AECOM

Translocation 2017 of the little whirlpool ramshorn snail

Highways England

26 January 2018

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Rev No	Comments	Checked by	Approved by	Date
1	First draft	[redacted]	[redacted]	30/01/2018
2	Revised draft	[redacted]	[redacted]	25/04/2018
3	Final draft	[redacted]	[redacted]	22/05/2018

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Job No 47075202 Reference December 2017

Contents

1 Introduction

The little whirlpool ramshorn snail *Anisus vorticulus* is a small, aquatic snail with a dorsoventrally flattened shell approximately 5 mm in diameter. It is a UK Biodiversity Action Plan Priority Species and the only British non-marine gastropod which is a European Protected Species. It is also listed in Annex II of the EU Habitats and Species Directive and therefore requires the designation of Special Areas for Conservation (SAC) (Annex II). In the UK, populations of *Anisus vorticulus* have been declining since the 1960s and, although the precise cause is not clear, it is thought that drainage, over frequent dredging, and eutrophication are all likely to be contributing factors (JNCC, 2007; Van Damme, 2012).

Anisus vorticulus is also challenged by extreme dispersal limitation, which may prevent it expanding its range into suitable habitat even if conditions improve (Niggebrugge et al. 2007). Using translocation to assist with expanding the range of the species may therefore be appropriate, and to this end a pilot translocation (the Pilot Translocation) of *Anisus vorticulus* was conducted in the summer of 2016 to test both the feasibility of such action and the response of the species to it (AECOM/Abrehart Ecology 2016a). The Pilot Translocation involved the movement of 800 *Anisus vorticulus* from Acle to [redacted] (Figure 1), following an in-depth analysis of the habitat preferences of *Anisus vorticulus* to identify suitable donor sites (AECOM/Abrehart Ecology 2016b).

An initial monitoring survey of the Pilot Translocation, conducted in late October 2016, gave promising results regarding the survivorship of *Anisus vorticulus* at the receptor sites and their continued presence at the donor sites. Monitoring surveys will continue every six months over a period of five years (as per the terms of the translocation licence) and are reported under separate cover.

Figure 1. Location of [redacted] part of Translocation 2017.

As per the feasibility report for the conservation translocation of *Anisus vorticulus* (AECOM, 2015a), a staged translocation was proposed, by which additional translocations could be implemented in subsequent years, with the methodology of translocation being adapted after each small scale movement of *Anisus vorticulus*. The Pilot Translocation of the species represented the first stage of the conservation translocation project. The current report presents the second translocation exercise of the project (working title of "Translocation 2017", to differentiate it from the Pilot Translocation).

The scoping study to find suitable donor sites and detailed surveys to ascertain the environmental suitability (both abiotic and biotic factors) of both donor and receptor sites have been previously documented and as such this current report should be read in conjunction with both AECOM/Abrehart Ecology (2017a.) *Translocation of the little whirlpool ramshorn snail: Scoping survey 2016*, and AECOM/Abrehart Ecology (2017b) *Translocation of the little whirlpool Ramshorn snail: Detailed surveys 2016/2017*.

The current Translocation 2017 used donor populations from [redacted]. Receptor sites were located in suitable mid-late successional ditches at [redacted].

The information contained within this report relates only to the methods employed during the Translocation 2017. Due to the method employed in both the Pilot Translocation and Translocation 2017, whereby the presence/absence and abundance of Anisus vorticulus in the donor and receptor ditches are assessed immediately prior to translocation to confirm the validity of the proposed translocation, these results are included in the monitoring report (AECOM/AbrehartEcology 2017c). Such results are important to validate the method and also allow for refinement of the methodology. Thus the included discussion, presented in Section 4, restricts its content to the refinement of the method.

Monitoring (assessing the actual results) of the Pilot Translocation and Translocation 2017 are reported under separate cover (AECOM/AbrehartEcology 2017d).

2 Methods

2.1 Licence requirements

Natural England licences were required for each aspect of this project, including surveying (disturbing *Anisus vorticulus),* collecting full aquatic invertebrate samples for laboratory analysis (killing *Anisus vorticulus*), and for the translocating from the [redacted], to the [redacted], further south (translocation of *Anisus vorticulus*).

Translocations of *Anisus vorticulus* were carried out in accordance with Translocation Licence 23292. Subsequent surveys and sample collection were conducted in accordance with Survey Licence 25961. Full licence details are provided in Appendix A.

2.2 Translocation method

The Pilot Translocation of 800 *Anisus vorticulus* from [redacted] took place in May 2016, with the second translocation (Translocation 2017) spread over a six-month period in 2017 (June and further in October/November 2017). During Translocation 2017, an initial 1,000 *Anisus vorticulus* were moved in June 2017, with a further 2,000 animals moved in October/November 2017.

Prior to the commencement of Translocation 2017 (during both June and October/November), sampling surveys were conducted at all potential translocation donor and receptor sites across [redacted] (Figure 2). The sampling survey focused chiefly on ascertaining the presence/absence of live *Anisus vorticulus* at the receptor sites, and the continuing persistence and necessary abundance of *Anisus vorticulus* at the donor sites.

An additional donor site, [redacted], was chosen as part of Translocation 2017. This is a [redacted] with a known population of *Anisus vorticulus*. Surveys conducted by Abrehart Ecology in 2016 found the *Anisus vorticulus* density at this site to be suitable to act as a donor population. Highest densities of *Anisus vorticulus* were recorded in late-successional ditches which were scheduled to be cleared/dredged as part of routine habitat maintenance. The translocation was seen as a way to remove a large number of snails from the ditch and prevent potential harm resulting from these works. As with the Pilot Translocation ditches, the ditches in [redacted] were surveyed prior to Translocation 2017, to ensure the continuing persistence and necessary abundance of *Anisus vorticulus* for donation (during both June and October).

Data and sample collection was conducted by a pair of surveyors, including an experienced, on-site mollusc surveyor ([redacted], Ecologist and National Mollusc Specialist) and a second team member responsible for recording ditch features, abiotic variables, and botanical diversity ([redacted] and [redacted], Ecologists at Abrehart Ecology). At each sample location, ditch characteristics and a range of other environmental features were recorded (repeating the 2015 survey used in finding sites for the Pilot Translocation, AECOM 2015c). Parameters included exposed and submerged bank profiles, channel width and depth, and levels of grazing, poaching and shelving. Abiotic parameters were recorded in the surface 10cm of water, including pH and conductivity (measured using a HI98129 pH/Conductivity Tester; Hanna Instruments), dissolved oxygen and temperature (measured using a PD0-520 Dissolved Oxygen metre; Lutron). Each sample point was recorded on an Archer2 sub metre dGPS.

2.2.1 Sampling and translocation

Pre Translocation 2017 sampling (monitoring) at the donor ditches aimed to ensure that the Pilot Translocation had caused no long-term negative effects on *Anisus vorticulus* populations and that the sites were still suitable to acts as donor sites. In addition to checking the abundance of *Anisus vorticulus* in the donor ditches, the wider mollusc community was assessed to ensure that the disturbance has not caused any long-term shifts in species composition and / or abundance.

For consistency, samples were collected using the same sweep netting method as the Pilot Translocation monitoring report (AECOM/Abrehart Ecology 2016c, first described in AECOM/Abrehart Ecology 2016a). This method was developed to minimise disturbance at the receptor sites, by taking smaller samples than using a typical sweep net protocol (as was used in the detailed surveys described in AECOM/Abrehart Ecology 2015, 2016a, and 2017b). It is acknowledged that the simplification of the sweep technique may result in a slightly lower detection rate for *Anisus vorticulus* than the method described in AECOM/Abrehart Ecology 2016a. However, minimising disruption of mollusc / aquatic invertebrate populations during translocation sweeps was considered a priority.

The material collected during the sweep was placed in a white gridded tray filled with water from the same sample area. Molluscs were released from the collected vegetation by agitating the contents of the tray, after which excess vegetation was then removed. The floating contents of the tray (chiefly vegetation and larger invertebrate species) were poured back into the ditch, with molluscs retained in the bottom of the tray; it is accepted that a small proportion of *Anisus vorticulus* may be lost at this stage, attached to some of the floating vegetation, but previous tests of this method have shown such losses to be negligible (T. Abrehart, *pers. obs.*). The material remaining was then evenly distributed across the tray for assessment. Any *Anisus vorticulus* present were individually counted and photographed for subsequent estimation of age (see Section 2.3). After identification, the snails were carefully placed into small plastic containers (with water taken from the sample area) for translocation to receptor sites ([redacted]).

Snails were released into receptor ditches in groups of 100 animals. Release points were 1 m apart, adjacent to banks / bankside vegetation, [redacted]; with detailed GPS references taken using an Archer2 sub metre dGPS. Release points were selected based on previously identified habitat structure, including plant species present, bank structure, and stage of succession (mid-management cycle).

It should be noted that more monitoring surveys will be required to understand the effects, if any, of the translocation on the donor sites. Results and discussion are presented within the Monitoring Update Report (AECOM/Abrehart Ecology, 2017c).

Figure 2. Locations of donor sites at [redacted] for Phase 2 Translocation of *Anisus vorticulus* in 2017.

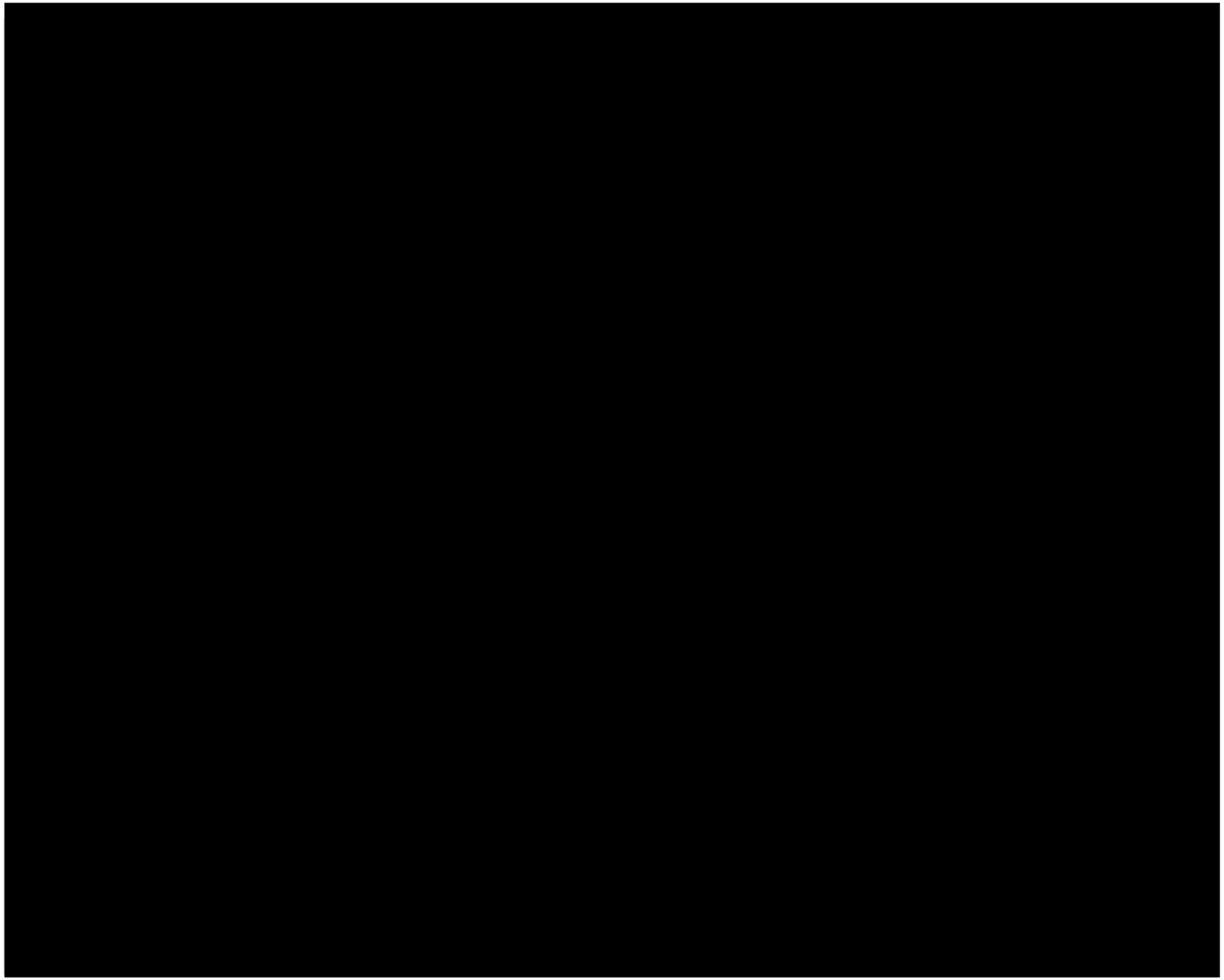

Figure 3. Location of donor site at [redacted] for Phase 2 Anisus vorticulus Translocation 2017.

Figure 4. Locations of receptor sites at [redacted] for Phase 2 of *Anisus vorticulus* Translocation 2017.

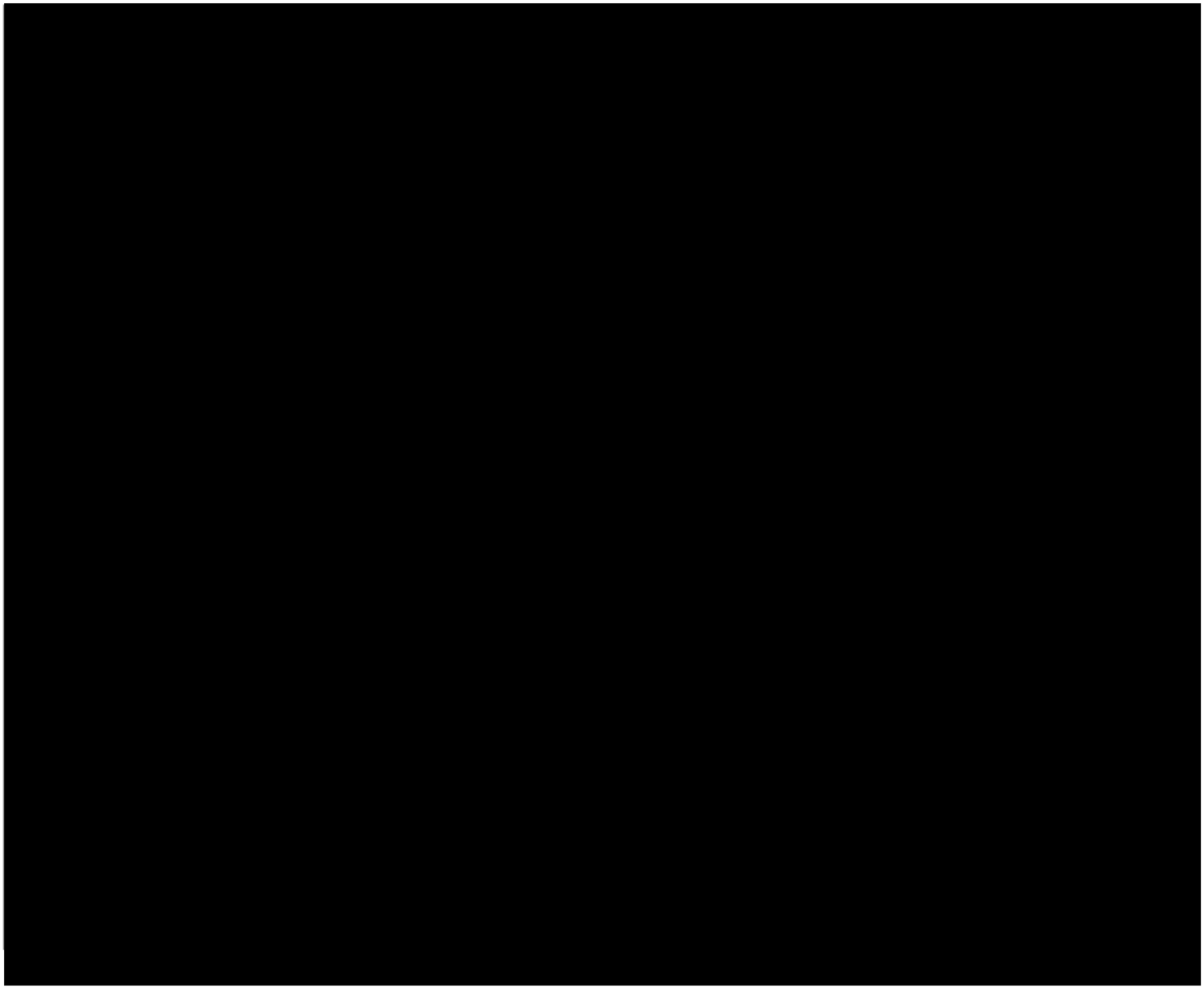

Figure 5. Locations of receptor sites at [redacted] for Phase 2 of *Anisus vorticulus* translocation in 2017.

2.3 Life stage classification

All *Anisus vorticulus* collected from the donor sites were photographed on grid-marked laminated sheets, to allow more detailed assessment of the age profile / recruitment of the population during subsequent monitoring surveys. Using the photographs, the shell diameter of all individuals was measured using ImageJ software (v1.50i; Rasband 1997-2016). The scale for measurements was set using the grid squares of the paper in each photograph. Shells were measured from the edge of the shell aperture, through the central point of the whorl of the shell, to the opposite outer edge of the shell (Figure 6). All measurements were taken in millimetres.

The *Anisus vorticulus* were classed by age according to their size following the guidelines devised by Glöer & Groh (2007). Those with a diameter <2.5mm were classed as juveniles; small adults were classed as between 2.5-3mm (this was the size at which copulation was first observed; Glöer & Groh 2007); large adults were classed as having a diameter >3mm.

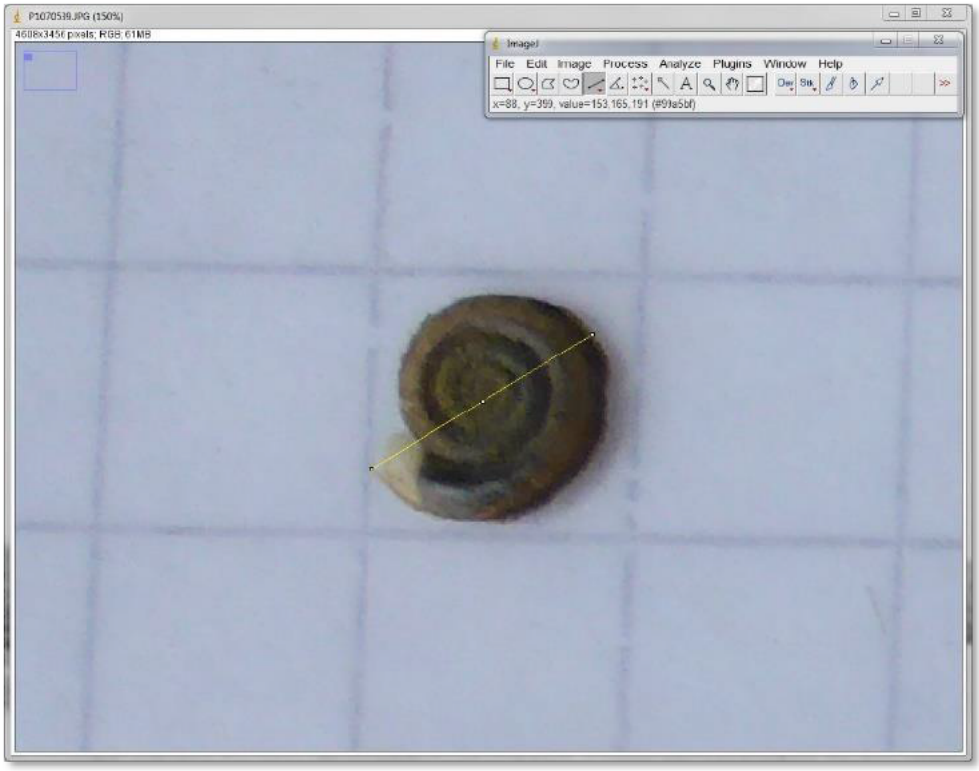

Figure 6. Measurement of shell diameter using Image J software. The full diameter of the shell was measured in each case, from the outer edge of the aperture, passing through the central whorl, to the opposite edge.

3 Results

3.1 Population status at donor sites

As described in Section 2.2.1, samples were taken from proposed donor sites prior to Translocation 2017. The sampling was conducted to ensure that *Anisus vorticulus* persisted in the donor ditches and that the population was viable to act as a donor population. Live *Anisus vorticulus* were found in good numbers within donor ditches at [redacted] used for the Pilot Translocation in both pre-translocation monitoring (Figure 2) and at the new (additional) Translocation 2017 donor ditches at [redacted] (Figure 3).

The June sampling indicated that the ditches at [redacted] were still suitable for translocation but those at [redacted] held only a low-density population. A re-assessment in October at both sites indicated a much higher density with over 100 snails, of varying age classes, were recorded in a single sweep. This showed that the ditches at [redacted] were still suitable to act as donors for the translocation study, as had been identified in the scoping study and detailed surveys (AECOM/Abrehart Ecology, 2017a, 2017b).

The translocation was split into two periods following the initial spring assessment as only [redacted] held high enough number for translocation and accordingly this was undertaken. The remaining translocation was carried out in the late autumn and early winter of 2017, when much higher numbers were present.

3.2 Translocation to [redacted] (June 2017)

As reported in AECOM/Abrehart Ecology, (2017a, 2017b), in the summer and autumn of 2016, many sites across the Norfolk Broads National Park were surveyed to select additional receptor sites for possible translocations in 2017.

The sites chosen were [redacted]. Both sites were chosen due to several biotic and abiotic factors indicating that they would be suitable to support *Anisus vorticulus*. An additional important factor in the assessment (beyond biotic and abiotic factors directly relatable to the ditches) was ensuring the land owner was content with the introduction of *Anisus vorticulus* onto their land and prepared to reduce the frequency of the ditch clearance. This aspect was difficult to realise.

[redacted] supported a wide range of mollusc species (29 aquatic species, including two Red Data Book (RBD) species) as found during previous detailed surveys and is located between marshes known to support *Anisus vorticulus* ([redacted] The site was of low quality 30 years ago but, due to continued land improvements (removing the arable land around the ditches and reverting to grazing marshes), the water quality across the site has improved and the invertebrate communities have responded. The ditches are now significantly more diverse than previously, indicating a suitability to support *Anisus vorticulus*.

[redacted] contain a high density of ditches, representing a wide range of successional stages. Several potential receptor sites were identified during scoping surveys (AECOM/Abrehart Ecology, 2017a); however, landowner permission was not granted for a number of these. Suitable ditches to the west of the site were found to support a rich invertebrate and mollusc community, and the landowners were amenable to having *Anisus vorticulus* introduced here. Multi-variate statistical analysis (AECOM/Abrehart Ecology, 2016b) has shown that the botanical and invertebrate species recorded at [redacted] have a strong correlation for supporting or co-existing with *Anisus vorticulus.* Although these ditches had been cleared in 2015, they had wide poached margins which are wet year-round which created a late successional habitat suitable for *Anisus vorticulus*. Potential limiting factors were identified during desk studies and field surveys; for example, the [redacted] through the marshes. Although [redacted] and at present, these marshes are far enough upstream of the coastline to be outside the influence of saline incursion. Therefore, this was not considered to be a significant limitation to the translocation effort.

In June 2017, 1,000 *Anisus vorticulus* were collected from [redacted] (800) and [redacted] (200) these were moved to five sample points at [redacted] (500) and five sample points at [redacted] (500). Locations of release points are shown in Figures 4 and 5.

3.3 Translocation to [redacted] (November 2017)

Due to the difficulty in finding sufficient numbers of *Anisus vorticulus* in June 2017 (for translocation to [redacted] only 1,000 of the originally planned 3,000 animals were moved. 500 animals were moved to 5 sub sites at [redacted] in one 5m section of ditch and 500 were moved to [redacted] to 5 sub sites within one 5m section within the same ditch.

During the October/November 2017 monitoring surveys it was noted that there were much higher numbers of snails within the ditches at both [redacted] and so the last 2,000 were collected.

In total, 1,000 were collected from Donor 1 in [redacted] and 2,000 were collected from a single ditch within [redacted]. The majority of the *Anisus vorticulus* collected from each of the sites were juveniles.

4 Discussion

Selection of new translocation sites:

The Pilot Translocation conducted in 2016 (AECOM/Abrehart Ecology, 2016a) focussed translocation effort on ditches within the [redacted] area. A significant component of the Translocation 2017 effort was the identification and current management of new receptor and donor ditches. The new sites used within this phase were selected based on the following factors: a known population of *Anisus vorticulus* [redacted] for donor sites; a strong correlation with botanical and invertebrate communities, and historical evidence of *Anisus vorticulus* persisting in the local area, but no current population [redacted] and a strong correlation with botanical and invertebrate communities but no evidence of *Anisus vorticulus* in the immediate surrounding area [redacted] for receptor sites. Importantly, for receptor sites, was landowner permission to introduce a protected mollusc species into the ditches and grant access for future monitoring works.

Translocation 2017 effort:

A total of 3,000 *Anisus vorticulus* were moved from donor sites at [redacted] (1,300 animals), [redacted] (200 animals), and [redacted] (1,500 animals), and subsequently released at receptor sites at [redacted]. 1,500 snails were released at each site and release points were marked for future monitoring (these are shown in Figures 4 and 5). All snails were photographed on grid-marked paper for life-stage classification using ImageJ software. This data will be examined during future monitoring studies and associated statistical analysis, to determine survivorship and breeding success.

4.1 Future Work

The Pilot Translocation methodology was largely repeated in Translocation 2017, using repeatable methods for further iterations of the translocation methods (Abrehart Ecology 2016), with small refinements in relation to seasonality based on limited numbers of *Anisus vorticulus* recorded in the donor ditches. An additional Translocation is planned for June 2018 (Translocation 2018) subject to agreement with both Highways England and Natural England. Scoping and detailed surveys have been carried out to locate sites that will act as suitable donor and receptor site to this end.

Key factors for consideration in the method to be employed in Translocation 2018 include:

- Additional information to better inform the selection of suitable receptor sites, in cognisance of the problems in finding suitable receptor site, due to both the autecology of the species (and associated range limitations) and the willingness of landowners to receive a population of a protected species that has the potential to impact upon land management regimes and associated land management grants;
- Additional information on the optimal timings for translocation and monitoring in the future. Such information would provide valuable insight for this process. The variability in population size within an annual period i.e. the insufficient numbers recorded during sampling pre translocation in June limits informed mitigation and wider implementation of conservation translocation. Monthly monitoring of a selection of known *Anisus vorticulus* ditches with a simplified sampling technique, to avoid unnecessary disturbance will elucidate this situation.
- Additional water chemical analysis of receptor sites to complement those already collected combined with statistical analyses of combined data sets from Pilot Translocation, Translocation 2017, detailed surveys and monitoring visits this will additionally inform help identify optimal receptor sites, the finding of which is proving problematical and a limitation to the current study on the conservation translocation of *Anisus vorticulus*.
- Further to steering group meetings in 2015, and 2016, a future meeting should be held. This will allow interested parties to input in to the methods, results and conclusions drawn to date and investigate additional techniques that could additionally be employed such as the use of eDNA, to locate receptor and donor sites etc.

5 Acknowledgements

Thanks to [redacted] for granting access to the survey sites, and for their support and interest in the project. Thanks too to [redacted] for his help and support with access and information on his sites. To [redacted] for allowing translocation onto [redacted].

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Appendix A - Licences