16	BS, IKM
Coleoptera	*Nacerdes melanura*	None	Nicholaston Burrows	SS518877	41	5	23-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Oxwich Burrows	SS514877	41	2	23-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Pendine Burrows	SN287068	44	1	21-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Pendine Burrows	SN298068	44	1	21-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Pendine Burrows	SN280069	44	1	21-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Pendine Burrows	SN300069	44	1	21-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Pendine Burrows	SN291068	44	1	21-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Pendine Burrows	SN295068	44	1	21-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Pendine Burrows	SN277070	44	1	21-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Pendine Burrows	SN276070	44	1	21-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Pendine Burrows	SN292068	44	1	21-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Pendine Burrows	SN254075	44	1	21-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Tywyn Burrows	SN362063	44	4	24-Jun-16	BS, IKM
Coleoptera	*Nacerdes melanura*	None	Tywyn Burrows	SN362062	44	3	24-Jun-16	BS, IKM
Coleoptera	*Nacerdes melanura*	None	Tywyn Burrows	SN363062	44	2	24-Jun-16	BS, IKM
Coleoptera	*Nacerdes melanura*	None	Tywyn Burrows	SN363063	44	1	24-Jun-16	BS, IKM
Coleoptera	*Nacerdes melanura*	None	Tywyn Burrows	SN359062	44	1	24-Jun-16	BS, IKM
Coleoptera	*Nacerdes melanura*	None	Tywyn Burrows	SN361063	44	3	24-Jun-16	BS, IKM
Coleoptera	*Nacerdes melanura*	None	Whiteford Burrows	SS449964	41	2	23-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Whiteford Burrows	SS430943	41	5	23-Jun-16	BS

Coleoptera	*Nacerdes melanura*	None	Whiteford Burrows	SS433945	41	1	23-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Whiteford Burrows	SS450963	41	1	23-Jun-16	BS
Coleoptera	*Nacerdes melanura*	None	Baglan Burrows	SS720921	41	2	13-Jun-16	BS
Coleoptera	*Grammoptera ruficornis*	None	Cefn Sidan	SN360050	44	1	17-Jun-16	BS
Coleoptera	*Chrysolina polita*	None	Tywyn Burrows	SN366046	44	1	24-Jun-16	BS, IKM
Coleoptera	*Otiorhynchus atroapterus*	None	Pendine Burrows	SN294068	44	1	21-Jun-16	BS
Coleoptera	*Philopedon plagiatum*	None	Cefn Sidan	SN364042	44	1	17-Jun-16	BS
Coleoptera	*Philopedon plagiatum*	None	Tywyn Burrows	SN361063	44	1	24-Jun-16	BS, IKM
Diptera	*Chrysopilus cristatus*	Common	Tywyn Burrows	SN366046	44	1	24-Jun-16	BS, IKM
Diptera	*Philonicus albiceps*	None	Whiteford Burrows	SS429940	41	2	23-Jun-16	BS
Diptera	*Philonicus albiceps*	None	Oxwich Burrows	SS513876	41	3	23-Jun-16	BS
Diptera	*Philonicus albiceps*	None	Oxwich Burrows	SS514877	41	5	23-Jun-16	BS
Diptera	*Philonicus albiceps*	None	Whiteford Burrows	SS435945	41	p	23-Jun-16	BS
Diptera	*Philonicus albiceps*	None	Whiteford Burrows	SS451962	41	5	23-Jun-16	BS
Diptera	*Philonicus albiceps*	None	Whiteford Burrows	SS454962	41	1	23-Jun-16	BS
Diptera	*Philonicus albiceps*	None	Whiteford Burrows	SS440949	41	1	23-Jun-16	BS
Diptera	*Philonicus albiceps*	None	Whiteford Burrows	SS449964	41	2	23-Jun-16	BS
Diptera	*Philonicus albiceps*	None	Tywyn Burrows	SN362062	44	2	24-Jun-16	BS, IKM
Diptera	*Philonicus albiceps*	None	Blackpill	SS618903	41	p	27-Jun-16	BS
Diptera	*Philonicus albiceps*	None	Singleton dunes	SS624911	41	p	27-Jun-16	BS
Diptera	*Eristalis tenax*	None	Whiteford Burrows	SS454962	41	1	31-Jul-16	BS
Hymenoptera	*Lasius flavus*	None	Whiteford Burrows	SS445958	41	p	23-Jun-16	BS
Hymenoptera	*Vespula vulgaris*	None	Whiteford Burrows	SS429941	41	1	23-Sep-16	BS
Hymenoptera	*Ammophila sabulosa*	None	Whiteford Burrows	SS454962	41	1	31-Jul-16	BS
Hymenoptera	*Cerceris arenaria*	None	Whiteford Burrows	SS454962	41	3	31-Jul-16	BS
Hymenoptera	*Bombus humilis*	None	Oxwich Burrows	SS513876	41	1	23-Jun-16	BS
Hymenoptera	*Bombus lapidarius*	None	Blackpill	SS619905	41	1	27-Jun-16	BS

Hymenoptera	*Bombus lapidarius*	None	Blackpill	SS618903	41	4	27-Jun-16	BS
Hymenoptera	*Bombus lapidarius*	None	Singleton dunes	SS624911	41	3	27-Jun-16	BS
Hymenoptera	*Bombus lucorum sens. lat.*	None	Whiteford Burrows	SS453960	41	1	31-Jul-16	BS
Hymenoptera	*Bombus lucorum sens. str.*	None	Oxwich Burrows	SS513876	41	1	23-Jun-16	BS
Hymenoptera	*Bombus lucorum sens. str.*	None	Whiteford Burrows	SS454962	41	6	31-Jul-16	BS
Hymenoptera	*Bombus pascuorum*	None	Singleton dunes	SS623910	41	1	27-Jun-16	BS
Hymenoptera	*Bombus pascuorum*	None	Singleton dunes	SS624911	41	1	27-Jun-16	BS
Hymenoptera	*Bombus terrestris*	None	Blackpill	SS618903	41	1	27-Jun-16	BS
Hymenoptera	*Bombus terrestris*	None	Whiteford Burrows	SS454962	41	4	31-Jul-16	BS
Hymenoptera	*Colletes marginatus*	Na	Whiteford Burrows	SS454962	41	2	31-Jul-16	BS
Mytiloida	*Mytilus edulis*	None	Whiteford Burrows	SS439947	41	p	23-Sep-16	BS
Mytiloida	*Mytilus edulis*	None	Tywyn Burrows	SN3506	44	o	27-Sep-16	BS
Veneroida	*Acanthocardia echinata*	None	Tywyn Burrows	SN3506	44	o	27-Sep-16	BS
Veneroida	*Mactra stultorum*	None	Whiteford Burrows	SS439947	41	p	23-Sep-16	BS
Veneroida	*Mactra stultorum*	None	Tywyn Burrows	SN3506	44	a	27-Sep-16	BS
Veneroida	*Ensis siliqua*	None	Tywyn Burrows	SN3506	44	f	27-Sep-16	BS
Veneroida	*Donax vittatus*	None	Tywyn Burrows	SN3506	44	f	27-Sep-16	BS
Veneroida	*Pharus legumen*	None	Whiteford Burrows	SS439947	41	p	23-Sep-16	BS
Veneroida	*Pharus legumen*	None	Tywyn Burrows	SN3506	44	f	27-Sep-16	BS
Heterobranchia	*Acteon tornatilis*	None	Tywyn Burrows	SN3506	44	r	27-Sep-16	BS
Mesogastropoda	*Polinices catenus*	None	Tywyn Burrows	SN3506	44	r	27-Sep-16	BS
Neogastropoda	*Buccinum undatum*	None	Tywyn Burrows	SN3506	44	o	27-Sep-16	BS
Neogastropoda	*Nucella lapillus*	None	Tywyn Burrows	SN3506	44	r	27-Sep-16	BS
Neogastropoda	*Hinia reticulata*	None	Tywyn Burrows	SN3506	44	r	27-Sep-16	BS
Stylommatophora	*Monacha cantiana*	None	Singleton dunes	SS624911	41	p	27-Jun-16	BS
Stylommatophora	*Hygromia cinctella*	None	Blackpill	SS618903	41	p	27-Jun-16	BS
Stylommatophora	*Cepaea nemoralis*	None	Whiteford Burrows	SS433945	41	p	23-Jun-16	BS

Sepiida	*Sepia officinalis*	None	Tywyn Burrows	SN3506	44	r	27-Sep-16	BS
Carcharhiniformes	*Scyliorhinus canicula*	None	Tywyn Burrows	SN3506	44	p	27-Sep-16	BS
Urodela	*Triturus helveticus*	None	Pendine Burrows	SN300069	44	1	21-Jun-16	BS
Procellariiformes	*Puffinus puffinus*	A	Nicholaston Burrows	SS519877	41	1	23-Jun-16	BS
Pelecaniformes	*Morus bassanus*	A	Tywyn Burrows	SN3506	44	1	27-Sep-16	BS
Ciconiiformes	*Egretta garzetta*	A	Whiteford Burrows	SS448970	41	5	31-Jul-16	BS
Ciconiiformes	*Egretta garzetta*	A	Whiteford Burrows	SS448970	41	3	08-Aug-16	BS
Ciconiiformes	*Egretta garzetta*	A	Whiteford Burrows	SS454964	41	9	01-Sep-16	BS
Accipitriformes	*Buteo buteo*	A	Cefn Sidan	SN360049	44	1	27-Sep-16	BS
Falconiformes	*Falco peregrinus*	A	Cefn Sidan	SN362045	44	1	27-Sep-16	BS
Charadriiformes	*Haematopus ostralegus*	A	Cefn Sidan	SN3603	44	1300	27-Sep-16	BS
Charadriiformes	*Haematopus ostralegus*	A	Cefn Sidan	SN3702	44	700	27-Sep-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS454959	41	2	06-Jun-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS453962	41	2	06-Jun-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS451962	41	2	06-Jun-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS450963	41	2	06-Jun-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Cefn Sidan	SS430993	44	2	07-Jun-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Cefn Sidan	SS434996	44	1	07-Jun-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Cefn Sidan	SS434997	44	2	07-Jun-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Tywyn Burrows	SN362063	44	2	11-Jun-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Tywyn Burrows	SN359060	44	2	11-Jun-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Baglan Burrows	SS720923	41	3	13-Jun-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Laugharne Burrows	SN309070	44	2	19-Jun-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Pendine Burrows	SN281069	44	2	21-Jun-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Pendine Burrows	SN278069	44	2	21-Jun-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS448970	41	80	31-Jul-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS453962	41	2	31-Jul-16	BS

Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS454962	41	20	31-Jul-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS448970	41	129	08-Aug-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS454964	41	152	08-Aug-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Tywyn Burrows	SN3604	44	215	30-Aug-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Tywyn Burrows	SN3506	44	1	30-Aug-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Tywyn Burrows	SN3506	44	1	30-Aug-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS454964	41	49	01-Sep-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS455961	41	37	15-Sep-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS429946	41	22	15-Sep-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS439952	41	66	15-Sep-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS443963	41	18	15-Sep-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS448970	41	180	15-Sep-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS454964	41	220	15-Sep-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Whiteford Burrows	SS433945	41	60	23-Sep-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Cefn Sidan	SN360049	44	40	27-Sep-16	BS
Charadriiformes	*Charadrius hiaticula*	A	Cefn Sidan	SN3603	44	30	27-Sep-16	BS
Charadriiformes	*Calidris canutus*	A	Whiteford Burrows	SS448970	41	1	08-Aug-16	BS
Charadriiformes	*Calidris canutus*	A	Tywyn Burrows	SN3604	44	18	30-Aug-16	BS
Charadriiformes	*Calidris canutus*	A	Whiteford Burrows	SS454964	41	2	01-Sep-16	BS
Charadriiformes	*Calidris canutus*	A	Whiteford Burrows	SS459962	41	6	01-Sep-16	BS
Charadriiformes	*Calidris canutus*	A	Whiteford Burrows	SS454964	41	3	15-Sep-16	BS
Charadriiformes	*Calidris alba*	A	Whiteford Burrows	SS448970	41	6	08-Aug-16	BS
Charadriiformes	*Calidris alba*	A	Whiteford Burrows	SS454964	41	1	08-Aug-16	BS
Charadriiformes	*Calidris alba*	A	Tywyn Burrows	SN3604	44	170	30-Aug-16	BS
Charadriiformes	*Calidris alba*	A	Whiteford Burrows	SS429946	41	12	15-Sep-16	BS
Charadriiformes	*Calidris alba*	A	Whiteford Burrows	SS439952	41	3	15-Sep-16	BS
Charadriiformes	*Calidris alba*	A	Whiteford Burrows	SS454964	41	2	15-Sep-16	BS

Charadriiformes	*Calidris alba*	A	Whiteford Burrows	SS433945	41	6	23-Sep-16	BS
Charadriiformes	*Calidris alba*	A	Cefn Sidan	SN3603	44	530	27-Sep-16	BS
Charadriiformes	*Calidris alba*	A	Cefn Sidan	SN3702	44	220	27-Sep-16	BS
Charadriiformes	*Calidris alba*	A	Cefn Sidan	SN360049	44	12	27-Sep-16	BS
Charadriiformes	*Calidris minuta*	A	Whiteford Burrows	SS454964	41	1	08-Aug-16	BS
Charadriiformes	*Calidris minuta*	A	Tywyn Burrows	SN3604	44	1	30-Aug-16	BS
Charadriiformes	*Calidris minuta*	A	Whiteford Burrows	SS454964	41	1	01-Sep-16	BS
Charadriiformes	*Calidris minuta*	A	Whiteford Burrows	SS443963	41	1	15-Sep-16	BS
Charadriiformes	*Calidris ferruginea*	A	Whiteford Burrows	SS454964	41	3	01-Sep-16	BS
Charadriiformes	*Calidris ferruginea*	A	Whiteford Burrows	SS455961	41	1	15-Sep-16	BS
Charadriiformes	*Calidris ferruginea*	A	Whiteford Burrows	SS443963	41	3	15-Sep-16	BS
Charadriiformes	*Calidris ferruginea*	A	Cefn Sidan	SN360049	44	5	27-Sep-16	BS
Charadriiformes	*Calidris alpina*	A	Whiteford Burrows	SS454959	41	1	06-Jun-16	BS
Charadriiformes	*Calidris alpina*	A	Whiteford Burrows	SS448970	41	50	31-Jul-16	BS
Charadriiformes	*Calidris alpina*	A	Whiteford Burrows	SS454962	41	10	31-Jul-16	BS
Charadriiformes	*Calidris alpina*	A	Whiteford Burrows	SS448970	41	172	08-Aug-16	BS
Charadriiformes	*Calidris alpina*	A	Whiteford Burrows	SS454964	41	59	08-Aug-16	BS
Charadriiformes	*Calidris alpina*	A	Tywyn Burrows	SN3604	44	250	30-Aug-16	BS
Charadriiformes	*Calidris alpina*	A	Whiteford Burrows	SS454964	41	255	01-Sep-16	BS
Charadriiformes	*Calidris alpina*	A	Whiteford Burrows	SS455961	41	234	15-Sep-16	BS
Charadriiformes	*Calidris alpina*	A	Whiteford Burrows	SS429946	41	68	15-Sep-16	BS
Charadriiformes	*Calidris alpina*	A	Whiteford Burrows	SS439952	41	89	15-Sep-16	BS
Charadriiformes	*Calidris alpina*	A	Whiteford Burrows	SS443963	41	123	15-Sep-16	BS
Charadriiformes	*Calidris alpina*	A	Whiteford Burrows	SS448970	41	168	15-Sep-16	BS
Charadriiformes	*Calidris alpina*	A	Whiteford Burrows	SS454964	41	586	15-Sep-16	BS
Charadriiformes	*Calidris alpina*	A	Whiteford Burrows	SS433945	41	20	23-Sep-16	BS
Charadriiformes	*Calidris alpina*	A	Cefn Sidan	SN360049	44	30	27-Sep-16	BS

Charadriiformes	*Calidris alpina*	A	Cefn Sidan	SN3603	44	60	27-Sep-16	BS
Charadriiformes	*Calidris alpina*	A	Cefn Sidan	SN3702	44	30	27-Sep-16	BS
Charadriiformes	*Arenaria interpres*	A	Tywyn Burrows	SN3604	44	20	30-Aug-16	BS
Charadriiformes	*Arenaria interpres*	A	Whiteford Burrows	SS455961	41	1	15-Sep-16	BS
Charadriiformes	*Arenaria interpres*	A	Whiteford Burrows	SS429946	41	1	15-Sep-16	BS
Charadriiformes	*Arenaria interpres*	A	Whiteford Burrows	SS439952	41	12	15-Sep-16	BS
Charadriiformes	*Arenaria interpres*	A	Whiteford Burrows	SS443963	41	4	15-Sep-16	BS
Charadriiformes	*Arenaria interpres*	A	Whiteford Burrows	SS448970	41	3	15-Sep-16	BS
Charadriiformes	*Arenaria interpres*	A	Whiteford Burrows	SS454964	41	3	15-Sep-16	BS
Charadriiformes	*Arenaria interpres*	A	Whiteford Burrows	SS433945	41	2	23-Sep-16	BS
Charadriiformes	*Arenaria interpres*	A	Cefn Sidan	SN360049	44	2	27-Sep-16	BS
Charadriiformes	*Arenaria interpres*	A	Cefn Sidan	SN3603	44	2	27-Sep-16	BS
Charadriiformes	*Arenaria interpres*	A	Cefn Sidan	SN3702	44	12	27-Sep-16	BS
Charadriiformes	*Chroicocephalus ridibundus*	A	Whiteford Burrows	SS439952	41	70	08-Aug-16	BS
Charadriiformes	*Chroicocephalus ridibundus*	A	Whiteford Burrows	SS454964	41	16	01-Sep-16	BS
Charadriiformes	*Chroicocephalus ridibundus*	A	Cefn Sidan	SN3603	44	30	27-Sep-16	BS
Charadriiformes	*Larus canus*	A	Cefn Sidan	SN3603	44	40	27-Sep-16	BS
Charadriiformes	*Larus argentatus*	A	Cefn Sidan	SN3603	44	150	27-Sep-16	BS
Charadriiformes	*Larus marinus*	A	Cefn Sidan	SN3603	44	3	27-Sep-16	BS
Charadriiformes	*Uria aalge*	A	Tywyn Burrows	SN3506	44	1	27-Sep-16	BS
Passeriformes	*Alauda arvensis*	A	Cefn Sidan	SS430993	44	1	07-Jun-16	BS
Passeriformes	*Alauda arvensis*	A	Cefn Sidan	SS434996	44	1	07-Jun-16	BS
Passeriformes	*Alauda arvensis*	A	Cefn Sidan	SS430994	44	1	07-Jun-16	BS
Passeriformes	*Alauda arvensis*	A	Cefn Sidan	SS428992	44	1	07-Jun-16	BS
Passeriformes	*Alauda arvensis*	A	Cefn Sidan	SS424996	44	2	07-Jun-16	BS
Passeriformes	*Alauda arvensis*	A	Cefn Sidan	SS423988	44	2	07-Jun-16	BS
Passeriformes	*Alauda arvensis*	A	Cefn Sidan	SS434997	44	1	07-Jun-16	BS

Passeriformes	*Alauda arvensis*	A	Laugharne Burrows	SN325077	44	1	19-Jun-16	BS
Passeriformes	*Alauda arvensis*	A	Laugharne Burrows	SN313070	44	1	19-Jun-16	BS
Passeriformes	*Alauda arvensis*	A	Pendine Burrows	SN280069	44	1	21-Jun-16	BS
Passeriformes	*Alauda arvensis*	A	Whiteford Burrows	SS454962	41	1	31-Jul-16	BS
Passeriformes	*Riparia riparia*	A	Cefn Sidan	SS435997	44	3	07-Jun-16	BS
Passeriformes	*Riparia riparia*	A	Pendine Burrows	SN287068	44	30	21-Jun-16	BS
Passeriformes	*Sylvia communis*	A	Pendine Burrows	SN287068	44	1	21-Jun-16	BS
Passeriformes	*Saxicola torquatus*	A	Whiteford Burrows	SS426937	41	2	09-Jun-16	BS
Passeriformes	*Oenanthe oenanthe*	A	Tywyn Burrows	SN362063	44	1	30-Aug-16	BS
Passeriformes	*Oenanthe oenanthe*	A	Whiteford Burrows	SS447965	41	1	01-Sep-16	BS
Passeriformes	*Oenanthe oenanthe*	A	Whiteford Burrows	SS454964	41	1	15-Sep-16	BS
Passeriformes	*Oenanthe oenanthe*	A	Whiteford Burrows	SS456962	41	2	23-Sep-16	BS
Passeriformes	*Oenanthe oenanthe*	A	Whiteford Burrows	SS433945	41	1	23-Sep-16	BS
Passeriformes	*Oenanthe oenanthe*	A	Tywyn Burrows	SN363062	44	1	27-Sep-16	BS
Passeriformes	*Motacilla alba yarrellii*	None	Broughton Borrows	SS425934	41	1	09-Jun-16	BS
Passeriformes	*Motacilla alba yarrellii*	None	Whiteford Burrows	SS453962	41	1	31-Jul-16	BS
Passeriformes	*Anthus pratensis*	A	Whiteford Burrows	SS426937	41	1	09-Jun-16	BS
Passeriformes	*Anthus pratensis*	A	Pendine Burrows	SN276070	44	1	21-Jun-16	BS
Passeriformes	*Anthus pratensis*	A	Whiteford Burrows	SS453962	41	2	31-Jul-16	BS
Passeriformes	*Anthus pratensis*	A	Tywyn Burrows	SN363062	44	4	27-Sep-16	BS
Passeriformes	*Anthus petrosus*	A	Whiteford Burrows	SS426937	41	4	09-Jun-16	BS
Passeriformes	*Carduelis cannabina*	A	Whiteford Burrows	SS426937	41	1	09-Jun-16	BS
Passeriformes	*Carduelis cannabina*	A	Whiteford Burrows	SS434945	41	12	31-Jul-16	BS
Passeriformes	*Carduelis cannabina*	A	Whiteford Burrows	SS456963	41	45	01-Sep-16	BS
Passeriformes	*Carduelis cannabina*	A	Whiteford Burrows	SS455961	41	12	15-Sep-16	BS
Passeriformes	*Carduelis cannabina*	A	Whiteford Burrows	SS456962	41	25	23-Sep-16	BS
Passeriformes	*Carduelis cannabina*	A	Whiteford Burrows	SS450963	41	15	23-Sep-16	BS

Passeriformes	*Carduelis cannabina*	A	Whiteford Burrows	SS433945	41	12	23-Sep-16	BS
Passeriformes	*Carduelis cannabina*	A	Tywyn Burrows	SN363062	44	30	27-Sep-16	BS
Urodela	*Triturus helveticus*	None	Whiteford Burrows	SS434943	41	1	23-Jun-16	BS
Urodela	*Triturus helveticus*	None	Whiteford Burrows	SS434945	41	15	13-Jul-16	BS
Squamata	*Anguis fragilis*	None	Pendine Burrows	SN281069	44	2	21-Jun-16	BS
Squamata	*Anguis fragilis*	None	Pendine Burrows	SN266072	44	1	21-Jun-16	BS
Squamata	*Anguis fragilis*	None	Pendine Burrows	SN274070	44	1	21-Jun-16	BS
Squamata	*Anguis fragilis*		Pendine Burrows	SN25550755	44	p	25-Sep-16	CO
Squamata	*Lacerta vivipara*	None	Laugharne Burrows	SN319071	44	1	19-Jun-16	BS
Squamata	*Lacerta vivipara*	None	Whiteford Burrows	SS454961	41	1	31-Jul-16	BS
Carnivora	*Halichoerus grypus*		Pendine Burrows	SN25900736	44	p	25-Sep-16	CO
Cetacea	*Delphinus delphis*	None	Tywyn Burrows	SN363062	44	1	27-Sep-16	BS
Cetacea	*Globicephala melas*	None	Whiteford Burrows	SS430944	41	1	23-Sep-16	BS
Lagomorpha	*Lepus europeus*		Pendine Burrows	SN30880705	44	p	25-Sep-16	CO
Rodentia	*Apodemus sylvaticus*	None	Cefn Sidan	SN365042	44	3	27-Sep-16	BS

Appendix 3. Notes on fauna associated with *E. complanata*.

CNIDARIA

Medusozoa

Hydrozoa

A few strandings of By-the-wind Sailor *Velella velella* were encountered in late summer. Given the small number of strandings the species is unlikely to make any significant contribution to strandline invertebrate ecology, although in years when there are mass strandings, the species could influence predator-prey interactions.

Scyphozoa

Rhizostomae

Barrel Jellyfish *Rhizostoma octopus* was encountered commonly along the strandline, with numbers increasing during summer and autumn. No direct association with *E. complanata* was noted although stranded jellyfish are likely to help support strandline invertebrates upon which *E. complanata* are known to prey upon. Compass Jellyfish *Chrysaora hysoscella* was also noted but in much smaller numbers.

ECHINODERMATA

Echinoidea

Spatangoidea

Significant numbers of Sea Potatoes *Echinocardium cordatum* were occasionally found along the strandline adding small quantities of organic material to the strandline.

ANNELIDA

Unidentified pink worms approximately 2mm wide were locally abundant under logs on the lower strandlines (inhabitants of the sand but appearing to be feeding on damp wood) where *E. complanata* was occasionally frequent and potentially could form part of the diet of adults and/or larvae.

ARTHROPODA

Maxillopoda

Penduculata

Occasional strandings Goose Barnacles *Lepas anatifera* were recorded, but were at a level unlikely to impact upon the strandline ecosystem.

Malacostraca

Amphipoda

Talitrids are described as being the main prey of *E. complanata* (King & Stabins, 1971) and were found to be abundant wherever *E. complanata* was recorded. The family is made up of detritivores that are largely reliant on deposits of marine algae (primarily fucoids) and avoid desiccation by seeking refuge under beach debris including accumulations of macro-algae, shells and flotsam. No attempts were made to routinely identify the species occurring on the strandlines of the study sites, but random sampling together with previous studies by Llewellyn (1996) at the same sites indicate *Talitrus saltator,*

Orchestia gammarellus and *Talorchestia deshayesii* are the most abundant talitrids.

Isopoda

Isopods such as *Oniscus asellus* (including a striking chestnut form with a black head at Pendine) and *Armadillidium vulgare* were locally frequent encountered sharing refuges with *E. complnata*. Other species, such as *Porcellinoides cingendus, Ligia oceanica* and *Philoscia muscorum,* were less frequent. The nationally scarce *Armadillidium album* was locally frequent at Whiteford, Pembrey Burrows and Laugharne Burrows, but was absent from large sections of beach.

Decapoda

Small numbers of crabs were found washed up on the strandline and occasional live juvenile Shore Crabs *Carcinus maenas* were recorded under refuges used by *E. complanata*. Whilst it is unlikely this group has a significant influence on strandline ecology, immature crabs, provide a potential resource for *E. complanata*.

Diplopoda

Ommatoiulus sabulosus (Striped Millipede) was abundant on most beaches, typically occurring on higher strandlines along with occasional *Glomeris marginata*. Limited sampling of taxa requiring more critical examination provided records for *Tachypodoiulus niger*, *Cylindroiulus punctatus* and *C. latestriatus*. These species are considered unlikely to be important prey for *E. complanata.*

Chilopoda

Centipedes were frequent associates of *E. complanata* along the higher strandlines. No attempt to determine the species involved were made, though *Lithobius forficatus* and *L. melanops* were identified on one visit when the author was accompanied by I.K. Morgan. Some of the larger species could be potential predators of *E. complanata*.

Arachnida:

Araneae

Unidentified species were frequently encountered, with observations including occasional Lycosid females carrying spiderlings and the occasional large Agelenid. *Arctosa perita* (Sand Bear-spider) is readily identifiable in the field and was found to be locally frequent under drift-wood on some beaches. Given the nature of the strandline environment, it would appear unlikely that spiders are significant predators, nor are important prey of *E. complanata*.

Opiliones

Phalangium opilio was the only harvestman encountered with any level of frequently.

Insecta:

Orthoptera

Open strandlines were mostly devoid of orthopteroids, the only species noted being Mottled Grasshoper *Myrmeleotettix maculates* and Common Field Grasshopper *Chorthippus brunneus*.

Dermaptera

Forficula auricularia was locally frequent under logs and other items of larger debris.

Hemiptera

An order in which some of the smaller species were most likely overlooked, the only species noted being the conspicuous *Beosus maritimus, Eurygaster testudinaria* and *Dicranocephalus agilis*. The group would seem unlikely to have any significant impact on strandline ecology.

Lepidoptera

Adult Sand Darts *Agrotis ripae* (Nb), Shore Wainscot *Mythimna litoralis* (Nb) and White Colon *Sideridis albicolon* (Nb) were discovered resting on sand under logs on several occasions. Lepidopteran larvae can be frequent on Sea Rocket *Cakile maritima* and other embryo dune forbes and are potential prey items for adults and larvae of *E. complanata*. Larvae of the Lackey *Malacosoma neustria* were found occasionally around strandline debris and an influx of the migratory Diamond-back Moths *Plutella xylostella* were associated with stands of Sea Rocket.

Coleoptera.

Strandlines provide an important niche for beetles other than *E. complanata* and the assemblage recorded included a number of scarce species. The Carabidae was the most frequently encountered family, *Broscus cephalotes* being an almost constant associate of *E. complanata* under logs and other debris, not infrequently in double figures. The species was present on almost every beach including those where *E. complanata* has apparently disappeared, even at sites where large items of beach debris were minimal. The diurnal *Cicindela maritima* (Nb) was also locally frequent, but other carabids were generally found at much lower frequency. Additional characteristic coastal species that were recorded included *Agonum emarginatum, Amara lucida* (Nb), *Bembidion pallidipenne* (Nb), *Calathus mollis, C. erratus*, *Dicheirotrichus gustavii, Harpalus anxius*, *H. neglectus, H. tardus, Nebria salina, Pogonus chalceus* and *Syntomus foveatus*. Other coleopteran families were represented by strandline inhabitants that included species from the Curculionidae; *Otiorhynchus atroapterus* and *Philopedon plagiatum,* Histeridae *Hypocaccus dimidiatus* (Nb) and *H. rugiceps* (Na), Oedemeridae; *Nacerdes melanura*, Scarabaeidae: *Aegialia arenaria* and *Anomala dubia* and Tenebrionidae: *Phaleria cadaverina* and *Xanthomus pallidus* (Nb). A few Nationally Notable species were also recorded that are not restricted to coastal habitats, these including members of the Carabidae; *Trechus rubens* (Nb), the Scarabaeidae: *Aphodius sordidus* (Na) and *Onthophagus nuchicornis* (Nb). Additional families were represented by more widespread and/or ubiquitous species such as the Chrysomelidae; *Chrysolina polita*, Dytiscidae; *Colymbetes fuscus*, Elateridae; *Agrypnus murinus*, Cerambycidae; *Grammoptera ruficornis* and Lucanidae; *Dorcus parallelipipedus*. Staphylinids were well represented at many sites but no attempts were made to determine what species were present. Given the diversity of Coleoptera in strandline habitats, it would seem plausible to consider that interspecific interactions may influence the abundance and distribution of *E. complanata*.

Diptera

Relatively few records were made of species from this important order, the larvae of which are said to be important prey for *E. complanata* larvae (King & Stabins, 1971). Coelopids and other unidentified kelp fly taxa were locally frequent where accumulations of fucoids were washed up, though the lack of storms in 2016 resulted in relatively small quantities being washed up during the survey period. Adult asilids were prominent during the surveys, with *Philonicus albiceps* in particular being frequent along the strandline at most sites. *Pamponerus germanicus* (RDB3) is well know from the Carmarthen Bay dune systems, but was not recorded during the current survey. Otherwise only a few token syrphid and rhagonid species were identified.

Hymenoptera

Unidentified ant species were frequently present under logs on higher strandings and ichneumonids were occasionally seen in these habitats, though it is not known if *E. complanata* is a parasitoid host. Other families, such as Sphecidae; e.g. *Ammophila sabulosa*, Crabronidae; e.g. *Cerceris arenaria* and Vespidae; e.g. *Vespula vulgaris*, were noted along the strandline, but foraging *Bombus* species (Apidae) were the most conspicuous hymenopterans, *B. humilis* (a section 42 species) being the most significant species recorded. *Collectes marginatus* (Na) was noted on the flowers of *Eryngium maritimum* and has been noted on strandline flowers in previous years. The Apidae are unlikely to directly influence *E. complanata* ecology, although undoubtedly play an important role facilitating the pollination of strandline forbes.

MOLLUSCA

Bivalvia

Washed up shells of bivalves were frequent along all shores. It seems plausible that larger shells of species such as Otter Shell *Lutraria lutraria* and Pod Razor *Ensis siliqua* might be used as refuges when larger beach items are scarce or absent. Due to their numerical abundance, shells were not routinely turned during the survey, though ad hoc checking failed to demonstrate shells are used as refuges. Other species recorded in abundance included *Mytilus edulis*, *Mactra stultorum, Donax vittatus* and *Pharus legumen*. These species are not infrequently involved in mass strandings events of moribund animals and the large organic input from such events would seem likely to have an influence on strandline ecology.

Gastropoda

Casual observations of conspicuous terrestrial species were noted, particularly where taking refuge alongside *E. complanata* on higher strandlines. Species noted included *Cepaea nemoralis*, *Cernuella virgata*, *Cochlicella acuta* and *Helix aspersa*. Empty shells of marine species included *Acteon tornalis, Polinices catenus, Buccinum undatum, Nucella lapillus* and *Hinia reticulata*, which were generally found in much smaller quantities compared to strandings of marine bivalves.

Cephalopoda

Cuttlebones of the Common Cuttlefish *Sepia officinalis* were frequent along the strandline at certain times and although only a few were turned *E. complanata* was found to have used this resource on one occasion as a day-time refuge.

CHORDATA

Chondrichthyes

Occasional strandings of Lesser Spotted Dogfish *Scyliorhinus canicula* were noted as were egg cases of this species.

Actinopterygii

Washed up specimens of Grey Triggerfish *Balistes capriscus* were recorded on two occasions at Whiteford.

Amphibia

A Palmate Newt *Triturus helveticus* was found hiding by day under a log on the Pendine strandline, though this behaviour would appear to be atypical.

Reptilia

Observations were made of Viviparous Lizard *Lacerta vivipara*, hiding beneath logs at Laugharne Burrows and Berges Island. Slow-worms *Anguis fragilis* were occasional under large logs on the Pendine strandline. Neither species is considered as likely to be a significant predator of the nocturnal *E. complanata*.

Aves

Ringed Plover *Charadrius hiaticula* was recorded nesting on all beaches where *E. complanata* was present. Numbers were significantly boosted during autumn migration with a whole suite of other wading birds observed foraging across all sections of the beach, including the strandline. Turnstones *Arenaria interpres* routinely turn items over in search of prey, but always items much smaller than those used by *E. complanata*. Despite most waders being nocturnal, as-well-as diurnal, feeders, it seems unlikely *E. complanata* is a key prey species, although occasional bird predation would seem likely. Pied Wagtail *Motacilla alba*, Rock Pipit *Anthus petrosus* and Carrion Crow *Corvus corone* were present along the strandline on most beaches invariably in small numbers. Hirundines were occasionally seen gathering in larger late summer gatherings on beaches, presumably feeding on dipterans. None of these species are considered as likely to be important predators of *E. complanata*.

Mammalia

Footprints of Red Fox *Vulpes vulpes* working the strandline were occasionally seen, this being a potential nocturnal predator of *E. complanata*. Active strandline nests of Field Vole *Microtus agrestis* and Wood Mouse *Apodemus sylvaticus* were noted at Laugharne Burrows and Tywyn Burrows. Marine strandings during the study period included a Long-finned Pilot Whale *Globicephala melas* at Whiteford in August, a Common Dolphin *Delphinus delphis* at Tywyn Point and Grey Seal *Halichoerus grypus* at Laugharne in September.

Appendix 4. Photographs.

Photo 1: Part of an aggregation of 82 *E. complanata* at Cefn Sidan revealed under the bin shown in photo 2. 24th June. (Ian Morgan)

Photo 2: Ian Morgan standing next to the bin under which 82 *E. complanata* were recorded on 24th June

Photo 3: Eroding dunes at Whiteford lacking beach debris at northern limit of SD4 vegetation. 23rd Sept.

Photo 4: Cefn Sidan with refugia buried by sand after strong winds rendering most refugia inaccessible to *E. complanata*. 27th Sept.

Photo 5: Bird box at Cefn Sidan under which *E. complanata* was recorded on several successive visits. 10th June.

Photo 6: Light-weight breeze block at Whiteford under which two *E. complanata*.were recorded on 23rd June.

Photo 7: Peat block at Whiteford under which five *E. complanata*.were recorded on 23rd June.

Photo 8: Tyre at Whiteford under which six *E. complanata*.were recorded on 31st July.

Photo 9: Log on shingle at eroding section at Whiteford under which nine *E. complanata w*ere recorded. 31st July.

Photo 10: Sofa cushion at Whiteford under which *E. complanata* were noted on several dates. 23rd June.

Photo 11: Plastic trays such as these at Cefn Sidan provided *E. complanata* with refuges at several sites. 10th June.

Photo 12: Unoccupied habitat in favourable condition for *E. complanata* at Baglan Burrows. 13th June.

Photo 13: Excessive accumulation of beach debris at Cefn Sidan. *E. complanata* was present but was difficult to find here!. 17th June.

Photo 14: The same section of Cefn Sidan as photo 13 after a period of strong onshore winds. *E. complanata*. 17th June.

Photo 15: Tyre with *E. complanata* at Laugharne Burrows with band of SD2 (Sea Rocket) vegetation fronting dunes. 19th June.

Photo 16: Plastic debris at Cefn Sidan with *E. complanata*, with low accreting SD4 beach profile. 19th June.

Photo 17: Bags of hand-picked beach debris at Oxwich with immovable logs still in situ, though partially burned. 23rd June.

Photo 18: Logs like this are rare at Oxwich and are unlikely to last long. SD2 (Sea Sandwort) backed by SD6 (Marram). 23rd June.

Photo 19: Burnt logs, such as these at Blackpill, are the norm in Swansea Bay. Diverse SD2. 27th June.

Photo 20: Sheltered strandline debris behind Tywyn Point, where *E. complanata* habitat gives way to saltmarsh. 27th Sept.

Photo 21: Part of several km of eroding dunes in the central part of Cefn Sidan lacking *E. complanata*. 17th June.

Photo 22: Wood gathered at Whiteford for removal/burning with good numbers of *E. complanata*. SD4 (Sand Couch). 6th June.

Photo 23: Wood gathered at Whiteford for removal/burning with 64+ *E. complanata* under tyre. 6th June. All taken before Sept.

Photo 24: Examination of dead specimens trapped in a plastic tub revealed *E. complanata* to be capable of flight.

Photo 25: Barafundle Bay lacking a strandline and any signs of accreting dunes. 20th June (Paul Culyer)

Photo 26: Huge shingle beach at Freshwater West following winter storms. 26th May (Paul Culyer)

Photo 27: North end of Tenby beach, with shingle base to eroded dune cliff. 16th June (Paul Culyer)

Photo 28: Extensive shinge beach backed by SD6 (Marram) at Merthyr Mawr. 16th June (Duncan Ludlow)

12. Data Archive Appendix

The data archive contains:

[A] The final report in Microsoft Word and Adobe PDF formats.

[B] Species records, which are held on the NRW Recorder 6 database.

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue http://libcat.naturalresources.wales or http://catllyfr.cyfoethnaturiol.cymru by searching 'Dataset Titles'. The metadata is held as record no 116830.

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