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The Marine Invasive Non-Native Species *Didemnum vexillum*: Loch Creran Surveys - September 2016

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Summary

This report presents the results of two surveys in the vicinity of Loch Creran, performed in September 2016 in support of efforts to contain and control the marine invasive non-native tunicate *Didemnum vexillum*.

Survey 1 - Rubha Mor Site Survey – Monday 19 September 2016

This was the first survey by MSS of the shellfish farm in Loch Creran where *Didemnum vexillum* had been reported by the Scottish Association of Marine Science (SAMS – E Cook-Cottier, *pers. comm.*) on 1 September 2016. While SAMS had previously found approximately 10% of oyster bags to have *D. vexillum* fouling, this survey found approximately 0.1% fouling (i.e. 40 bags in a total of approximately 40,000). It should be noted that the initial SAMS survey was of the far western extreme of the farm, and was conducted before the farm started to manage the *D.vexillum*.

No samples were taken during this survey.

Survey 2 – Farm and Foreshore – Monday 26 September 16 to Wednesday 28 September 2016

Although this was planned to be a second survey of the farm, in order to see how *D. vexillum* had spread, this was abandoned as the farm site was obviously heavily managed (i.e. infected bags removed from the trestles and treated whenever Dvex observed), as was appropriate for an invasive non-native species. Hence time on site was used to conduct a detailed visual foreshore survey around the Loch, as well as to collect live samples of *D. vexillum* to take back to the containment aquarium in Aberdeen for trials and tests.

The live samples consisted of *D. vexillum* attached to oyster bags. Sections were cut out and the fouled sections, along with some fouled oysters, returned to the

containment aquarium in Aberdeen. These live samples were subsequently confirmed as *D. vexillum* using molecular techniques.

Unique sample identifier	Sample Ref.	Coll. Date	Molecular sample id	Analysis date	GenBank BLAST quick id
LcDv10	6 from Ellis aquarium	28/09/201 6	Sample 19	09/11/2016	D. vex
LcDv11	7 from Ellis aquarium	28/09/201 6	Sample 20	09/11/2016	D. vex

Rubha Mor Site Survey – Monday 19 September 2016

Narrative

This is a transcript of MSS field log books from a visual survey of the Caledonian Oyster Company oyster farm, Rubha Mor site, Loch Creran on Monday 19 September 2016.

The survey took approximately 2.5 hours (14:00-16:30). Low water springs was at 14:25 BST Oban (0.3 m). All times are recorded in BST.

At the start of the survey we recorded absence as well as presence of Dvex. However, mid-way through the survey we switched to recording presence only, as the tide was coming in.

The general way of operating was to walk round a block of trestles, taking photos, and then record on paper what was seen.

Waypoints (time, decimal latitude, decimal longitude, -ve indicates west) were recorded using the Android App – "MapPad". Datum – WGS84.

Photos were recorded on a Samsung Galaxy 5s.

Photos were tagged with time and some with latitude and longitude

Text in italics are comments added subsequently (i.e. not recorded in log book).



Figure 1: Location of surveyed farm (Rubha Mor) in relation to features of interest in Loch Creran. Purple is serpulid reef, red is flame shell bed.



Showing general arrangement of farm – view from southern edge of farm on approach to first set of trestles.







14:18 2nd set of trestles – No *D. vexillum* (WPT 5, 56.511136, -5.380621)



Note stationary sea water beneath some trestles. Material dislodged from these will enter the loch directly.





This view shows the "middle" row of trestles, and behind it the "wet" seaward row.



The two types of D. vexillum colonies seen – the "mat" type – very much enmeshed in the structure of a bag, and the "pendulous" type.

14:25 4th set of trestles – No sign of *D. vexillum* (WPT 7, 56.510727, -5.381578)



Clean from visible D. vexillum, but not from other biological material. It may be impossible to say from a visual inspection of trestles in this condition that there is no D. vexillum present in small colonies.

14:29	5th set of trestles (WPT 8, 56.51062, -5.381987)
	- One infested bag.











14:35 6th set of trestles – All clear. (WPT 9, 56.510745, -5.381972)









Note confused collection of growth underneath bags on the "wet" seaward row of trestles.





Empty trestles with D. vexillum present on it.

14:48	8th set of trestles (WPT 12, 56.510802, -5.383104)
	– Meet Farm Owner
	- set clear



Note here recently laid/cleaned bags.

At this point we meet owner of the Caledonian Oyster Company who gives us full permission to continue the survey.

14:53	9th set of trestles (WPT 13, 56.510832, -5.383311)
	– All clear



Note here the different state of bags within the farm. The ones above are clean of fouling, and have either been freshly cleaned, or freshly laid. Trestles are free from fouling.

	Going to do deepest ones along water's edge		
14:56	10th set of trestles (WPT 14, 56.511063, -5.383191)		
	- Some on trestle		
	- Bits all over sediment – loose		
	- AM thinks bits on bag on barge		



The "wet" seaward trestles - heavily fouled, very wet sediment beneath.



A loose piece of D. vexillum lying in a pool of water alongside a trestle.



Possibly D. vexillum?



Probably not D. vexillum. But this shows the mixture of different types of material in the biofouling complex present.



More loose D. vexillum on the sediment alongside trestles.



This is a floating raft used to tow bags around the farm in the shallows at low tide. There seems to be considerable within-farm movement of bags and equipment.



Loose D. vexillum on sediment.



15:05	11th set of trestles (WPT 15, 56.51107, -5.38348)
	– All clear



Note seaward trestles are in seawater in all but the very low point of a spring tide.

As tide about to come in – we are doing sweep of remaining trestles and
will only record presence – not absence

15:12 | 1 occurrence (WPT 16, 56.512025, -5.384121)



The "wet" seaward trestles.



15:15 | 1 occurrence – unidentified (WPT 17, 56.511961, -5.384355)



15:19 1 occurrence – under wet trestle





15:21 All wet trestles have material under













Probably not D. vexillum

15:34	- Definite sightings of <i>D. vexillum</i> on wet trestles	
	- (WPT 19, 56.51292, -5.385098)	





TIDE COMING IN

15:39 - Loose bits on sediment (WPT 20, 56.512936, -5.385722)







GPS Test

Current GPS accuracy - 10 - 13 feet, 25 satellites

[using the Android App "GPS Test+"]

15:42 Bag on its own – *D. vexillum* (WPT 21, 56.512879, -5.385693)



This may be evidence of management of fouled bags.



15:47 New Bags (WPT 22, 56.51306, -5.386307





15:50 D. vexillum (WPT 23, 56.513683, -5.387597



Stacked Bags





Secondary set of trestles at NW corner of farm (Surveyed by Andy Mayes).



Example of trestle construction.



Supplementary Information

Two patches of D. vexillum were observed on the secondary set of trestles (pictures below). Location: 56° 30' 58"N, -5° 23' 37"W (measured using 'Compass' app on iPhone 4C). Observed at 16:00.





A magnified view of the same colony.



A patch of D. vexillum on the underside of a bag. This was observed about 2 m from the colony pictured above.

Second Loch Creran Survey – Monday 26 September 201616 to Wednesday 28 September 201616

Timetable

Date	Day	Time	Activity		
26/09/16	Monday	1500 - 1900	MSS travel to Oban (Aberdeen Public		
			Holiday)		
27/09/16	Tuesday	1000 - 1200	Discussions on farm with Hugo		
		1300 - 1500	Discussions at SAMS with Liz Cook		
28/09/16	Wednesday	0900 - 1200	Farm survey or Foreshore survey		
		1200 - 1430	Collect samples from Caledonian Oyster		
			farm		
		1430 - 1800	Travel back to Aberdeen		
			Place samples in biosecure aquarium		

Report

On arrival at the farm on Tuesday 27 September 2016 it quickly became evident that the situation we had expected to find (i.e. 40 infected bags still on trestles of farm) was no longer present.

It was evident that:

- Low water on 27 September was not sufficiently low to access the site. Work really does need to be done at LW springs.
- It was clear that we are now dealing with a farm where control treatments are applied as soon as Dvex is observed. The operators have been taking infected bags and treating with freshwater (by submerging them in a FW burn) and placing the treated bags high up the shoreline (just below the high tide mark). This means that the infected material we thought was present to do a trial of acetic acid is no longer present.
- There were signs of lots of moribund looking *D. vexillum* attached to bags and oyster shells on the upper shoreline that the operators have "treated".

Hence a repeat farm survey was no longer appropriate. We decided on two courses of action:

1. To return the following day (Wednesday 28 September) to pick up samples (oysters and bags) that had been treated both with the freshwater method and the partial-drying method. As a control of how transporting the material would

affect samples, we also picked up samples of *D. vexillum* fresh from the farm trestles that day.

2. To use the spare time to do a foreshore survey.

The results of the foreshore survey are recorded below. In short, no *D. vexillum* was found.

The samples were successfully returned to Aberdeen. A Biosecurity Risk Assessment was performed for their containment and transport, and this was formally approved by the Fish Health Inspectorate at Marine Scotland. The samples were transported directly from the site to the high biosecurity unit in the Ellis Building, Marine Scotland Science, Aberdeen, where they were placed into isolation tanks. Access to this facility is strictly controlled, and all effluent treated before leaving the building. The aquaria are rated to handle notifiable infectious aquatic diseases.

The samples will be used to test the efficacy of different treatment regimes to help improve the Best Practice guidance.

Objective of the follow-up aquarium-based study:

- 1. To observe live *D. vexillum* and devise measures of viability. i.e. what tests or observations can we make to ensure *D. vexillum* is alive or dead.
- 2. To determine the mortality of *D. vexillum* under the two farm treatment methods of soaking in freshwater, or partial drying.
- 3. To use live *D. vexillum* to test acetic acid spraying, freshwater treatments.
- 4. To provide any genetic samples needed.
- 5. To trial e-DNA tests from water samples containing live *D. vexillum*.

A sample consists of a bag with *D. vexillum* ingrained plus ten oysters with *D. vexillum* ingrained on shell.

The three sets of samples are:

- 1. TODAY: taken from the farm trestles on Wednesday 27 September 2016.
- 2. HALF TIDE: taken from the farm trestles on Wednesday 21 September 2016 and laid out at the half tide mark. Exposed to air and rain.
- 3. BURN: taken off the farm trestles on Wednesday 21 September 2016 and laid in freshwater for 24 hours, then also laid at half tide mark.

Foreshore Survey

MSS staff (BT and LB) surveyed the foreshore at:

Site	Lat	Long	Distance From Farm
			(KM)
Below Creagan Inn	56º 32.963'N	005º 17.986'W	6.7
South Creagan Bay	56º 32.665'N	005º 17.779'W	6.1
Marine Resource Centre	56º 31.786'N	005º 18.852'W	5.0
(Jetty and Foreshore)			
Creran Marine (Slip and Foreshore)	56º 31.684'N	005º 19.161'W	4.5
Rubha Mor Foreshore	56º 30.709'N	005º 22.740'W	0.5

Hard structures and natural hard substrates were visually examined between 0900 and 1130 BST (LW Oban – 1106 BST, 1.1 m).

See maps of survey sites below.

No *D. vexillum* was observed.

Please note that normal Fish Health Inspectorate biosecurity measures were followed when entering and leaving all survey sites by Marine Scotland Science staff.

Foreshore Survey Maps

Below Creagan Inn



South Creagan Bay



Marine Resource Centre (Jetty and Foreshore)



Creran Marine (Jetty and Foreshore)



Rubha Mor Foreshore

