Monitoring the Gipsywort Weevil *Datonychus arquatus* on Pembrey Air Weapons Range in 2022

NRW Evidence Report No. 700

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Mae Gwiddonyn Llysiau'r Sipsiwn *Datonychus arquatus* wedi'i gyfyngu yn y DU i Faes Tanio Pen-bre, sy'n rhan o SoDdGA Arfordir Pen-bre. Yma, fe'i cysylltir yn bennaf â chlystyrau uchel o Lysiau'r Sipsiwn *Lycopus europaeus* sy'n tyfu o dan Helyg Llwyd *Salix cinerea* mewn llaciau twyni aeddfed. Cofnododd arolwg a gynhaliwyd rhwng 19 a 21 Awst 2022 14 gwiddonyn llawn dwf mewn pedair gorsaf sampl ar Faes Tanio Pen-bre, sy'n rhan o SoDdGA Arfordir Pen-bre. Canfuwyd saith oedolyn yn sampl Gorsaf PB01, gydag un, tri a thri unigolyn arall yng Ngorsafoedd PB02, PB03 a PB04, yn y drefn honno. Gellir cymharu hyn â'r cyfrifiad blaenorol o 11 yn 1998 (yng Ngorsafoedd PB01 a PB02), dau yn 2006 (Gorsaf PB03) a saith yn 2016 (5 yng Ngorsaf PB03, 2 yng Ngorsaf PB04), er y dylid cofio bod yr ymdrech samplu wedi amrywio'n sylweddol dros y blynyddoedd. Ni chofnodwyd *D. arquatus* ar unrhyw un o'r planhigion Llysiau'r Sipsiwn y tu allan i'r pedair gorsaf samplu a samplwyd yn 2022, sy'n awgrymu bod y pedair gorsaf samplu yn cynrychioli'r ardaloedd pwysicaf o gynefin bridio addas ym Mhen-bre.

Datblygwyd Amcan Cadwraeth ar gyfer *D. arquatus* ym Mhen-bre yn 2007, a addaswyd yn 2016, sy'n cynnwys diffiniad o gynefin addas ar gyfer y gwiddonyn, sef: *Ardal o Lysiau'r Sipsiwn tal, trwchus sy'n tyfu mewn llystyfiant ar wlyptir heb ei aflonyddu. Rhaid i'r ardaloedd fod o leiaf un metr sgwâr, gyda'r planhigyn hwn yn gorchuddio o leiaf 50% ohonynt, a rhaid i'r rhan fwyaf o'r ardal fod yn mesur 50cm o uchder neu fwy*. Yn 2022, cofnodwyd 24 o ardaloedd cynefin addas – chwech yng Ngorsaf PB01, tair yng Ngorsaf PB02, 11 yng Ngorsaf PB03 a phedair yng Ngorsaf PB04. Mae'r canlyniadau hyn yn bodloni maen prawf yr Amcan Cadwraeth i gael cyfanswm o 20 neu fwy o ardaloedd cynefin addas yn y pedair gorsaf samplu, yn ogystal â'r gofyniad i gael pedair neu fwy o ardaloedd cynefin addas mewn o leiaf dwy o'r gorsafoedd samplu (Cyflawnodd Gorsafoedd PB01, PB03 a PB04 oll y targed hwn yn 2022).

Mae canlyniadau arolwg 2022 yn dangos, gan ddefnyddio'r meini prawf a ddatblygwyd yn yr Amcan Cadwraeth, bod poblogaeth y *D. arquatus* ym Mhen-bre mewn cyflwr **Ffafriol**. Credir bod hwn yn ganlyniad gwirioneddol, gyda'r safle yn cael ei reoli mewn ffordd sy'n llawer mwy tosturiol i'w anghenion. Fodd bynnag, mae sychder eithafol y llaciau a thyfiant crebachlyd llawer o'r clystyrau o Lysiau'r Sipsiwn (yn enwedig mewn corstir sy'n fwy agored), a methiant cysylltiedig y twyni i greu ardaloedd newydd o laciau gwlyb, yn parhau i fod yn destun pryder. Dylid parhau i dorri ardaloedd o brysgwydd Helyg Llwyd a Gwern yn y pedair gorsaf samplu ac mewn mannau eraill yn y clystyrau trwchus o brysgwydd i'r gorllewin o orsaf sampl PB03. Mae pori gan wartheg yn helpu i gynnal brithwaith o gynefinoedd ymylol gyda Llysiau'r Sipsiwn yn sampl Gorsaf PB04. Fodd bynnag, roedd llawer o'r clystyrau o'r planhigyn hwn wedi'u pori/sathru'n eithaf trwm ar adeg yr arolwg hwn, ac efallai y byddai'n ddymunol cael gwared ar dda byw yn hwyr yn yr haf er mwyn caniatáu i Lysiau'r Sipsiwn flodeuo a hadu. Mae'r darganfyddiad o bump *D. arquatus* ar hyd ffin y safle hwn a choedwigaeth sy'n eiddo i CNC i'r de, a phresenoldeb dau unigolyn arall o dan ganopi Gwern trwchus yng Ngorsaf samplu PB04 yn awgrymu y gallai ymchwilio ymhellach i ardaloedd coetir gwlyb yng Nghoedwig Pen-bre arwain at ddarganfod poblogaethau pellach o'r chwilen hon. Dylai'r arolwg ganolbwyntio ar glystyrau o ffeniau Gwern-Helyg Llwyd gwlypach (e.e. o amgylch y pyllau amrywiol yn y goedwig).

Executive summary

The Gipsywort Weevil *Datonychus arquatus* is currently restricted in the UK to Pembrey Air Weapons Range, part of Pembrey Coast SSSI. Here, it is mostly associated with tall stands of Gipsywort *Lycopus europaeus* growing under Grey Willow *Salix cinerea* within mature dune slacks. A survey from 19th to 21st August 2022 recorded 14 adults of the weevil in four sample stations on Pembrey Air Weapons Range, part of Pembrey Coast SSSI. Seven adults were found in sample Station PB01, with a further one, three and three individuals in Stations PB02, PB03 and PB04 respectively. This compares with previous counts of 11 in 1998 (in Stations PB01 & PB02), two in 2006 (Station PB03) and seven in 2016 (5 in Station PB03, 2 in Station PB04), although it should be borne in mind that there is a considerable variation in sampling effort between the years. None of the Gipsywort plants outside the four sample stations that were sampled in 2022 produced any records of *D. arquatus*, which suggests that the four sample stations do represent the most important areas of suitable breeding habitat at Pembrey.

A Conservation Objective (CO) for *D. arquatus* on Pembrey was developed in 2007 and modified in 2016 which includes a definition of suitable habitat for the weevil as: *a patch of tall, dense Gipsywort growing in undisturbed wetland vegetation. Patches must be at least one metre square, with this plant comprising at least 50% percentage cover and most of the patch is 50cm tall or greater*. In 2022, 24 suitable habitat patches were recorded – six in Station PB01, three in Station PB02, 11 in Station PB03 and four in Station PB04. These results meet both the criterion in the CO for a total of 20 or more suitable habitat patches to be present within the four sample stations and the requirement for there to be four or more suitable habitat patches in at least two of the sample stations (Stations PB01, PB03 & PB04 all reached this target in 2022).

The results of the 2022 survey demonstate that, using the criteria developed in the CO, the population of *D. arquatus* at Pembrey is in **Favourable** condition. This is thought to be a genuine result, with the recent management of the site being much more sympathetic to its needs. However, the extreme dryness of the slacks and the stunted growth form of many of the stands of Gipsywort (especially in more open fen) and linked to this, the lack of dune dynamism creating new areas of wet slacks, remain causes of concern. Rotational cutting of areas of Grey Willow and Alder scrub within the four sample stations and elsewhere in the dense stands of scrub lying to the west of sample Station PB03 should be continued. Cattle grazing is helping to maintain a mosaic of edge habitats with Gipsywort in sample Station PB04. However, many of the stands of this plant had been quite heavily grazed/trampled at the time of this survey and it might be desirable to remove stock in the late-summer period in order to allow the Gipsywort to flower and set seed.

The discovery of five *D. arquatus* along the boundary of this site with the NRW-owned forestry to the south and the presence of two further individuals under a dense Alder canopy in sample Station PB04 suggest that further investigation of wet woodland areas in Pembrey Forest could result in the discovery of further populations of this beetle. Survey should focus on stands of wetter Alder-Grey Willow carr (e.g. around the various pools within the forestry).

1. Introduction

Until the discovery of a single adult on Pembrey Air Weapons Range in 1997, the Gipsywort Weevil *Datonychus arquatus* (Herbst, 1795) had not been seen in either Britain or Ireland for at least 50 years and probably much longer (Fowles & Morris, 1999). Although there are two unconfirmed reports from Essex and Norfolk in the 1940s, definite British records are restricted to the end of the 19th century. At this time, it was known from several localities in Lancashire, Lincolnshire, Nottinghamshire and Surrey. It was last recorded in Ireland from a single site on the shore of Lough Neagh in 1923.

An earlier survey of Pembrey in 1998 recorded 11 adults, of which nine were associated with tall stands of Gipsywort *Lycopus europaeus* growing under Grey Willow *Salix cinerea* around the edge of a large, open mature slack (Fowles & Morris, 1999). The remaining two specimens were in open fen. These findings supported observations from the continent, which suggest *Datonychus arquatus* is associated with wet woodland. However, at Pembrey it was only the woodland edges that provided good habitat for the weevil, as areas of dense willow carr supported little foodplant. In 2006, two adults were found on tall, dense patches of Gipsywort growing in fen sheltered by regenerating willow and other tall vegetation where the height and density of the vegetation provided a shaded, cool and relatively humid micro-climate (Boyce, 2007). Seven adults were recorded in 2016 but the two main areas of dune slack supporting the weevil had been mown immediately prior to the survey, which may have resulted in localised extirpations (Fowles, 2016). Since then, a Management Plan has been agreed between the MoD and NRW to avoid a repetition of such incidents and to secure more sympathetic management.

This report decribes the results of monitoring work undertaken in August 2022 on the population of *D. arquatus* on the Pembrey Air Weapons Range (hereafter referred to simply as 'Pembrey'). The site comprises an element of the Arfordir Pen-bre/Pembrey Coast Site of Special Scientific Interest (SSSI). This work was commissioned by Natural Resources Wales (NRW) and aimed to establish the status of the weevil at Pembrey and to assess the current quality of its habitat here. A central grid reference for the site approximates to SN366049. The area to be surveyed is an air weapons range that is owned and manged by the Ministry of Defence (MoD). It lies on the southern side of the mouth of the Gwendraeth estuary in the county of Carmarthenshire (Watsonian vice-county 44) and is bounded to the south by the NRW-owned and managed land at Pembrey Forest. Figure 1 shows the location of the study site.

A Conservation Objective (CO) was initially developed by Boyce (2007) and has subsequently been modified by Fowles (2016). The modified CO is shown in Table 1 below. It aims to provide simple criteria for monitoring and assessing the condition of the population of *D. arquatus* and its habitat at Pembrey.

Pembrey has mature sand dune vegetation comprising a mix of of dry dune grassland, damper slacks and scrub woodland. The drier areas mostly support stands of mature, late-successional dune-grassland that is species-rich with a range of herbs such as Red Fescue *Festuca rubra*, Smooth Meadow-grass *Poa pratensis*, Lady's Bedstraw *Galium verum*, Ribwort Plantain *Plantago lanceolata,* Common Bird's-foot-trefoil *Lotus*

corniculatus, White Clover *Trifolium repens*, Red Clover *T. pratense* and Pyramidal Orchid *Anacamptis pyramidalis*. Around the seaward edge of the dunes, there is a band of younger dunes with typical mid-successional vegetation dominated by Marram *Ammophila arenaria* and with other frequent species including Sand Couch *Elytrigia junceiformis* and Sea Spurge *Euphorbia paralias*. There are a few stands of dense Sea Buckthorn *Hippophae rhamnoides* along the foredune ridge, though this species is not sufficiently frequent to be having a significant negative impact on the open dune habitats at Pembrey. Large areas have been cleared of Sea Buckthorn in recent years to restore more open dune conditions.

Table 1. Conservation objective for *Datonychus arquatus* at Pembrey Coast SSSI

Conservation objective (for when the feature is in favourable condition:	To maintain the weevil *Datonychus arquatus* at Pembrey Coast SSSI in favourable condition, where:
Lower limit	The weevil is present in two of the four sample stations during one-hour timed searches
Habitat quality: lower limit	20 patches of suitable habitat recorded from within the four sample stations, with at least 12 of these patches occurring within two metres of the edge of overhanging willow or alder canopy. Two of the four sampling stations should contain a minimum of four patches of suitable habitat.
Definition of suitable *Datonychus arquatus habitat*	A patch of tall, dense Gipsywort growing in undisturbed wetland vegetation. Patches must be at least one metre square, with this plant comprising at least 50% percentage cover and most of the patch is 50cm tall or greater

Low-lying areas have a mix of open dune slack vegetation and dense Grey Willow *Salix cinerea* and Alder *Alnus glutinosa* carr. The open slacks are mostly rather dry and have a dense and mature cover of tall fen-meadow vegetation in which Blunt-flowered Rush *Juncus subnodulosus*, sedges *Carex* spp., Yellow Flag *Iris pseudacorus*, Purple Loosestrife *Lythrum salicaria*, Meadowsweet *Filipendula ulmaria*, Common Fleabane *Pulicaria dysenterica*, Hemp Agrimony *Eupatorium cannabinum*, Water Mint *Mentha aquatica* and marsh-orchids *Dactylorhiza* spp. are prominent associates. Stands of mature Creeping Willow *Salix repens* are frequent in these open slacks and become locally dominant. This vegetation type is the main locus for stands of Gipsywort at Pembrey, especially where there is partial shade from scrub. Where this plant was growing in more open fen-meadow, it was quite stunted and ‘yellowed’. Some good stands of Gipsywort were also present under the canopy of Grey Willow and Alder scrub.

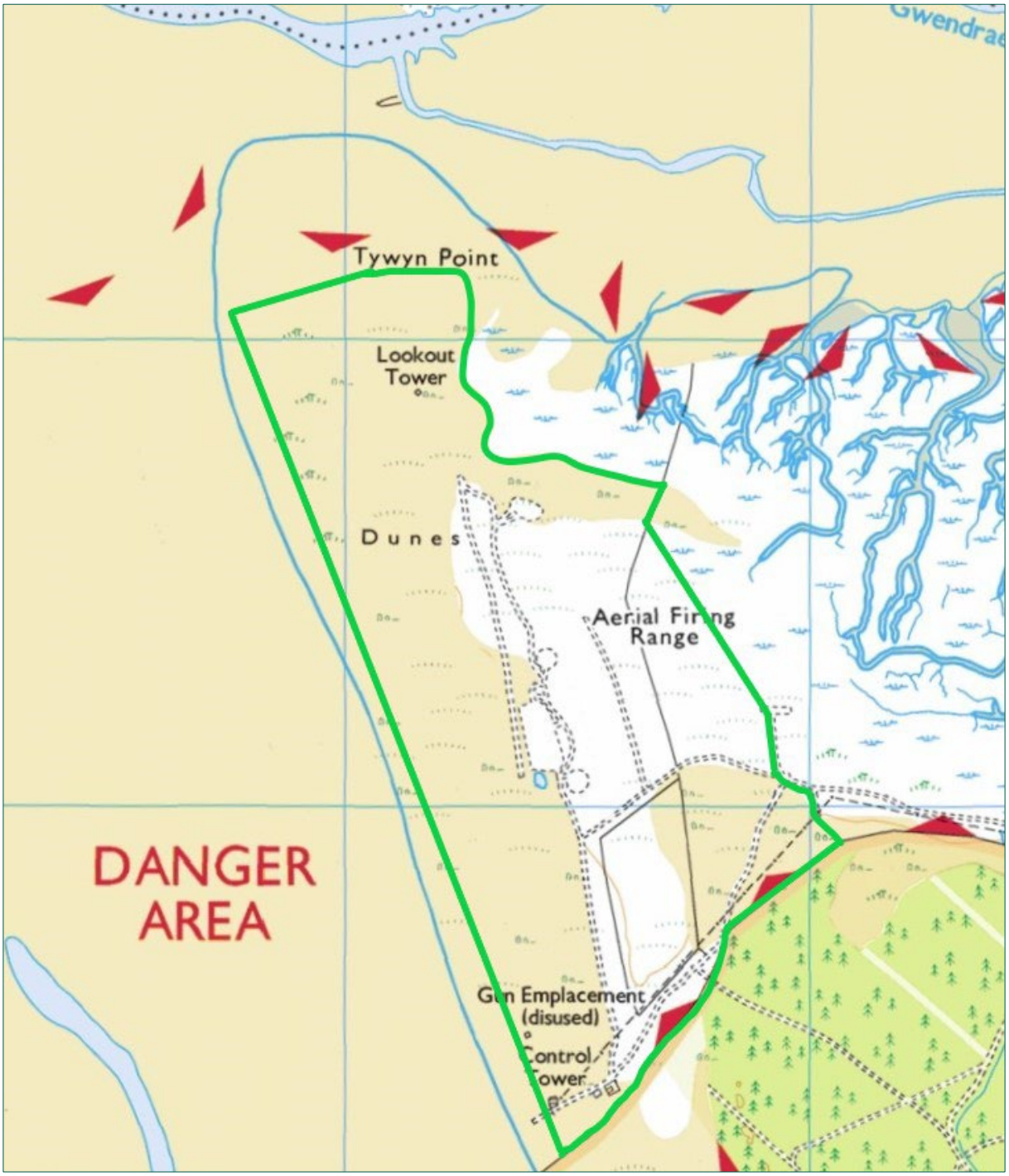

Figure 1. Location of Pembrey survey site for *Datonychus arquatus*.

2. Methods

The area of Pembrey surveyed for *D. arquatus* in 2022 is shown on Figure 1 (green boundary line). This corresponds to that part of the site with dune grassland and slack habitats that were thought to have the potential to support stands of Gipsywort. On the first

day, a walk-over of this area was undertaken that aimed to identify the distribution of patches of Gipsywort, which would be the subject of more detailed study on the following two days.

The survey was undertaken on 19th, 20th and 21st of August 2022. The main focus of survey effort has been on the four sample stations identified by Fowles (2016), which he and Boyce (2007) have identified as the most important parts of the site for *D. arquatus*. Within each of these sample stations, searches for the weevil have been carried out and all stands of suitable habitat have been recorded. Any threats to the habitat have also been documented.

The Common Standards Monitoring methodology developed by Boyce (2007) and subsequently modified by Fowles (2016) was repeated in 2022. As such, the methodology adheres to the CO guidance presented in the latter report. One of the main modifications to the CO between the two surveys was the addition of a fourth sample station in and around the fringes of the Alder in the cattle-grazed enclosure (Station PB04 in Figure 2).

Within each of the four sample stations shown on Figures 2 and 3, all qualifying patches of suitable habitat have been recorded (as defined in the CO at Table 1), with a photograph and eight-figure grid reference of each taken. Following this, timed one-hour searches were carried out in each sampling station (but see section 5.1 below), during which all of the patches of Gipsywort qualifying as suitable habitat, as well as most other Gipsywort plants that did not qualify as suitable habitat, were sampled. Although smaller plants (often stunted specimens growing in open fen) were investigated, the one-hour sample period was targeted towards taller plants (> 30 cms) in clumps as this is the situation that has produced specimens in the previous surveys. Gipsywort plants exhibit a range of heights in relation to soil moisture, competition and grazing pressure and as such there are many short plants in each sample station, especially in 2022, when the extreme drought conditions led to many of the plants in open fen being stunted and 'yellowed'. The technique employed involved placing a plastic tray (35 cms x 25 cms) underneath the foliage of gipsywort plants or clumps, bending a single plant (or handful if they are close together) over the tray, and then running the other hand up the stems to shake off any weevils. An initial attempt to use a beating tray to capture a greater surface area of plants proved inefficient amongst the fen vegetation and was rapidly abandoned. The tray contents were examined after each sample and any weevils present were recorded. Inevitably some Water Mint plants were disturbed at times during sampling, as this plant is widespread amongst the Gipsywort in the sample stations, and hence care was taken to ensure that the related species *D. melanostictus* was not mistaken for *D. arquatus*. *D. melanostictus* was present but it is readily identified in the field with experience by its more elongate body shape and the less clear, mottled, look to the patterning on its elytra (see Figures 4 & 5).

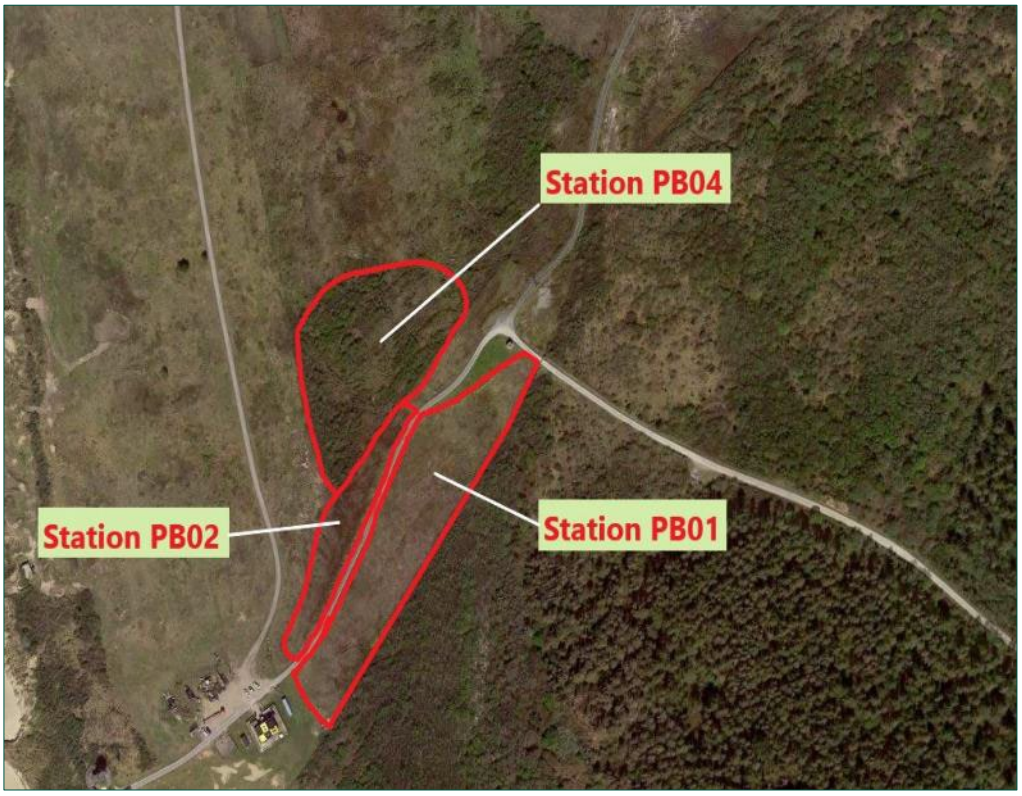

Figure 2. Location of sample Stations PB01, PB02 and PB04.

Figure 3. Location of sample Station PB03.


Figures 4 & 5. *Datonychus arquatus* (2.5 - 3.2mm) & *D. melanostictus* (2.2 - 3.4mm).
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3. Results

3.1. Survey for Adult *Datonychus arquatus* at Pembrey in 2022.

The results of the one-hour timed searches for *D. arquatus* in the four sample stations at Pembrey are presented in the last four rows of Table 2 below and Figures 6 and 7 show their location. Seven adult *D. arquatus* were recorded in sample Station 1 in 2022, with a further one, three and three individuals in Stations PB02, PB03 and PB04 respectively. The first five rows in Table 2 show the number of adults recorded during earlier surveys of the site. As can be seen from this table, the total of 14 adults recorded this year represents the highest count achieved at the site in any year, though it should be borne in mind that there is a considerable variation in sampling effort between the years.

Table 2. Counts of *Datonychus arquatus* at Pembrey, 1997-2022.

Grid reference (location)	Date	Adult count
SN3605 (Station PB03?)	14/06/1997	1
SN366044 (Stations PB01 & PB02)	28/08/1998	11
SN363055 (Station PB03)	15-17/09/2006	2
SN36260552 (Station PB03)	12/08/2016	5
SN36620463 (Station PB04)	12/08/2016	2
SN362054 (Station PB03)	19 & 21/08/2022	3
SN366044 (Station PB01)	20/08/2022	7
SN366045 (Station PB02)	20/08/2022	1
SN366046 (Station 4)	20/08/2022	3

None of the Gipsywort plants outside the four sample stations that were sampled in 2022 produced any records of *D. arquatus*, which suggests that the four sample stations do represent the most important areas of suitable breeding habitat at Pembrey.

3.2. Survey of suitable habitat for *Datonychus arquatus* at Pembrey in 2022

Table 3 lists all of the stands of Gipsywort within the four sample stations that meet the CO criteria for suitable *D. arquatus* habitat. These are all assigned a unique alphanumeric code, which is given in the first column of the table. The location of these habitat patches is also shown on Figures 6 and 7. Photographs of all the habitat patches listed in Table 3 can be found at Appendix 1. The highlighted text in the description (column four of the table) indicates those habitat patches meeting the target in the CO of lying within two metres of the edge of an overhanging willow or Alder canopy. Note that three habitat patches in sample Station PB01 (C, D and E) were not judged to meet this criteria because the frequent regenerating Alder and Grey Willow in these three patches was too low to be affording significant shade to the Gipsywort plants.

24 qualifying habitat patches were recorded at Pembrey in 2022: six in PB01; three in PB02; 11 in PB03; and four in PB04. These results meet both the criterion in the CO for a total of 20 or more suitable habitat patches to be present within the four sample stations and the requirement for there to be four or more suitable habitat patches in at least two of the sample stations (sample Stations PB01, 03 and 04 all reached this target in 2022).

As can be seen from the photos in the Appendix, many of the best stands of Gipsywort are, at least partially, shaded by scrub. This accords with the known habits of *D. arquatus* on the continent, where it is strongly associated with stands of the foodplant growing under the canopy of wet woodland. In the past, all records of the beetle at Pembrey were from stands of Gipsywort growing either in open fen or at the edge of scrub. However, in 2022, two adults were tapped from plants growing in deep shade under a dense Alder canopy in sample Station PB04.

Table 3. Suitable habitat patches for *Datonychus arquatus* at Pembrey in 2022.

Habitat patch	Grid reference	Adult count	Description
PB01A	SN36630442	2 *D. arquatus*	20-30 plants along fenceline at edge of fen **adjacent to dense willow-Alder scrub** that also has some Gipsywort plants growing under the canopy.
PB01B	SN36650444	3 *D. arquatus*	c30 Gipsywort plants along fenceline at edge of fen **adjacent to dense willow-Alder carr** with further plants in the deep shade under the trees.
PB01C	SN36640446	2 *D. arquatus*	c200 Gipsywort plants in open fen with low, regenerating Grey Willow and Alder across area of approximately 5x15m.
PB01D	SN36650448	0	c50 Gipsywort plants in c2x3m patch of fen with abundant low, regenerating Alder.
PB01E	SN36690453	0	c50 rather stunted and 'yellowed' Gipsywort plants in c2x2m patch of fen with low, regenerating Grey Willow and one Alder.
PB01F	SN36700455	0	c50 rather stunted and 'yellowed' Gipsywort plants in c1x2m patch of fen.

Habitat patch	Grid reference	Adult count	Description
PB02A	SN36660457	1 *D. arquatus*	c40 Gipsywort plants in c2x2m patch of open fen.
PB02B	SN36640453	0	c40 Gipsywort plants in c1x2m patch of open fen with abundant mature Creeping Willow and some regenerating Alder.
PB02C	SN36630454	0	c70 Gipsywort plants in c1x3m patch of open fen.
PB03A	SN36290535	0	c20 Gipsywort plants **at edge of Grey Willow** in scrubby fen.
PB03B	SN36300536	0	c30 Gipsywort plants at **edge of Grey Willow** in scrubby fen.
PB03C	SN36310537	1 *D. arquatus*	c50 Gipsywort plants **at edge of Grey Willow** in scrubby fen.
PB03D	SN36290538	1 *D. arquatus*	c300-400 Gipsywort plants in area of c5x5m with most plants being **at the edge of scattered regenerating Grey Willows**.
PB03E	SN36300541	0	Small patch of c30 Gipsywort plants growing **in and under dense, regenerating Grey Willows**.
PB03F	SN36300542	0	Small but dense patch of c70 Gipsywort plants growing **between two regenerating Grey Willows**.
PB03G	SN36250542	0	Large patch of c100 Gipsywort plants growing **in quite dense shade at the edge of dense Grey Willow carr**.
PB03H	SN36270543	0	Small patch of c25 Gipsywort plants in area of c1x1.5m **at edge of regenerating Grey Willow scrub**.
PB03I	SN36300544	1 *D. arquatus*	Small patch of c15 Gipsywort plants in area of c1x1m growing **at edge of regenerating Grey Willow**.
PB03J	SN36290546	0	Somewhat diffuse group of c25 Gipsywort plants in area of c1x2.5m **at edge of regenerating Grey Willow**.
PB03K	SN36290548	0	Clump of c25 Gypsywort plants in area of c1x3m **at edge of regenerating Grey Willow scrub**.
PB04A	SN36640458	0	c100 Gipsywort plants,fen **at edge of Grey Willow-Alder scrub** across area of approximately 2x3m. Within enclosure and many plants grazed/trampled
PB04B	SN36650460	2 *D. arquatus*	c80 Gipsywort plants **in dense shade under Alder scrub** within enclosure and some plants grazed/trampled.
PB04C	SN36660462	1 *D. arquatus*	c500 Gipsywort plants in scrubby glade growing amongst tall Creeping Willow within enclosure **surrounded by Alder-Grey Willow carr**, some plants grazed/trampled.
PB04D	SN36660463	0	c50 Gipsywort plants in same glade as PB04C growing amongst tall Creeping Willow within enclosure **surrounded by Alder-Grey Willow carr**, some plants grazed/trampled.

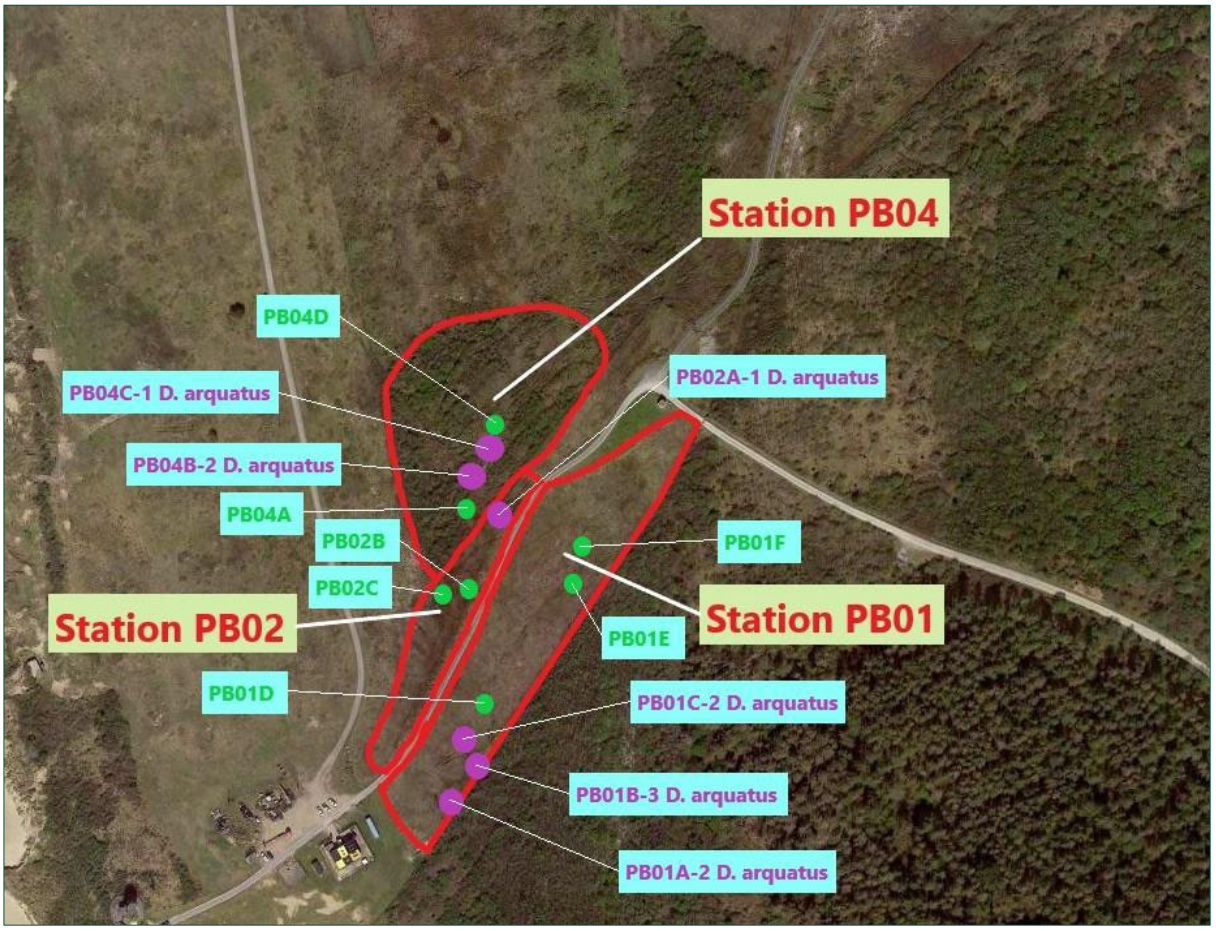

Figure 6. *Datonychus arquatus* records and habitat patches at sample Stations PB01, PB02 and PB04.

3.3. Other invertebrates.

The more frequent *Datonychus* species, *D. melanostictus*, which can also be found on Gipsywort but is most frequent on Water Mint, was recorded in sample Stations PB03 and PB04 in 2022.

Some casual records of other important invertebrates were made during the course of this survey. The rare and threatened ground beetle *Eurynebria complanata* was noted under driftwood on the strandline along with the rove beetle *Heterothops binotatus* and the White Pill Woodlouse *Armadillidium album*. Near here, another scarce rove beetle, *Bledius unicornis*, was recorded at the interface between the foredunes and the upper saltmarsh. Two other Nationally Scarce species, the ground beetle *Lebia chlorocephala* and the jumping spider *Synageles venator* were tapped from Gipsywort plants while undertaking the *D. arquatus* timed searches in sample Station PB03.

A full list of all these additional invertebrate records has been supplied to NRW in MS Excel format.

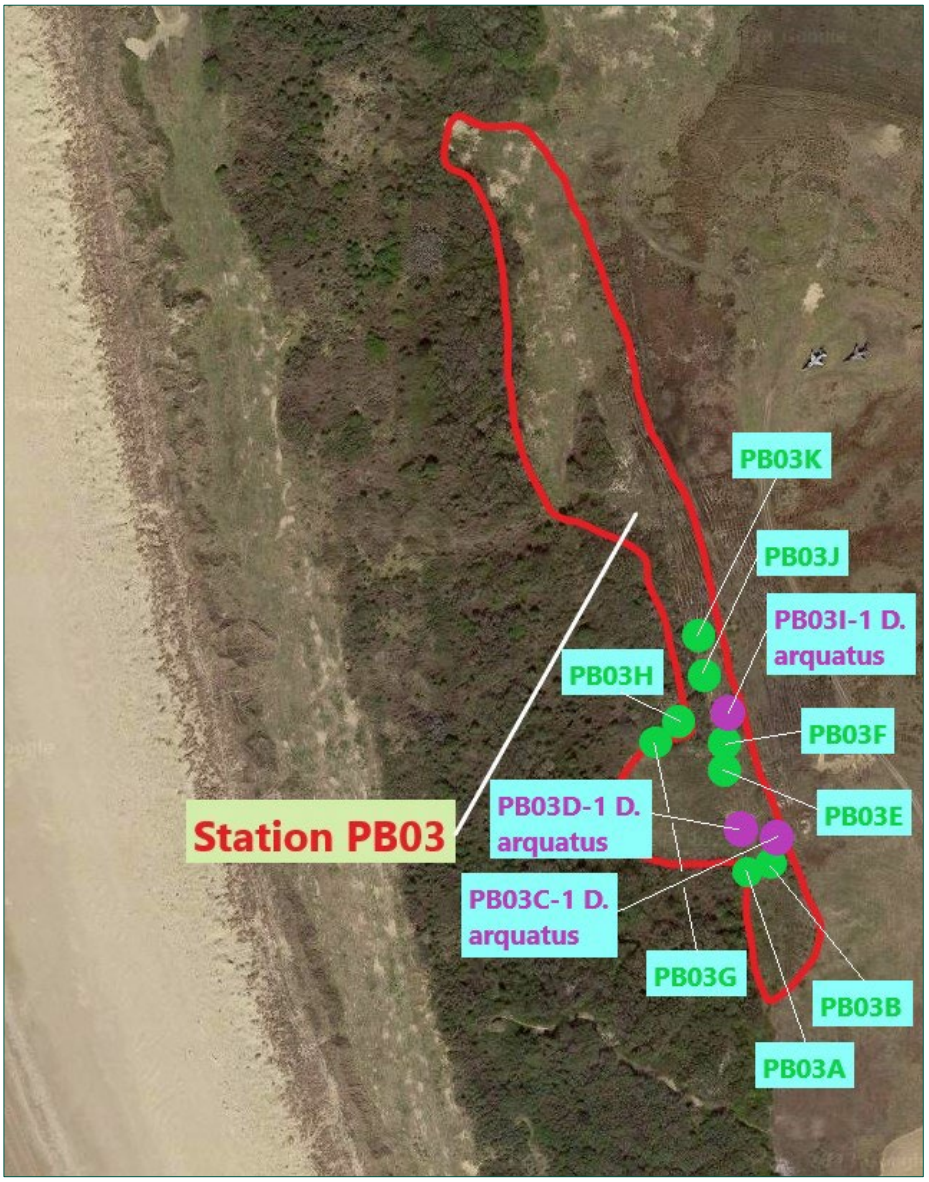

Figure 7. *Datonychus arquatus* records and habitat patches at sample Station PB03.

4. Discussion

The results of the 2022 survey demonstate that, using the criteria developed in the CO, the population of *D. arquatus* at Pembrey is in **Favourable** condition. This is thought to be a genuine result, with the recent management of the site being much more sympathetic to its needs. However, the extreme dryness of the slacks and the stunted growth form of many of the stands of Gipsywort (especially in more open fen) and linked to this, the lack of dune dynamism creating new areas of wet slacks, remain causes of concern.

Rotational cutting of areas of Grey Willow and Alder scrub within the four sample stations and elsewhere in the dense stands of scrub lying to the west of sample Station PB03 should be continued. Cattle grazing is helping to maintain a mosaic of edge habitats with

Gipsywort in sample Station PB04. However, many of the stands of this plant had been quite heavily grazed/trampled at the time of this survey and it might be desirable to remove stock in the late-summer period in order to allow the Gipsywort to flower and set seed.

The discovery of five *D. arquatus* along the boundary of this site with the NRW-owned forestry to the south and the presence of two further individuals under a dense Alder canopy in sample Station PB04 suggest that further investigation of wet woodland areas in Pembrey Forest could result in the discovery of further populations of this beetle. Survey should focus on stands of wetter Alder-Grey Willow carr (e.g. around the various pools within the forestry).

5. Acknowledgements

I would like to thank Mike Howe of NRW for setting up this contract and for much assistance in its planning and execution. Many thanks also to Mark Evans and Heather Young of Landmarc, Ministry of Defence, for facilitating safe access to the Pembrey Air Weapons Range.

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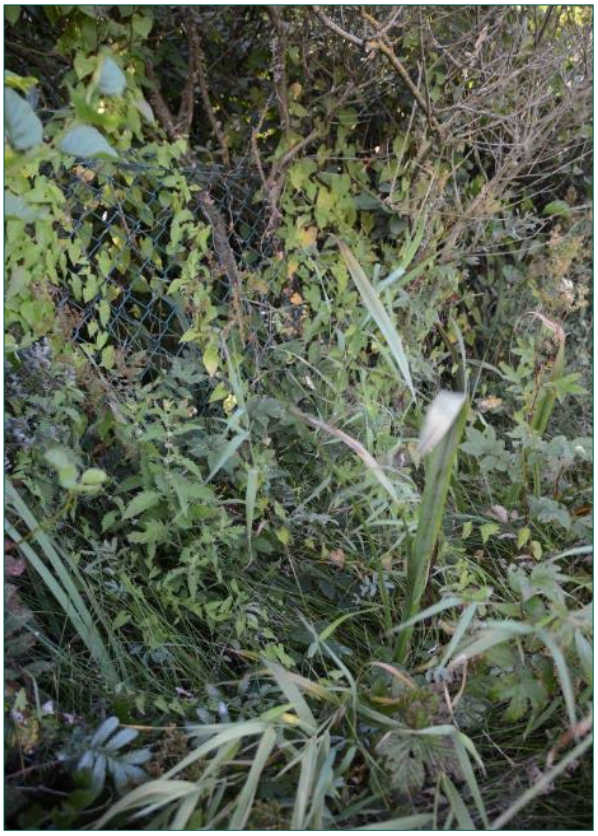
7. Appendix 1. Suitable habitat patches for *Datonychus arquatus* within the four samples stations at Pembrey in 2022.



A1.1. Habitat patch PB01A

A1.2. Habitat patch PB01B

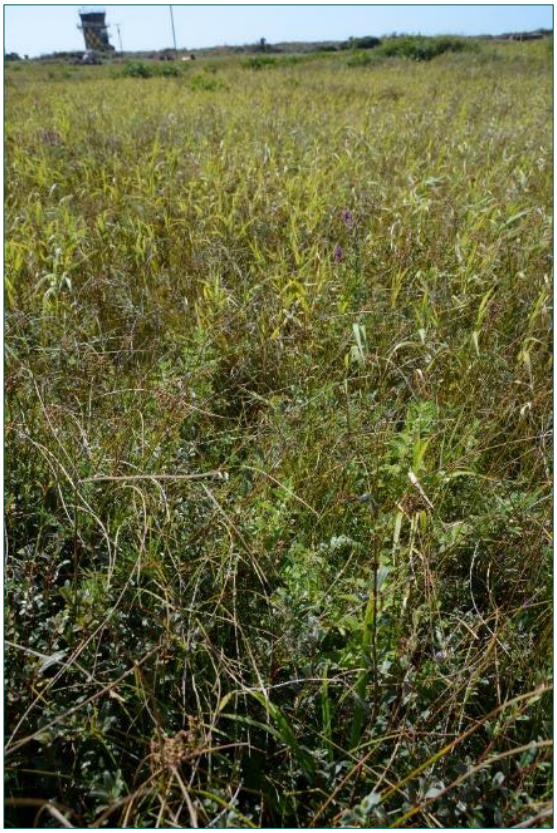
A1.3. Habitat patch PB01C

A1.4. Habitat patch PB01D

A1.5. Habitat patch PB01E

A1.6. Habitat patch PB01F

A1.7. Habitat patch PB02A



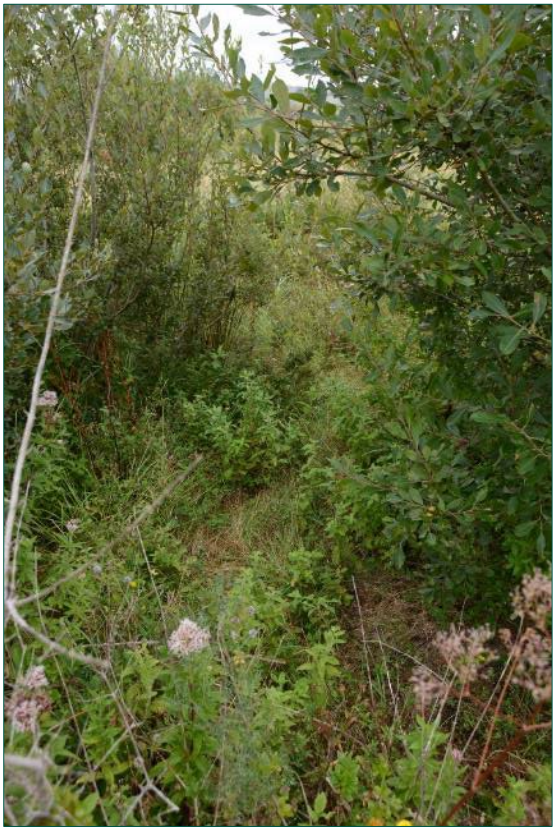
A1.8. Habitat patch PB02B

A1.9. Habitat patch PB02C

A1.10. Habitat patch PB03A

A1.11. Habitat patch PB03B

A1.12. Habitat patch PB03C



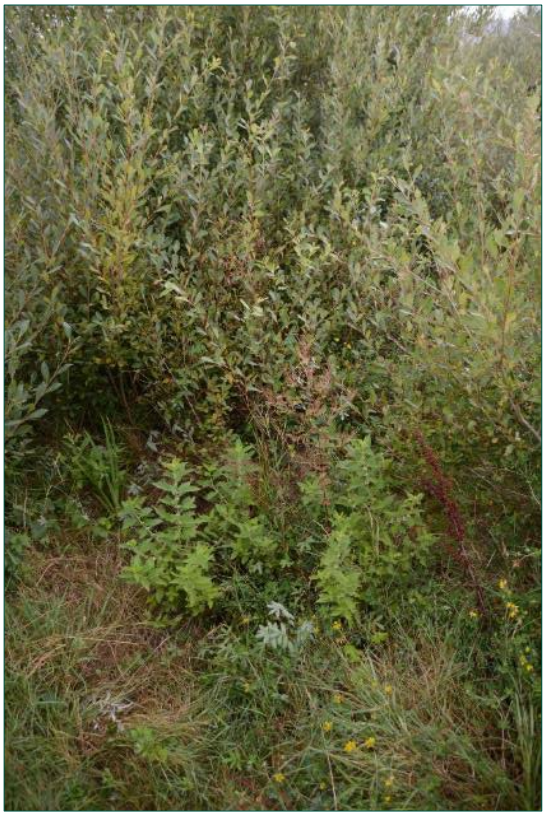
A1.13. Habitat patch PB03D

A1.14. Habitat patch PB03E

A1.15. Habitat patch PB03F

A1.16. Habitat patch PB03G

A1.17. Habitat patch PB03H



A1.18. Habitat patch PB03I

A1.19. Habitat patch PB03J

A1.20. Habitat patch PB03K

A1.21. Habitat patch PB04A

A1.22. Habitat patch PB04B

A1.23. Habitat patch PB04C

A1.24. Habitat patch PB04D

Data Archive Appendix

The data archive contains:

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

~~[B] A full set of maps produced in JPEG format.~~

~~[C] A series of GIS layers on which the maps in the report are based with a series of word documents detailing the data processing and structure of the GIS layers~~

~~[D] A set of raster files in ESRI and ASCII grid formats.~~

~~[E] A database named [name] in Microsoft Access 2000 format with metadata described in a Microsoft Word document [name.doc].~~

~~[F] A full set of images produced in [jpg/tiff] format.~~

[G] Species records held in Welsh Invertebrate Database (WID).

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue https://libcat.naturalresources.wales (English Version) and https://catllyfr.cyfoethnaturiol.cymru (Welsh Version) by searching 'Dataset Titles'. The metadata is held as record no. 125552.