Norfolk County Council

NORWICH WESTERN LINK ROAD

Desmoulin's Whorl Snail Report

70061370-09-15
JUNE 2021

PUBLIC

Norfolk County Council

NORWICH WESTERN LINK ROAD

Desmoulin's Whorl Snail Report

TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. 70061370-09

OUR REF. NO. 70061370-09-15

DATE: JUNE 2021

WSP

62-64 Hills Road
Cambridge
CB2 1LA

Phone: +44 1223 558 050

Fax: +44 1223 558 051

WSP.com

QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	First issue			
Date	30/06/2021			
Prepared by	TRA – Abrehart Ecology			
Checked by	UKSJM011			
Authorised by	UKIDE002			
Project number	70061370-09			
Report number	70061370-09-15			

CONTENTS

TABLES

APPENDICES

1. INTRODUCTION

1.1. PROJECT BACKGROUND

1.1.1. The Norwich Western Link Road (NWL) is a highway scheme linking the A1270 Broadland Northway from its junction with the A1067 Fakenham Road to the A47 trunk road near Honingham.

1.1.2. The NWL, hereafter referred to as the Scheme, will comprise the following listed below.

- Dualling the A1067 Fakenham Road westwards from its existing junction with the A1270 to a new roundabout located approximately 400m to the north west.
- Construction of a new roundabout.
- Constructing a dual carriageway link from the new roundabout to a new junction with the A47 near Honingham.

1.1.3. As part of a separate planned scheme, Highways England proposes to realign and dual the A47 from the existing roundabout at Easton to join the existing dual carriageway section at North Tuddenham. If that scheme proceeds, it is expected that Highways England will construct the Honingham junction and the Norwich Western Link will connect to the north-eastern side of that junction.

1.1.4. The Scheme will cross the River Wensum and its flood plain by means of a viaduct. The Scheme will also cross four minor roads by means of overpass or underpass bridges. The Scheme will include ancillary works such as provision for non-motorised users, necessary realignment of the local road network and the provision of environmental mitigation measures.

1.2. ECOLOGICAL BACKGROUND

1.2.1. Desmoulin's whorl snail *Vertigo moulinsiana* (hereafter referred to as *V. moulinsiana*) is a snail typically found in old or semi-natural open calcareous fen and wetlands, usually adjacent or close to rivers, streams, lakes and ponds. In the UK it is chiefly distributed in a broad band of country from central-southern England to East Anglia (Kerney, 1999). Outlying populations also exist in the midland meres, north Wales, and north Cornwall. Across its range the species has experienced significant reductions in its populations, several of which are no longer viable.

1.2.2. *V. moulinsiana* is categorised as Rare (category 3) in the UK Red Data Books (Bratton, 1991), and more recently has been classified as vulnerable on the IUCN based UK red list review (Seddon, et al., 2014). The species is listed in Annex II a of the European Community Habitats and Species Directive (92/43/EEC) and is a Natural Environment and Rural Communities (NERC) Section 41 'Species of Principal Importance in England' (replacing the UK BAP priority species in 2006). Since the designation of *V. moulinsiana* as a Priority Species in 1995, many surveys have been undertaken (summary details of some of these appear in Drake (1999)).

1.2.3. The requirement for *V. moulinsiana* survey was established in 2018 following identification, through a Desk Study (WSP UK Ltd., 2018), of the River Wensum Special Area of Conservation (SAC) which will be crossed by the Scheme. *V. moulinsiana* is a qualifying feature (S1016) (Code UK0012647) of the River Wensum SAC and as such it was considered important to understand its distribution in relation to the Scheme.

1.2.4. A targeted survey for *V. moulinsiana* was therefore undertaken by WSP UK Ltd in 2019 in order to provide baseline data regarding the presence and extent of this species within the vicinity of the Scheme (WSP UK Ltd, 2020). The Survey Area focussed on a stretch of the River Wensum SAC from TG 13741 15658 to TG 14141 15368 (British National Grid) and associated grazing marshes and ditches within the Scheme Boundary.

1.2.5. The survey identified the presence of *V. moulinsiana* within two ditches interspersing the grazing marshes associated with the River Wensum. Further survey work was therefore recommended to establish the wider context of the population recorded, specifically whether this population consisted of a single outlier population or part of a larger scattered population within the grazing marshes of the River Wensum valley.

1.3. BRIEF AND OBJECTIVES

1.3.1. In 2020, WSP UK Ltd was commissioned to undertake a survey for *V. moulinsiana* over an extended Survey Area in order to provide baseline data regarding the presence and extent of this species within the vicinity of the Scheme. To achieve this, the following objectives were set:

- Carry out an assessment of the suitability of habitats for supporting *V. moulinsiana* within the extended Survey Area detailed in Section 1.4 below;
- Carry out sampling in areas of suitable habitat to confirm the presence or likely absence of *V. moulinsiana*;
- To assess the status of *V. moulinsiana* populations where presence is confirmed; and
- Present the findings of the survey in a baseline report.

1.3.2. The methods and results of the *V. moulinsiana* survey are provided in this report and the subsequent assessment will be included within the Ecology Chapter of the Scheme Environmental Statement.

1.4. STUDY AND SURVEY AREA

STUDY AREA

1.4.1. An updated ecological Desk Study was completed in March 2020 to include recent data relevant to the Scheme.

1.4.2. The updated Desk Study defined Study Areas for *V. moulinsiana* as follows:

- Records of *V. moulinsiana* within 2km of the Scheme; and

- A search for statutory sites designated for *V. moulinsiana* within 10km of the Scheme.

1.4.3. These Study Areas are presented in **Error! Reference source not found.Error! Reference source not found.Error! Reference source not found.Error! Reference source not found.**.

SURVEY AREA

1.4.4. The Survey Area encompassed the River Wensum floodplain within the Scheme boundary which was subject to *V. moulinsiana* surveys in 2019 (WSP UK Ltd, 2020), as well as an extended area of the Wensum valley between St Margaret's Church track off the Fakenham Road to the north west of the Scheme to Ringland Road to the south east.

1.4.5. The 2020 Survey Area also encompassed a section of Foxburrow Stream, a tributary of the River Tudd which will also be crossed by the Scheme. The section of Foxburrow Stream flows east to west through an area of wet / marshy grassland in the southern aspect of the Scheme.

1.4.6. *V.* moulinsiana sampling locations within the Survey Areas discussed above are show in separate document Appendix B.

2. RELEVANT LEGISLATION

2.1. LEGAL COMPLIANCE

2.1.1. *V. moulinsiana* are afforded a high level of protection under Annex II of the Habitats and Species Regulations 2017 (the 'Habitats Regulations'). Under this legislation, it is an offence to;

- Deliberately capture, injure or kill a wild *V. moulinsiana*;
- Deliberately disturb wild *V. moulinsiana*; '*disturbance of animals includes in particular any disturbance which is likely:*

(a) to impair their ability —

(i) to survive, to breed or reproduce, or to rear or nurture their young; or
(ii) in the case of animals of a hibernating or migratory species, to hibernate or migrate; or

(b) to affect significantly the local distribution or abundance of the species to which they belong.'

- Damage or destroy a breeding Site or resting place used by this species.

2.1.2. Protection is also afforded under the Wildlife and Countryside Act 1981 (as amended) with respect to disturbance of animals when using places of shelter, and obstruction of access to places of shelter.

2.1.3. It is listed in the British Red Data Book (Bratton 1991) as an RDB3 (rare) species.

2.1.4. Due to the high level of protection afforded to *V. moulinsiana* and their habitat, mitigation for this species is governed by Natural England. No licence is required; however, SAC, SSSI, and Natural England consents will be required as part of the planning permission and must be obtained before mitigation is carried out. Works which do not require planning permission must still adhere to Natural England consents.

2.1.5. Consent is subject to three tests, as defined under the Habitats Regulations. These must also be applied by a planning authority before granting permission for activities affecting *Vertigo moulinsiana*. For permission to be granted the following criteria must be satisfied:

- The proposal is necessary *'to preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment'*;
- *'There is no satisfactory alternative'*; and
- The proposals *'will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'.*

2.1.6. *V. moulinsiana* are also listed as a Species of Principal Importance (SPI) for the Conservation of Biodiversity in England in accordance with Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. Under Section 40 of the NERC Act (2006) public bodies (including local planning authorities) have a duty to have regard for the conservation of SPI when carrying out their functions, including determining planning applications.

3. METHODS

3.1. OVERVIEW

3.1.1. The presence and distribution of *V. moulinsiana* was assessed using spot sampling undertaken in July, September and November 2020 across different parts of the Survey Area. In total, 101 sampling locations were subject to detailed survey.

3.1.2. All *V. moulinsiana* records collected during the 2020 surveys will be submitted to Norfolk Biodiversity Information Service (NBIS).

3.2. DESK STUDY

3.2.1. The updated ecological desk study, completed in March 2020, requested records of any notable or legally protected species, including *V. moulinsiana*, from within 2km of the Scheme were requested from the Norfolk Biodiversity Information Service (NBIS).

3.2.2. A review of the Multi-Agency Geographic Information for the Countryside (MAGIC) website (www.magic.defra.gov.uk) was completed to identify any statutory sites designated for *V. moulinsiana* within 10km of the Scheme.

3.3. FIELD SURVEY

3.3.1. The habitat preferences of *V. moulinsiana* at a broad level are known (Kerney, 1999). For example, in general the snail prefers *Carex* vegetation and 'swampy' conditions. However, the specific and fine-scale habitat preferences and thus the optimal biotic and abiotic conditions for the species are not known. As a result, surveying potentially unsuitable habitat is often undertaken to ensure a robust assessment as occasionally *V. moulinsiana* can be found in other habitats. This also contributes to improving assessment knowledge for the species which can be applied to other sites. A high degree of surveyor experience was therefore used to assess habitat suitability and select sampling locations.

3.3.2. The presence and distribution of *V. moulinsiana* was assessed using spot sampling undertaken in July, September and November 2020. At each sampling location two sub-samples of terrestrial molluscs were taken, described as samples A and B. Duplicating sampling in this way minimises the risk that, where present at a given sampling location, *V. moulinsiana* might not be detected.

3.3.3. The mollusc community was sampled using a non-destructive method. A white plastic tray (40cm x 60cm) was held near the base of the vegetation and the vegetation was bent over the tray and shaken vigorously. Adult *V. moulinsiana* snails were identified and separated from other molluscs by the presence of a developed lip and apertural teeth in the shell and then they were counted. All other terrestrial molluscs present were noted and quantified. Once this analysis was complete animals were returned to their origin.

3.3.4. *V. moulinsiana* can be easily identified in the field and as such no samples needed to be retained.

3.3.5. At each sampling location, a minimum of five minutes was spent to record all molluscs and vegetation within an area of one metre from a centre point.

3.3.6. At each sampling location, several environmental and biotic variables were recorded at the sampling locations:

- Canopy cover (shade) (Table 3-1);
- Average height of the vegetation;
- Vegetation composition – DAFOR scale; and
- Moisture content of the soil (Table 3-2)

Table 3-1 – Canopy Cover Classes

Canopy cover	Percentage
1	0-20%
2	21-40%
3	41-60%
4	61-80%
5	81-100%

Table 3-2 – Soil moisture classes

Soil Moisture Classes	Description
1 – Dry	No visible moisture on ground surface.
2 – Damp	Ground visibly damp, but water does not rise under pressure.
3 – Wet	Water rises under light pressure.
4 – Very wet	Pools of standing water, generally less than 5cm deep.
5 – Site under water	Entire Sampling Location in standing or flowing water over 5cm deep.

BOTANICAL ASSESSMENT

3.3.7. Quadrats were used to assess the composition of vegetation around each mollusc sampling location.

3.3.8. The percentage cover of vegetation was recorded within each quadrat. In addition to this, other biotic and abiotic factors were also recorded including:

- Open water;
- Litter depth;
- Field layer;
- Vegetation height;
- Slope;
- Aspect; and
- NVC community.

3.3.9. In this sample-site specific survey, the emphasis was on covering the area immediately around the mollusc sampling locations and detecting as many plant species as possible.

3.3.10. In this sample-site specific survey, the emphasis was on covering the area immediately around the mollusc sampling locations and detecting as many plant species as possible.

Table 3-3 - Vegetation classes

Vegetation Classes	Description
Class I	Tall *Carex* species, *Cladium mariscus* *Glyceria maxima*
Class II	*Equisetum fluviatile* *Phragmites australis*
Class III	*Juncus subnodulosus* *Mentha aquatica* *Angelica sylvestris*
Class IV	*Urtica dioica* *Eupatorium cannabinum* and all other species

Vegetation cover within each quadrat was assessed as follows:

- D – Dominant (over 70% cover)
- A – Abundant (50-70% cover)
- C – Common (30-50% cover)
- F – Frequent (10-30% cover)
- O – Occasional (3-10% cover)
- R – Rare (less than 3% cover)

3.3.11. The exact mid-point of a quadrat was located by GPS co-ordinates at ten figure grid references.

3.4. DATES OF SURVEY AND PERSONNEL

3.4.1. The recommended survey period for *V. moulinsiana* is from mid-late summer into the autumn inclusive (Killeen I.J., 2000), following the main reproductive period; however, this species does breed throughout the year, with juveniles present in samples across all seasons meaning that *V. moulinsiana* can be successfully detected at any time of year. The surveys should be carried out before the first frosts of the autumn, before the main vegetation has started to collapse and whilst the conditions are not too wet. This avoids excessive disturbance to the habitat.

3.4.2. The surveys were led by a Suffolk-based mollusc surveyor and nationally recognised Vertiginidae specialist, who is also a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM).

3.4.3. The Survey Area was initially visited on 20 July 2020 to undertake a habitat assessment and sampling at Foxburrow Stream, as well as a section of ditch within the Wensum floodplain just to the south of the Scheme adjacent to Low Farm. Follow-up visits were then carried out on 22 and 23 September 2020 to undertake a habitat assessment and limited sampling across the wider Wensum valley between St Margaret's Church track off the Fakenham Road to the north west of the Scheme to Ringland Road to the south east, with a return visit made on 24 and 25 November 2020 to undertake more extensive sampling.

3.5. NOTES AND LIMITATIONS

3.5.1. Sampling across the wider Wensum valley between St Margaret's Church track off the Fakenham Road to the north west of the Scheme to Ringland Road to the south east was planned for the optimal season; however, prolonged dry weather leading up to the proposed survey dates in September potentially reduced the suitability of the habitat. As such, a decision was made to delay the majority of sampling till November in order to allow a wetter period to promote breeding across the site and *V. moulinsiana* emergence from deeper grass layers. These later surveys (November 2020) followed a period when there had been considerable flooding in the previous week. However, given that *V. moulinsiana* were recorded in two locations within the Scheme boundary, and that a large new population was discovered, it is unlikely that any populations were missed. There remains a low risk though that small numbers of this species were not detected in some sampling locations.

4. RESULTS

4.1. OVERVIEW

4.1.1. *V. moulinsiana* was confirmed to be present at sixteen sampling locations across the Wensum valley between St Margaret's Church track off the Fakenham Road to the north west of the Scheme to Ringland Road to the south east. This indicated the presence of a large population within the floodplain north of Ringland Road situated to the south east of the Scheme. The continued presence of *V. moulinsiana* was also confirmed in the floodplain ditches within the Scheme Boundary as recorded in 2019 (WSP UK Ltd, 2020).

4.2. DESK STUDY

4.2.1. No records of *V. moulinsiana* were returned by NBIS within a 2km radius of the Study Area.

4.2.2. Two statutory sites designated for *V. moulinsiana* were identified within 10km of the Scheme. These are:

- The River Wensum SAC for which *V. moulinsiana* is a qualifying feature (S1016) (Code UK0012647), which the Scheme crosses; and
- The Norfolk Valley Fens SAC (Code UK0012892) which is approximately 6.2km north-east of the Scheme, for which *V. moulinsiana* is a primary reason for selection of the site.

4.2.3. Given the limited mobility of the species the population present within the Norfolk Valley Fens SAC will not be impacted by the Scheme, however the 10km Study Area allowed a wider view of the distribution of this species in the local area.

4.3. FIELD SURVEY

4.3.1. The Survey Area incorporated the 2019 Survey Area, as well as an extended area of the Wensum valley between St Margaret's Church track off the Fakenham Road to the north west of the Scheme to Ringland Road to the south east

4.3.2. The Survey Area also encompassed a section of Foxburrow Stream, a tributary of the River Tudd which will also be crossed by the Scheme to the south.

4.3.3. The Wensum valley Survey Area has been divided into three sections for reporting. The northern section (samples September 20-36 and November 48-77), the south-eastern section (north) (samples September 1-14), and south-eastern section (south) (samples September 15-18, November 1-47).

HABITAT ASSESSMENT

Wensum Valley - Northern Section

4.3.4. This part of the Survey Area incorporated the northern most extent of the Wensum floodplain which is intercepted by the Scheme Boundary (see separate document Appendix B.2).

4.3.5. The habitat in the northern section comprised a species poor *Lolium* ley grazing marsh situated to the west of the River Wensum, while to the east were areas of drier taller herb community dominated by *Arrhenatherum elatius* considered unsuitable for *V. moulinsiana*.

4.3.6. All of the floodplain ditches within this section, as well as the margins of the River Wensum were assessed for their potential to support *V. moulinsiana*.

4.3.7. The ditches ranged in width from 3-4m with the central ditch running parallel with the River Wensum being over 6m wide at bank top. The vegetation within ditches was a mosaic of *Glyceria maxima* and *Carex riparia* with smaller quantities of *Phalaris arundinacea*. Only two ditches to the north of the Scheme boundary were considered suitable to support *V. moulinsiana*, though both were heavily grazed from both sides at the time of survey, reducing the amount of suitable habitat. All the ditches further north of these were unsuitable, being overgrazed or too narrow.

4.3.8. An assessment of the river margins identified no suitable habitat for *V. moulinsiana*. Although there were several small stands of *Glyceria maxima* along the river margins, all of the stands were flat at the time of survey with their location adjacent to the river which is subject to fluctuations in water levels making them unsuitable for *V. moulinsiana*.

4.3.9. A small poplar plantation situated adjacent to the sou*thern bank of th*e River Wensum supported an area of potentially suitable Carex riparia habitat covering approximately 0.25 hectares (ha). At the time of the survey (Novembe*r) this was we*t and inundated with 15-30cm of water. In much of the rest of the year this will have been much lower. The vegetation in the understorey of the plantation was dominated by *Carex riparia,* which was at a light density, as would be expected in a plantation, with *Urtica dioica* on the dryer sections closer to the river. At the outer western and southern margins of the plantation *Carex riparia* formed hover habitat over a ditch. The sward here was denser though grazing from the marsh sides reduced habitat suitability. The poplar plantation created significant shade for much of the habitat, except along the outer margins to the south and west.

Wensum Valley - South-eastern Section (North)

4.3.10. This part of the Survey Area incorporated land to the east the River Wensum which encompassed part of Wensum Valley Golf Club (see separate document Appendix B.3). The habitat here was dominated by well-maintained amenity grassland with large unmanaged waterbodies and river margin.

4.3.11. The margins of the golf course waterbodies, as well as the eastern margin of the River Wensum were assessed for their potential to support *V. moulinsiana*.

4.3.12. The waterbody margins within the golf course often supported a dense sward of *Carex riparia* and *C. acutiformis*. All of the margins were considered unsuitable to support populations of *V. moulinsiana* as the habitat was very narrow (30cm to 50cm wide). After this, the water depth rapidly increases allowing for a very narrow margin of suitable habitat.

4.3.13. The margin of the River Wensum was dominated by *Phalaris arundinacea* and *Glyceria maxima*, with small stands of *Sparganium erectum* and *Carex riparia*. The hover margins ranged from 1-3m wide out into the river channel.

4.3.14. Of this habitat, only the marginal 1m (habitat directly adjacent the main channel) was considered to have potential to support *V. moulinsiana*, with the remainder being too dry to support the species for much of the year due to lower water levels in the river channel.

Wensum Valley - South-eastern Section (South)

4.3.15. This part of the Survey Area incorporated land to the west of the River Wensum which supported a range of grazing marshes, with a less intense grazing regime allowing for longer fen habitats to establish (see separate document Appendix B.3). Across this part of the survey area, the ditches were often choked with *Glyceria maxima* or *Carex riparia*. Many of the choked ditches, though supporting suitable plants species to support *V. moulinsiana*, were heavily grazed.

4.3.16. All of the ditches within this section were assessed for their potential to support *V. moulinsiana*.

4.3.17. The ditches were generally around 4m wide ranging in depth from 0.5 to 1m. A large proportion of the ditches were grazed from both sides by cattle or sheep, with very little habitat that was not accessed by livestock. Where the grazing was limited, the ditches supported a higher density of *Sparganium erectum* (not suitable for *V. moulinsiana*). The vegetation communities were very similar across the site with *Carex riparia, Glyceria maxima* and *Phalaris arundinacea* being prevalent. The wider, deeper ditches with a low to moderate flow supported a higher density of *Sparganium erectum*, but often there would be stands of Glyceria or Carex scattered throughout.

4.3.18. In two areas were stands of *Carex riparia*, both close to the River Wensum. The marsh at TG 1453 1438 was an area that appeared to be managed as reversion to flood meadow fen habitat, with a light sward of *Carex acutiformis* and a number of less common herb species developing. The vegetation was not dense and there was no thatch understorey. Although it was flooded at the time of the assessment, it obviously was not wet for much of the year. In addition, it was managed by mowing and hay removal. This would affect the potential for it to be able to support *V. moulinsiana*.

4.3.19. The other area of suitable habitat was from TG 1430 1372 to TG 1458 1409. There were a series of wet *Carex riparia* beds scattered through this zone, and areas of *Agrostis stolonifera, Festuca rubra* and *Deschampsia caespitosa* between them. These stands were wet at the time of the survey and had a layer of thatch and tussocks. This was deemed of low suitability; however, the stands of Carex had potential to support *V. moulinsiana*.

Foxburrow Stream

4.3.20. This part of the Survey Area incorporated Foxburrow Stream which flows west to east adjacent to Foxburrow Plantation in the southern aspect of the Scheme (see separate document Appendix B.4).

4.3.21. The area to the east of the stream was dry with limited habitat of grazed rough grasslands on sandy soils with only very small areas of damp habitat.

4.3.22. The stream was steep sided and with species-poor emergent vegetation. The base of the stream was shallow and gravelly.

4.3.23. The area to the west of the stream was dominated with wet flushes. The southern flush was dominated with *Juncus subnodulosus* and *Holcus lanatus*. A number of wetland forbs were present, including *Lychnis flos-culi, Lotus pedunculatus* and *Cirsium palustre*.

SAMPLING

Wensum Valley - Northern Section (samples July 1-8, September 20-36 and November 48-77)

4.3.24. A total of ten ditches were sampled in this part of the Survey Area, as well as the margins of the River Wensum and small poplar plantation.

4.3.25. Sampling in the central ditch within the Scheme boundary recorded the continued presence of *V. moulinsiana*. Samples taken from the same location as 2019 recorded a total of 49 adults, compared to 106 in 2019 (WSP UK Ltd, 2020) (see separate document Appendix C.1). Sampling in a further ditch within the Scheme boundary which extended towards the south from the central ditch also recorded *V. moulinsiana*, with a single adult recorded in both sampling locations (see separate document Appendix C.1). Sampling undertaken in this ditch in 2019 did not record any *V. moulinsiana*.

4.3.26. Sampling within ditches as well as the margins of the River Wensum and small poplar plantation to the north of the Scheme boundary did not record any *V. moulinsiana*. This included a ditch approximately 80m north west of the Scheme boundary which supported *V. moulinsiana* in 2019 (WSP UK Ltd, 2020). No *V. moulinsiana* were also found in the ditch to the south of the Scheme adjacent to Low Farm.

Wensum Valley - South-eastern Section (North) (samples September 1-14)

4.3.27. Samples were taken in all suitable and some unsuitable habitat along the edge of the river and across the golf course waterbody margins.

4.3.28. Sampling along the main river marginal habitats recorded a very limited mollusc fauna, with only three species present (*Galba truncatula, Succinea putris,* and *Deroceras laevae*).

4.3.29. Sampling across the golf course waterbody margins recorded a very limited mollusc fauna with only *Succinea putris* and a single *Galba truncatula* present. These snails are common wetland species.

4.3.30. No *V. moulinsiana* were recorded within the south-eastern section.

Wensum Valley – South-eastern Section (South) (samples September 15-18, November 1-47)

4.3.31. Several ditches were sampled within this section of the Survey Area, all of which were in a mid to late successional stage. A number of samples were taken, all of which were of the same species-poor mollusc community of *Galba truncatula, Succinea putris*, and occasional *Ashfordia granulata*.

4.3.32. A total of 20 samples were also taken across the southern *Carex* beds with *V. moulinsiana* recorded in 13 of these, ranging from a single specimen to 36 in a sample (see separate document Appendix C.2). All samples taken were small to not disturb the greater population. The main areas supporting *V. moulinsiana* were the *Carex* beds. Notably, significant numbers of *V. moulinsiana* were recorded within the *Deschampsia caespitosa, Festuca rubra* and *Agrostis stolonifera* that formed the vegetation community in between the *Carex* beds. This is an unusual habitat for *V. moulinsiana* and could indicate the potential for a wider distribution within this section of the site.

4.3.33. In these *Carex* bed samples, the general mollusc community was by far the richest within the Survey Area, with up to six species present. With the exception of *V. moulinsiana*, none of the species were of conservation significance, though of interest were good numbers of *Euconulus alderi* and *Ashfordia granulata*.

Foxburrow Stream (samples July 9-18)

4.3.34. The emergent vegetation was sampled and found only to support *Succinea putris* and *Deroceras laeve*.

4.3.35. The wet flushes to the south west were also sampled and no *V. moulinsiana* were recorded. The only species of note were *Vertigo substriata* and *Ashfordia granulata*. The presence of *Vertigo substriata* indicates that the habitat is too dry to support *V. moulinsiana*. Results from these samples also indicated that the habitats were too regularly managed to support *V. moulinsiana*.

5. REFERENCES

5.1. PROJECT REFERENCES

WSP UK Ltd. (2018). *Ecological Desk Study.* London.

WSP UK Ltd. (2020). *Interim Desmoulin's Whorl Snail Survey Report* Cambridge.

5.2. TECHNICAL REFERENCES

Abrehart Ecology, 2017. *Desmoulin's Whorl Snail (Vertigo moulinsiana) Article 17 Condition Assessment of River Wensum SAC for Natural England,* Suffolk: Abrehart Ecology.

Bratton, 1991. *Red Data Book of British Invertebrates,* London: Joint Nature Conservation Committee.

CIEEM, 2019. *Advice Note on the Lifespan of Ecological Reports and Surveys,* Winchester: CIEEM.

Drake, C. M., 1999. A review of the status, distribution and habitat requirements of Vertigo moulinsiana in England. *Journal of Conchology,* Issue 36, pp. 63-79.

Kerney, M. P., 1999. *Atlas of land and freshwater molluscs of Britain and Ireland,* Colchester: Harley Books.

Killeen, I. J., 2000. Monitoring Desmoulins Whorl Snail. *Monitoring series No. 6.*

Killeen, I. J., 2001. Surveys of EU Habitat Directive Vertigo species in England: 3. *Vertigo moulinsiana Part 7: The River Wensum cSAC.*

Seddon, M. B., Killeen, I. J. & Fowles, A. P., 2014. A Review of the Non-Marine Mollusca of Great Britain: Species Status No. 17. In: *NRW Evidence Report No: 14.* Bangor: Natural Resources Wales, p. 84.

Appendix A

DESMOULIN'S WHORL SNAIL STUDY AREA

Appendix B

DESMOULIN'S WHORL SNAIL SAMPLING LOCATIONS

Appendix B.1

SAMPLING LOCATIONS (OVERALL)

Appendix B.2

SAMPLING LOCATIONS (NORTHERN SECTION)

Appendix B.3

SAMPLING LOCATIONS (SOUTH-EASTERN SECTION (NORTH & SOUTH))

Appendix B.4

SAMPLING LOCATIONS (FOXBURROW STREAM)

Appendix C

DESMOULIN'S WHORL SNAIL RESULTS

Appendix C.1

RESULTS (NORTHERN SECTION)

Appendix C.2

RESULTS (SOUTH-EASTERN SECTION (SOUTH))

62-64 Hills Road
Cambridge
CB2 1LA

wsp.com