AECOM

Translocation of the little whirlpool ramshorn snail: Initial update 2016

Highways England

14 September 2016

Prepared by: ... [redacted]

Ecologist

Abrehart Ecology

Checke [redacted]

Principal Ecologist

Abrehart Ecology

Approved by: [redacted]

Associate Director

AECOM

Rev No	Comments	Checked by	Approved by	Date
1	First draft	[redacted]	[redacted]	
2	Revised draft	[redacted]		09/05/2017
3	Final draft	[redacted]	[redacted]	09/05/2017

AECOM, 2 City Walk, Leeds, LS11 9AR, United Kingdom

Telephone: +44(0)113 391 6800 Website: http://www.aecom.com

Abrehart Ecology Limited, Pound Farm, Low Road, Great Glemham, Suffolk, IP17 2DQ

Telephone: +44(0)1728 663282 Website: http://www.abrehartecology.com

Job No 47075202 Reference August 2016

Contents

1 Introduction

Little whirlpool ramshorn snail *Anisus vorticulus* is 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. Since 2004, *Anisus vorticulus* has been listed in the EU Habitats and Species Directive as a species of community interest, requiring special areas for conservation (Annex II) and strict protection (Annex IV), and is further listed as Red Data Book: Vulnerable. 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).

In addition to continuing pressures causing population decline, the recovery of *Anisus vorticulus* may be hampered by high levels of dispersal limitation (Niggebrugge et al. 2007). This means that, even when areas of suitable habitat exist, the species may not be able to colonise and/or recolonise. Habitat restoration and creation may therefore not be sufficient to aid the recovery of the species without additional measures, making research into the feasibility of translocation highly relevant.

Historical records of *Anisus vorticulus* snail exist for the marshes directly adjacent to the A47 between Norwich and Great Yarmouth, also known as the Acle Straight (Figure 1). [redacted] This report details the findings of a subsequent monitoring visit to the site 6 months post-translocation, which aimed to:

- Determine the survivorship of translocated *Anisus vorticulus* populations at the receptor sites;
- Assess whether translocated populations had spread into other areas of the translocation ditches;
- Assess whether there was any evidence of reproduction at the receptor sites (in the event that populations were persisting at the translocation sites); and,
- Assess whether donor populations had suffered any negative effects as a result of the translocation process.

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 Acle marsh system, to the [redacted] further south (translocation of *Anisus vorticulus*).

Translocations of *Anisus vorticulus* were carried out in accordance with Translocation Licence 2016-23292-SCI-SCI. Subsequent surveys and sample collection were conducted in accordance with Survey Licence 2015-14705-SCI-SCI.

Full licence details are provided in Appendix A.

Figure 1. Location of study Area 1 (Acle Straight) and Area 3 (Damgate) within the wider area.

2.2 Monitoring Method

The initial translocation of 800 *Anisus vorticulus* from [redacted] took place in May 2016. The initial monitoring survey reported here was conducted in late October 2016.

Post-translocation monitoring was conducted at all donor and receptor sites across [redacted] (Figure 2). The survey focused chiefly on the presence/absence of live *Anisus vorticulus* at the receptor sites, and assessed the continuing presence/absence and abundance of *Anisus vorticulus* at the donor sites. Vegetation communities were not fully assessed, as it was considered that they would not have changed significantly in the period following the initial translocation.

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], Ecologist at Abrehart Ecology / [redacted], Ecologist at Abrehart Ecology). At each sample location, ditch characteristics and a range of other environmental features were recorded (as in the 2015 survey, AECOM 2015c). These 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 as a 10-figure grid reference using a handheld GPS and recorded on an Archer2 sub metre dGPS.

2.2.1 Receptor ditches

Samples were collected using a simplified version of the sweep net method described in the initial detailed survey report for the pilot translocation (AECOM/Abrehart Ecology 2016a) and the subsequent translocation report (AECOM/Abrehart Ecology 2016). The simplified method was developed to deliberately collect smaller samples and minimise disturbance at the receptor sites. 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, it was considered precautionary to minimise disruption of translocated populations during monitoring. Furthermore, the method still allowed the detection of the presence/likely absence of *Anisus vorticulus*.

Beginning directly next to the canes marking the original translocation placement points, a 0.5mm mesh net was drawn towards the bank in a single sweep, covering 0.25m^2 to a depth of 25cm. The vegetation was gently agitated during the sweep, but any surrounding vegetation was disturbed as little as possible. Samples were also taken from 1m either side of the original placement points to assess whether the translocated individuals had begun to disperse into a wider portion of the ditch.

The material collected during the sweep was placed in a white gridded tray filled with water from the same ditch 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 molluscs may be lost at this stage, but previous tests of this method have shown such losses to be negligible [redacted], pers. obs.). The material remaining was then evenly distributed across the tray for assessment. All mollusc species were identified in the field, and the abundance of each species was quantified. Any *Anisus vorticulus* present were individually counted and photographed for subsequent estimation of age (see Section 2.3). After identification, the sample was carefully replaced at the point of collection.

2.2.2 Donor ditches

Monitoring at the donor ditches aims to ensure that the translocation has caused no long-term negative effects on the *Anisus vorticulus* population. In addition to assessing the density of *Anisus vorticulus* in the donor ditches, the wider mollusc community will be assessed to ensure that the disturbance has not caused any long-term shifts in species composition and / or abundance.

Samples were collected using the same sweep net method described in Section 2.2.1. Samples were taken at either end of the original donor ditch sections. As at the receptor sites, all mollusc species were identified in the field, and abundance of each was quantified. Any *Anisus vorticulus* present were individually counted.

It should be noted that more than one monitoring survey will be required to understand the effects, if any, of the translocation on the donor sites. Results presented here are preliminary indications of the state of the donor *Anisus vorticulus* population – more detailed analysis of the donor sites will be presented when the data is available.

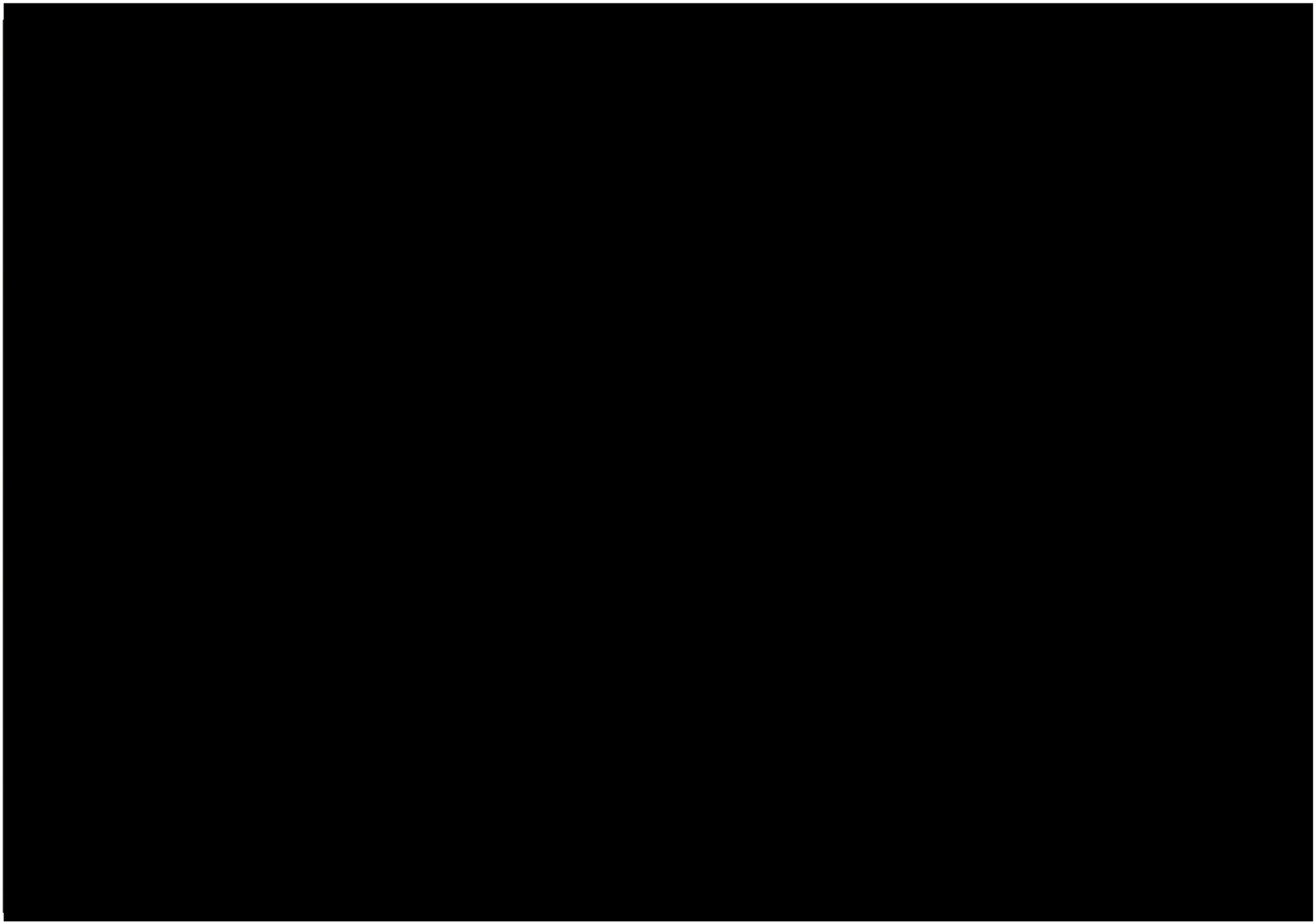

Figure 2. Locations of donor and receptor sites.

2.3 Life stage classification

All *Anisus vorticulus* that were found at the receptor sites were photographed to allow the subsequent assessment of the age profile of the population. The animals at each receptor site were grouped together in a white tray, and photographed next to a coin (used for scaling). Using the photographs, the shell diameter of each individual was measured using ImageJ software (v1.50i; Rasband 1997-2016). The scale for measurements was set using the coin 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. 3). All measurements were taken in mm.

The animals were classed by 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.

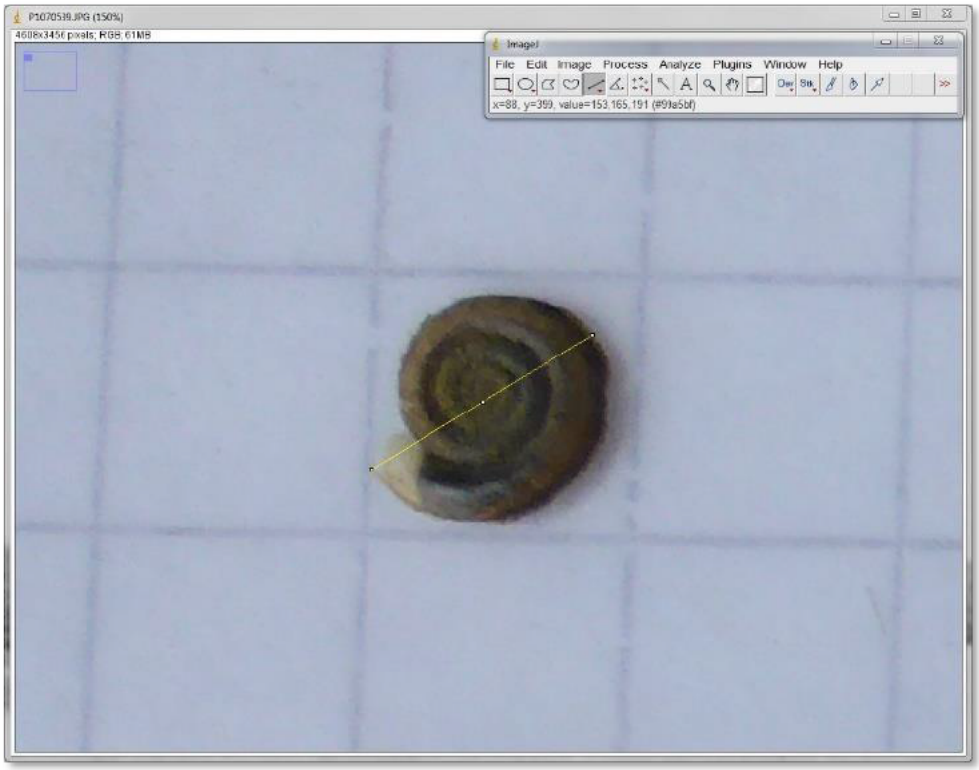

Figure 3. Measurement of shell diameter in an adult *Anisus vorticulus* using ImageJ software. The full diameter of the shell was measured in each case, from the outer edge of the aperture, passing through the central whorl, to the opposite edge.

3 Results

3.1 Survivorship of translocated *Anisus vorticulus*

One hundred Anisus vorticulus were placed at each receptor site, with 800 animals moved in total. Six months after translocation, a total of 123 Anisus vorticulus were found at the receptor sites.

Anisus vorticulus were found alive at each receptor site six months after the initial translocation, although the number found varied considerably between receptor sites. The number of individuals found ranged from 2-39, with the highest numbers found at receptor sites 3 and 4 (Figure 4). The highest numbers of *Anisus vorticulus* were found at receptor sites which had received populations from donor site 2, which may indicate a closer match in environmental conditions between donor site 2 and the chosen receptor sites; however, further investigation would be needed to confirm this.

The life span of *Anisus vorticulus* is believed to be up to 18-24 months (Glöer & Gloh 2007; Myzyk 2008), which indicates that individuals have survived for a significant portion of their expected life span in the new locations.

3.2 Colonisation of wider ditch areas

Samples were taken 1m either side of the translocation area, to see whether the translocated individuals would move out from the original placement points to colonise a wider area of the ditch.

There was some evidence for this at some receptor sites, as *Anisus vorticulus* were found outside the original 2m^2 translocation area (Fig. 5). However, individuals were only found in low numbers in these areas, with the majority remaining within the original area.

3.3 Evidence of breeding

The translocated animals consisted mainly of large adult individuals; very few juveniles or small adults were moved (Figure 6; also see AECOM 2016a for further details).

The *Anisus vorticulus* found six months post-translocation contained a higher proportion of juveniles and lower proportion of large adults when compared to the populations that were initially placed at the receptor sites (Figure 6). This may simply be due to the natural decline in numbers of large adults as they reach the end of their life span.

Receptor sites 3-6 were of interest, as a number of juveniles were found at these locations despite only adults originally being placed there. This provides strong evidence for reproduction of *Anisus vorticulus* at these locations, although further surveys will be required to determine whether this activity is sustainable. However, the proportions of juveniles to adults was similar at the receptor and donor sites, suggesting that the newly translocated populations are continuing to follow the same dynamics as more established sites.

3.4 Effects on donor populations

Live *Anisus vorticulus* were found in all the donor ditches 6 months after initial translocations took place (Figure 7). The absolute number of individuals found was lower than the original number collected for translocation, attributable to the simplified sweep-netting method (Section 2.2.1) and the fact that a smaller overall area was sampled during the post-translocation check. It is also possible that the timing of the monitoring survey – peaks in population sizes have been observed in other *Anisus vorticulus* populations in

However, the number of individuals found in each sweep was comparable to the densities initially found at each location.

The age structure of the *Anisus vorticulus* found during the post-translocation check had altered when compared to the age structure observed at the time of the initial translocation. Juveniles formed a much larger proportion of the observed individuals (up to 100% in some cases), while small and large adults were encountered only rarely (Figure 7). This age structure was similar to that observed at the receptor sites during the post-translocation check, where larger than expected numbers of juveniles were found (Figure 6). While further surveys will be required, this may suggest that the observed age structure at the receptor sites reflects the natural population cycle of *Anisus vorticulus*.

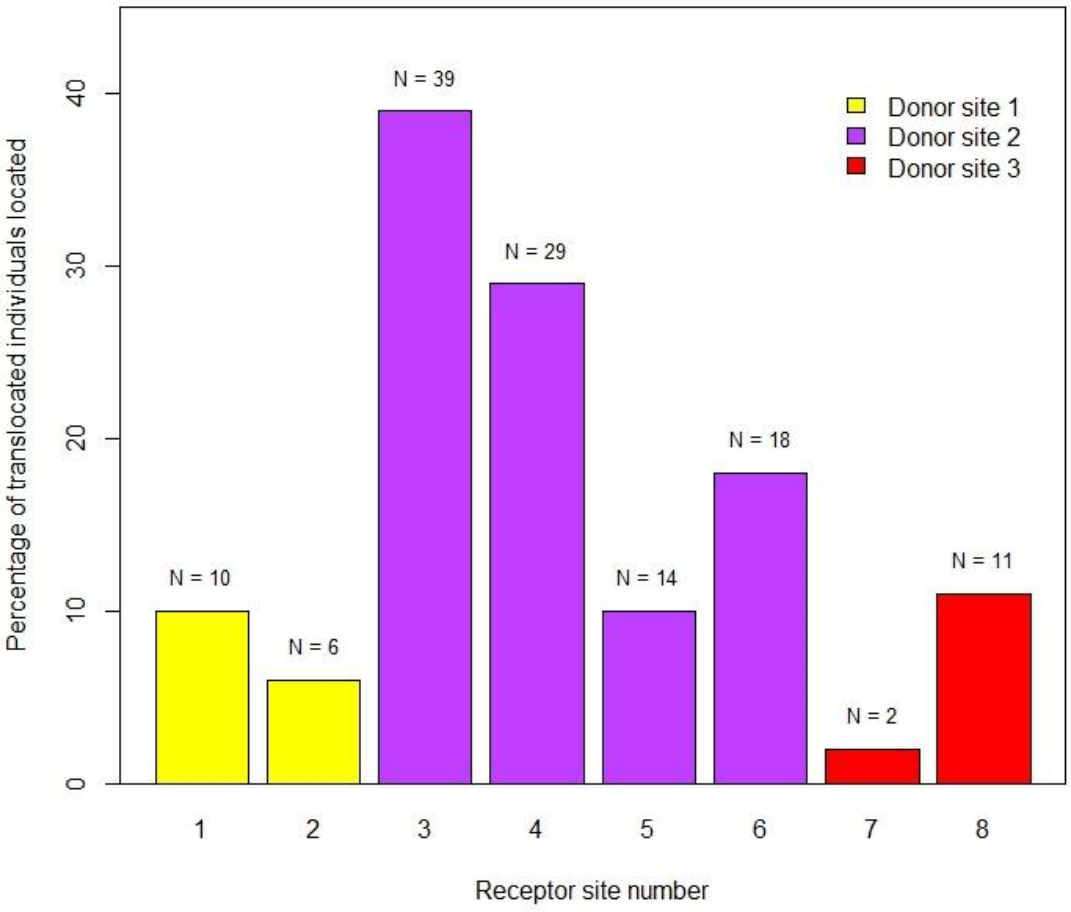

Figure 4. Percentage of translocated *Anisus vorticulus* found at each receptor site six months after translocation. The actual number of individuals found at each site is indicated above the relevant bar. Bar colours correspond to those in Figure 2.

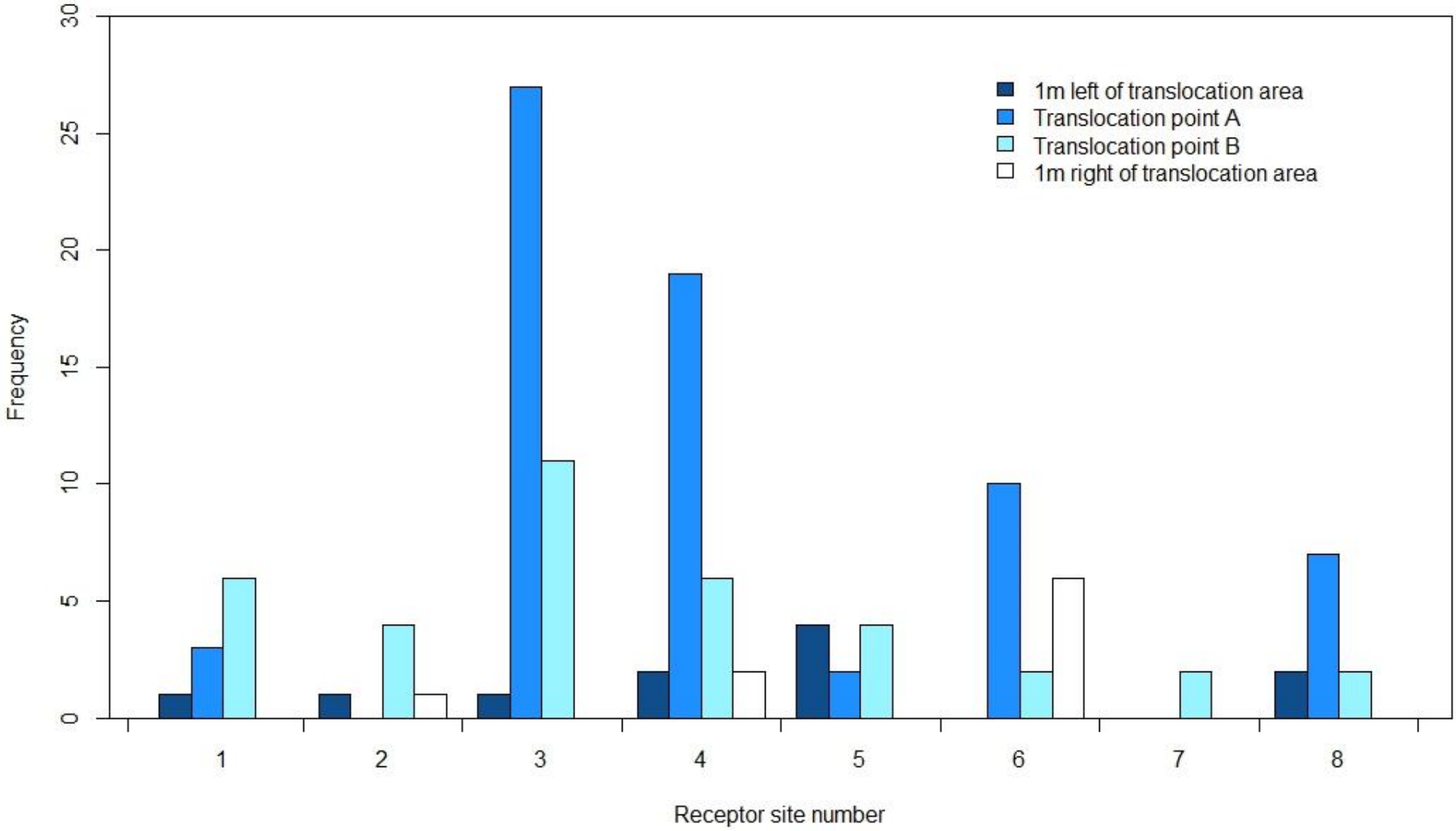

Figure 5. Locations of *Anisus vorticulus* found at receptor sites during 6 month post-translocation survey.

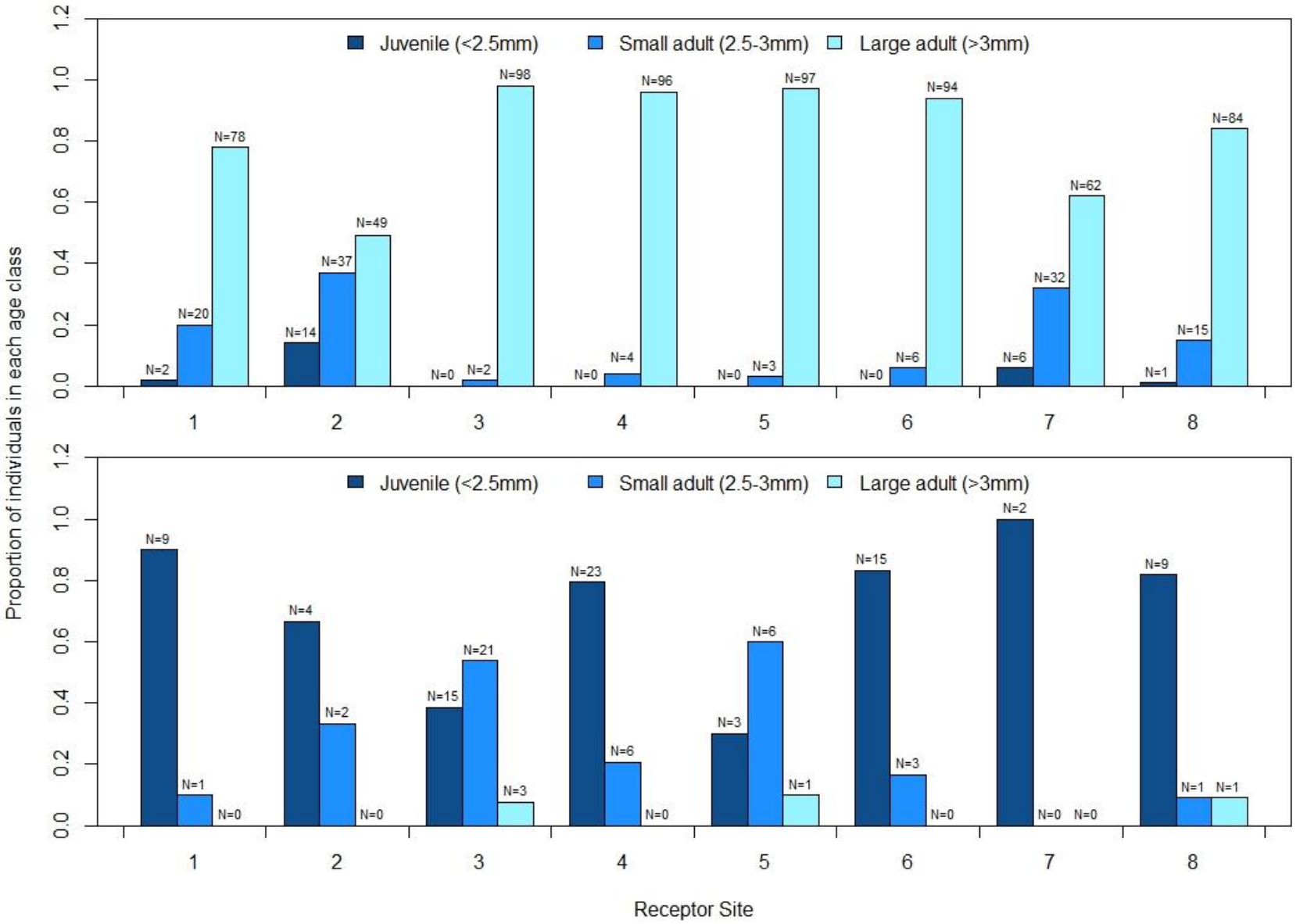

Figure 6. Top: Proportion of individuals in each age class in original translocated populations. Bottom: Proportion of individuals found in each age class during 6 month post-translocation survey. Age classes defined as described by Glöer & Gloh 2007. The actual number of individuals found in each case is indicated above the relevant bar.

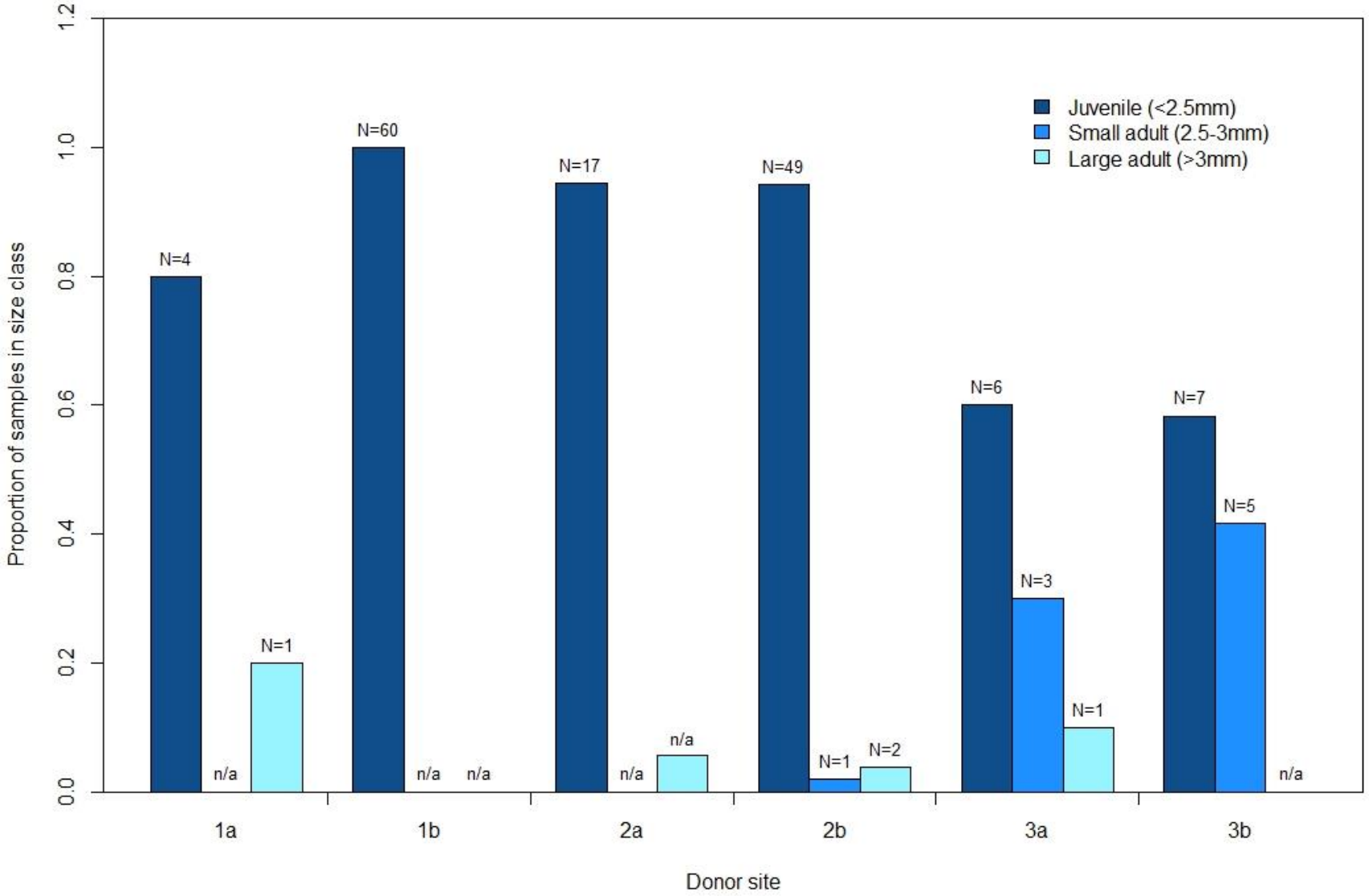

Figure 7. Proportion of *Anisus vorticulus* found in each age class in donor ditches 6 months after initial translocation.

4 Discussion

The main aim of the pilot translocation at [redacted] was to establish whether *Anisus vorticulus* could survive being moved within the local catchment area, while secondary objectives included assessing the dispersal and reproductive capability of translocated populations.

It must be stressed that the results reported here are from the early stages of this work, and will require a number of follow-up visits to confirm the initial findings. That being said, the results thus far are promising. *Anisus vorticulus* were found alive at all receptor sites (although in varying numbers) and many more juveniles were found during monitoring than were initially introduced. This appears to show that *Anisus vorticulus* has reproduced in the new locations, although further work will be required to determine whether this is sustainable in the longer term. There is also some evidence to suggest that the translocated populations have begun to disperse into wider areas of ditch, although in low numbers at this stage. *Anisus vorticulus* is known to be a dispersal-limited species (Niggebrugge et al. 2007), so any spread from the initial colonisation points would be expected to be slow - this is particularly true for this study system as there is little/no flow of water to aid movement. The results may therefore be interpreted as the beginnings of a continued colonisation process, but must be treated with caution given the early stage of the project. Further visits will be required to determine whether this is a sustainable process that will result in a larger and more widespread population of *Anisus vorticulus* at the receptor ditch system – statistical analysis will be conducted to aid interpretation of future findings, once sufficient data is available.

The densities of *Anisus vorticulus* found in the donor ditches were similar to those observed at the time of the initial translocation, suggesting that the process of removing animals from the donor locations has not had a negative effect on the source populations, at least in the short term. As previously stated, more than one monitoring survey will be required to understand the long-term effects, if any, of the translocation on the donor sites. Results presented here are preliminary indications of the state of the donor *Anisus vorticulus* population – more detailed analysis of the donor sites will be presented when the data is available, including a comparison of the wider mollusc community before and at several points after translocation.

It was noted that the age structure of the *Anisus vorticulus* found at the donor sites had changed since the initial visits, showing a larger proportion of juvenile individuals with many fewer adults in evidence. However, this concurs with studies of population dynamics in other *Anisus vorticulus* populations, which show peaks in reproduction between June-July (Killeen 1999) – under these conditions, an increase in the abundance of juvenile individuals would be expected later in the year, as observed here. The age structure observed at the donor sites was very similar to that observed at the receptor sites, where many more juveniles were observed than had originally been placed there (suggesting reproduction had occurred). The similarity in the population age structures suggests that the newly translocated populations are continuing to follow the natural dynamics of well-established source populations. Whilst further surveys are required, the results to date reflect positively on the likely viability of the new populations.

A successful translocation of *Anisus vorticulus* would be significant for the wider conservation of the species. Firstly, the ability to move and re-establish populations may aid mitigation around future development works and help to protect the species as landscapes change. In a wider context, dispersal limitation on *Anisus vorticulus* may mean that population ranges remain restricted even when large areas of suitable habitat exist. Work to identify such suitable areas, and to show that populations can be successfully established in new locations, may therefore pave the way to broadening the range of the species for the future.

5 Acknowledgements

Thanks to [redacted] for granting access to the survey sites, and for their support and interest in the project.

6 References

This report to be cited as: AECOM/Abrehart Ecology, 2016. Translocation of the little whirlpool ramshorn snail – initial update 2016. Report to Highways England.

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Appendix A - Licences

Conservation of Habitats and Species Regulations 2010 (as amended) and Wildlife and Countryside Act 1981 (as amended)

LICENCE - Schedule 5 for survey, science, education or conservation

This licence authorises acts that would otherwise be offences under the above legislation

Customer Services
Wildlife Licensing
First Floor
Temple Quay House
2 The Square
Bristol
BS1 6DG
T: 0300 060 3900
F: 0845 601 3438

Any request for information in this licence will be considered under the Environmental Information Regulations 2004 and the Freedom of Information Act 2000 as appropriate.

Natural England Ref:	**2016-23292-SCI-SCI**

Under the Conservation of Habitats and Species Regulations 2010 (as amended) and Wildlife and Countryside Act 1981 (as amended) Natural England has granted this licence for Schedule 5 (Wildlife and Countryside Act) - Animals except bats, dormice and great crested newts for the purpose of:

Science or education, under section 53(2)(a) and/or section 16(3)(a)

to:

Name (in full):	[redacted]
Company Name:	Abrehart Ecology
Address:	Pound Farm, Low Road Great Glemham Saxmundham
County:	Suffolk
Postcode:	IP17 2DQ

Between the dates of:

21 April 2016	and	20 May 2016	inclusive

At (locations):

Site/Location Name	County	OS Grid Reference
[redacted]	Norfolk	[redacted]
[redacted]	Norfolk	[redacted]

For the following species:

Species Common Name *(Taxonomic Name)*	Number	Activity	Method	Detailed Location	OS Grid Reference
Little whirlpool ram's-horn snail *(Anisus vorticulus)*	0	Disturb	Net	[redacted]	[redacted]
Little whirlpool ram's-horn snail *(Anisus vorticulus)*	0	Take	Net	[redacted]	[redacted]

This licence is granted subject to the licensee, including servants and named agents, adhering to the conditions and notes specified below.

Signature: [redacted] **Date:** 18 April 2016

(for and on behalf of Natural England)

WARNING

- **This licence authorises acts that would otherwise be offences under the Conservation of Habitats and Species Regulations 2010 (as amended) and Wildlife and Countryside Act 1981 (as amended). Any departure from the conditions relating to this licence may be an offence under that legislation;**
- **This licence conveys no authority for actions prohibited by any other legislation;**
- **This licence can be modified or revoked at any time by Natural England, but this will not be done unless there are good reasons for doing so. The licence is likely to be revoked immediately if it is discovered that false information had been provided which resulted in the issue of the licence.**

LICENCE CONDITIONS

1. These conditions apply to the licensee and any additional authorised person. The licensee and any additional authorised person(s) are responsible for ensuring that any licensed operations/ activities comply with all terms and conditions of the licence.

2. The licensee and any additional authorised person(s), shown on the licence, may act under the authority of this licence. The licensee or any additional authorised person(s) may also employ assistants provided they work under the direct personal supervision of the licensee or authorised person.

3. Whilst engaged in activities permitted by this licence, the licensee and/or any additional authorised person(s), must have access to a copy of this licence and produce it to any police officer or any Natural England officer on demand.

LICENCE CONDITIONS

4. The Licensee and any additional authorised person(s) shall permit an officer of Natural England, accompanied by such persons as he/she considers necessary for the purpose, on production of his/her identification on demand, reasonable access to the site for monitoring purposes and to be present during any operations carried out under the authority of this licence for the purpose of ascertaining whether the conditions of this licence are being, or have been, complied with. The Licensee shall give all reasonable assistance to an officer of Natural England and any persons accompanying him/her.

5. This licence does not convey any right of entry upon land, and the landowner's/occupier's prior permission must be obtained, as necessary, before the licence is used.

6. No licensed activity shall be carried out under this licence on a National Nature Reserve or Marine Nature Reserve except with the prior written permission of Natural England.

7. A person authorised by the licensee shall provide him/her with such information as is within his/her knowledge and is necessary for the Report, which the licensee is required to make to Natural England.

8. The 'Report by licensee of action taken under licence' must be completed, even if no licensed action is taken. It must be submitted on line or sent to the Natural England office at the address shown on this licence, to arrive no later than 14 days (two weeks) after the expiry of the licence. Failure to make a report may result in the licence being revoked and/or any future applications being refused.

Additional condition(s):

This licence may be modified or revoked at any time by Natural England.

There is no limit to the number of Little whirlpool ramshorn snail (Anisus vorticulus) that may be disturbed or taken under this licence provided all conditions and notes are adhered to.

NOTES

1. Please read the details of your licence carefully to ensure that you comply with it paying particular attention to the number and species licensed as this may differ to what was requested in your application.

2. Under Regulation 58(1) of the Conservation of Habitats and Species Regulations 2010 (as amended), it is an offence to contravene or fail to comply with a licence condition. This includes all persons authorised to act under this licence.

3. An additional authorised person is a suitably trained and experienced person who is able to carry out work under a licence without the personal supervision of the licensee. To carry out licensed activities their name will be on the licence. To comply with the licence conditions, additional licenced persons should have a copy of the licence accessible when acting under the licence.

NOTES

4. An assistant is a person assisting the licensee or the additional authorised person(s). Assistants are only authorised to act under a licence whilst they are under the direct supervision of either the licensee or the additional authorised person(s).

5. Please note the information of the ‘Report by licensee of action taken under licence' may have changed from previous years. The data required in your report and the required format can been viewed on the Natural England website. Alternatively you can request a copy from the Natural England address shown on your licence.

Additional note(s):

Additional Authorised Individuals

The additional authorised individuals listed below are also authorised to act under the terms and conditions of this licence:

Title	First Name	Surname	Address Line 1	Postcode
Doctor	[redacted]	[redacted]	AECOM	BT2 7GP
Doctor	[redacted]	[redacted]	South Maundin	HP14 4LZ

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Science or education, under section 53(2)(a) and/or section 16(3)(a)

to:

Name (in full):	[redacted]
Company Name:	Abrehart Ecology
Address:	Pound Farm, Low Road Great Glemham Saxmundham
County:	Suffolk
Postcode:	IP17 2DQ

Between the dates of:

31 October 2015	and	31 October 2016	inclusive

At (locations):

Site/Location Name	County	OS Grid Reference
[redacted]	Norfolk	[redacted]
[redacted]	Norfolk	[redacted]

For the following species:

Species Common Name *(Taxonomic Name)*	Number	Activity	Method	Detailed Location	OS Grid Reference
Little whirlpool ram's-horn snail *(Anisus vorticulus)*	0	Take	Hand Net	[redacted]	[redacted]
Little whirlpool ram's-horn snail *(Anisus vorticulus)*	0	Possess	As appropriate	[redacted]	[redacted]
Little whirlpool ram's-horn snail *(Anisus vorticulus)*	0	Disturb	Hand Net	[redacted]	[redacted]
Little whirlpool ram's-horn snail *(Anisus vorticulus)*	0	Kill	Hand Net	[redacted]	[redacted]

This licence is granted subject to the licensee, including servants and named agents, adhering to the conditions and notes specified below.

Signature: [redacted] **Date:** 29 October 2015

(for and on behalf of Natural England)

WARNING

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LICENCE CONDITIONS

2. The licensee and any additional authorised person(s), shown on the licence, may act under the authority of this licence. The licensee or any additional authorised person(s) may also employ assistants provided they work under the direct personal supervision of the licensee or authorised person.

3. Whilst engaged in activities permitted by this licence, the licensee and/or any additional authorised person(s), must have access to a copy of this licence and produce it to any police officer or any Natural England officer on demand.

4. The Licensee and any additional authorised person(s) shall permit an officer of Natural England, accompanied by such persons as he/she considers necessary for the purpose, on production of his/her identification on demand, reasonable access to the site for monitoring purposes and to be present during any operations carried out under the authority of this licence for the purpose of ascertaining whether the conditions of this licence are being, or have been, complied with. The Licensee shall give all reasonable assistance to an officer of Natural England and any persons accompanying him/her.

5. This licence does not convey any right of entry upon land, and the landowner's/occupier's prior permission must be obtained, as necessary, before the licence is used.

6. No licensed activity shall be carried out under this licence on a National Nature Reserve or Marine Nature Reserve except with the prior written permission of Natural England.

7. A person authorised by the licensee shall provide him/her with such information as is within his/her knowledge and is necessary for the Report, which the licensee is required to make to Natural England.

8. The 'Report by licensee of action taken under licence' must be completed, even if no licensed action is taken. It must be submitted on line or sent to the Natural England office at the address shown on this licence, to arrive no later than 14 days (two weeks) after the expiry of the licence. Failure to make a report may result in the licence being revoked and/or any future applications being refused.

Additional condition(s):

There is no limit to the number of Little whirlpool ramshorn snail that can be disturbed, taken, killed or possessed under this licence provided all conditions and notes are adhered to.

This licence may be modified or revoked at any time by Natural England.

NOTES

1. Please read the details of your licence carefully to ensure that you comply with it paying particular attention to the number and species licensed as this may differ to what was requested in your application.

NOTES

2. Under Regulation 58(1) of the Conservation of Habitats and Species Regulations 2010 (as amended), it is an offence to contravene or fail to comply with a licence condition. This includes all persons authorised to act under this licence.

3. An additional authorised person is a suitably trained and experienced person who is able to carry out work under a licence without the personal supervision of the licensee. To carry out licensed activities their name will be on the licence. To comply with the licence conditions, additional licenced persons should have a copy of the licence accessible when acting under the licence.

4. An assistant is a person assisting the licensee or the additional authorised person(s). Assistants are only authorised to act under a licence whilst they are under the direct supervision of either the licensee or the additional authorised person(s).

5. Please note the information of the 'Report by licensee of action taken under licence' may have changed from previous years. The data required in your report and the required format can been viewed on the Natural England website. Alternatively you can request a copy from the Natural England address shown on your licence.

Additional note(s):

Additional Authorised Individuals

The additional authorised individuals listed below are also authorised to act under the terms and conditions of this licence:

Title	First Name	Surname	Address Line 1	Postcode
Miss	[redacted]	[redacted]	[redacted]	[redacted]