Fisheries & Conservation Science

SCIENCE UPDATE

WP2 Habitat mapping: December 2013

Gwladys Lambert

PRIFYSGOL BANGOR UNIVERSITY

School of Ocean Sciences, College of Natural Sciences, Bangor University

Funded by:

Y Gronfa Pysgodfeydd Ewropeaidd:
Buddsoddi mewn Pysgodfeydd Cynaliadwy
European Fisheries Fund:
Investing in Sustainable Fisheries

Llywodraeth Cymru
Welsh Government

WP2 – Habitat mapping

1- Habitat assessment of Cardigan Bay SAC

We are proposing to run an experiment in the Cardigan Bay SAC. The work aims at determining the effect of scallop fishing impact on the seabed in order to advise the Welsh Government on possible sustainable options for the scallop fishery in an ecosystem approach framework. To do so, a gradient of fishing intensities will be applied by scallop fishing vessels in pre-determined, restricted areas and the effect of dredging on the benthic ecosystem will be assessed by sampling the seabed before and directly after scallop dredging with the RV Prince Madog (figure 1). At least one more scientific survey will be conducted after a few months to monitor recovery.

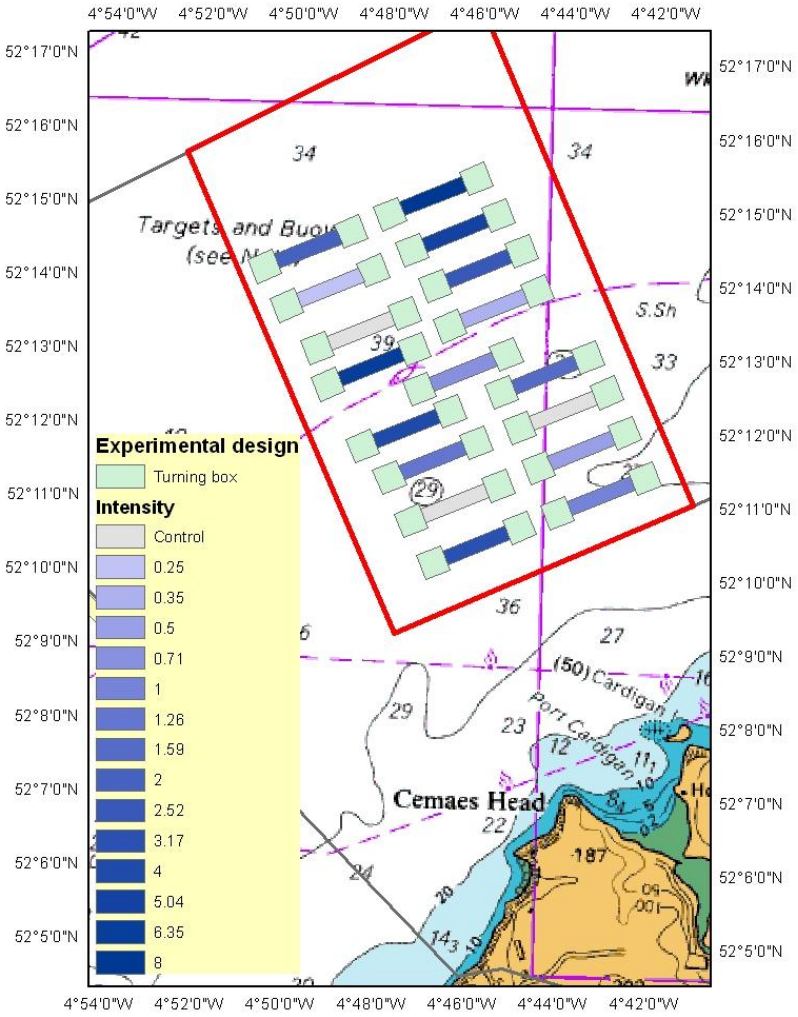

Figure 1. Experimental area and proposed design.

In order to get the authorisation to conduct this experiment, the first step was to make sure there was no feature for which the SAC was designated in the proposed experimental area. We therefore gathered all the evidence available and surveyed the area further. We present some of the results here but a full report is available online (Lambert et al. 2013).

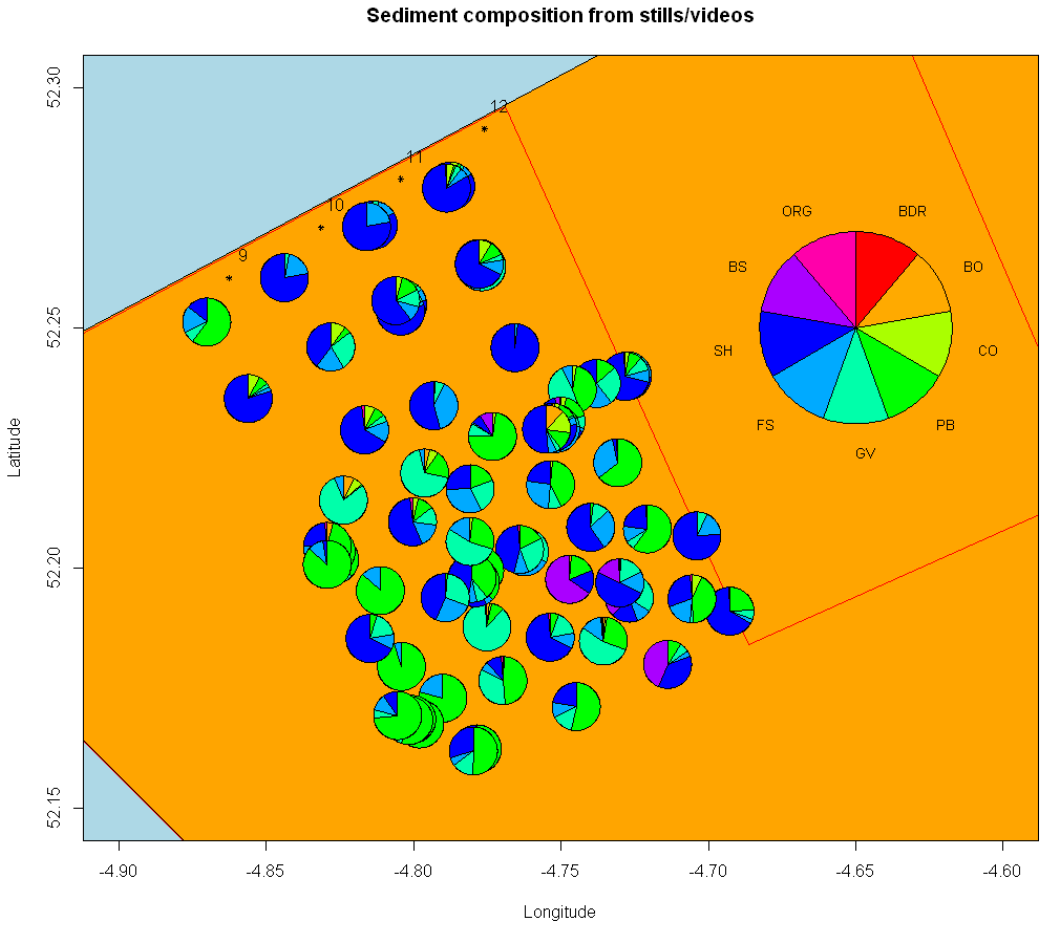

Figure 2. Sediment composition of all sites sampled between 2009 and 2012 in the proposed experimental area. Bedrock (BDR), Boulder (BO), Cobble (CO), Pebble (PB), Gravel (GV), Fine sediment (FS), Shells (SH), Brittle stars (BS), Other organism (ORG).

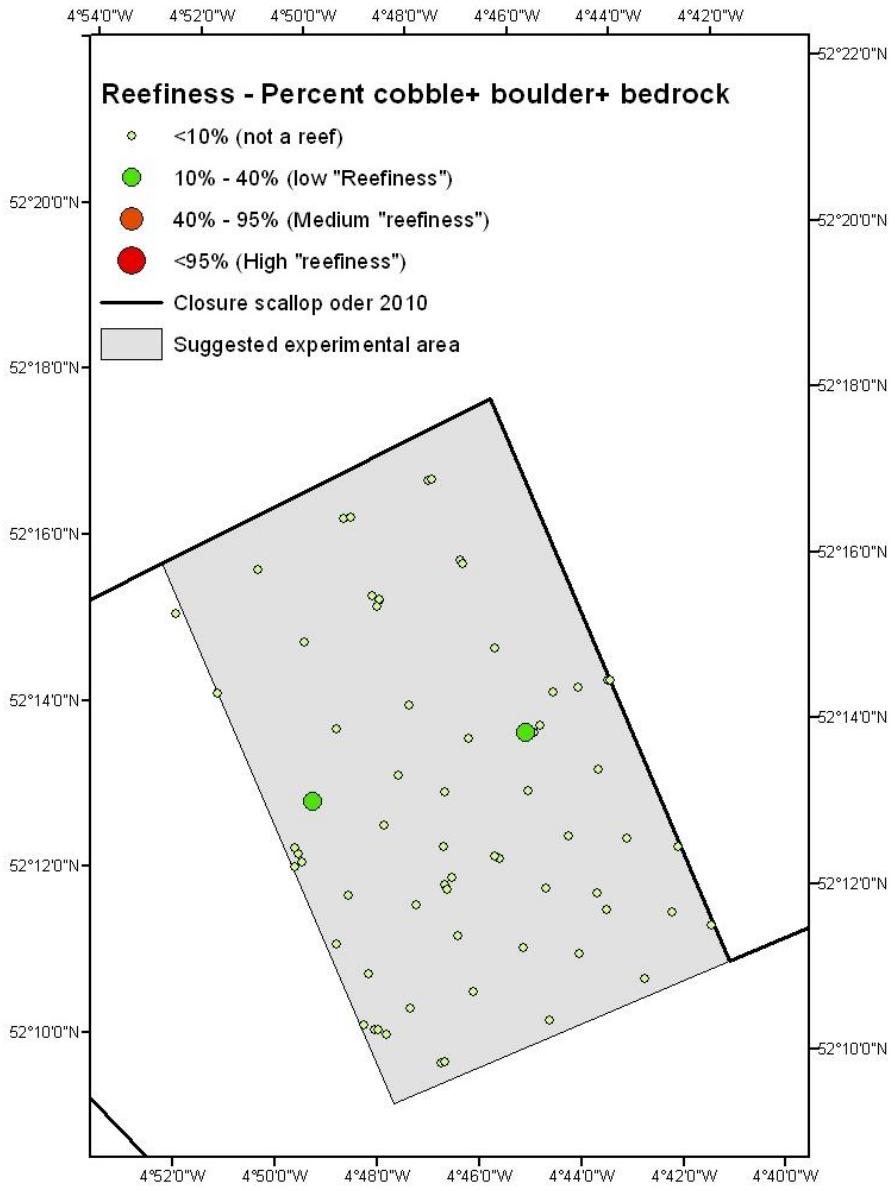

Figure 3. Percentage of cobble and boulder coverage (including bedrock) classified according to 'stony reef' criteria outlined by JNCC for all sites sampled between 2009 and 2012 in the proposed experimental area.

Video surveys were conducted by Bangor University and completed with the help of fishermen who used the mini-sled we designed for fishing vessels. The main results can be seen above in figures 2 and 3. In addition to those, NRW recommended to conduct a side scan survey in areas where the existence of cobble reefs had been suggested (figure 4). This survey was conducted by the Welsh Government and the data analysed by Bangor University.

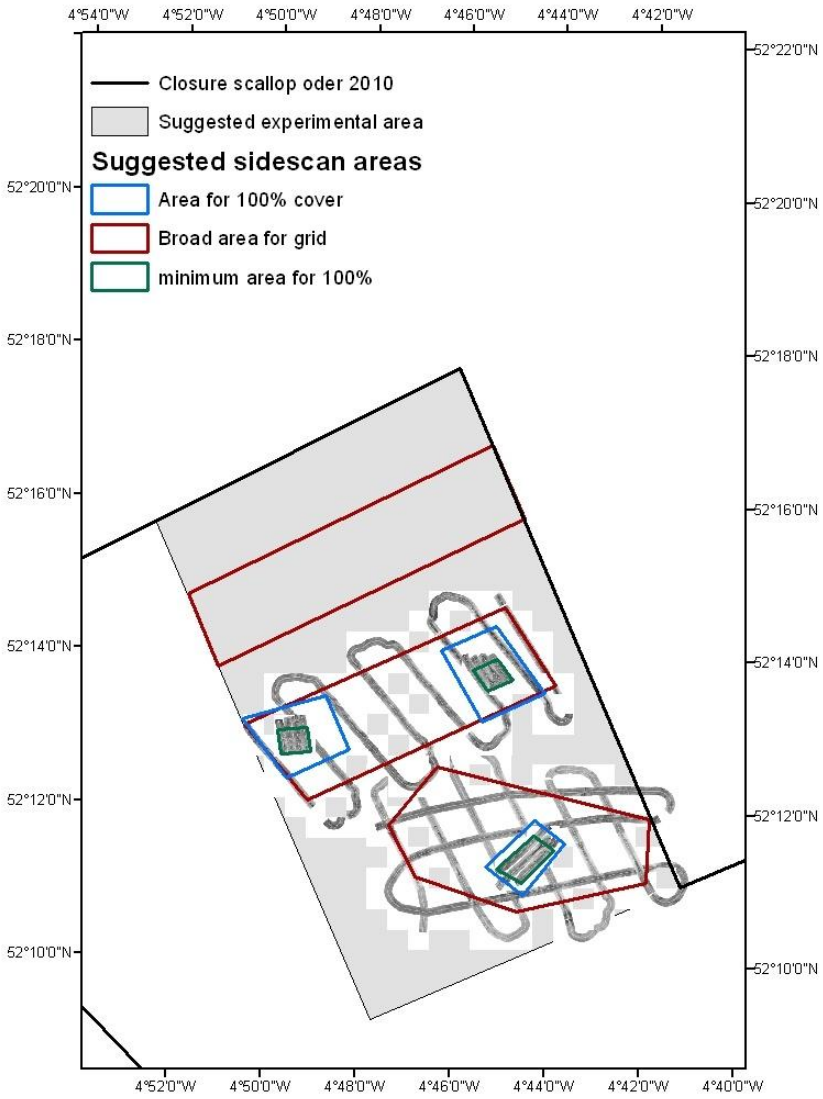

Figure 4. Side scan survey conducted by the Welsh Government in May 2013, with NRW recommended side scan overlaid. The red boxes were to be covered by a grid of side scan lines, the blue boxes were for 100% cover if possible with minimum 100% coverage of the green boxes in case the coverage of the blue areas was not logistically feasible.

The side scan and ground-truthing images showed that the area proposed for the experiment is dominated by mixed habitats, predominantly composed of sand and gravel but also of patches of cobbles and boulders. All data collected support existing maps of the area (source NRW, Digimap and other). There is no evidence of the existence of dense, stable and resilient stony patches supporting rich epifaunal communities.

Hinz et al. (2010a) found that, in the open area of the Cardigan Bay SAC, interspersed between fields of sand waves rougher ground with boulders casting distinct acoustic shadows were apparent and suggested that the area may consist of an underlying cobble and boulder habitat covered by highly mobile sand. The report by Lambert et al. (2013) backs up this assumption, with evidence of the presence of sand waves and stony patches in places, although there appeared to be more gravelly grounds in the proposed experimental area than in the open area.

More details on epifaunal biota are given by Hinz et al (2010b). In summary, Hinz et al. (2010b) found that gravel dominated habitats in the western part of the SAC were characterized by the brittlestars *Ophiura albida* (*Ophiotrix fragilis* at some sites) and Hydrozoan species including *Nemertesia* spp. Other species that were also common were small colonies of dead man's fingers *Alcyonium digitatum*, emergent Bryozoan colonies such as *Cellaria* and the star fish *Asterias rubens*. Richer communities of hard substrata species were found between 1.5 and 3nm, supporting the assumption of the existence of stony reefs further inshore, outside the proposed experimental area.

The proposed experiment should therefore not affect any protected feature and the fauna may be expected to be fairly resilient due to high levels of natural disturbance (Sciberras et al. 2013). The range of effort tested should help to answer this question and offer some alternative management strategies with respect to the wider environment and for the scallop fishery, which is now highly concentrated on a small area in a potentially unsustainable manner for the fishery and for seabed habitats and associated species, which may not be able to recover in the short term.

2- Habitat recovery of closed area of Cardigan Bay SAC

Bangor University has been sampling the Cardigan Bay SAC since the closure of the fishery in 2009. In 2009, 75% of the area of Cardigan Bay Special Area of Conservation (SAC) was closed to scallop dredging due to concerns over the rapid growth of the scallop fishery and the destructive potential of this fishing practice. The remaining 25% of the SAC remained seasonally open.

A study undertaken on data collected between December 2009 and April 2011 has not detected any signs of recovery in the SAC (Sciberras et al. 2013). However, it has been suggested that more time may be required for signs of recovery to become apparent. Therefore, we have built on this study and added data from another survey conducted in October 2012 (about 40 months after the closure). An analysis of functional traits, which provide information on the vulnerability or robustness of epifaunal communities, was also conducted for the first time. We tested the hypothesis that the closed area had benefited species and particularly groups of vulnerable species.

Figure 5 shows the maps of the sites used in the analysis (where video and images were recorded).

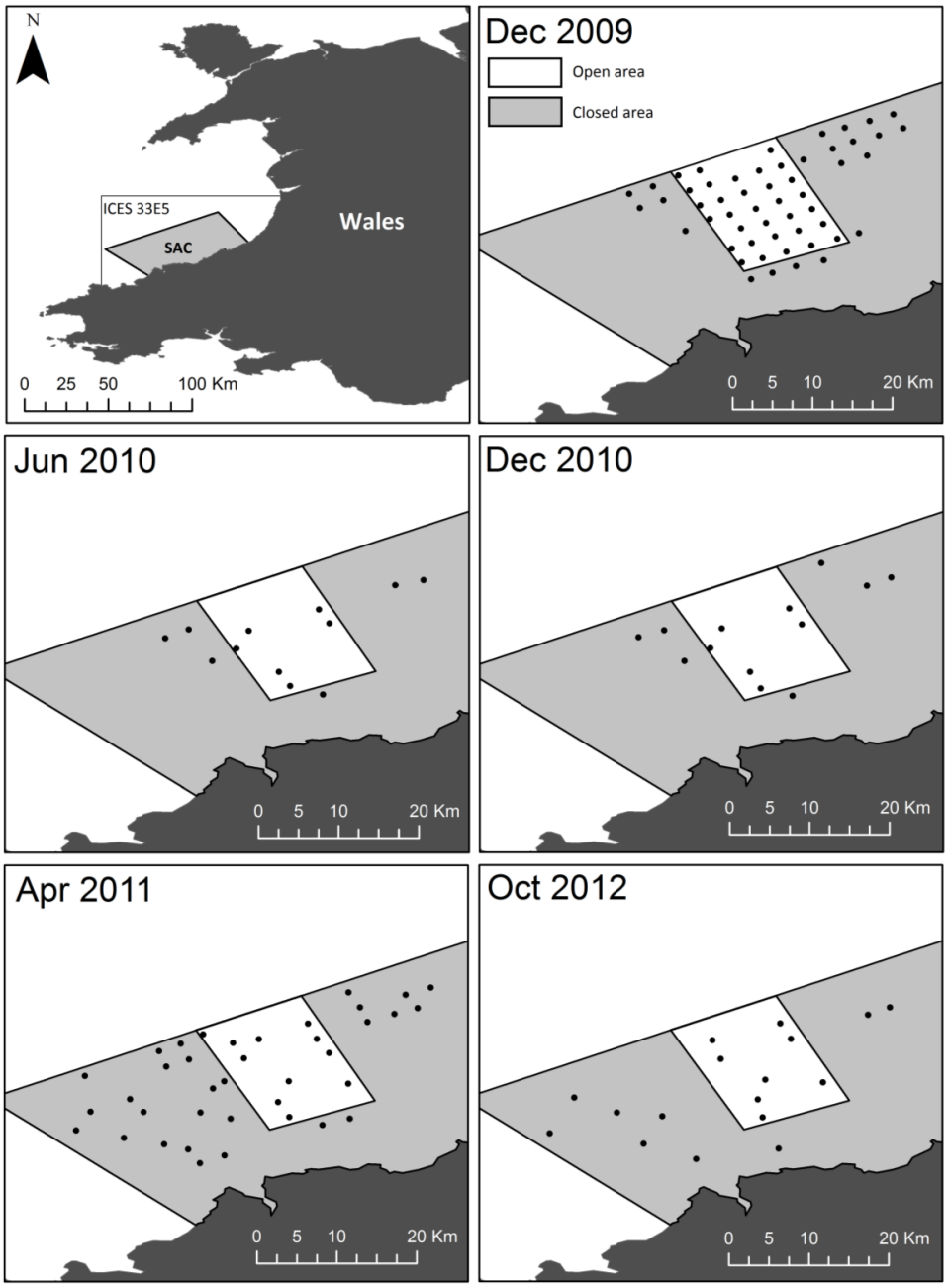

Figure 5. Map showing the location of the Cardigan Bay Special Area of Conservation (SAC) and ICES rectangle 33E5 in Wales (top left). Also shown are maps of the location of sampling stations (in both the open and closed areas) in each of the five surveys undertaken between December 2009 and October 2012.

Figures 6 and 7 show that there seems to be no significant effect of the closed area on epifaunal communities. Benthic communities appear to have changed in the same way in both the closed and open areas over the last 3 years.

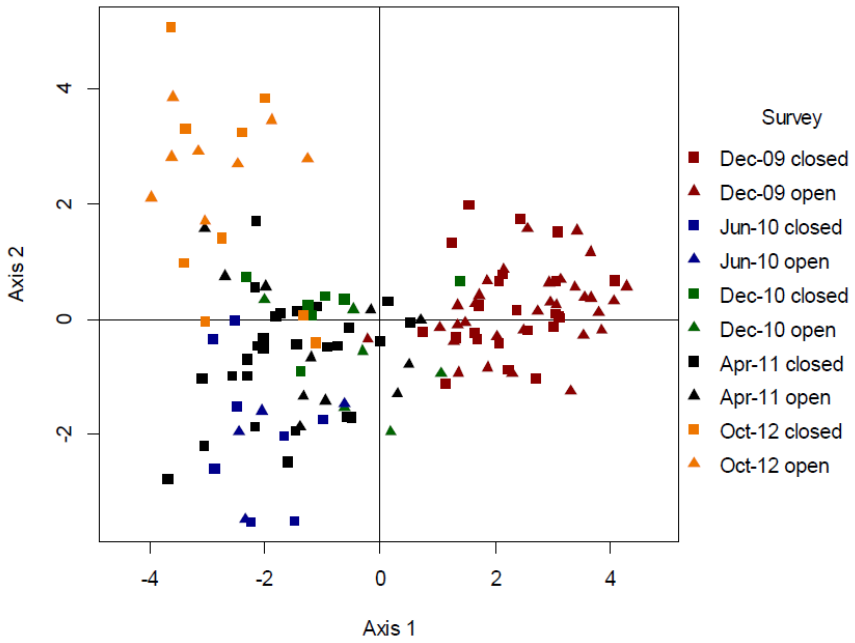

Figure 6. Ordination plot showing how the benthic communities have changed over time in both the closed and open areas. Each symbol is a different sampled site. The squares are sites in the closed area and the triangles are sites in the open area. Note that communities have moved from right to left between 2009 and 2012 in both the open and closed areas.

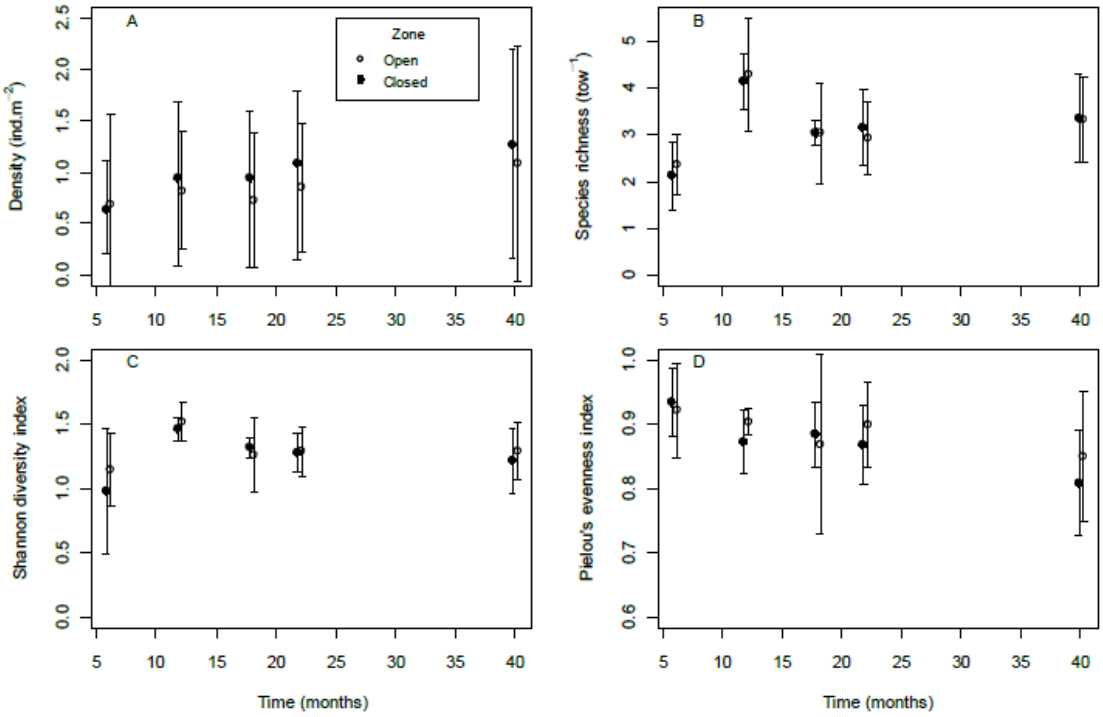

Figure 7. Changes in epifaunal communities with time (in months since closure). Mean ± standard deviation of square root transformed data for, A: total epifaunal density (individuals m^{-2}), B: species richness (number of species per camera tow), C: Shannon-Weiner diversity index (*H'*), and D: Pielou's evenness index (*J'*). Note that points have been separated slightly along the x-axis for ease of interpretation.

The full report of this study can be found online (Albrecht 2013). In brief, the results showed that there was no significant effect of the closed area on epifaunal communities. This result was attributed to relatively high levels of natural disturbance in the SAC caused by mobile sand wave seabed features, and the ability of epifaunal communities in the SAC to recover quickly through the recruitment of organisms with traits such as broadcast spawning and dispersal by planktonic larvae. When benthic communities have rapid recovery rates, permanent spatial closures to fisheries (for conservation or fisheries management) may not be necessary when less strict seasonal closures could provide adequate protection.

We now have another year of survey data and this is being added to the present study to see if signs of recovery can be observed in summer 2013 (over 4 years after the closure).

3- Mapping of Welsh waters

In addition to the work presented above, which focused very much on the Cardigan Bay SAC, we have conducted some video surveys off the Llyn Pensinsula and North of Anglesey. Figure 8 shows all the sites that have been sampled with the video and still camera from the RV Prince Madog since 2009. Most of the videos have been analysed and we are in the process of finishing the analysis of the images of the July 2013 survey. All this data is shared with NRW and will be used to improve the existing maps of Welsh water seabed habitats.

We have also planned a survey inshore Tremadog Bay, which will hopefully be conducted in spring/summer 2014 (figure 9).

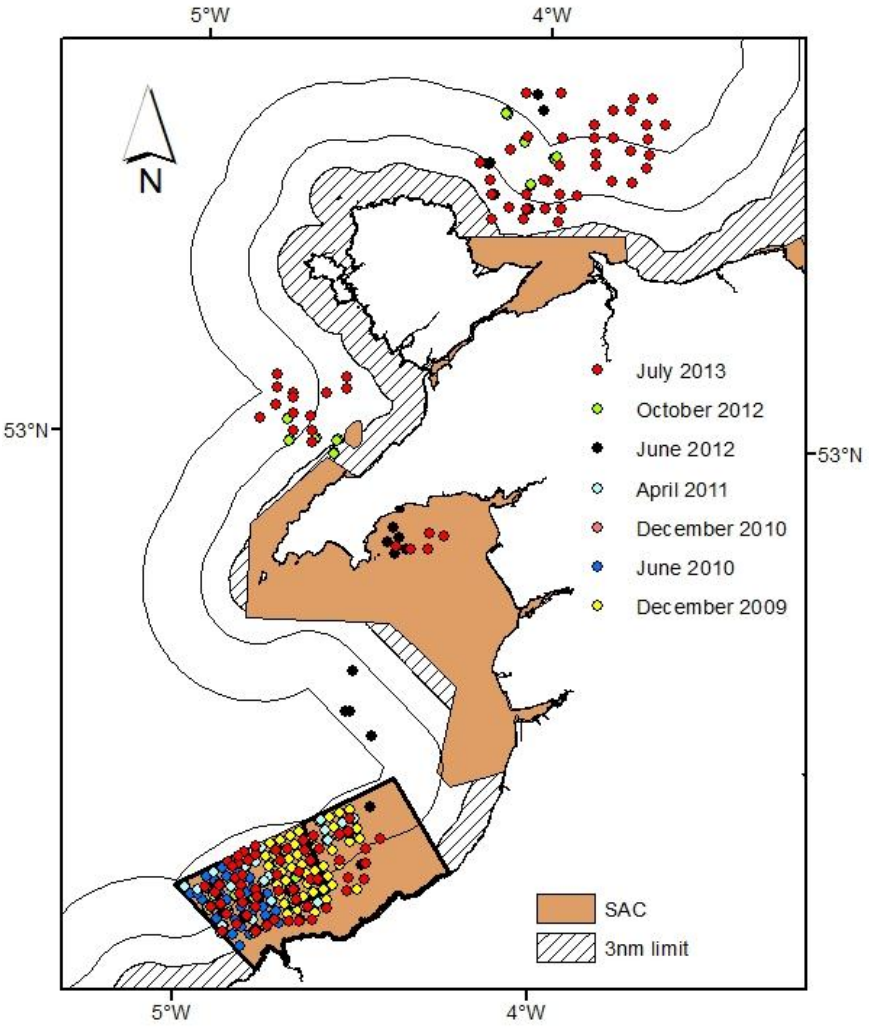

Figure 8. Video and still images surveys conducted by Bangor University as part of the EFF project and earlier work.

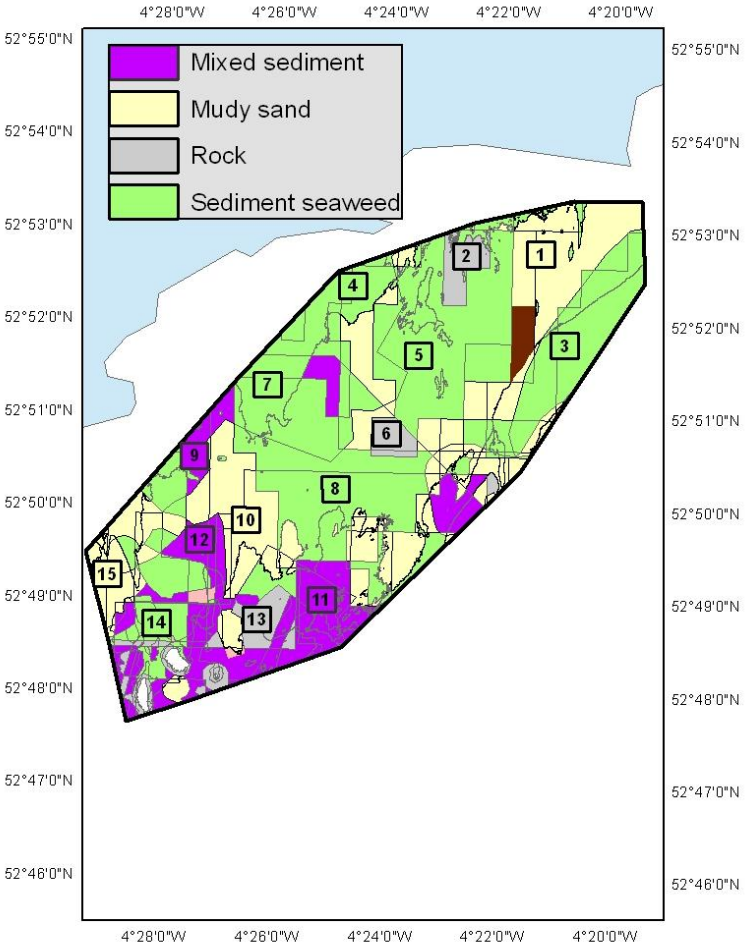

Figure 9. Tremadog Bay – video survey plan. Fifteen sites have been identified based on HabMap.

References

Albrecht, J. K. (2013). Taxonomic and functional recovery of epifauna after the permanent closure of an area of the Cardigan Bay Special Area of Conservation (SAC), Wales, to a scallop dredge fishery. MSc thesis, Bangor University, Fisheries & Conservation report No. 28, Pp.81

Lambert, G. I., Murray, L.G., Benell J.D. & Kaiser, M.J. (2013). Habitat assessment of the area of the Cardigan Bay SAC proposed for a fishing intensity experiment. Fisheries & Conservation report No. 23, Bangor University. Pp.51

Sciberras M, Hinz H, Bennell JD, Jenkins SR, Hawkins SJ, Kaiser MJ (2013) Benthic community response to a scallop dredging closure within a dynamic seabed habitat. Mar Ecol Prog Ser 480:83-98