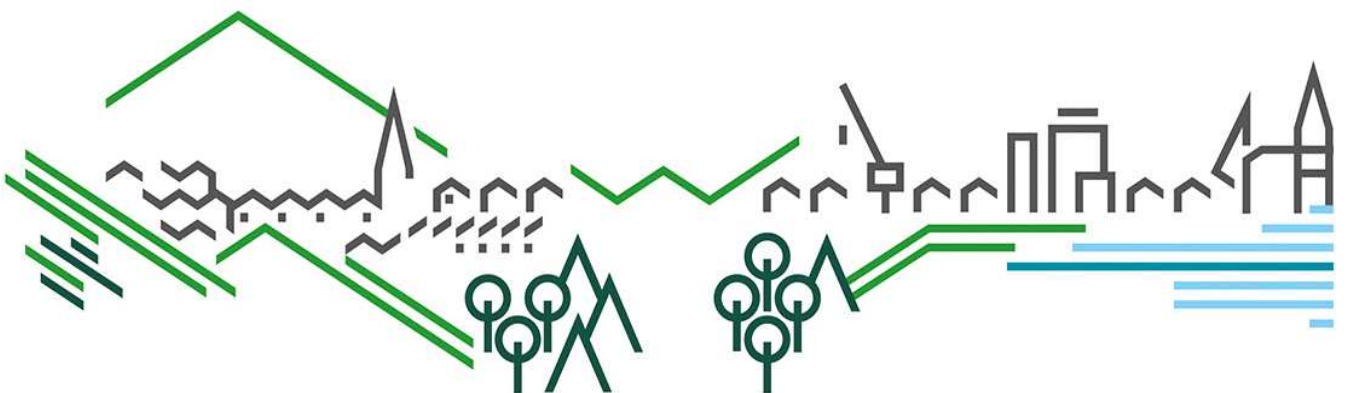


NRW CONWY ESTUARY *CREPIDULA FORNICATA* SURVEY AUGUST 2013

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Intertidal biodiversity, Welsh Language student
placement
NRW Evidence Report No 03

May 2014



About Natural Resources Wales

Natural Resources Wales is the organisation responsible for the work carried out by the three former organisations, the Countryside Council for Wales, Environment Agency Wales and Forestry Commission Wales. It is also responsible for some functions previously undertaken by Welsh Government.

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, used and enhanced, now and in the future.

We work for the communities of Wales to protect people and their homes as much as possible from environmental incidents like flooding and pollution. We provide opportunities for people to learn, use and benefit from Wales' natural resources.

We work to support Wales' economy by enabling the sustainable use of natural resources to support jobs and enterprise. We help businesses and developers to understand and consider environmental limits when they make important decisions.

We work to maintain and improve the quality of the environment for everyone and we work towards making the environment and our natural resources more resilient to climate change and other pressures.

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Evidence at Natural Resources Wales

Natural Resources Wales is an evidence based organisation. We seek to ensure that our strategy, decisions, operations and advice to Welsh Government and others are underpinned by sound and quality-assured evidence. We recognise that it is critically important to have a good understanding of our changing environment.

We will realise this vision by:

- Maintaining and developing the technical specialist skills of our staff;
- Securing our data and information;
- Having a well resourced proactive programme of evidence work;
- Continuing to review and add to our evidence to ensure it is fit for the challenges facing us; and
- Communicating our evidence in an open and transparent way.

This Evidence Report series serves as a record of work carried out or commissioned by Natural Resources Wales. It also helps us to share and promote use of our evidence by others and develop future collaborations. However, the views and recommendations presented in this report are not necessarily those of NRW and should, therefore, not be attributed to NRW.

Foreword

The overriding mission for Natural Resources Wales (NRW) is to ensure that the environment and natural resources of Wales are sustainably maintained, enhanced, and used by the people, communities and economy of Wales in the present and for the future.

The organisation, a Welsh Government (WG) Sponsored Body, will be expected to deliver for Wales and play its part in delivering against the three pillars of sustainability – people and communities, the environment; and the economy, thereby supporting Ministers to deliver the Welsh Government's 'Programme for Government'.

As a recognition of the establishment of NRW and the organisation's key role in delivering the Government's agenda, WG has committed to developing shared outcomes against which delivery and performance (of both partners) can be aligned.

These shared outcomes recognise the need for close working with stakeholders (including customers, communities, staff and representative groups). Multi-partner delivery will be central in addressing the key challenges associated with sustainable development and working in partnership with WG and other delivery partners, NRW Leadership Group will contribute collectively to deliver the shared outcomes:

1. The people of Wales are safe
2. Natural resources are healthy and resilient
3. There are more and better jobs for now and for the future
4. The people of Wales are healthy
5. People live in viable and vibrant places
6. There are increased opportunities for people to achieve a better quality of life, and people are wealthier with greater equality
7. People have the knowledge and ability to make the best choices for future wellbeing.

Delivery against these outcomes will require new 'ways of working' and NRW is committed to being a learning organisation adopting an ecosystems approach to deliver the NRW's overall mission.

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CRYNODEB

Mae ardal y Fenai ac aber Conwy wedi'i dynodi'n ardal cadwraeth arbennig (ACA) yng Nghymru. Sefydla'r Gyfarwydddeb Cynefinoedd y dylai rheoli ACAoedd amcanu sicrhau statws gadwraeth ffafriol nodweddion cynefinoedd a rhywogaethau a restrir yn ei chynefinoedd Atodiad I a'i rhywogaethau Atodiad II.

Mae *Crepidula fornicata*, ewin Mair, yn rhywogaeth estron, ymledol yng Nghymru. Fe'i ceir yn y de, yn enwedig cyffiniau Aberdaugleddau, heb ond ychydig gofnodion i'r gogledd o'r aber. Gwelwyd ewin Mair anaeddfed gan fyfyrwr MSc ar *Ascophyllum* yn arnofio yn aber Conwy yn ystod project gwaith coleg. Cododd hynny bryder y gallai'r rhywogaeth hon fod yn bresennol yn ardal Conwy, felly cynhaliwyd arolwg er mwyn chwilio'r cyffiniau. Chwiliwyd parthau rhynglanwol ac islanwol aber Conwy, gan ganolbwyntio ar welyau cregyn gleision a chynefin islanwol cymysg. Defnyddiwyd chwilio ac arsyllu uniongyrchol wrth chwilio cynnwys deunydd a grafangwyd o'r parthau rhynglanwol ac islanwol.

Dengys y canlyniadau na chanfuwyd unrhyw *C. fornicata* yn yr ardal hon. Cynhwysir yn yr adroddiad fapiau sy'n dangos ymhle y bu'r samplo adeg yr arolwg.

EXECUTIVE SUMMARY

The Menai Strait and Conwy estuary area is a designated Special Area of Conservation (SAC) in Wales. The Habitats Directive establishes that the management of SACs should aim to achieve the favourable conservation status of habitat and species features listed within its Annex I habitats and Annex II species.

Crepidula fornicata, the American slipper limpet is an invasive non native species in Wales. This species is found in south Wales, especially the Milford Haven area, with few records north of the Haven. A juvenile American slipper limpet was seen by an MSc student on floating *Ascophyllum* within the Conwy estuary area during a student project. This raised concern that this species could be present in the Conwy area, hence a survey was carried out to search within this area. The intertidal and subtidal zones were surveyed within the Conwy estuary area, focusing on mussel beds and subtidal mixed habitat. Direct search and observation in the intertidal and subtidal day grabs were used.

The results show that no *C. fornicata* were found in this area in 2013. Maps showing the location of the sample sites during the survey are included within the report.

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1. Introduction

1.1. Background

Crepidula fornicata, the slipper limpet, is an invasive, non-native species in the UK. This species has an oval shell and can reach 5 cm in length (Rayment 2008). The slipper limpet occurs on a variety of substrates, it is often found attached to the shells of mussels, *Mytilus edulis* as well as oysters, stones and other shells around the low water mark (Blanchard 1997, Rayment 2008).

Invasive non-native species are one of the greatest threats to biodiversity across the globe (Wilson & Smith 2008; Bohn *et al.* 2012; Thieltges *et al.* 2004; Decottignies *et al.* 2007). Their spread has had profound negative effects on biodiversity as well as on ecosystem processes (Bohn *et al.* 2012). Two main vectors of introduction exist, these include the transport of ballast water and also the movement of commercial oysters (Montaudouin *et al.* 1999; Bohn *et al.* 2013).

C. fornicata was first introduced into the UK from North America in the late 19th century (Bohn *et al.* 2012). It was first recorded in the Milford Haven waterway in Wales in 1953 (Bohn *et al.* 2012). Since this first recording, the species has thrived and today, up to >1000 individuals per m² can be found in the Milford Haven waterway area (Bohn *et al.* 2012). The Milford Haven waterway remains the northernmost self-sustaining population of slipper limpets along the Welsh coast (Bohn *et al.* 2012).

According to Montaudouin *et al.* (1999), *C. fornicata* causes conflict with native flora and fauna through trophic competition with other suspension feeders. *C. fornicata* has wide environmental tolerances and the species also enhances silt and clay sedimentation as well as competing spatially with macrozoobenthos (Montaudouin. 1999; Syvret & FitzGerald 2008). The species can have devastating effects on fisheries and marine ecosystems (Syvret & Fitzgerald 2008).



Figure 1: A map of the distribution of *C. fornicata* in the UK (Rayment 2008)

The Menai Strait mussel fishery in north Wales is the largest in the UK (Wilson & Smith 2008; Syvret & Fitzgerald 2008). The mussel 'seed' is imported from outside the area. The problem with importing the seed from elsewhere is that there is the risk of accidentally introducing the invasive slipper limpet. This was the case in 2006 when *C. fornicata* escaped into the Menai Strait (Wilson & Smith 2008). This has led to routine screening of mussel imports into Europe (Syvret & Fitzgerald 2008). In an attempt to remove the slipper limpets, the area was dredged and then mussels from an area without slipper limpets were relayed densely to smother any remaining ones (Wilson & Smith 2008). There have been no records of slipper limpet from the area since that time.

In the experiments of Thieltges *et al.* (2004), the population dynamics of the species was strongly affected by cold winters. The spread of *C. fornicata* may be facilitated by the expected rise in sea water temperature as a result of global warming (Bohn *et al.* 1999; Thieltges *et al.* 2004).

A juvenile individual of this non native species, *C. fornicata* was thought to have been identified on floating *Ascophyllum* near the Conwy estuary, during an MSc student project.



Figure 2: A chain of 3 individual slipper limpets (Rayment 2008)

2. Methodology

2.1. Location

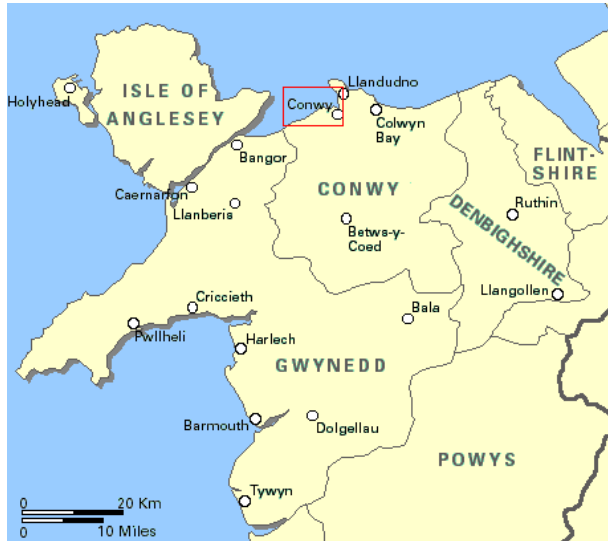


Figure 3: Map of North Wales with Conwy highlighted in the red box



Figure 4: Sampling sites on and around the mussel beds at Conwy estuary

A search and direct observation technique was used in this survey to determine whether the species was present in the Conwy estuary. The survey involved searching for *C. fornicata* along the mussel beds and surrounding area at Conwy. During the time available to complete the survey, we as much ground as possible was covered.



Figure 5: Sample sites on the intertidal mussel beds (yellow stars) and the Subtidal grab sample sites (purple circles)

2.2. Intertidal Sampling

The mussel beds were sampled between 8th August and 9th August 2013 during the early morning low tides. 34 random site locations were chosen and at each site 3 x 0.25m² quadrats were sampled giving a total of 102 quadrat samples. The substratum, mussel percentage, barnacle percentage and presence of *C. fornicata* were recorded on a proforma recording sheet (Appendix 1).

Site locations were recorded using the GPS and then imported into the GIS software package, MapInfo.

A number of photos were taken on site. Pictures included general location views together with pictures of quadrats and other subjects thought to be relevant at the time of survey. Jpg photographs were renamed using the following convention:

'Date (year month day)' underscore 'Photographers initials', underscore 'Survey location' underscore 'photograph number' underscore, habitat.

A risk assessment was carried out for this work (see Appendix 4)

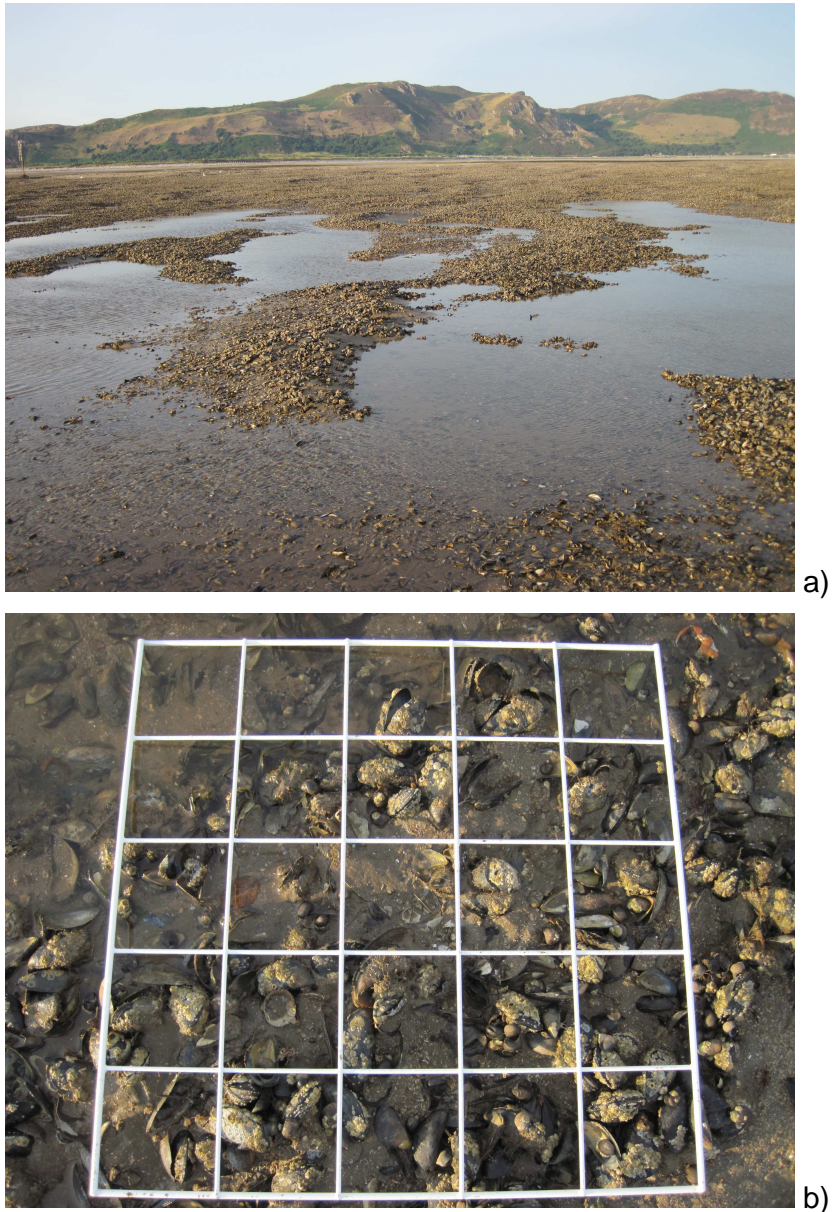


Figure 6: a) The intertidal survey location at Conwy estuary b) 0.25m² quadrat

2.3. Subtidal Sampling

A 0.1m² day grab was deployed from Mersey Guardian, an Environment Agency survey vessel, at each site (see purple circles in Figure 5 above). The day grabs were originally organised for Water Framework Directive monitoring. In some cases however, the grab jaws were not able to shut fully due to the substrate being coarse (cobbles, gravel and sand with many large mussels) and jamming the grab. In these unusable grab samples, Matthew Green searched through the material quickly, specifically looking for *C. fornicata*. 33 of these grab samples were checked for the invasive species. These sample points were imported into the GIS software package, MapInfo. See Appendix 3 for the worked up grab sample results.

3. Results

3.4. Intertidal and Subtidal

There were no *C. fornicata* individuals found on the survey in the Conwy estuary area despite a thorough search over an extensive area. 34 intertidal sites, totalling 102 quadrats (3 quadrats at each site) and 33 subtidal locations were sampled for the non-native species. Data from both the intertidal and subtidal sampling can be found in Appendix 2 and Appendix 3 respectively.

3.5. Substrate

A variety of different substrata were sampled, a list of the intertidal substrates sampled can be found in Appendix 1, along with the % of mussels, fucoids and barnacles. In the intertidal area, where these percentages were recorded, an average of 46.8% *Mytilus edulis*, 11.9% *Fucus* spp. and 29.2% barnacles were recorded in the quadrats.

4. Discussion

The Conwy estuary survey has provided a relatively good coverage of the subtidal channel in the lower Conwy estuary as well as the intertidal area of the estuary. Both the intertidal and subtidal samples showed a 100% absence giving a positive indication that there is no *C. fornicata* in the lower Conwy estuary.

Despite comprehensive coverage across the lower estuary channel and mussel beds, it cannot be confirmed that *C. fornicata* is entirely absent from the whole Conwy estuary. Individuals of the species may have been missed as quadrats didn't cover every existing section of the estuary. Juvenile *C. fornicata* may prove difficult to see, when they are in a variety of habitats.

5. References

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APPENDIX 1: C.FORNICATA RECORDING SHEET

Conwy *C. fornicata* Survey 2013

Date:

Surveyors:

Weather conditions:

Sheet number:

Station / Quadrat number	Substratum	Mussel %	Fucoid %	Barnacle %	Crepidula Y/N	Comments

APPENDIX 2: DATA COLLECTED FROM QUADRAT SAMPLES IN THE INTERTIDAL

Station No /Quadrat	Substratum	Mussel %	Fucoid %	Barnacle %	Crepidula %
1A	Sand	70	60	60	N
1B	Sand	40	75	20	N
1C	Sand and gravel	50	30	50	N
2A	Sand and gravel	10	10	15	N
2B	Sand, gravel, shell and rock	10	30	10	N
2C	Sand and gravel	0	20	1	N
3A	Sand and gravel	0	3	0	N
3B	Sand and gravel	0	30	0	N
3C	Gravel and sand	0	20	1	N
4A	Sand	0	0	0	N
4B	Sand and shell	0	0	0	N
4C	Rock and sand	1	20	10	N
5A	Sand and gravel	4	0	10	N
5B	Sand and cobble	10	0	20	N
5C	Sand and cobble	1	0	5	N
6A	Shell, sand and cobble	10	2	5	N
6B	Sand and rock	15	0	25	N
6C	Sand, shell and cobble	5	0	5	N
7A	Sand and shell	50	0	40	N
7B	Shell	60	0	30	N
7C	Shell and sand	60	0	40	N
8A	Coble, sand and shell	20	0	30	N
8B	Shell	5	0	2	N
8C	Sand and shell	80	0	60	N
9A	Gravel and shell	60	0	40	N
9B	Gravel and shell	70	1	40	N
9C	Sand and shell	80	0	30	N
10A	Sand and shell	90	15	70	N
10B	Shell	70	0	30	N
10C	Shell	70	2	30	N
11A	Gravel, sand and shell	50	1	50	N
11B	Gravel, sand and shell	40	15	40	N
11C	Cobble, sand and gravel	40	0	40	N
12A	Shell, sand and cobble	40	5	50	N
12B	Shell, sand and cobble	50	5	40	N
12C	Sand, gravel and shell	40	10	50	N
13A	Gravel, cobble and sand	10	1	40	N
13B	Gravel, cobble and sand	5	0	60	N
13C	Gravel, cobble and sand	10	4	30	N
14A	Gravel, cobble and sand	5	0	5	N
14B	Sand, shell and gravel	20	0	10	N
14C	Sand, shell and gravel	15	0	10	N
15A	Pebble, gravel and sand	10	0	1	N
15B	Pebble, gravel and sand	5	0	2	N
15C	Pebble, gravel and sand	5	0	5	N
16A	Pebble, gravel and sand	95	0	40	N
16B	Pebble, gravel and sand	95	0	15	N
16C	Pebble, gravel and sand	90	0	40	N
17A	Sand and mussel shell	90	10	50	N
17B	Sand and mussel shell	60	35	30	N
17C	Sand and mussel shell	70	40	30	N
18A	Sand and shell	60	0	20	N
18B	Sand and shell	55	5	30	N

Station No /Quadrat	Substratum	Mussel %	Fucoid %	Barnacle %	Crepidula %
18C	Sand and shell	50	2	20	N
19A	Muddy sand	60	0	20	N
19B	Muddy sand	70	1	15	N
19C	Muddy sand	40	20	20	N
20A	Cobble, pebble and shell	30	0	50	N
20B	Cobble, pebble and shell	30	0	50	N
20C	Cobble, pebble and shell	25	0	40	N
21A	Cobble, shell and sand	40	0	70	N
21B	Cobble, shell and sand	50	3	70	N
21C	Cobble, shell and sand	60	0	70	N
22A	Sand and shell	80	5	0	N
22B	Sand and shell	90	0	1	N
22C	Sand and shell	80	0	1	N
23A	Mud and sand	70	0	20	N
23B	Mud and sand	70	2	30	N
23C	Mud and sand	80	5	30	N
24A	Mud and sand	70	10	5	N
24B	Mud and sand	70	0	5	N
24C	Mud and sand	70	0	5	N
25A	Sand	30	70	40	N
25B	Sand	60	20	50	N
25C	Sand	60	50	50	N
26A	Sand, cobble and shell	30	1	50	N
26B	Sand, cobble and shell	40	0	70	N
26C	Sand, gravel and cobble	40	0	30	N
27A	Muddy sand	95	30	50	N
27B	Muddy sand	90	100	40	N
27C	Muddy sand	90	50	40	N
28A	Sand	40	25	40	N
28B	Sand, pebble and shell	20	1	10	N
28C	Sand, pebble and shell	30	10	20	N
29A	Mud and sand	50	80	60	N
29B	Mud and sand	80	95	60	N
29C	Sand	30	50	10	N
30A	Sand and shell	50	15	20	N
30B	Sand and shell	70	20	60	N
30C	Sand and shell	80	40	50	N
31A	Sand, shell and gravel	10	0	1	N
31B	Sand, shell and gravel	95	0	50	N
31C	Sand and shell	90	0	20	N
32A	Sand and shell	50	0	20	N
32B	Gravel and pebble	5	0	5	N
32C	Sand, gravel and shell	40	0	5	N
33A	Sand and shell	90	0	50	N
33B	Cobble, gravel and shell	20	0	5	N
33C	Sand, cobble and shell	80	0	20	N
34A	Pebble and sand	90	1	50	N
34B	Pebble and sand	90	55	50	N
34C	Pebble and sand	90	5	60	N

APPENDIX 3: DATA COLLECTED FROM THE SUBTIDAL DAY GRAB SAMPLES

Time UTC	name and / or sample point code	WGS84Latitude	WGS84 Longitude	OSGB36 Easting	OSGB36 Northing	Indicative station code	Water depth (m)	Sample type	description
14:14	CWT13SO01B	53°19.7533'N	3°52.5053'W	275 224	383 008	CWT13AA	5.44	Not accepted	stones
14:16	CWT13SO01B	53°19.7566'N	3°52.5438'W	275 182	383 015	CWT13AA	5.45	Not accepted	stones
10:34	CWT13SO08B	53°18.0831'N	3°51.2411'W	276 547	379 875	CWT13M	9.19	Not accepted	mussels
10:36	CWT13SO08B	53°18.0827'N	3°51.2415'W	276 547	379 874	CWT13M	9.1	Not accepted	mussels
10:37	CWT13SO08B	53°18.0829'N	3°51.2381'W	276 550	379 874	CWT13M	8.81	Not accepted	mussels
10:41	CWT13SO08B	53°18.0834'N	3°51.4505'W	276 315	379 882	CWT13L	8.23	Not accepted	mussels
10:42	CWT13SO08B	53°18.0822'N	3°51.4409'W	276 325	379 879	CWT13L	8.23	Not accepted	mussels
10:47	CWT13SO08B	53°18.0653'N	3°51.7487'W	275 983	379 857	CWT13K	8.71	Not accepted	mussels
10:50	CWT13SO08B	53°18.0708'N	3°51.7370'W	275 996	379 866	CWT13K	8.78	Not accepted	mussels
10:44	CWT13SO08B	53°18.0798'N	3°51.4475'W	276 318	379 875	CWT13L	8.04	Not accepted	stone & mussels
11:02	CWT13SO08B	53°17.6925'N	3°50.3536'W	277 514	379 125	CWT13F	14.38	Not accepted	stone & mussels
10:01	CWT13SO08B	53°17.4997'N	3°50.0733'W	277 816	378 760	CWT13D	11.21	Not accepted	stones
10:03	CWT13SO08B	53°17.4971'N	3°50.0787'W	277 810	378 755	CWT13D	11.88	Not accepted	stones
10:05	CWT13SO08B	53°17.4959'N	3°50.0810'W	277 808	378 753	CWT13D	12.07	Not accepted	stones
10:10	CWT13SO08B	53°17.7462'N	3°50.3954'W	277 470	379 226	CWT13F	13.32	Not accepted	stones
10:13	CWT13SO08B	53°17.7835'N	3°50.4515'W	277 410	379 297	CWT13F	11.58	Not accepted	stones
10:15	CWT13SO08B	53°17.7966'N	3°50.4507'W	277 411	379 321	CWT13F	11.98	Not accepted	stones
10:17	CWT13SO08B	53°17.8560'N	3°50.5027'W	277 356	379 433	CWT13G	9.67	Not accepted	stones
10:18	CWT13SO08B	53°17.8675'N	3°50.5082'W	277 351	379 454	CWT13G	8.71	Not accepted	stones
10:20	CWT13SO08B	53°17.8660'N	3°50.4953'W	277 365	379 451	CWT13G	8.14	Not accepted	stones
10:23	CWT13SO08B	53°18.1019'N	3°50.8029'W	277 035	379 897	CWT13N	10.83	Not accepted	stones
10:25	CWT13SO08B	53°18.1037'N	3°50.8037'W	277 034	379 900	CWT13N	11.21	Not accepted	stones
10:26	CWT13SO08B	53°18.0939'N	3°50.7911'W	277 047	379 882	CWT13N	9.81	Not accepted	stones
10:29	CWT13SO08B	53°18.0687'N	3°51.0047'W	276 809	379 841	CWT13J	9.39	Not accepted	stones
10:30	CWT13SO08B	53°18.0747'N	3°51.0057'W	276 808	379 852	CWT13J	9.48	Not accepted	stones
10:32	CWT13SO08B	53°18.0752'N	3°51.0022'W	276 812	379 853	CWT13J	9.87	Not accepted	stones
10:59	CWT13SO08B	53°17.7878'N	3°50.4224'W	277 442	379 304	CWT13F	10.35	Not accepted	stones
11:37	CWT13SO10B	53°18.0880'N	3°51.1264'W	276 675	379 881	CWT13J	9.39	Not accepted	mussels & stones
11:40	CWT13SO10B	53°18.0871'N	3°51.3684'W	276 406	379 886	CWT13L	9.58	Not accepted	mussels & stones
11:42	CWT13SO10B	53°18.0839'N	3°51.5641'W	276 189	379 886	CWT13L	8.14	Not accepted	stones
12:02	CWT13SO10E	53°17.6939'N	3°52.7248'W	274 880	379 196	CWT13E	7.56	Not accepted	mussel shells & little sand
12:00	CWT13SO10E	53°17.7038'N	3°52.7276'W	274 878	379 215	CWT13E	7.75	Not accepted	mussels
12:03	CWT13SO10E	53°17.6930'N	3°52.7037'W	274 904	379 194	CWT13E	7.37	Not accepted	mussels

APPENDIX 4: RISK ASSESSMENT FOR INTERTIDAL WORK AT CONWY ESTUARY

Title of project:	NRW Intertidal <i>Crepidula</i> survey 2013
Operations:	Marine biological surveys on rocky shore habitats
Date(s):	08/08/2013 – 09/08/2013
Location of operations:	Conwy estuary area
Client:	Natural Resources Wales
Names of Surveyors:	Paul Brazier, Chloe Jennings
Other personnel present:	Other representatives from CCW may join team occasionally to observe work
Survey equipment	See detailed equipment list. No mains power tools, heavy equipment or other hazardous equipment
Access to sites	By car and then foot along the shore
Communication equipment	Mobile telephones: Paul Brazier (07909874497) Chloe Jennings (07983016979)
Emergency procedures:	See separate sheet of standard procedures. Site specific procedures: Inform a reliable person of your expected work start and finish times prior to start of work – then later inform them when the surveyors are safely off site. That person must know your survey plans and will be responsible for calling the coastguard should you fail to report in. Inform coastguard of your work plans.
Safety equipment:	For each survey pair: first aid kit, throwing line, mobile phone, local map, compass, GPS, whistle. Individual: appropriate clothing (for weather, walking, and muddy areas), waterproofs, wellies/waders, spare warm clothing, sunscreen, bottle of water

Risk Assessment Record Activity:		Location: Conwy Estuary area		
Crepidula survey		Persons/ groups at risk: NRW Staff		
Hazard	Risk			
	H	M	L	
Weather/sea conditions				
Hypothermia, sunstroke/heat exhaustion Fading light/fog		*	*	Wear appropriate clothing/sunscreen. Carry/drink adequate water. Do not survey in very cold weather. Survey only during daylight hours and if visibility is >30m. Check weather forecast daily.
Site conditions				
Slippery / unstable / rough substrata	*	*		Appropriate footwear. Leave plenty of time to/from survey areas. Don't rush. Do not climb up/down unsafe cliffs/slopes.
Fast rising tide / cut off by tide	*	*		Know tide times. Work will be carried out approximately 2 hours each side of low water. Surveyors to be vigilant of speed of incoming tide. Take account of local knowledge of site.
Survey stations close to strong currents			*	Be aware of currents. Have throw ropes easily to hand. Wear life jackets in areas of particular concern or abandon plans to survey that station.
Crossing steep / muddy channels	*	*		Use a pole to assess sediment and find safe place to cross. Cross one by one and have throw rope to hand.
Survey personnel & 3 rd parties				
Inadequate surveyor fitness			*	Check fitness of surveyors before survey and daily

Conwy estuary *Crepidula fornicata* survey 2013

Conflict with owner / occupiers or other users			*	Contact owner/occupiers before survey; and provide dates/times if required. Carry official letter from NRW and any other required permissions.
Surveyor(s) lost / location not known			*	Always work in pairs and maintain frequent contact between pairs.
Surveyor injury			*	Keep to agreed safe working practices. First aid kit easily available to each survey pair.
Work equipment				
Mobile phone not working / no reception		*	*	More than one mobile phone per survey team. Charge battery before every day of survey.
Safety equipment/clothing damaged		*	*	Ensure all equipment is maintained and in-service. Check equipment and clothing daily.
Missing safety equipment		*	*	Go through daily checklist of equipment before survey.

Animals				
Weaver fish 'sting'			*	Appropriate sturdy footwear
Biohazard agents				
Contamination from bird droppings			*	Wash hands before eating
<p>ACTION REQUIRED (in priority order)</p> <p>Ensure that there is one member of each survey team experienced in intertidal working and one person in each team with HSE 1st Aid at work certificate. Check tides and weather forecasts daily Ensure all site related hazards listed above are addressed prior to survey and that suitable equipment is taken by each team.</p> <p>IS RESIDUAL RISK ACCEPTABLE? YES</p> <p>ASSESSMENT MADE BY Paul Brazier COMPLETION DATE 06/08/2013</p>				

APPENDIX 5: DATA ARCHIVE

The report and data collected archived as Project No 442, Media No. 1482. This archive is maintained on backed-up server based storage at NRW Maes y Ffynnon, Bangor office.

Report citation:

Jennings, C. 2014. NRW Conwy Estuary *Crepidula fornicata* Survey August 2013. NRW Evidence Report No 03, 16pp + viii, Natural Resources Wales, Bangor.

The data archive consists of:

[A] Report and proformae for recording at both the intertidal and Subtidal sites in word

[B] Spreadsheets

[C] Photographs in jpeg format of quadrats and of the site in general

[D] Marine Recorder file

The file path for the report:

H:\Science\MFSG\Marine_Habitats_and_Species\Non-native species\Alien Crepidula

The file path for the data and analyses:

H:\Science\MFSG\Marine_Habitats_and_Species\Non-native species\Alien Crepidula\Data and GIS

The file path for the archive:

W:\Media1401to1500\Media1482

Metadata for this project is publicly accessible through contacting the NRW marine and freshwater data manager.



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