2022 Addendum to Vertigo moulinsiana surveys of Sturry Marshes, Sturry, Kent report.

Carried out for:

Project Centre

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Executive summary

Abrehart Ecology Ltd were commissioned by the Project Centre to survey for the presence and abundance of Desmoulin's whorl snail, *Vertigo moulinsiana*, for the A28 Sturry Link Road site in Sturry Kent.

The aim of the survey detailed in this report was to ascertain whether *Vertigo moulinsiana* was still present in previously recorded areas of marsh at the survey site and to record their abundance and distribution across the survey site. This can then be used to inform future development adjacent to the survey site and be used to prepare an enhancement and management strategy for the habitat and its mollusc community.

A walkover survey was carried out in October 2022 to re-assess the distribution of *Vertigo moulinsiana* at the survey site in Sturry Marshes. These marshes were first surveyed in 2015 to inform Land at Sturry Planning Application (CA/20/02826). In 2019 and 18th November 2021the marshes were resurveyed for the Sturry Link Road project. All the suitable habitat was re-surveyed including the areas where *Vertigo moulinsiana* had not been found for six years. *Vertigo moulinsiana* was re-found in the larger area of around 0.64ha, this land was south of the railway line and *Vertigo moulinsiana* was recorded at low numbers. This increases the habitat suitable to support *Vertigo moulinsiana* to just over 0.84 ha at the survey site. This is important in the larger context of the Stodmarsh SAC and Ramsar boundary, this extends the known habitat able to support *Vertigo moulinsiana* 1.2km to the west. The survey site marshes are functionally linked by the River Stour and to the rest of the Stodmarsh SAC to the east. During flood events there could possibly be an exchange between the two populations, or there could be a yet undiscovered population to the west of the survey site. The nearest population that is known of is from Unit 1 of the Stodmarsh SSSI, in the western arm of Westbere Lakes gravel pit/rowing lake. Here it is found in the flooded sedge beds along the sides of the quarry.

The suitable habitat on the survey site ranges from *Phragmites australis* (poor habitat) with an understory of *Carex riparia* (moderate habitat), leading into *Carex riparia* (good habitat) beds, and then into outer reaches of *Carex acuta* (Poor /moderate habitat) on the southern edge of the main survey site. The ditch supports a range of habitats, but it is dominated by *Phragmites australis* (poor habitat) in the north, with *Glyceria maxima* (good habitat) along most of the ditch, and areas of *Berula erecta* (poor to moderate habitat).

In the 2022 survey, one hundred and twenty four terrestrial mollusc samples were examined for *Vertigo moulinsiana*; these were from the two main areas of the original survey area where *Vertigo moulinsiana* was found in 2015. This was focusing on the hover vegetation of the ditch and habitat south of the railway track.

The 2022 survey confirmed the continued presence of *Vertigo moulinsiana* in 23 samples across seven transects running south from the railway track. In addition, *Vertigo moulinsiana* was found in all four transects running east to west across the main ditch.

The north-south ditch water level in 2022 was at least 30cm lower than in the last survey in 2021. The 2022 summer was long hot dry summer (May – August) and little rain to recharge the marshes, this is the main reason for the changes on survey site. The population in the ditch was lower than in 2021, though it still covered approximately 380m².

The area close to the railway track was still very dry with little to no moisture noticeable underfoot; however, *Vertigo moulinsiana* was found in seven transects in very low numbers. The continued survival, in an area previously thought to have been lost, is a gain of approximately 5231m².

In a national context this population is small to moderate covering 0.5ha, with an average density of 1.5 animals per positive sample giving an approximate total of around 8,000 *Vertigo moulinsiana* on the survey site. Given that this species can occur at densities of over 4,000 per m², this is not a large, densely populated habitat.

1. Methods

Background information

Desmoulin's Whorl Snail *Vertigo moulinsiana* (Dupuy, 1849) is a small snail found mostly 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). Populations are known to exist within the Stodmarsh Special Area of Conservation (SAC), Ramsar Site and Site of Special Scientific Interest (SSSI). This is the main area supporting *Vertigo moulinsiana* in Kent, there are a small number of additional records from near Maidstone and Folkestone.

It was categorised as Rare (category 3) in the UK Red Data Books (Bratton, 1991), and more recently as Vulnerable on the IUCN-based UK red list status review (Seddon et al., 2014). The snail is listed on Annex IIa of the European Community Habitats and Species Directive (92/43/EEC) and is also an English Section 41 'Species of Principal Importance'.

In Britain *Vertigo moulinsiana* is locally distributed across southern and eastern England from Dorset to north Norfolk and Shropshire with a few isolated colonies elsewhere. It had not been recorded in Kent until August 1999 when specimens were found in a grazing marsh ditch on Westbere Marshes. Westbere marshes are the western portion of the Stodmarsh Special Area of Conservation (SAC), Ramsar Site and Site of Special Scientific Interest (SSSI). A brief survey was carried out in 1999 (Killeen) to determine the size and extent of the *Vertigo moulinsiana* population, principally in the area of its initial discovery and also on potentially suitable habitats nearby. In 2014 an Article 17 survey was carried out for Natural England of Westbere Marshes in 2014, with additional privately funded surveys of the lake edges at Westbere in 2018; all these later surveys were carried out by Abrehart Ecology limited.

At the survey sites within the Stodmarsh SAC, *Vertigo moulinsiana* was found scattered in low numbers mainly within the *Carex riparia*, *Carex paniculata* and *Glyceria maxima* stands around the water bodies and within the marshes. All the habitat at Westbere is unmanaged currently, with beavers creating new habitat in the east of the survey site.

Prior to the 2015 survey, *Vertigo moulinsiana* had not been recorded from the section of marsh at Sturry under current investigation. To make this survey as repeatable as possible, samples were surveyed in several small transects across the marshes leading south from the railway track and along the river margin where suitable habitat existed - as in the 2015 survey. In August 2019 a re-survey was carried out and only *Vertigo moulinsiana* was found in the north-south ditch. In February 2021 the last re-survey was carried out and found *Vertigo moulinsiana* in the ditch only. These surveys were to inform Land at Sturry Planning Application (CA/20/02826) and the 2019 and 2021 surveys were additionally to inform the Sturry Link Road project.

A condition assessment was carried out in 2015 at the survey site and repeated within this survey report. These surveys have shown that the survey site was, and still is, in an unfavourable condition. Management will be required to improve the habitat with the main issue identified as drying out of the marshes. Grazing had been reduced on the survey site in recent years and a more rank vegetation had developed. Although this had created a more suitable vegetation structure, the ground was still too dry. Overgrazing can reduce the density of the sward and create a less suitable habitat, the current low grazing is benefiting the habitat, but the low water levels are having a significant effect on the potential habitat and on the expansion of the population.

Objectives of the 2022 survey

Following on from previous surveys by Abrehart Ecology Ltd, a new survey was commissioned to carry out a full assessment of the survey site to ascertain if the extent had changed in the previous year and to offer habitat

improvements to the survey site.

Terrestrial mollusc sampling methods

The sampling strategy and recording procedure is designed to provide information on the population and distribution of *Vertigo moulinsiana*, including its finer scale distribution.

Survey methodology broadly followed the 'level 1' survey techniques detailed in Killeen & Moorkens (2003). Consequently, searches for *Vertigo moulinsiana* were carried out by the well-established technique of beating herbaceous fen vegetation onto a gridded white plastic tray.

1. Tray beating was undertaken in damp weather conditions. A gridded white beating tray measuring approximately 38cm x 54cm was used at selected locations. This allowed approximate *Vertigo moulinsiana* numbers per unit area to be estimated (5 trays being approximately equivalent to $1m^2$). At each sample location the beating tray was placed at the base of a fresh, undisturbed area of vegetation. These samples were within 5m of a single sampling point. All molluscs were recorded in the field with *Vertigo moulinsiana* numbers counted in the field to record numbers of adult and juvenile. Survey stations were selected at approximate 5m distance from the previous point in a transect until the habitat has become obviously unsuitable. In areas of low or lying flat vegetation beating was difficult, the vegetation here was shaken over sieve to try and release *Vertigo moulinsiana* from the vegetation.

2. Approximate area of occupancy was assessed with the use of a drone for mapping.

3. Degree of ground moisture (using a version of the '5 Point Wetness scale' of Killeen & Moorkens, 2003) was recorded at all survey sites:

1. Ground dry: Possibly with cracks, and no evidence of surface moisture.
2. Ground damp: Moisture observed on the surface, but water does not rise under light pressure.
3. Ground wet: No surface veneer, but water rises under light (foot) pressure.
4. Ground wet: Surface veneer of water less than 1-2cm deep
5. Ground very wet: Water depth greater than 2cm which may cover the sward and tussocks.

4. Dominant vegetation presence was recorded, noting particularly "+" and "-" *Vertigo moulinsiana* 'suitability indicators' (e.g. Carex sp., *Glyceria maxima* as "+" indicators and *Epilobium* sp. and *Urtica dioica* as "-");

5. Shading was not recorded as none was present.

6. Other potentially important survey site environmental and management details were recorded e.g. (i) grazing and/or ground poaching, (ii) recent cutting, (iii) human trampling.

Survey limitations

The survey limitations on the survey area were that the survey site was very dry following a long hot and dry summer. In previous surveys the survey site was wetter with areas being difficult to access due to higher water levels.

2. Results

Desmoulins Whorl Snail *Vertigo moulinsiana* was located at 55 of the 124 samples taken at Sturry Marshes, Kent on 10th October 2022. *Vertigo moulinsiana* was found in the two main areas on the survey site. The population was present in all four of the transects over the hydroseral/floating vegetation over the ditch. The ditch still held the dense hydroseral habitat and accessing the ditch was surprisingly easy with a 40cm lower water level. The vegetation supported the surveyors' weight and so a ladder was not needed in October 2022 to cross the ditch. The ditch level was lower in 2022, but still supported a water and mud layer, beneath the vegetation, of approximately 80cm. The habitats were broadly similar to previous surveys with a mosaic of *Typha latifolia, Sparganium erectum, Berula erecta, Carex riparia*, and *Glyceria maxima* across the ditch. The only main changes were the increase of *Urtica dioica* and *Cirsium arvense* indicating a drying community. The moisture was at level 4 - with water rising over the boot toes when pressed into the vegetation. *Vertigo moulinsiana* was found in the areas of the ditch with a deeper water level below it, but ranging from 10cm to 80cm deep, at a range of densities from 1-23 in a sample.

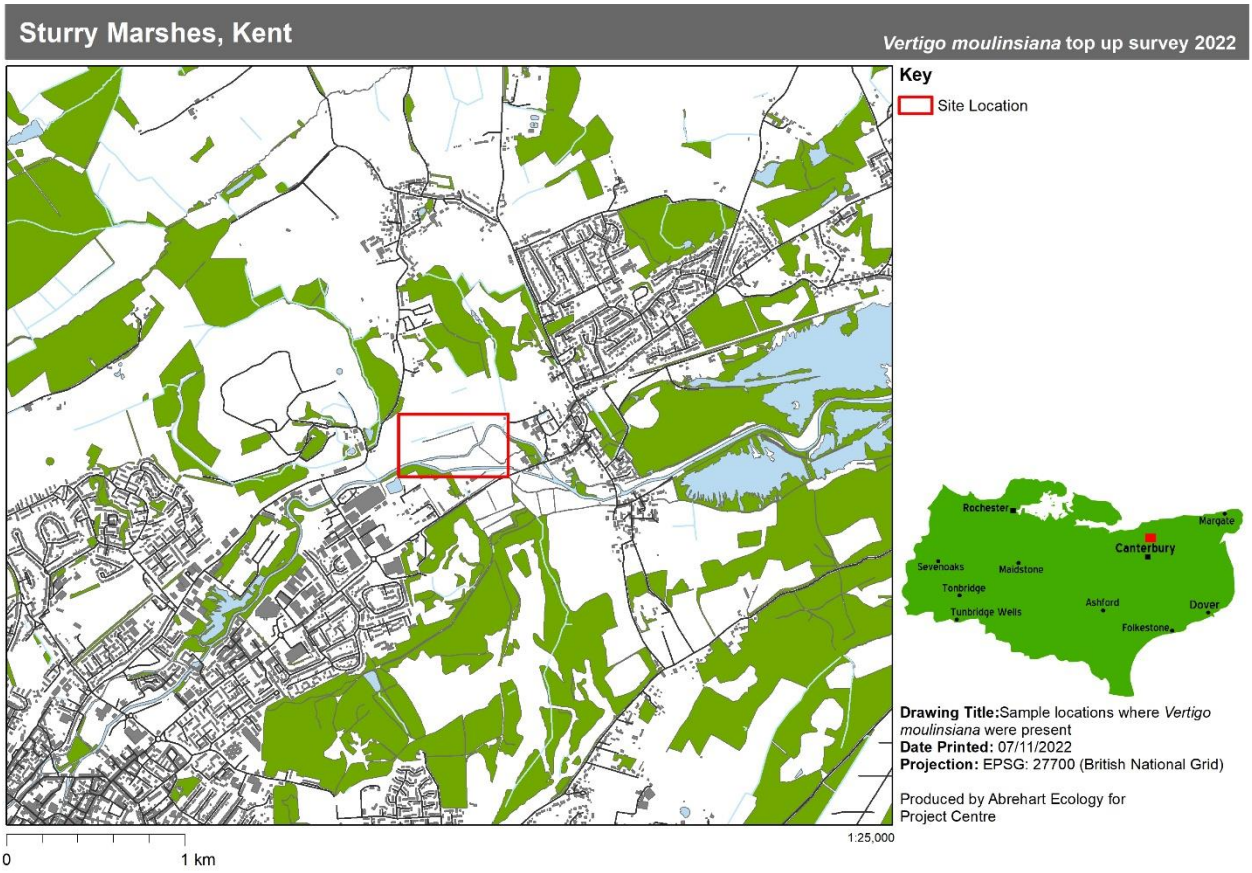

Figure 1; Overview of survey site

The whole area found to support *Vertigo moulinsiana* in 2015 has suffered a dry event over the past six years but was re-surveyed in 2019 and 2021. In the 2019 and 2021 surveys it was previously deemed too dry to support *Vertigo moulinsiana* and none were found in the habitat leading south of the railway track east and west of the main ditch. These were deemed not suitable to support the *Vertigo moulinsiana* at the time.

The *Carex riparia* community was becoming dominated by *Phragmites australis* with *Urtica dioica* and *Cirsium arvense* showing drying changes across the habitat. *Urtica dioica* and *Cirsium arvense* are classic indicators of a drying

marshy habitat.

A total of 29 samples within this section of the survey site were found to support *Vertigo moulinsiana* in low numbers, with both adult and juveniles present, showing a breeding event had occurred recently. Ninety-four samples were taken across the ten transects in this sampling round. Additional mollusc data was collected at the time, showing a depauperate mollusc community. The most common additional species was *Cepaea hortensis;* this was noted at low numbers. Only very low numbers of seven common wetland species were identified.

The survey was carried out at an appropriate time of year and there was only one limitations to the survey, the dry spell that had occurred in the southeast of England over the past two years, reducing available water levels on the survey site.

Vertigo moulinsiana survey results are displayed in Appendix A and photo of the best habitat is given in Appendix B.

Figure 2 Map of all transects carried out on Sturry Marshes in October 2022 with Vertigo moulinsiana presence recorded.

Table 1: Summary of Results - Sturry Marshes, Kent 2015-2022

Summary of results	October 2015	August 2019	December 2021	October 2022
No. of samples with V. moulinsiana	18	6	17	55
Total No. of V. moulinsiana	91	493	165	224
Mean no. per sample	5	82	6	4
Range	1-14	9-265	1-41	1-23
Total no. of adults	28	153	85	49
Mean no. per sample	1.5	25	7	1.5
Range	1-9	2-85	1-26	1-5
Total no. of juveniles	63	340	80	175
Mean no. per sample	3.5	57	5	4
Percentage of adults	25%	45%	52%	22%

3. Discussion

The original 2015 transects were re-surveyed during all three of the previous surveys. It was only the 2022 survey that showed that the habitat still supported *Vertigo moulinsiana*. The 2019 and 2021 surveys did not find any *Vertigo moulinsiana*. In the current 2022 survey the transects running south from the railway line (Transects 1-10) supported low numbers of *Vertigo moulinsiana* in seven of the transects. No more than four animals were found in any of these samples. This shows that *Vertigo moulinsiana* may well have been present since 2015 in very low numbers and survived at a very low density until the habitat became wetter, or had been able to adapt to drier than normal habitat for the species. Although it has been very dry over the summer of 2022, species ability to cope with a variety of low moisture levels is probably due to the species plasticity to survive habitats in a suboptimal condition until it becomes more suitable.

The four transects across the main *Vertigo moulinsiana* ditch showed that it still supported a healthy population, although this was still very limited in extent. The ditch water level was around 40cm lower than in 2021, creating a reduced area of suitable habitat. The hydroseral/floating vegetation was still present over the whole ditch and unlike in 2021 (where a ladder was laid across to sample) it was possible to walk across the hover habitat without getting wet feet.

The water quality testing has shown that the *Vertigo moulinsiana* ditch had similar water quality to the nearby larger habitats at Westbere lakes and marshes on the western end of the Stodmarsh SAC. pH range was 7-7.6, mS 0.41-1.1, ppm 293-667, calcium 88-104mg/l $Ca^{2}+$ and low phosphate levels 0.04-0.09 $PO4^{3}-$.

The re-finding of the low-level population in the marshes to the west of the main ditch indicates that there is potential to improve this habitat with a more stable water regime. It appears that *Vertigo moulinsiana* can survive at a low density when the habitat is unsuitable.

Vertigo moulinsiana was found in low numbers, with both adult and juveniles present, showing a breeding event had recently occurred.

The survey was carried out at an appropriate time of year and there were no limitations to the survey excepting the dry spell that had occurred in the southeast of England over the past two years, reducing available water levels on the survey site.

As part of the previous survey for the presence absence of *Vertigo moulinsiana* an additional piece of work was undertaken to assess the ditch profile and water depth under the floating surface vegetation across the four transects. This was to gain an understanding of what profile may need to be recreated during the potential mitigation phase at the survey site. The profiles were revisited, and they had not changed in the previous year.

Enhancement and management

It is proposed the phased clearance and widening of up to a 90m length of the late successional and overgrown ditch that supports the densest *Vertigo moulinsiana* colony. This would improve the ditch's water retention capacity and encourage colonisation by wetland plants to enhance its suitability for the snails. Ditch clearance would have been undertaken in a phased manner and under the supervision of a mollusc expert to ensure that the existing population is protected during the works.

However, Natural England's comments on this proposal have resulted in a change to the details of the proposed enhancement works. The works will now involve restoring the ditch systems in which the snail was found previously on the site first. This will be done by creating spurs (short 15m sections of new ditch leading at right angles from the main ditch connected) leading from the main *Vertigo moulinsiana* ditch. The new ditch spurs will be profiled to create a shallow banking margin and a minimum of 1m depth in the centre with a bank top width of over 8m, therefore increasing the potential habitat area within the overall wetland habitat mitigation area.

Vegetation from the main *Vertigo moulinsiana* ditch will be placed on the banks sections of the banks of the new ditch spurs to kick start the establishment of the suitable *Vertigo moulinsiana* habitat. Once it has been confirmed through annual monitoring surveys that the new habitats are colonised with a stable, established population, habitat enhancement works in the form of reprofiling the ditch banks within the ditch where the snails are currently located will be undertaken. Following a telecon between KCC and NE on 29 January 2020, the phasing for the enhancement works was agreed as set out below:

➢ Year 1 creation of new habitat ditches leading within the ditches where the snails were previously located

➢ Year 2 allow vegetation and habitat to establish with some vegetation moved from the main *Vertigo moulinsiana* ditch.

The population of Desmoulin's whorl snail will be monitored annually for 10 years to confirm that a viable population has established in the new habitat, unless otherwise agreed in writing with Natural England. Once a viable population has been established, then improvements will be made to the existing ditch in which the Desmoulin's whorl have been recorded in years 8 and 10.

Table 2: Changes in habitat of *Vertigo moulinsiana* at the Sturry Marshes survey site.

Survey site:	Survey summary	Conservation status' summary
Transect 1	This area held a scarcely diverse flora dominated by *Carex acutiformis*, with *Cirsium arvense* showing occasional abundance in the northern end of the transect. During this survey no *V. moulinsiana* were found in eight small samples.	**Unfavourable** (*Vertigo moulinsiana* was not present at this transect)
Transect 2	This area held a scarcely diverse flora dominated by *Carex acutiformis*, with *Cirsium arvense* showing frequent abundance and *Phragmites australis* was found occasionally at the northern end of the transect. During this survey two juvenile *V. moulinsiana* were found in ten small samples.	**Unfavourable** (*Vertigo moulinsiana* found in all samples in low numbers – the habitat is vulnerable to drying out)
Transect 3	This area held a scarcely diverse flora dominated by *Carex acutiformis*, with *Cirsium arvense* and *Phragmites australis* showing frequent to occasional abundance. *Urtica dioica* showed frequent abundance to the northern end of the transect. During this survey no *V. moulinsiana* were found in six small samples.	**Unfavourable** (*Vertigo moulinsiana* was not present at this transect)
Transect 4	This area held a scarcely diverse flora dominated by *Carex acutiformis* and *Phragmites australis* showing. *Cirsium arvense* appeared frequently to the south of the transect. During this survey no *V. moulinsiana* were found in ten small samples.	**Unfavourable** (*Vertigo moulinsiana* was not present at this transect)
Transect 5	This area held a scarcely diverse flora dominated by *Phragmites australis* to the northern end of the transect and *Carex nigra* dominating to the south of the transect. *Carex acutiformis* was common to the northern end of the transect. During this survey eleven *V. moulinsiana* were found in sixteen small samples, six were adults and five were juveniles.	**Unfavourable** (*Vertigo moulinsiana* found in all samples in poor numbers – the habitat is vulnerable to drying out)

Transect 6	This area held a scarcely diverse flora dominated by *Phragmites australis* to the northern end of the transect, *Carex acutiformis* dominating the mid reaches of the transect, and *Carex nigra* dominating to the south of the transect. During this survey nine *V. moulinsiana* were found in twenty small samples, seven were adults and two were juveniles. All were found in the northern end of the transect.	**Unfavourable** (*Vertigo moulinsiana* found in all samples in poor numbers – the habitat is vulnerable to drying out)
Transect 7	This area held a moderately diverse flora dominated by *Carex acutiformis* and *Phragmites australis* to the northern end of the transect. *Epilobium hirutum* was common in the mid reaches of the transect and *Cirsium arvense* showing occasional abundance in the south of the transect. During this survey seven *V. moulinsiana* were found in ten small samples, three were adults and four were juveniles.	**Unfavourable** (*Vertigo moulinsiana* found in all samples in poor numbers – the habitat is vulnerable to drying out)
Transect 8	This area held a moderately diverse flora dominated by *Carex acutiformis* throughout the transect. *Phragmites australis* showed varying abundance along the transect, being abundant in the northern end, dominant in the mid reaches, and occasional in the southern end. During this survey four *V. moulinsiana* were found in six small samples, two were adults and two were juveniles.	**Unfavourable** (*Vertigo moulinsiana* found in all samples in poor numbers – the habitat is vulnerable to drying out)
Transect 10	This area held a moderately diverse flora dominated with *Phragmites australis* being more dominant in the northern end of the transect and *Carex acutiformis* dominating the southern end. *Carex nigra* was in frequent abundance in the mid-reaches of the transect. During this survey two *V. moulinsiana* were found in six small samples, one adult and one juvenile.	**Unfavourable** (*Vertigo moulinsiana* found in all samples in poor numbers – the habitat is vulnerable to drying out)
Transect 11	Detailed surveys of the ditch (four transects) showed that the ditch held a moderately diverse flora dominated by *Phragmites australis*, *Sparganium erectum, Carex riparia, Berula erecta,* and occasionally *Glyceria maxima*. Sedges were rare here along with *Rumex conglomeratus, Mentha aquatica,* and *Typha latifolia*. The vegetation formed a complete cover over the ditch width and was floating over up to 1m of water and soft muds. During this survey between 1 and 2 animals were found in eight small samples. Though *V. moulinsiana* was found in all five of the samples here the habitat is still under threat from desiccation. There was light grazing on each side of the ditch by the sheep on the marsh. There were obvious signs of grazing on the marginal vegetation.	**Unfavourable** (*Vertigo moulinsiana* found in all samples in moderate to good numbers – the habitat is vulnerable to drying out)
Transect 12	The ditch held a moderately diverse flora dominated with *Typha latifolia, Sparganium erectum, Phalaris arundinacea, Carex riparia, Berula erecta* and occasionally *Glyceria maxima* to the west. Sedges were rare here along with the forbs *Lycopus europea, Mentha aquatica* and *Rumex conglomeratus*. The vegetation formed a complete cover over the ditch width and was floating over up to 1m of water and soft muds. During this survey between 1 and 39 animals were found in eight small samples. Though *V. moulinsiana* was found in five of the samples here the habitat is still under threat from desiccation. There was light grazing on each side of the ditch by the sheep on the marsh. There were obvious signs of grazing on the marginal vegetation.	**Unfavourable** (*Vertigo moulinsiana* found in all samples in moderate to good numbers – the habitat is vulnerable to drying out

Transect 13	The ditch held a moderately diverse flora dominated by *Phalaris arundinacea, Carex riparia, Typha latifolia, Sparganium erectum, Berula erecta* and occasionally *Glyceria maxima* to the west. Sedges were rare here along with the forbs *Lycopus europea, Mentha aquatica* and *Rumex conglomeratus*. The vegetation formed a complete cover over the ditch width and was floating over up to 1m of water and soft muds. During this survey between 1 and 41 *V. moulinsiana* were found in eight small samples. Though *V. moulinsiana* was found in five of the samples here, the habitat is still under threat from desiccation. There was light grazing on each side of the ditch by the sheep on the marsh. There were obvious signs of grazing on the marginal vegetation.	**Unfavourable** (*Vertigo moulinsiana* found in all samples in moderate to good numbers – the habitat is vulnerable to drying out
Transect 14	The ditch held a moderately diverse flora dominated by *Typha latifolia, Sparganium erectum, Phalaris arundinacea, Carex riparia, Berula erecta* and occasionally *Glyceria maxima* to the west. Sedges and rushes were scattered here along, including *Juncus inflexus*. The vegetation formed a complete cover over the ditch width and was floating over up to 1m of water and soft muds. During this survey no *Vertigo moulinsiana* were found. There was light grazing on each side of the ditch by the sheep on the marsh. There were obvious signs of grazing on the marginal vegetation.	**Unfavourable** (*Vertigo moulinsiana* was not present at this transect)

4. References

To be cited as: Abrehart Ecology 2022. Addendum to *Vertigo moulinsiana* surveys at Sturry Marshes, Kent 2022.

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5. Acknowledgements

Many thanks are due to the many landowners who allowed us access to their lands and special thanks to Junior King's School, Sturry for allowing access to the survey site through their land.

Appendix A

Survey results (All survey sites with *Vertigo moulinsiana* present are shown)

					Vegetation										**Vertigo moulinsiana**		Additional molluscs							
Location	Sample	A/B	Grid reference	Moisture	*Carex acutiformis*	*Phragmites australis*	*Carex nigra*	*Cirsium arvense*	*Urtica dioica*	*Agrostis stolonifera*	*Epilobium hirsutum*	*Glyceria maxima*	*Berula erecta*	*Typha latifolia*	**Adult**	**Juvenile**	*Cepea hortensis*	*Monacha cantiana*	*Derocras reticulata*	*Succinea putris*	*Derocras laevae*	*Vertigo pygmaeum*	*Aegopinella nitidula*	*Euconulus alderi*
T1	1	A	TR1685260096	1	D			O									6							
T1	1	B	TR1685260096	1	D			O									2							
T1	2	A	TR1685160091	1	D			O																
T1	2	B	TR1685160091	1	D			O										1						
T1	3	A	TR1685560083	1	D																			
T1	3	B	TR1685560083	1	D													1						
T1	4	A	TR1685860078	1	D			O									1							
T1	4	B	TR1685860078	1	D												3							
T1	5	A	TR1686460069	1	D			O																
T1	5	B	TR1686460069	1	D			O																
T2	1	A	TR1687360103	1	D	O		F									1							

T2	1	B	TR1687360103	1	D	O		F									2						
T2	2	A	TR1687660100	1	D			F								**1**	2						
T2	2	B	TR1687660100	1	D											**1**	5						
T2	3	A	TR1687760099	1	D			F									3						
T2	3	B	TR1687760099	1	D			F									6						
T2	4	A	TR1688160093	1	D												2						
T2	4	B	TR1688160093	1	D			F									4						
T2	5	A	TR1688960087	1	D			F															
T2	5	B	TR1688960087	1	D			F															
T3	1	A	TR1689860109	1	D	O			F								2		2				
T3	1	B	TR1689860109	1	D	O			F								1						
T3	2	A	TR1690360105	1	D	F		F									2		1				
T3	2	B	TR1690360105	1	D	F		O															
T3	3	A	TR1690960101	1	D	O		O									1						
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T4	1	A	TR1698160133	1	A	D											7						
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T4	2	A	TR1698560127	1	A	D											2						

T4	2	B	TR1698560127	1	A	D											1		1					
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T5	1	A	TR1701560143	1	C	D									**1**	**1**	3							
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T5	5	A	TR1703160119	1	D		F								**1**		2							
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T5	6	A	TR1703260116	1			D										2							

T5	6	B	TR1703260116	1			D										2						
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T6	4	A	TR1708360141	1	D	O											2						
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T7	3	A	TR1712660165	2	D	F									**2**	**1**	2						1	
T7	3	B	TR1712660165	2	D	F					C				**1**	**1**	5						1	
T7	4	A	TR1712960157	2	D	F											4				1			
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T8	1	A	TR1714460186	1	D	A										**1**	1					1		

T8	1	B	TR1714460186	1	D	A									**1**	**1**	2		1					
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T10	1	A	TR1717360197	1	A	D									**1**		3							
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Ditch transects																								
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T11		450													**9**	**2**								

T11	4	500																					
T11		550																					
T11	5	600													2								
T11		650																					
T11	6	700													3								
T11		750												1	1								
T11	7	800												1	3								
T11		850													4								
T11	8	900																					
T11		950																					
T11		1000	TR1715860163																				
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T12	3	400																					
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T12	4	500												2									
T12		550																					
T12	5	600												4	15								
T12		650																					
T12	6	700												2	21								
T12		750																					
T12	7	800												2	4								
T12		850																					
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T12		950																					

T12		1000	TR171636151																					
T13		0	TR1717560144																					
T13		50																						
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T13		150																						
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T13		650																						
T13	6	700													**1**	**12**								
T13		750																						
T13	7	800													**3**									
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T13		1000	TR1716860140																					
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T14	2	300													**1**	**2**								

T14		350																					
T14	3	400													**2**								
T14		450																					
T14	4	500														**4**							
T14		550																					
T14	5	600														**3**							
T14		650																					
T14	6	700														**4**							
T14		750																					
T14	7	800													**3**								
T14		850																					
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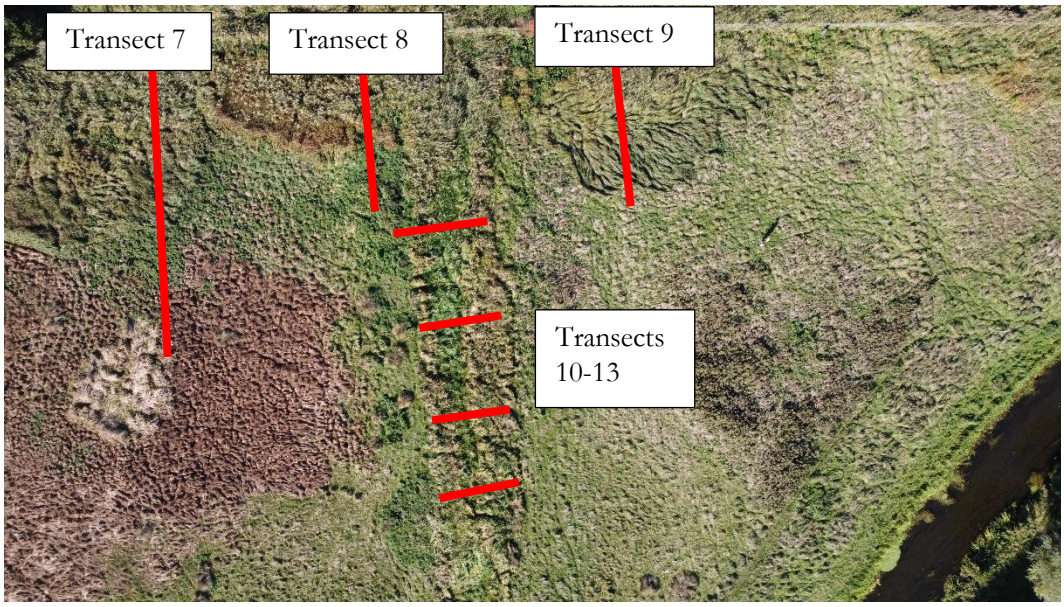
T14		950																					
T14		1000	TR1717260129																				

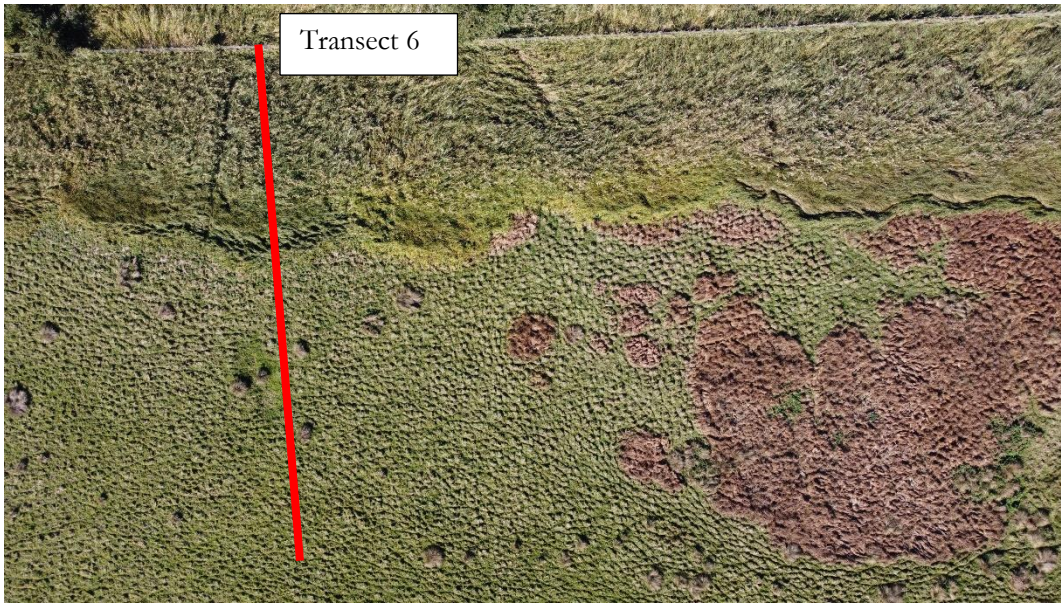
Start finish grid references for transects

Appendix B

Selection of drone photos from the survey



Drone image of the eastern end of the survey area at Sturry marshes Kent



Drone image of the central section of the survey area at Sturry marshes Kent

	Photo showing habitat across transect 7 with the *Phragmites australis* near the railway line with *Carex riparia* extending south.
	Photo showing habitat near transect 6

Vertigo moulinsiana living on *Glyceria maxima* in the ditch