Welsh Fishermen's Association
Cymdeithas Pysgotwyr Cymru

The national voice of Welsh fishermen

Follow up questions to the WFA-CPC from the Climate Change, Environment and Rural Affairs Committee further to oral evidence 30th March 2017 to the Committee Inquiry into the Management of Marine Protected Areas in Wales:

May 2017

Follow Up Questions from CCERA Session 30th March 2017:-

Can you give us your perspective on:-

1*. Why fishermen want to carry out scalloping?*

2. *What it involves?*

3*. The scale of it?*

4. *The potential advantages?*

5. *The income (how much would the scallop fishers would earn from the new fishery)?*

6. *Other economic impacts and what it means?*

7. *To the fishermen concerned?*

Also can you also tell us:-

8. *If you have any information about the sentinel fleet that you mentioned?*

9. *If you have any information or material on the Bangor University SEACAMS work using fisherman as trained observers that he mentioned?*

10. *If you have any information about whether or not the 1964 London convention has been repealed?*

WFA-CPC response to Questions as numbered above:-

1. Why fishermen want to carry out scalloping?

- To provide some context the small scale fishing fleet in Wales is limited in terms of fishing opportunities as the majority of fishing boats are either non-sector or under 10metre vessels whereby the opportunity to fish for total allowable catch

(TAC)/Quota Species is limited to a “Pool” entitlement which is managed by Welsh Government Fisheries Division via Licence Variations: The TAC/Quota allocation for the “Pool Entitlement” in the whole of Wales in 2016 was 122 tonnes, of which, some species entitlements only apply to ICES Sub-regions of the sea in which many of our Welsh vessels, due to their size and capacity limitations, cannot access, hence the importance of shell fisheries and non TAC species in Wales. Access to mixed fisheries is fundamental to sustainable management of naturally renewing resources to avoid over reliance/pressure on one particular species furthermore it is important to appreciate the seasonal availability of certain species and the importance of being enabled to change from one fishery to another within a twelve month fishing plan it is for these reasons that the scallop fishery is such an important resource that supports Welsh fishing and seafood businesses for six months of each year, as the fishery is only open from November 1st to April 31st:

- It is important to understand that due to the highly dynamic nature and composition of the seabed in Cardigan Bay Scallop fishing can be undertaken without compromising resilience or conservation objectives (Lambert *et al., 2015a*)

- To demonstrate the resilience of Cardigan Bay to scallop fishing the WFA-CPC contracted leading independent and international consultancy MRAG (that specialise in the sustainable utilisation of natural marine resources) to undertake a pre-assessment of the Cardigan Bay King Scallop (Pectin maximus) fishery based on the latest version of the Marine Stewardship Council’s (MSC) Certification requirements (Version 2.0 October 2014). An additional objective of this pre-assessment was to compare the status quo management system with the proposed new management measures – *a full report of the pre-assessment is attached on the understanding that the report is treated by the Committee as “commercially confidential” and is not for publication at this time:*

- The king scallop “Cregyn Bylchog” (*Pectin maximus*) provides an important fishery for the Welsh fleet and can generate a considerable revenue for fishermen, merchants and processors based in Wales that can be managed sustainably:

- Large scallop beds are found close to the Welsh coast and therefore are accessible to our smaller fishing vessels (less than 12metres) most of which are based in their home ports:

- Many of the Welsh inshore scallop vessels participate in other fisheries, such as potting for lobsters, crabs and whelks. The six month winter scallop fishery provides an important respite for these fisheries and also at a time when catch rates from pots can be low. A typical Welsh inshore multi-fishery vessel is shown in Figure 1:

- Welsh fishermen have used dredges to capture scallops for over 40 years and possess the necessary knowledge and expertise to focus effort to areas where scallops prevail avoiding areas of vulnerable habitats, such as horse mussel beds

which support the wider marine bio-diversity and many other passive fisheries such as potting, line and netting:

Figure 1. Nefyn scallop vessel

VESSEL DETAILS

Fishing vessel:	CO366 Melessa
Owner/Skipper:	Peter Jones
Port:	Nefyn
Fishing gear:	Scallop dredge, pot & net
Target species:	King scallops, whelk, lobster, crab and herring

2. What it involves:-

- Principally it involves local knowledge of the scallop beds, seabed habitat and tidal regime to know where and how best to safely fish the scallop grounds:

- The fishery also requires skill to safely operate scallop dredges, especially the small number of dredges that can only be used on typical small scale Welsh inshore vessels:

- Robust vessels are needed with adequate engine power but not exceeding 221(kw) Kilowatts (Scallop Order Wales 2010):

- King scallops are harvested using the Newhaven ‘spring-loaded’ scallop dredge comprising eight to nine 110mm long ‘spring-loaded’ metal teeth spaced at centres of 118mm apart:

- The Welsh fleet use between two and seven dredges aside, whilst visiting vessels operating beyond 12 miles of the Welsh coast can operate up to 20 dredges aside:

3. The scale of the scallop fishery:-

- Discrete scallop beds are found throughout Welsh waters, but principally within Cardigan Bay, North and South of the Llyn Peninsula and off the NE coast of Anglesey:

4. Potential advantages:-

- There are many advantages of this fishery to our fleet, including:-

    - Proximity of fishing grounds to our coast and therefore access for our inshore vessels;
    - It is a significant part of the traditional mixed fisheries that the Welsh fishing fleet depend on thereby relieving pressure on specific and seasonal stocks;
    - It supports coastal communities, local buyers, processors and merchants and associated suppliers and traders;
    - It has led to collaborative working with:
        - Welsh Government to spatially manage scalloping activity, protecting MPA features and other sensitive areas. This involved successful trials and subsequent implementation of an Inshore Vessel Monitoring Systems (iVMS) relaying the precise geographic position of a vessel with a polling frequency of 10 minutes 24/7 using GPS via the mobile phone network) to monitor compliance with spatial and temporal restrictions;
        - Natural Resources Wales to ensure scalloping is compatible with the conservation objectives of Welsh MPA's and the Nature Directives:
        - The University of Wales to (a) better understand the location, size and health of our scallop populations, (b) the impact of scallop dredging on the seabed and (c) lessen the seabed impact of scallop dredging through the attachment of skids on the belly of the bags (see Figure 2):

            - By developing the means by which to manage an area of seabed rotationally this provides a longer term opportunity to enhance the King Scallop fishery by introducing "scallop spat/ juveniles" to sub-areas within the overall fishery boundaries that are part of a rotational opening and closing regime: This will increase bio-mass, recruitment, bio-diversity and economic value within the limited footprint of the Cardigan Bay Scallop Fishery:

Figure 2.

Skids fitted to the belly bag to reduce contact with the seabed:

5. Potential earnings:-

As mentioned in Bullet 3 Question 1 above, by pursuing MSC Certification for the sustainable management of the Cardigan Bay Scallop Fishery we would be confident of increasing economic activity, primarily a premium would be achieved for the product but also the added value in the supply chain that would create and support further processing employment shore side in Wales:

- King scallops are one of the most valuable species landed into Welsh ports, £1.8 million were landed by Welsh and UK vessels in 2015 (MMO).

6. Other economic impacts:-

- In addition to fishermen and associated trades and suppliers, the fishery supports processors and merchants in Wales: The landed value of a sustainable scallop fishery will also be significantly enhanced with the introduction of processing facilities to service the demand for scallops certified as sustainable:

- Some scallop fishermen (skippers and crew) live in remote coastal communities such as those on the Llyn Peninsula where employment opportunities are few. The scallop fishery supports the well-being of families in their local communities and secures local culture and tradition associated with these outlying areas.

7. What it means to fishermen:-

- Some Welsh fishermen derive most of their annual income from king scallops whilst for others it is a very important contribution to mixed fisheries and particularly important during the winter months when commercial crustacean species are not as active and are therefore not a main fishery:

- The closure of fishing grounds since 2010 forced some dedicated Welsh scallop boats to fish elsewhere such as the Isle of Man and English Channel:

- The fishery helps to maintain fishing and associated businesses which is especially important in remote Welsh coastal communities:

- King Scallops are a valuable resource to Welsh fishermen and future generations, if managed sustainably we firmly believe that the proposed new measures for Cardigan Bay will achieve this aim:

8. **Information about the sentinel fleet**:-

The WFA-CPC is currently engaged in a project that will report in the spring of 2018 that involves a sentinel fleet of fishermen in various locations throughout the Welsh coastline. The project is a pilot study that makes use of APP Technology that will enable fishermen to record the location of easily recognisable invasive and non-native species that can be caught in a variety of fishing gear types. Electronically reporting the presence and species of INNS is fundamental to monitoring the range of known established non-native's and is essential to inform strategies to control the spread of non-native species in Wales' marine area. We continue to work with Bangor University Fisheries & conservation Science Team in developing technological solutions as an alternative to traditional methods of fisheries data collection. The developing technology together with the necessary data handling systems will provide for the electronic reporting of a Sentinel Fleet;
please see report titled:- " Implementing Parallel – Paired Lasers in On-board Camera Systems for Data Collection in Crustacean Fisheries".

- Initiated by the Welsh Waters Scallop Strategy Group and guided by Bangor University, nominated sentinel fishermen began recording data on their catches and retaining samples for the University in 2012 to assess the state of scallop populations around Anglesey and within Cardigan Bay. The study continued for two years and the University determined the status of the scallop beds between 2012 & 2014. (Lambert *et al., 2015a*)

9. Information or material on the Bangor University SEACAMS work using fisherman as trained observers:-

- There is some confusion between this question and our evidence on the 30th March 2017 – to clarify we have worked on a variety of studies and surveys with Bangor

Fisheries Conservation Department that has involved observers from the University; for example:- *The Cardigan Bay Experimental Fishery.* We also have a number of fishermen that have undertaken training module with Swansea University and Seafish whereby they have successfully completed a course on marine ecological surveying including : intertidal and sub-tidal surveys – the intention is to prepare fishermen to meet future qualification requirements for data collection such as statutory monitoring of habitats and species, this could ultimately make available over 400 vessels/scientific platforms from which to develop an evidence base, to inform future monitoring and sustainable management of our natural marine resources including feature presence and range our work with Seacams 2 is in connection with their Envoke Project that is seeking to create a real-time environmental data hub, the project is in its early stages, our interest and discussions to date have considered the potential for the environmental evidence hub to receive and present electronic data that could support *The Adaptive Management of Fisheries in Wales:*

- Welsh fishermen continue to collaborate with Bangor University to: (a) better understand the impact of scalloping on the seabed in Cardigan Bay; (b) modify the scallop dredge to lessen seabed contact (as mentioned above); and (c) trial 'gear in/gear out' technology using sensors to record when scallop dredges were in or out of the water this technology, when type approved, will support control and enforcement measures via iVMS Statutory Reporting:

- The Cardigan Bay study involved local fishermen working with Bangor University to map seabed habitats and undertake a fishing intensity experiment whereby discrete areas were subject to varying intensities of fishing over a short period and then monitored to determine the rate of recovery. According to Professor Mike Kaiser who oversaw the work*, 'this study was the largest of its kind to be undertaken anywhere in the world… this research has enabled us to identify the threshold of scallop fishing disturbance at which environmental impacts become apparent. The findings told us that the seabed at this location in Cardigan Bay could withstand disturbance up to a fishing intensity of being fished three times per year":*

- Fishermen also undertook surveys using a video sled system towed by fishing vessels on the seabed in specified areas observers trained verified and analysed the data: *Pan Wales EMS Project Report:*

- The 'gear in/gear out' technology was combined with Inshore Vessel Monitoring System (iVMS) and proved robust compliance with restrictions on where fishing is permitted and how environmental thresholds for fishing could be monitored remotely:

- A member of the Welsh Waters Scallop Strategy Group, Seafish (a Non-Departmental Government Body), stated *"having fishermen involved from the beginning is essential, because they understand the fishery and the environment in*

which they operate. To achieve a sustainable and profitable fishery, you need fishermen in the room with scientists and regulators to know where the balance point is":

10. Information about the 1964 London convention:-

The London Fisheries Convention 1964 is the principle framework that provides access to the UK's territorial waters between 6 to 12 nautical miles to the fishing vessels of European Countries including:- France, Germany, Holland, Denmark, Spain, Ireland and Belgium, commonly referred to as "Historic Rights Access" (The 1964 Convention was superseded by EU law in the Annex to Council Regulation 2371/2002). Significant Welsh fisheries resources are exploited by non UK vessels within our territorial waters it is therefore important that Welsh and UK waters exclude access to non UK fishing vessels at the time of our exit from the EU. This measure would support effective and sustainable management of Welsh inshore fishing communities by repatriating fishing opportunities that would revitalise the catching sector in Wales without increasing pressure on Welsh species: On the basis that when the UK leaves the EU the Treaties will no longer apply and therewith the Common Fisheries Policy and the Council Regulation will fall the question is then will the 1964 London Convention be revived after 40 years? Experts considered this hypothesis unlikely, however, to avoid any potential challenge in respect of continuing Historic Rights Access under the 1964 Convention post exit. Given that a period of two years notice is required for the UK to lawfully withdraw from the 1964 Convention it would appear to be an unreasonable and unnecessary risk for the UK Government to wait until 2019 to withdraw. If the Convention provides a means by which non UK vessels could continue to exploit fishery resources within our territorial waters:
At the time of giving evidence to the Committee Members on the 30th March 2017 we advised that various national publications had reported the UK Government were to rescind the London Convention 1964 at the time of triggering Article 50, this was later claimed to be a "Leak" therefore no action has been undertaken by the UK Government to withdraw from the London Convention prior to the General Election. Fishing organisations throughout the Devolved Nations of the United Kingdom are unanimous that the "Historic Rights Access" must end and urge the UK Government to withdraw from the London Convention 1064 at the earliest possible opportunity:

WFA-CPC 15th May 2017

Reports of Welsh fishermen collaborating with statutory authorities and Universities to collect environmental data

Flora E. A. Kent, Mark J. Gray, Kim S. Last & William G. Sanderson (2016). Horse mussel reef ecosystem services: evidence for a whelk nursery habitat supporting a shellfishery, International Journal of Biodiversity Science, Ecosystem Services & Management, 12:3, 172-180, DOI: 0.1080/21513732.2016.1188330.

Glyn, C. (2016), Anglesey Marine Code of Conduct, Marine Ecosystems Project. Anglesey County Council

Glyn, C. (2016), Gwynedd Marine Code of Conduct, Marine Ecosystems Project. Gwynedd County Council

Pantin, J.R., Murray, L. G., Hinz, H., Le Vay, L. and Kaiser, M. J. (2015). The Inshore Fisheries of Wales: a study based on fishers' ecological knowledge. Fisheries & Conservation report No. 42, Bangor University. Pp.60.

Swansea University (2013). Marine Ecological Survey Training flyer.

Woolmer, A. (2012). Video Survey Handbook. Guidance for fishermen involved in collaborative underwater video surveys with Natural Resources Wales. Welsh Fishermen's Association.

Woolmer, A. (2013). Fishermen's Video Survey Trial – Pen Llŷn a'r Sarnau SAC. Welsh Fishermen's Association.

Woolmer, A. (2015). Welsh Fishermen's Monitoring project. Final Report (NRWEMS Grant 22194). Welsh Fishermen's Association.

Cambie, G., Kaiser, M.J., Monkman, G., J.G. Hiddink, & Powell, B. (2016). Implementing parallels paired lasers in on board camera systems for data collection in crustacean fisheries. Fisheries and Conservation report No. 63 , Bangor University. Pp.15

MRAG pre-assessment of the Cardigan Bay king Scallop fishery 1st August 2016.

STRIKING THE BALANCE

July 2012

An Ecosystem-Based Approach for MCZ Management in Wales

The current implementation of Highly Protected Marine Conservation Zones in Wales threatens the culture and economy of Welsh coastal communities by prohibiting traditional low impact fishing and recreational activities. This report outlines a viable alternative MCZ approach that will promote ecosystem recovery and resilience and better our understanding of the marine environment without adverse the impact to fishermen and local communities.

Prepared by Dr A.P. Woolmer for Welsh Fishermen's Association Ltd - Cymdeithas Pysgotwyr Cymru Cyf

Striking the Balance

AN ADAPTIVE CO-MANAGEMENT ECOSYSTEM-BASED APPROACH FOR MCZ MANAGEMENT IN WALES

INSHORE FISHING VESSELS AT SOLVA

Striking the Balance

AN ADAPTIVE CO-MANAGEMENT ECOSYSTEM-BASED APPROACH FOR MCZ MANAGEMENT IN WALES

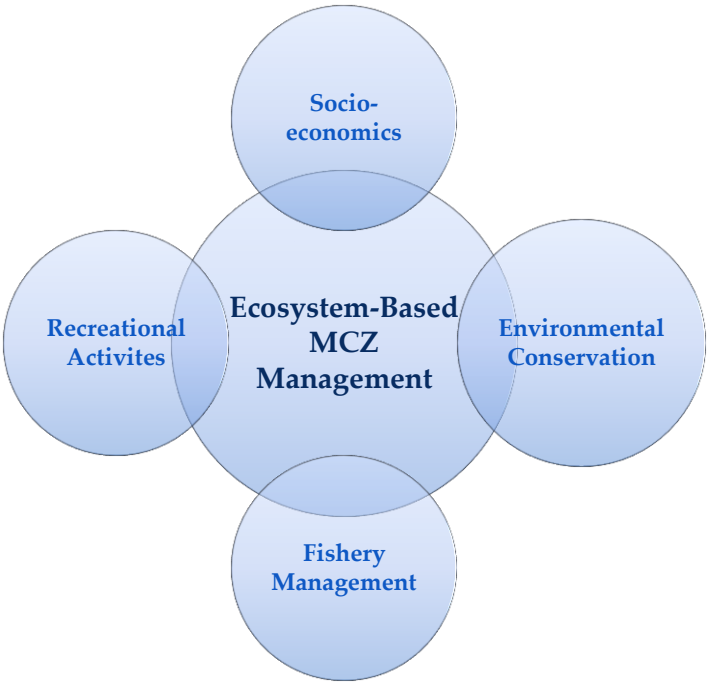
WELSH FISHERMAN'S ASSOCIATION VISION | EXECUTIVE SUMMARY

The Welsh Fisherman's Association (WFA) believes that a healthy and well managed marine environment is fundamental to the long-term sustainability of its industry and the communities from which they operate. With this aim the WFA are proposing an alternative to the current highly protected implementation of MCZs in Wales which will have serious economic, social and cultural impacts on fishermen, recreational sea users and coastal communities.

The WFA has developed an alternative adaptive co-management ecosystem-based model for MCZ management in Wales that will deliver the high level objectives and high levels of protection through adaptive and proportionate risk-based management rather than blanket prohibition of activities.

Our approach, based upon internationally recognised best practice in MPA management, has been conceived to promote ecosystem recovery and resilience, and improve our understanding of the marine environment and the role that MCZs, including no-take-zones, have in marine management. Importantly for the Welsh fishing industry and local communities, this approach will preserve their cultural and economic life, and secure traditional low-impact fisheries and recreational activities along with the related businesses.

The WFA believe that the adaptive co-management ecosystem-based model, once demonstrated successfully within the MCZs, could be applied more widely to other MPAs and wider Welsh seas where very real gains in terms of ecosystem recovery and resilience could be made.



THE ECOSYSTEM-BASED MCZ CONCEPT

Key principles of the WFA Adaptive Co-Management Ecosystem-Based MCZ approach:

1. **Welsh MCZs should be managed as multiple-use sites:** Multiple-use MCZs managed on ecosystem-based principles can deliver the win-win-win of environmental, fisheries and socio-economic gains for the sites and local communities.

2. **Strong environmental protection but proportionate to risk:** WFA believes that sensitive habitats should be protected from damage and disturbance; it believes that the nature of this protection should be precautionary but proportionate to the risk.

3. **Local solutions to local issues:** WFA proposes the establishment of MCZ adaptive co-management groups made up of relevant local sea users including fishermen, recreational anglers and conservation groups. The aim of these groups should be to develop locally applicable management in a bottom-up partnership process rather than a top-down impositional dictat.

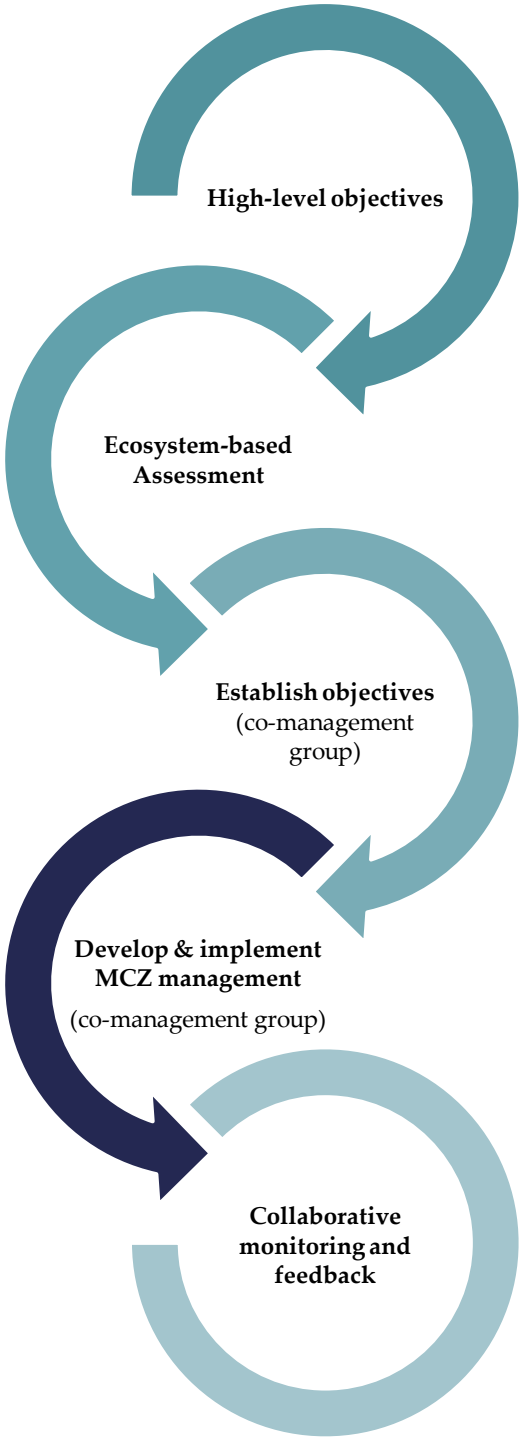
4. **Management should be flexible and adaptive:** The natural world is highly variable and our understanding of it requires constant updating; MCZ management therefore needs to be adaptive and flexible to reflect this continuous change.

5. **Evidence and knowledge-based management:** Fisheries and conservation management should be evidence-based rather than advocacy-led. Flexible and adaptive management will only be possible with a well-informed understanding of the marine environment and the ways in which we interact with it. The WFA stands ready to play a central role and accept its responsibilities in research and monitoring to provide the necessary data to management.

6. **Compliance and enforcement:** WFA recognise that without widespread compliance with MCZ management measures, the protection of the marine environment would be jeopardised. Welsh fishermen are keen to embrace a new role as environmental stewards to ensure compliance within MCZs.

WFA Ecosystem-Based MCZ Management Model

The WFA adaptive co-management ecosystem-based MCZ model is best considered as a dynamic and iterative process that develops and adapts site-specific management over time. At the heart of the process are the MCZ site co-management groups made up of relevant statutory bodies and relevant sea users and stakeholders.



The role of the co-management groups is to develop and implement site specific management aimed to deliver high level objectives guided by Welsh, UK and EU policy.

WFA propose that an integrated environmental, fisheries and socio-economic assessment is carried out. This assessment will identify the risks to habitats and representative species from existing activities and the social, economic and cultural drivers that underpin these activates. The results from the assessment will provide the foundation upon which effective ecosystem management of MCZs can be developed.

The ecosystem-based assessment will highlight alongside the current good practice in the MCZ those activities that require better management. This information will enable the co-management group to set site specific management objectives for the MCZ.

The primary role of the co-management group is to develop locally applicable management measures aimed at achieving the site specific objectives.

MCZ management should be adaptive and flexible, constantly reviewed and revised in relation to feedback from monitoring and research. The WFA are willing to place a central role in monitoring and research so that researchers can take full benefit of our local ecological knowledge and expertise.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1. The principles of the WFA Welsh MCZ approach

This set of principles has been agreed by the 7 Welsh fishermen's associations and have guided the development of our proposals for an alternative approach to MCZ implementation in Wales.

Welsh MCZs should be managed as multiple-use sites: WFA believe that Welsh MCZs should be managed as multiple-use sites which reflect the traditional access to, and use of, the sites by commercial fishermen and other coastal stakeholders. At present in Wales, fisheries and conservation issues are managed in what often appears to be an uncoordinated and conflicting manner. There is also little management of recreational activities. The WFA believe that a joined-up or holistic approach, which acknowledges the high conservation value of these sites, but at the same time also acknowledges that current uses of the site are fundamental parts of the ecosystem, can deliver fisheries, environmental and socio-economic gains without serious economic and cultural impacts on local communities.

Multiple-use MCZs managed on adaptive co-management ecosystem-based principles can deliver the win-win-win of environmental, fisheries and socio-economic gains for the sites and local communities

Strong environmental protection but proportionate to risk: The WFA believes that the marine environment can be given high levels of protection without overly prohibited restrictions in many areas. The majority of current fishing activity within the proposed MCZs is predominately carried out using low-impact static gears and targeting mobile species that are not resident within them.

Whilst the WFA agrees that sensitive habitats and species should be protected from damage and disturbance, it believes that the nature of this protection should be proportionate to the risk, e.g. a fragile biogenic reef may require protection from mobile gears but the use of low-impact static gears should be able to continue.

A risk-based approach can provide high levels of environmental protection without overly-precautionary blanket closures

Local solutions to local issues: The adaptive co-management approach has been widely adopted to enable successful development and management of MPAs. The WFA proposes that local MCZ co-management groups are formed from relevant local sea users including commercial fishermen, recreational anglers and other relevant groups. The aim of these groups should be to develop locally applicable and flexible management strategy in a bottom-up partnership process rather than via a top-down imposition.

MCZ management that works in one area may not necessarily work in another; fishing, and other activities differ all around the Welsh coast and site management should reflect this

Management should be flexible and adaptive: The marine ecosystem is a dynamic system and subject to change and evolution. Management should not aspire to halt this process but should adapt to it. WFA believes that fisheries and environmental management should be flexible and reflect changes in the drivers of ecosystem dynamism whether these are in the natural environment, society and markets, or advances in our understanding of our effect on habitats and biodiversity.

Fishermen understand that inflexible management will not work in an environment that constantly changes in response to weather, climate and natural cycles in commercial species and wildlife.

The natural world is complex and variable, and our understanding of it is constantly improving. MCZ management therefore needs to be adaptive and flexible to reflect this

Evidence and knowledge based management: Fisheries and conservation management should be evidence-led to avoid needless and excessively precautionary restrictions which result in conflict, disengagement and non-compliance. Flexible and adaptive management will only be possible with a sound understanding of the marine environment and the ways in which we interact with it. The current MCZ process has already drawn together a great deal of ecological information about the proposed sites. The WFA would like to build upon this foundation by participating in research to increase our marine understanding and to play a lead role in the environmental monitoring and surveillance necessary to inform adaptive and flexible management.

Welsh fishermen are already supporting marine research in Wales by participating in University research e.g. the European Fishery Funded Welsh Fisheries Project at Bangor University. A number of fishermen have already demonstrated their ability to collect monitoring data to inform environmental assessments. The long-earned knowledge of their fishing grounds is gaining rapid acceptance as important information in our understanding of

TENBY HARBOUR, A TYPICAL BUSY SMALL WELSH PORT, HOME TO COMMERCIAL AND RECRATIONAL VESSESLS

the marine environment. The WFA stands ready to play a central role in obtaining data and to accept its responsibilities for the conveyance of environmental information to management.

Adaptive co-management requires a comprehensive knowledge base of high quality information and data, and Welsh fishermen can play a central role in its development

Compliance and enforcement: WFA recognise that without widespread compliance with management measures, protection of the marine environment would be jeopardised. WFA believes that the local adaptive co-management approach proposed will promote high levels of compliance through the development of workable solutions and the development of a sense of ownership, and its members are keen to accept the role of stewards of the HPMCZs and to work closely with enforcement bodies to ensure such compliance within the industry and among other sea users.

Welsh fishermen support a new role as environmental stewards to ensure management measures are complied with inside Welsh MCZs

WELSH FISHERMAN USING HIS LOCAL KNOWLEDGE IN PURSUIT OF THE CATCH

2. WFA Ecosystem Based MCZ Management Model

The WFA have reviewed the literature on internationally adopted adaptive co-management (ACM) approaches and examples of best practice in fisheries and conservation management that are applicable in a Welsh context (see publications cited in the References below), and from this review, WFA have identified broad principles centred on an ACM ecosystem-based approach to MPA and fisheries management that recognize and balance societal requirements with conservation and environmental management.

These include the following adaptive principles: complexity; uncertainty; diversity; resilience; adaptive cycle; adaptive capacity; self-organization; learning by doing; and experimentalism.

They also include the following co-management principles; participation; partnership; knowledge sharing; accountability; legitimacy; equity; empowerment; and transparency. These principles form the foundation of a pragmatic and balanced framework for managing a true network of MCZs in Wales.

The WFA propose a network of MCZs where high levels of protection are achieved through spatial management rather than prohibition of activities to achieve the aims of ecosystem recovery and resilience, and establishing a better understanding of the role that MCZs, including no-take-zones, have in marine management.

A great deal of work has been undertaken by Welsh Government agencies to collate physical environmental and ecological information that has been used to identify the proposed MCZ sites. The WFA acknowledge this effort and consider this body of work a valuable resource that can underpin evidence-led MCZ management. We want to build upon this database by working in partnership to ensure that Welsh MCZ management is securely founded on evidence .

We believe that our approach has the potential for wider application in Wales to deliver fisheries and biodiversity gains that promote ecosystem recovery and resilience not just inside MCZs but across the whole of Welsh seas. These approaches have the potential to contribute to the delivery of the Welsh Government's conservation and fishery policy commitments.

LOOKING TOWARDS DALE AND ST ANNES HEAD, MILFORD HAVEN

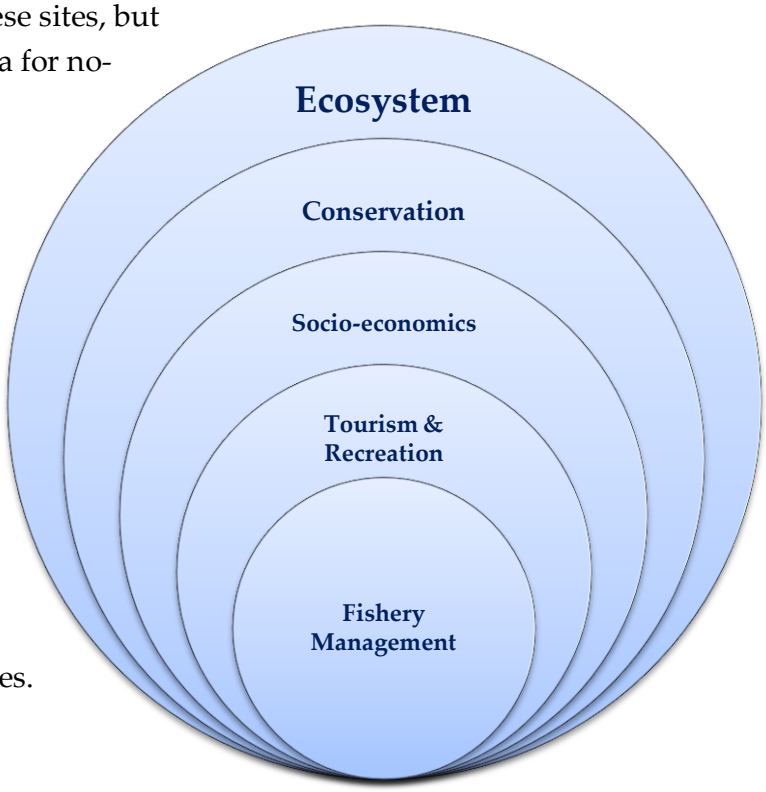
a. The international best practice MCZ management approaches applicable to Welsh MCZs

i. The ecosystem-based approach

> ***"An ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organization, which encompass the essential structure, processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diversity, are an integral component of many ecosystems."***
>
> Excerpt from the definition of the ecosystem-based approach adopted by Convention on Biological Diversity 2000, and endorsed by World Summit of Sustainable Development in 2002

A social-ecological system (SES) approach to ecosystem-based management is a management approach that recognizes the need to consider the human dimension in managing the marine environment. This approach attempts to balance the requirements of resource use (e.g. fisheries and recreational access), the socio-economics of society and communities with those of environmental protection and conservation. The current implementation of MCZs in Wales does not adequately account for, or even acknowledge, the local or wider societal importance of these sites, but rather focuses on a narrow green agenda for no-take –zones.

Social-ecological system -based management has emerged as the primary approach for managing the natural environment and its resources. The SES ecosystem-based management approach is considered by many to be the basis of best practice in fisheries and conservation management, and is seen as the most viable model for the long-term management of sustainable fish stocks and environmentally sustainable fisheries.



THE SOCIAL-ECOLOGICAL SYSTEM ECOSYSTEM-BASED MANAGEMENT CONCEPT

Until recently coastal and marine management has been focused around specific uses such as fisheries, oil and gas extraction or nature conservation which

has resulted in separate governance regimes for each use. It has become readily apparent that this sectoral approach can result in conflicts among stakeholder groups and falls short in meeting the requirements for environmental protection. The shift away from the management of individual resources to an integrated SES approach is internationally recognised and promoted in the work of international organizations ranging from the International Oceanographic Commission, to the Food and Agriculture Organization, the United Nations Environment Programme, and the Global Environment Facility.

The FAO consider that the purpose of an SES approach to fisheries is:

"*..to plan, develop and manage fisheries in a manner that addresses the multiple needs and desires of societies, without jeopardizing the options of future generations to benefit from the full range of goods and services provided by marine ecosystems..*"[1]

Without conflicting with nature conservation and natural resource objectives, SES ecosystem-based management considers at a fundamental level that the coastal communities and their related economic/social and cultural structures are integral parts of the ecosystem.

Perhaps most importantly from WFA's perspective, SES ecosystem-based management addresses the varied processes of change within natural systems and resources that healthy ecosystems provide. As a consequence of our incomplete understanding of our marine environment and how we interact with it, SES ecosystem-based MCZ management will have to be fundamentally an adaptive, learning-based process that applies the principles of the scientific method to the processes of management. SES ecosystem-based management is an on-going process and not an end-state and therefore requires a flexible organisational and governance framework to facilitate it. The WFA believes that a participatory and collaborative approach will deliver such a framework for managing MCZs in Wales.

The Convention on Biological Diversity has defined 12 principles for the SES Ecosystem Approach and the WFA asks that Welsh Government reflects on these when considering our proposals and in light of the likely impacts of the current MCZ policy (see next page). The CBD Principles are the keystone to the WFA's proposals as they reflect and address many of the issues currently faced.

[1] The Ecosystem Approach to Fisheries. FAO Technical Guidelines for Responsible Fisheries 2003 – p.121

Convention on Biological Diversity has defined 12 principles for the SES Ecosystem Approach

Principle 1: The objectives of management of land, water and living resources are a matter of societal choices.

Principle 2: Management should be decentralized to the lowest appropriate level.

Principle 3: Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.

Principle 4: Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:

- Reduce those market distortions that adversely affect biological diversity;
- Align incentives to promote biodiversity conservation and sustainable use;
- Internalize costs and benefits in the given ecosystem to the extent feasible.

Principle 5: Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.

Principle 6: Ecosystems must be managed within the limits of their functioning.

Principle 7: The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.

Principle 8: Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.

Principle 9: Management must recognize that change is inevitable.

Principle 10: The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.

Principle 11: The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.

Principle 12: The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

The policy drivers for SES ecosystem-based management

Welsh and UK Government are already committed to the implementation of an ecosystem-based management approach to natural resource and conservation management through a series of international, European and National policies and agreements. The UK's national commitment to marine ecosystem based management is through the Marine and Coastal Access Act 2009[2]. The key European commitment is via the European Integrated Maritime Policy (IMP)[3] via the Marine Strategy Framework Directive (MSFD)[4] the reformed Common Fisheries Policy.

International agreements include the declaration of the Convention on Biological Diversity and the World Summit on Sustainable Development both of which promote the adoption of the ecosystem-based approach in resource management.

However, the ecosystem-based approach has often been interpreted too narrowly, applied only to the ecological elements of the ecosystem. What the WFA is claiming is that a true conception of the ecosystem-based approach must include the human as well as the ecological elements in the ecosystem. By using the term 'social-ecological system', this requirement is met.

Why is SES ecosystem-base management the appropriate model for managing fisheries and other activities within MCZs?

In Wales, as in the rest of the UK, due to a combination of societal, practical and jurisdictional factors, the majority of Marine Protected Areas such as Special Areas for Conservation, Special Protection Areas and Marine Conservation Zones are sited within 6 miles of the shore. Siting MPAs in these areas where the intensity of fishing (commercial and recreational) is high and where recreational activities are more common, brings into sharp focus the potential conflicts between human activities and nature conservation objectives. This is especially true when the MPA designation process does not

POT FISHING OFF THE LLYN PENNINSULAR

[2] Marine and Coastal Access Act 2009 http://www.legislation.gov.uk/ukpga/2009/23/pdfs/ukpga_20090023_en.pdf
[3] An Integrated Maritime Policy for the European Union http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0575:FIN:EN:PDF
[4] Marine Strategy Framework Directive 2008 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:164:0019:0040:EN:PDF

adequately consider the potential economic impact on commercial stakeholders such as the fishing industry and on the adjacent coastal communities. Small scale fleets from ports in close proximity to an MPA are likely to bear the brunt of any loss of access to traditional fishing grounds as they are unable either to move to other areas or to access new fishing opportunities.

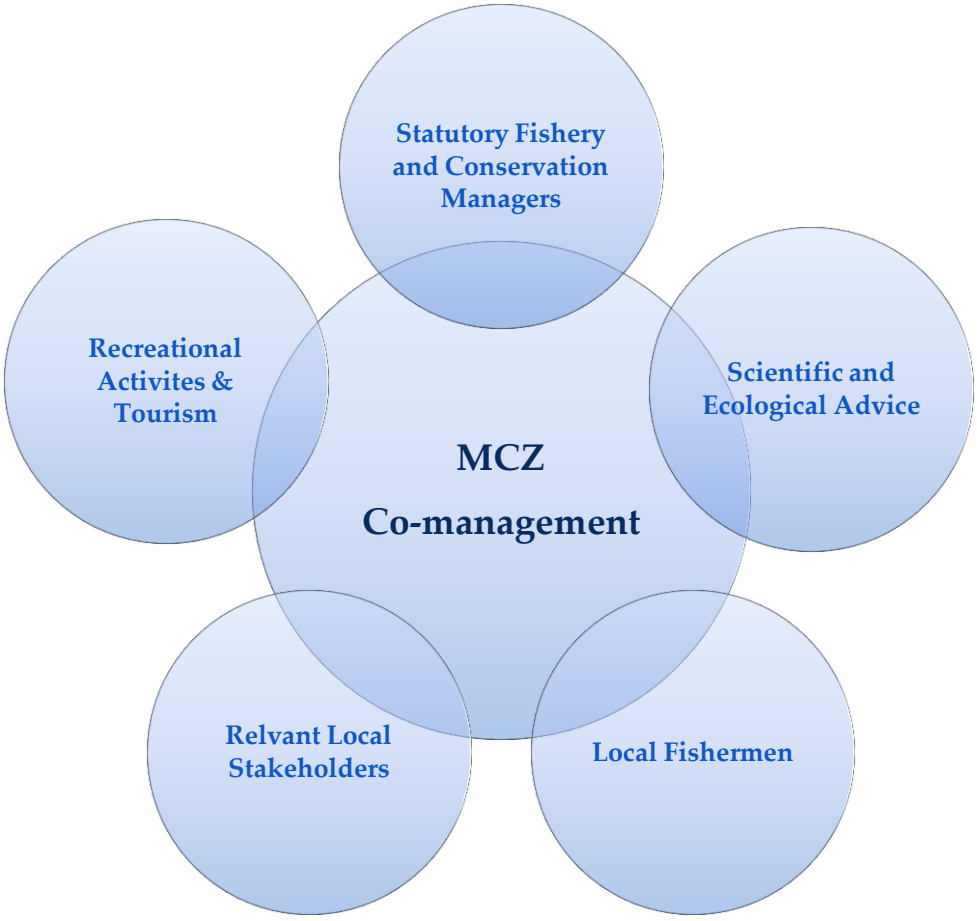
The consideration of fisheries, conservation and socio-economics explicit in SES ecosystem-based management makes it a viable approach for developing a framework for the management of Welsh MCZs. The application of the SES ecosystem-based management approach will enable managers and stakeholders to mitigate risk to sensitive sites, the wider ecosystem and commercial species and consequently maintain and secure the societal and economic services provided by the MCZ area. The SES ecosystem-based management model does not weaken or negate any of the conservation aims or objectives within the sites but ensures that appropriate management measures can be applied in a proportionate and focused manner thus reducing conflict with recreational and commercial sea users.

The WFA believe that an SES ecosystem-based management approach applied at a variety of spatial and temporal scales across Wales, can deliver significant biodiversity and fishery gains whilst minimising the all-too-common conflict between marine users.

ii. Co-management – partnership working

Co-management is widely considered by governments, environmental organisations and academics as central to the development and implementation of ecosystem-based management structures. The FAO and WWF both consider co-management to be a key tool in the delivery of the Ecosystem Approach to Fisheries.[5,6] The UNEP describe participation and engagement as the cornerstones of effective ecosystem-based management.

Fisheries and conservation co-management is an organisational structure where the responsibilities of fishery and conservation management are shared between statutory managers and relevant coastal stakeholders. In the context of an MCZ these may include local commercial and recreational fishermen, tourism and recreational representatives and relevant local stakeholders including community groups and environmental interests.



A CONCEPTUAL MCZ CO-MANAGEMENT PARTNERSHIP

[5] FAO Fisheries Department, 2003. The ecosystem approach to fisheries. FAO Technical Guidelines for Responsible Fisheries. No. 4, Suppl. 2. Rome, FAO. 2003. pp 112 ftp://ftp.fao.org/docrep/fao/005/y4470e/y4470e00.pdf
[6] Policy Proposals and Operational Guidance for Ecosystem-Based Management of Marine Capture Fisheries www.panda.org/downloads/marine/WWF_EBMFisheries_FullDoc.pdf

What can MCZ co-management achieve?

Participatory Democracy: Fisheries and conservation co-management promotes a more democratic approach to management through placing fishery, community and conservation stakeholders at the heart of the decision making process that directly affects their livelihood and the economic and environmental concerns of their communities.

Shared Understanding and Compliance: The efficacy of site management is considered to be improved in co-management structures as management measures are more readily seen as legitimate and accepted when stakeholders have been involved in the decision-making process. Also, local knowledge of the site and activities leads to locally appropriate solutions, which engenders a better understanding within the group of the wider issues affecting all stakeholders and can act to reduce conflict and improve communication between disparate sectors. Compliance with management measures follows as a result of the process and development of better understanding of the issues.

Promotion of Evidence-Led Decision Making: A co-management structure is able to draw upon the capacity, expertise and knowledge of its fishery and conservation members whilst being supported by the scientific expertise and technical capacity of the statutory managers and scientific community involved. Very often resource constraints can hinder or prevent adequate data gathering to inform fisheries and conservation management. These constraints have resulted in overly-precautionary or poor decision making to the detriment of the fishery or conservation interests. Stakeholder participation, by providing information and assisting data gathering, can address data gaps and facilitate effective evidence-led decision making.

MUSSEL BEDS AT WHITEFORD POINT, GOWER

The co-management scale

There is no fixed formula or structure that describes a co-management framework; customized solutions and approaches can be developed to address local, regional or national requirements. Different co-management structures confer differing levels of responsibility and authority:

Instructive: There is minimal exchange of information between government and stakeholders in instructive systems. This type of co-management regime is only different from centralised management in the sense that the mechanisms exist for dialogue with users, but the process itself tends to be government informing users on the decisions they plan to make.

Consultative: Consultative systems have mechanisms for governments to consult with stakeholders but all decisions are ultimately taken by government.

Cooperative: This system is considered to be the definition of true of co-management. In cooperative management systems government and stakeholders cooperate together as equal partners in decision making.

Advisory: the balance of power and responsibility is weighted towards stakeholders who advise government of decisions to be taken and government endorses these decisions.

Informative: Government has delegated authority to make decisions to user groups who are responsible for informing government of these decisions. This is full self-governance.

iii. Adaptive management – "learning by doing"

> ***"The ecosystem approach requires adaptive management to deal with the complex and dynamic nature of ecosystems and the absence of complete knowledge or understanding of their functioning."***
>
> Excerpt from the definition of the ecosystem-based approach adopted by Convention on Biological Diversity 2000, and endorsed by World Summit of Sustainable Development 2002

The adaptive management concept is fast gaining ground as the best practice approach to the management of complex and dynamic systems. The marine ecosystem is, by its very nature, highly dynamic. Despite advances in our understanding of Welsh seas many questions remain about the linkages among species, habitats, oceanography and climate. In managing MCZs, therefore, even in those sites where we have most information, uncertainty is unavoidable. Adaptive management is an iterative process which addresses 'uncertainty' by developing understanding by trialling and adapting alternative management measures. In other words, adaptive management is learning by doing.

> *"One must learn by doing the thing. For though you think you know it, you have no certainly until you try"*
> Sophocles 496-406 BC

Adaptive management is widely accepted by resource managers and is considered one of the most useful tools in dealing with climate change both in the sea and on land. Adaptive management is a central theme of the 'Open Standards for the Practice of Conservation'[7] published by the International Union for Conservation of Nature (IUCN), a partnership of environmental NGOs including WWF International. The United Nations Environment Programme considers an adaptive approach to be fundamental in marine and coastal ecosystem-based management[8].

The EU Marine Strategy Framework Directive 2008 follows an adaptive management approach stipulating that Marine Plans are reviewed and revised on a 6-year cycle. Adaptive management is one of the five core principles of Defra's Ecosystem Approach Action Plan, 'Securing a healthy natural environment'[9]which outlines Defra's action plan for embedding an ecosystems approach into policy-making and delivery on natural environment matters (Defra, 2007).

[7] Open Standards for the Practice of Conservation. The Conservation Measures Partnership 2007 – p. 40
[8] Taking Steps toward Marine and Coastal Ecosystem-Based Management. UNEP 2011 – p. 68
[9] Securing a healthy natural environment: An action plan for embedding an ecosystems approach. Defra 2007 – p. 60

The WFA believe that if Welsh MCZs, and Welsh territorial seas beyond them, are to be effectively managed, an adaptive approach is necessary, one where policy decisions and management measures are monitored to assess their effectiveness and then altered to reflect the consequent advances in understanding.

FISHING VESSEL AT FERRYSIDE

The Adaptive Management Framework (in the context of an MCZ)

Assess Issues: MCZ management issues are identified and defined by statutory bodies working in partnership with stakeholders. At this stage of the adaptive cycle, existing knowledge about the site should be collated to inform the assessment of the potential effects or outcomes of alternative management or operational actions. The predicted outcomes of potential actions enable the co-management group to identify the most locally appropriate actions that will meet high level conservation MCZ management objectives. It is at this stage that key information gaps and sources of uncertainty are identified

Plan: an MCZ management and monitoring plan is designed and agreed by the co-management group. This plan should outline management objectives, establish goals and targets and identify performance indicators. The plan should outline the underlying management strategies and define the locally appropriate management measures.

A complementary monitoring plan should be developed by the group aimed at delivering accurate and robust information on the efficacy of individual management options. The monitoring plan is intended to address the main 'uncertainties' and information gaps, using a robust scientific approach.

Implementation & Monitoring: the MCZ management plan is implemented. The monitoring plan becomes operational and data is gathered in partnership with stakeholders to determine the efficacy of the management actions. The results of the monitoring programme are used to test predicted outcomes and to increase our understanding of ecosystem component interactions.

Analyse and Review: The results of the monitoring programme are used to evaluate the efficacy of the management plan and identify priorities for revision.

Adapt: Management actions, operational details and objectives are revised based on monitoring results, our growing understanding of the MCZ function and feedback from stakeholders. The adaptive cycle continues, acting to increase understanding of the system and long-term processes.

Although the adaptive management cycle usually follows a formal time-table, revision and adaptation can and should occur as information becomes available within the cycle.

iv. Collaborative science and monitoring

The Principles of the Convention on Biological Diversity emphasise that SES ecosystem-based management should consider all forms of relevant information, including scientific and indigenous knowledge. Closely linked to co-management and key to enabling the adaptive management of MCZs, participative science is a key element of the WFA's vision for Welsh MCZ management.

Adaptive management requires the timely provision of good quality information in order to assess and adjust MCZ management. This may be costly and logistically difficult in a network of sites, but collaboration with fishermen and other coastal stakeholders can help address these barriers to information and provide unlooked for benefits through access to information and understanding.

Until relatively recently, fisheries and conservation management structures have overlooked the hard-won expertise of fishermen and other stakeholders. There is however a growing recognition of the value of the Local Ecological Knowledge (LEK) held by fishermen.

This collective knowledge, based upon centuries of traditional use and more recent experience working at sea, often includes profound insights into natural cycles in species and the environment. In particularly this local ecological knowledge can help to contextualize more formal scientific interpretations of natural phenomena to inform MCZ management. By working at sea all year round, fishermen observe the seasonal changes affecting their target species and wildlife and often have a deep knowledge of the habitats and wildlife in their traditional fishing grounds.

SWANSEA UNIVERSITY RESEARCHERS WORKING WITH FISHERMEN IN SKOMER MCZ

The California Collaborative Fisheries Research Program, established in 1999, is a good example of how participatory science can play an integral role in protected site management by delivering high quality science and monitoring information[10].

Welsh fishermen already collaborate with scientists and researchers from Universities and government agencies in a number of projects. For instance, the School of Ocean Sciences (SOS) (Bangor University) are embarking on a £2 million project to assess Welsh fisheries resources in partnership with Welsh fishermen; fishermen are working in partnership with SOS to develop low impact scallop gears. The CCW FishMap Mon project relies on fishermen's information to map fishing activity and develop sensitivity assessments. Individual fishermen participate in seabird and marine mammal surveys with CCW and NGOs. A series of native oyster surveys is being carried out by students from Aberystwyth and Swansea Universities using Welsh fishing vessels and drawing upon local knowledge.

Researchers from the Susfish project at Swansea University are leading the way in collaborative MCZ research at Lundy which goes well beyond using local fishing vessels as sampling platforms. The researchers have been working side-by-side with fishermen who play an integral part in the data collection; they have even been trained to take blood samples from protected lobsters within the not-take-zone.

The importance and potential of MCZs as important sites for study is not lost on WFA members: on the contrary, a key aim of Welsh MCZs is to improve our understanding of the marine environment and human effects on it. The WFA wish to build upon the relationships it has already established with the research community to develop new projects and studies to develop this understanding. It is expected that as part of these studies, scientific areas of appropriate sizes could be set aside as de facto no-take-zones for specific experiments or studies.

FISHERMAN TAKING LOBSTER BLOOD SAMPLE

[10] http://seagrant.mlml.calstate.edu/research/ccfrp/

v. Spatial management – zoning and geofences

Spatial management or zoning is viewed as a key management tool for use in multiple-use Marine Protected Areas[11]. The WFA believe that spatial management through zonation is a valuable tool for management of Welsh MCZs particularly where there is a need to protect sensitive habitats.

When informed by sensitivity risk assessments, zoning can define which activities can and cannot occur in different areas of an MPA in relation to the site conservation and resource management objectives. The use of zoning establishes the footprint of acceptable use by different activities and of development within the site. By identifying those areas of a site that are important for particular purposes such as the protection of sensitive habitats or nursery areas, or for research, anchoring, fishing and tourism activates, zonation helps to reduce or eliminate disturbance to the environment and conflict between sea users.

Importantly, zoning enables traditional access to MCZs by commercial fishermen and recreational sea users to continue whilst affording protection to sensitive habitats.

A system of zoning is currently being trialled in the Lyme Bay and Torbay candidate SAC. The cSAC is proposed for designation for the protection of bedrock reef, biogenic reef and sea cave habitat feature and the related flora and fauna those features support including fragile sponge, coral, sea fan and bryozoan species. These habitats have been identified as being highly vulnerable to physical damage from mobile fishing gears (trawls and scallop dredges). In order to protect these habitats and enable fishermen to retain access to their traditional fishing grounds a spatial plan was

FV HARMONI, ONE OF THE WELSH FISHING VESSELS TRIALING INSHORE VMS TECHNOLOGY

[11] Guidelines for Management Planning of Protected Areas. IUCN 2003 – p.87

developed. A prerequisite for this plan being accepted by conservation managers was a means of ensuring high levels of compliance. This was provided by a newly developed inshore Vessel Monitoring System (iVMS) which can track permitted vessels in real time and alert management and enforcement bodies should a vessel cross into a prohibited area defined by a "geofence".

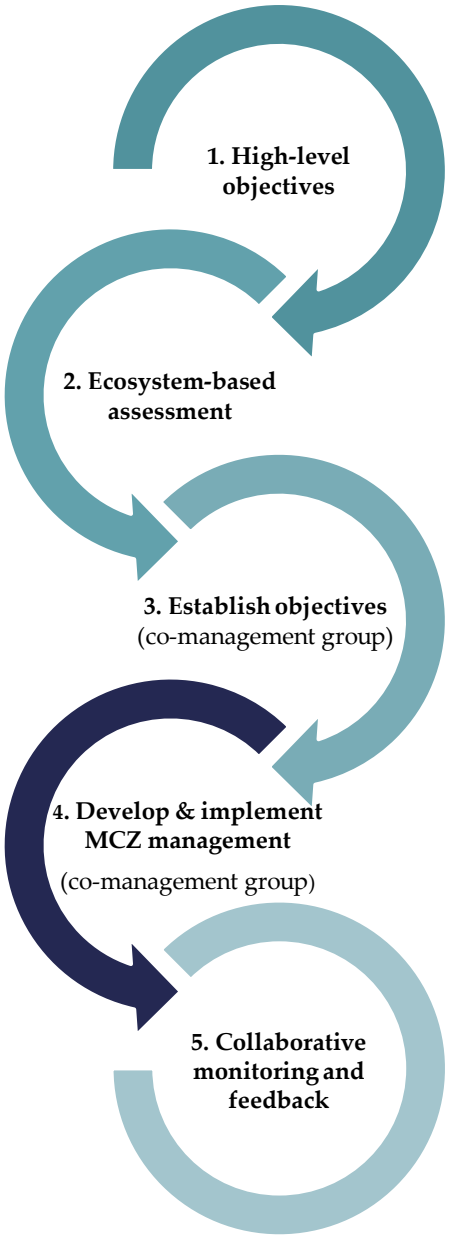
This technology is currently being trialled by Welsh fishing vessels operating in Cardigan Bay and is considered by the WFA as a key tool in managing the valuable scallop fishery in operation there. The WFA believe that iVMS may be an important management mechanism to enable best practice spatial management within multiple-use Welsh MCZs.

INSHORE FISHING VESSESLS AT PORTHGAIN

b. Overview of the WFA SES Ecosystem-based MCZ management model

The intention of this section is to provide an overview of our model and explain the roles of each stage of the process and highlight the best practice approaches that have been applied. Detailed descriptions of best practice elements are provided in successive sections.

The WFA SES Ecosystem Based MCZ model is best considered as a dynamic and iterative process that develops and adapts site-specific management over time. At the heart of the process are MCZ site co-management groups made up of relevant statutory bodies and relevant sea users and stakeholders.



The role of the co-management groups is to develop and implement site specific management aimed to deliver high -level objectives guided by Welsh, UK and EU policy.

WFA propose that an integrated environmental, fisheries and socio-economic assessment is carried out. This assessment will identify the risks to habitats and representative species from existing activities and the social, economic and cultural drivers that underpin these activates. The results from the assessment will provide the foundation upon which effective ecosystem management of MCZs can be developed.

The ecosystem-based assessment will highlight alongside the current good practice in the MCZ those activities that require better management. This information will enable the co-management group to set site specific management objectives for the MCZ.

The primary role of the co-management group is to develop locally applicable management measures, including the use of zones, aimed at achieving the site specific objectives.

MCZ management should be adaptive and flexible, constantly reviewed and revised in relation to feedback from monitoring and research. The WFA are willing to place a central role in monitoring and research so that researchers can take full benefit of our local ecological knowledge and expertise.

1. High-level objective setting

It is important that the co-management groups are guided by a clear set of policy objectives and guiding principles. These should include high-level policy objectives laid out in Welsh, UK and EU legislation; these are the statutory drivers for MCZs and associated marine management. In future WFA hope that the interpretation and implementation of such policy drivers in a Welsh context can be done in partnership with stakeholders.

The existing conservation objectives for Highly Protected MCZs will need to be revised with stakeholders to reflect the proposed ecosystem-based approach for multiple-use MCZs. Involvement of relevant stakeholders will provide an opportunity to develop a good level of general understanding and prevent situations where conflict might arise later in the process.

The co-management group should have an agreed set of Principles to guide its development and implementation of site specific MCZ management. It is envisaged by the WFA that these will reflect the SES ecosystem-based approach reflecting the shared aims of a healthy marine environment and a vibrant fishing industry and coastal economy.

2. Ecosystem-based assessment

A prerequisite for the development of effective management is a firm foundation of knowledge from which to identify management priorities and enable management objectives to be established. In order that MCZ adaptive co-management groups can develop effective site-specific management measures they first need to know which sensitive habitats and species are at risk from current commercial and recreational activities and where they are located. The co-management group also needs to understand the importance of these habitats and activities to the culture and economy of the local communities.

There are existing risk-based assessment approaches which focus on individual aspects such as habitat and species sensitivity or fishery sustainability. For example, the sensitivity matrix of pressures on MCZ/MPA features recently developed by MarLN/the Marine Biological Association of the UK for Defra[12] enables a rapid special assessment of seabed impacts of a variety of commercial and recreational activities within MCZs. Also, the Marine Stewardship Council pre-assessment framework[13] measures individual fisheries against a set of conditions that it might be reasonable to expect a well-managed fishery to meet. Such assessments of fisheries occurring inside Welsh MCZs would highlight management shortcomings in need of attention and those fisheries that are already examples of sustainable best practice.

The challenge will be to organise these individual evaluations into an integrated (i.e. SES) ecosystem-based assessment. A potential solution may be to integrate the most suitable approaches into a fisheries Strategic Environmental Assessment (fSEA). A fSEA is a formalised

[12] Development of a sensitivity matrix (pressures-MCZ/MPA features). ABPMer, Southampton and the Marine Life Information Network (MarLIN) Plymouth: Marine Biological Association of the UK. 2011 – p.947

[13] MSC Fishery Standard Principles and Criteria for Sustainable Fishing Vrsion 1.1. Marine Stewardship Council. 2010 – p 8

and structured way of assessing, and identifying appropriate mitigation, for the effects on the marine environment of a fisheries, in this context an MCZ, management framework. The wide-ranging focus of an fSEA enables assessment of a variety of factors such as the effects of management on biological populations of target species; the impacts on seabed features and wildlife; and the socio-economic effects on coastal communities. A number of Government and NGO organisations have suggested applying the SEA process to fisheries management in the same way that it has been applied to other marine industries such as offshore renewables and aggregates[14],[15]. The WFA are aware of an fSEA having been carried out in the UK; this work in the North Eastern Sea Fisheries Committee district may serve as a useful starting point for discussion[16].

The WFA would like to work with the Welsh Government and relevant stakeholders to develop and agree a framework for an integrated ecosystem-based assessment to inform multiple-use MCZ management.

3. Establish objectives

The outputs of an SES ecosystem-based assessment will highlight issues that require management attention. Where the risk of impact is high the management should be precautionary in nature. The co-management groups then need to establish site specific management objectives (guided by the revised conservation objectives and high-level policy); establish goals and targets; identify performance indicators; and assign priorities to each objective.

This stage of the process enables the adaptive co-management group to focus its resources in an efficient and cost effective manner.

4. Develop and implement MCZ management

This can be considered to be the operational phase of the SES ecosystem-based MCZ management process. The adaptive co-management group is tasked to develop and implement locally applicable management measures aimed to achieve the agreed site management objectives along with corresponding monitoring. This may take the form of a management plan but given the adaptive nature of the process this would be a "live document" and subject to constant review and revision. It is at this stage that spatial management can be considered and implemented. It is envisaged that a typical MCZ management cycle will be annual or biannual depending on the management plan and urgency of priority issues. Nevertheless, the adaptive nature of the process should allow more timely adaptation to arising events or new information from monitoring or research.

[14] The Application of Strategic Environmental Assessments in the UK Fisheries Sector. IEEP report to WWF. 2006 – p.71
[15] Net Benefits, a Sustainable and Profitable Future for UK fishing. Prime Minister's Strategy Unit. 2004 – p. 200
[16] Pilot Shellfisheries Strategic Environmental Assessment – Environmental Report. Mott Macdonald report to NESFC. 2008 – p.166

Clearly close working with members from relevant statutory bodies will be necessary in order that management measures are legal and can be enforced. Although best practice can be promoted in MCZ site users through voluntary codes, where sensitive habitats and species are at risk there is a clear requirement for a statutory approach.

5. Collaborative monitoring and feedback

Adaptive and flexible MCZ management requires the timely provision of high confidence information in order to assess the efficacy of management and to inform adjustments of management measures.

It is envisaged that monitoring will be carried out in a participatory manner utilising local expertise and stakeholder knowledge from a wide group of sea users including wildlife groups, leisure boaters in addition to commercial fishermen. These stakeholders, allied with technical experts and scientific researchers may be able to deliver the necessary MCZ monitoring in a scientifically robust and a cost effective way.

The WFA envisage that Welsh MCZs may include NTZ areas set aside for well-founded scientific research. These modest but meaningful areas will help researchers and policy makers to better understand the utility of such areas in marine management and to use them as a measure against which to judge the success of the wider MCZ management.

3. Conclusions

Our approach, based upon internationally recognised best practice in MPA management, has been conceived to deliver high levels of environmental protection, to promote ecosystem recovery and resilience, and improve our understanding of the marine environment and the role that MCZs, including no-take-zones, have in marine management.

Importantly for the Welsh fishing industry and local communities this approach will preserve their cultural and economic life, secure traditional low-impact fisheries and recreational activities along with the related business.

The WFA believe that the SES ecosystem-based model described in this document, once demonstrated successfully within the MCZs, could be applied more widely to other Welsh MPAs to form a truly cohesive network by which very real gains in ecosystem and fishery recovery and resilience could be made.

WELSH POTTING VESSEL HEADING OUT FROM ABERYSTWYTH

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Fishermen's Video Survey Trial – Pen Llŷn a'r Sarnau SAC

Abstract: This trial set out to demonstrate how commercial fishermen with an interest in marine conservation could play an active role in seabed habitat surveys using underwater video equipment. This type of information is often crucial to inform the management of fisheries in sensitive sites to ensure that sensitive habitats are adequately protected from disturbance.

A series of collaborative video surveys were planned and successfully carried out from inshore fishing vessels in partnership with staff from Natural Resources Wales, Pen Llŷn a'r Sarnau SAC and Seafish.

The surveys produced high quality seabed footage of 38 sites around the Pen Llŷn a'r Sarnau SAC whilst building the capacity to undertake further surveys within the local fishermen and site officers.

Cyfoeth Naturiol Cymru
Natural Resources Wales

WFA CPC

SEAFISH
the authority on seafood

Contents

1. Introduction

1.1. The Pen Llŷn a'r Sarnau SAC

The Pen Llŷn a'r Sarnau Special Area of Conservation (SAC) is the largest SAC in Wales and until recently the second largest in the UK. The Pen Llŷn a'r Sarnau SAC extends for 230 km around the coast from Nefyn in the north, westward around the Pen Llŷn, encompassing Bardsey Island and then onwards to Tremadoc Bay, Barmouth and the Mawddach estuary, southwards to the Dyfi estuary and ends at xxxx north of Aberystwyth. The SAC extends seaward to encompasses an area of seabed of 146,024 km^2 , see Figure 1.

Figure 1. Map demonstrating the 146,024 km^2 Pen Llŷn a'r Sarnau Special Area of Conservation

The Pen Llŷn a'r Sarnau SAC is designated for 5 Annex I habitats:

- Sandbanks which are slightly covered by sea water all the time
- Estuaries
- Coastal lagoons
- Large shallow inlets and bays
- Reefs
- Mudflats and sandflats not covered by seawater at low tide
- Salicornia and other annuals colonising mud and sand
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- Submerged or partially submerged sea caves

There are no Annex II listed as a primary reason for the site designation but 3 are present:

- Bottlenose dolphin *Tursiops truncatus*
- Otter *Lutra lutra*
- Grey seal *Halichoerus grypus*

1.2. Concept

This project was conceived to investigate the utility of involving fishermen and their vessels in survey work to inform SAC management.

Survey and monitoring work in the marine environment is notoriously difficult and costly to undertake. This often leads to a paucity of information on the nature and extent of sensitive seabed habitats and species. Very often these information shortfalls prevent effective site management and can force managers to adopt a precautionary approach which leads to conflict with marine users. Information shortfalls can prevent Habitat Regulation Assessments from progressing with the result that consenting process of sustainable development such as aquaculture and certain wild capture fisheries can be delayed or prevented with associated economic impacts[1][2].

Welsh Government and therefore National Resources Wales have a series of legal commitments to monitor the marine environment e.g. Water Framework Directive and Habitats Directive. These commitments are a significant cost burden to the Welsh Government and government agencies. The Welsh Fishermen's Association (WFA) has expressed an interest in participating in survey and monitoring work where its members may have relevant skills. The use of fishing vessels and crews could be a cost effective solution for some survey work especially where deployment of sampling gears is involved.

There is a growing recognition in the value of collaborative fisheries science studies that involve researchers working in partnership with fishermen. In such studies researchers and fishermen work in partnership to better understand the marine environment; the fishermen are able to provide their Local Ecological Knowledge (See box), whist the researchers are able to provide formal scientific techniques.

Seafish have recently developed an underwater video system for use on board fishing vessels. The current project aims to use the system from small inshore vessels typical of those operating around Wales to gather seabed habitat information in the Pen Llŷn a'r Sarnau working in partnership with NRW and SAC site officers.

Local Ecological Knowledge
(From Seafish, Fishermen's Environmental Monitoring Pilot)

"Fishermen have an in-depth knowledge of their fishing grounds built up over many years experience fishing and from traditional knowledge passed down from the older generation. This knowledge has become more accepted as a potential source of valuable information in fishery and conservation management over the last decade and a half. There are a number of terms commonly used to describe this knowledge and perhaps the most commonly used are "Traditional Environmental Knowledge" (TEK), "Local Environmental Knowledge" (LEK), and "Fishermen's Environmental Knowledge" (FEK) and very often "environmental" is replaced by "ecological". Fishermen's Ecological Knowledge may incorporate a variety of information types acquired through their own experience, from their peers and based upon more traditional cultural knowledge. This may include ecological information such as inter-annual, seasonal, lunar, diet and food-related variations in the behaviour and movements of marine fauna and physical information such as tidal streams, seabed types, local operating constraints and effects of prevailing weather conditions."

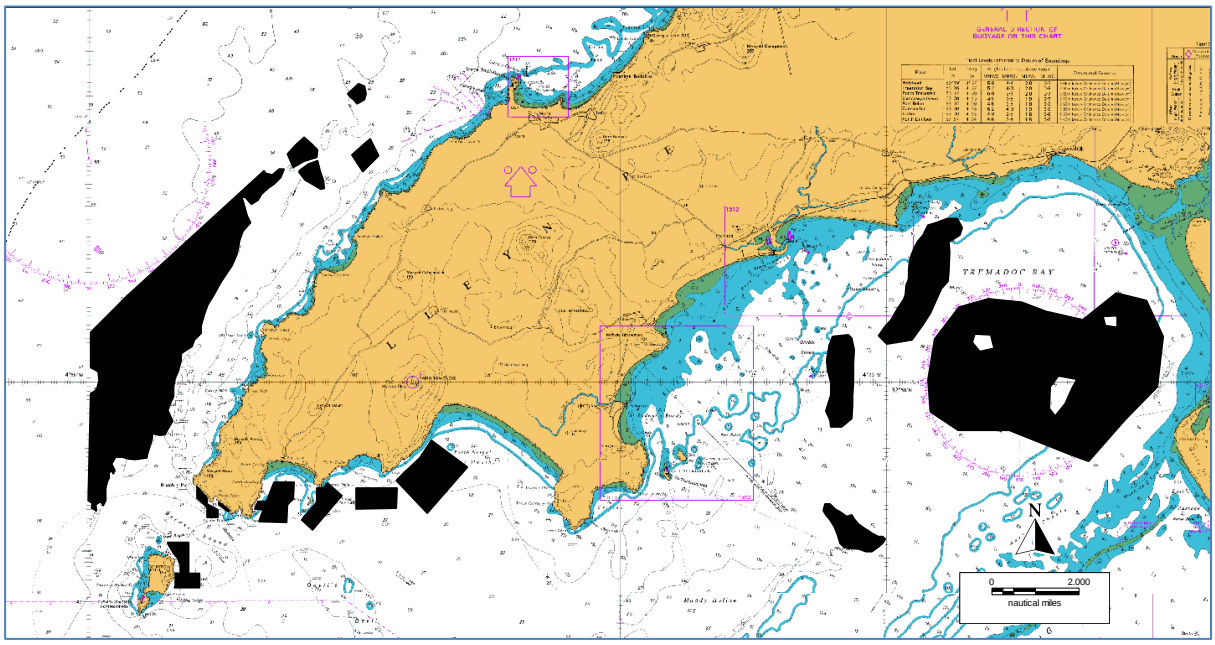
[1] http://www.seafish.org/media/Publications/StrategicEnvironmentalAssessmentProject.pdf
[2] Fishermen's Environmental Monitoring Pilot, Seafish 2013 in prep (link to be added)

2. Method and approach

2.1. Planning workshop

Identification of priority areas for the surveys was carried out in collaboration between NRW officers, SAC site staff and fishermen at a planning workshop facilitated by Seafish. The workshop for participating fishermen served to introduce the aims of the project and to build working relationships. A series of GIS charts were produced by NRW highlighting areas were previous survey work had been undertaken or where records of seabed habitats and species existed. The areas where information gaps existed where highlighted as polygons (Figure 2). These charts served as a focus for discussions and enabled fishermen to suggest areas of interest discuss local operational constraints such as tidal streams and areas of shelter. Following the workshop a revised set of charts were produced with target polygons highlighting the priority areas for the survey work to take place within.

Figure 2. Areas where information gaps exist on seabed habitat types identified by NRW



2.2. Methods Handbook

A Video Survey Handbook was produced to provide participating fishermen and SAC staff with information that would enable them to familiarise themselves with the procedures and for future reference. This drew upon previous Seafish work which developed Standard Operating Procedures to enable shellfish farmers to undertake video surveys to inform aquaculture developments. The Handbook provides an introduction to basic video surveys, and provides some background on the requirements for better seabed information for MPA management. The Handbook is clearly laid out leading the reader through a description of the equipment, survey planning and the importance of collaboration, survey design, and finally a simple step-by-step SOP for the survey itself. See Appendix I.

2.3. Implementation and Video Survey

The surveys were carried out from two beach launched inshore fishing vessels; the FV “Lara B” a 19ft Orkney Fastliner equipped with a cuddy for protection operated by Brett Garner and the FV “William Stanley” an 8 m catamaran built locally by Colin Evans.

Both vessels normally work static gear which results in a clear deck layout even on a small vessel as there are no winches, warps or trawl gear.

Figure 3. The FV “Lara B” launching from the stone slip on Hells Mouth

Figure 4. The FV “William Stanley” launching from Poth Colman

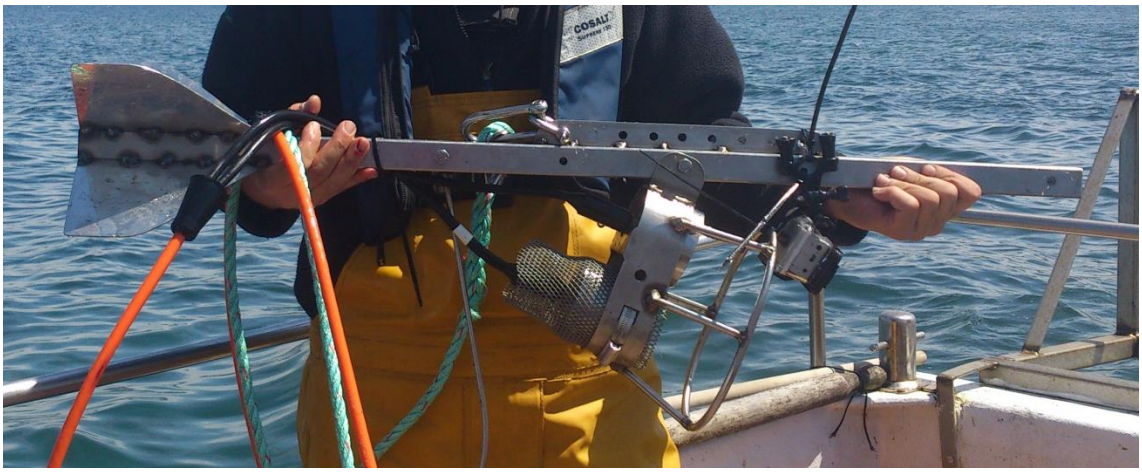
In addition to participating fishermen SAC Officer Alison Hargrave and Seafish Wales Officer Holly Whitley joined the surveys on alternate days. This approach aimed to build capacity at a local site and national level to enable them to participate or lead future surveys.

The video survey procedure closely followed that laid out in the Handbook (Appendix I). A video log form used by NRW surveyors was used and was filled out at each station. Key tasks were naturally delegated utilising the skills of the participants; fishermen were involved in navigating and manoeuvring the vessels, the site or Seafish officer present key tasks operated the topside video control unit and acted as recorder, the fishermen usually undertook deployment and recovery of the sledge and the adjustment of lights, cameras and scaling lasers. Recording sheet was completed SAC or Seafish staff but the live video feed was observed by all participants who all provided identification and interpretation.

Figure 5. Fisherman Brett Garner and SAC Officer Alison Hargrave undertaking video survey work off the South Llyn

In addition to deployment of the Seafish video sledge a tow fish was trialled. This piece of equipment was developed for use over rocky ground and sites where seaweed or seagrass cover would obscure the video cameras.

Figure 6. Prototype video towfish



3. Results

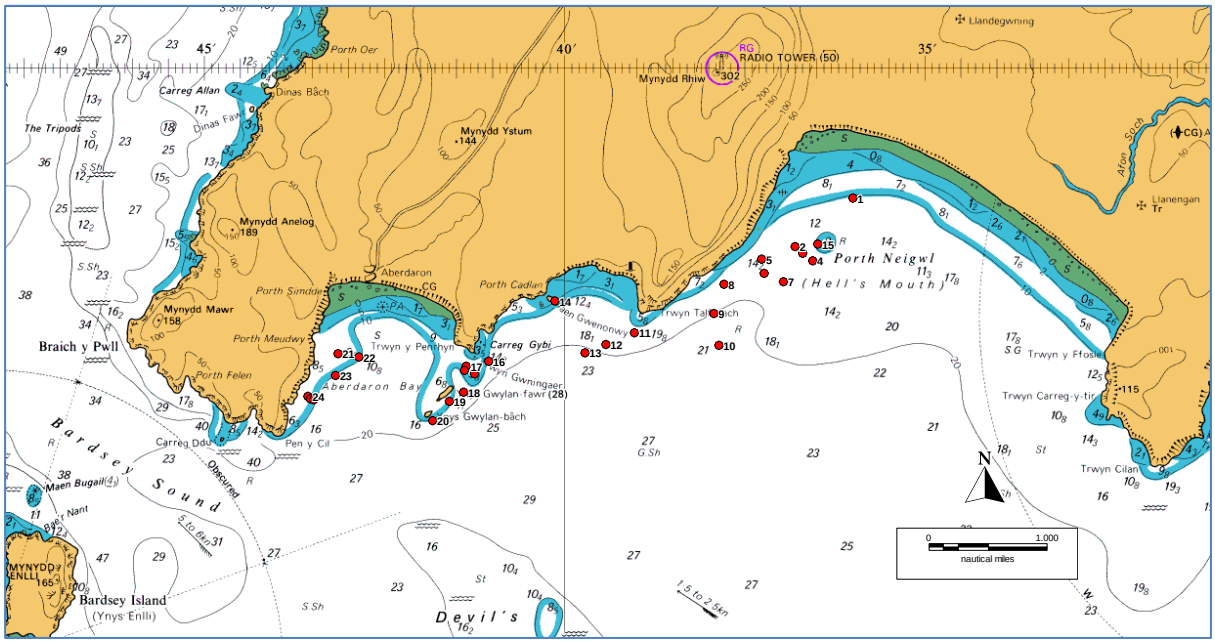
3.1. Account of survey days

A total of 38 video stations were worked over the 3 days of survey and training, these produced over 5 hours of video footage.

Day 1: The first day of survey was carried out by Holly Whitely (Seafish Wales) and Brett Garner (FV "Lara B"). The first stations were worked in two areas at the western end of Hells Mouth (Figure x). Good progress was made and deploying the video sledge proved straightforward from the small vessel. The for'ard cuddy of the FV "Lara B"proved to be ideal for the topside unit keeping it out of the spray and in shade. Good quality footage was recorded at 15 stations.

Day 2: The second day of survey was carried out by Alison Hargrave (SAC Officer) and Brett Garner (FV "Lara B"). The survey focused on Aberdaron Bay and areas around the islands Ynys Gwynlan-bach and Yny Gwylan-fawr where a total of 13 video stations were worked. The video towfish was tested in both areas and despite the need for some adaptations to improved directional stability proved to be effective in the rocky kelp beds.

Figure 7. Video survey stations worked on Days 1 & 2



Day 3: The third day of survey was carried out by Alison Hargrave (SAC Officer) and Sion Williams (FV William Stanley). This work took place on the north of the Llyn Peninsula working from Porth Colmon. We were unable to target the priority areas identified by NRW to the south west of the launch site due to sea conditions. The decision was made to use the time to gather information on areas of conservation interest as directed by local knowledge. The first stations aimed to investigate areas thought to contain *Modiolus* reef. The second set of stations gathered footage of the seagrass beds in Porthdinllyn. A further station was worked on the return passage to gather footage of a historic wreck close to Porth Colmon. A total of 10 video stations were worked as a longer time was

spent steaming between areas. The video towfish work well following overnight adaptations and proved to be effective in providing footage of the seagrass beds.

Figure 8. Video survey stations worked on Day 3

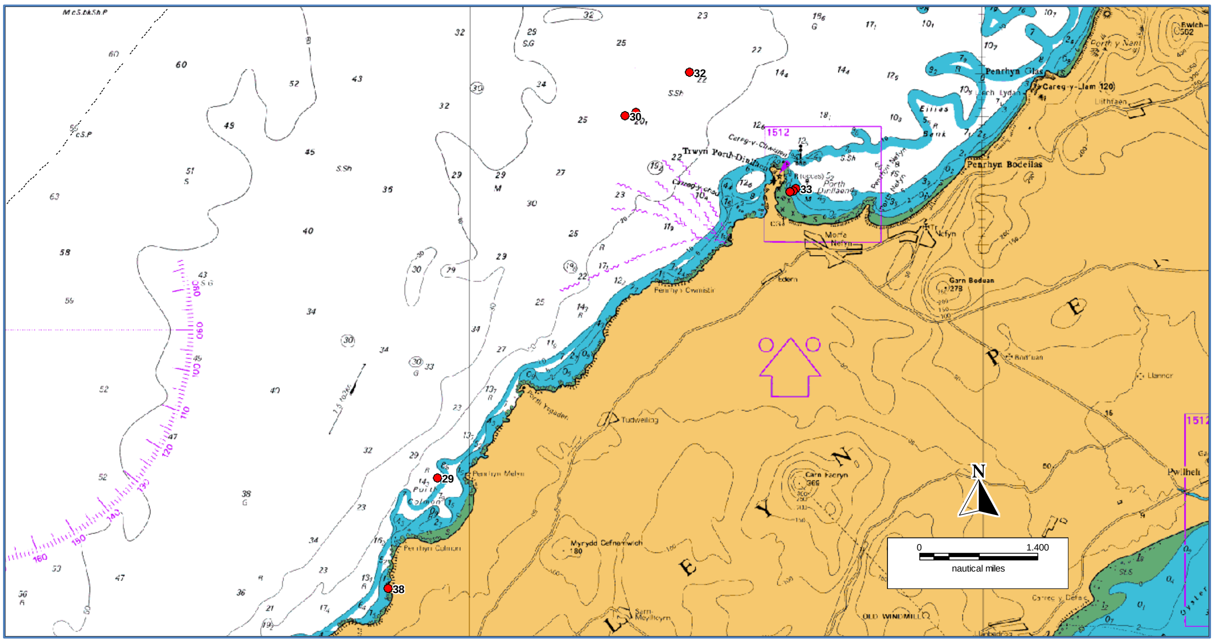


Figure 9. Fisherman Brett Garner and Seafish Wales Officer Holly Whitley engaged in a video survey.

3.2. Field log and observations

Table 1. Exerpts from field log sheets recorded during surveys.

Location	Station	Longitude	Latitude	Depth (m)	Sediment	Conspicuous Species
Llyn Hells Mouth	**1**	52.81511667	-4.6	9.5	Mixed ground of gravel, pebbles, areas of gravel waves and sand	Kelp and red and green seaweed
Llyn Hells Mouth	**2**	52.80828333	-4.613316667	16.5	Gravel, cobbles,, pebbles and areas of larger cobbles and gravel	Hermit crabs, sponges, spiny starfish (*marthasterias*)
Llyn Hells Mouth	**3**	52.80733667	-4.611585	13.5	Gravel, pebbles and cobbles with areas of cobble reef	Seaweed, sponges
Llyn Hells Mouth	**4**	52.80622	-4.609333333	12.5	Pebbles, cobbles, large cobbles, boulders	Red seaweeds, sponges and sea urchins
Llyn Hells Mouth	**5**	52.80646667	-4.621158333	16.5	Pebbles, cobbles, on a gradient of gravel and sand	Sponges, ascidians, red seaweeds and hydroids
Llyn Hells Mouth	**6**	52.80448667	-4.620488333	18.6	Area of gravel, pebbles, sand and silt. Area clean shell gravel and pebbles. Areas of pebbles, large cobbles and boulders	Bryozoans and hydroids
Llyn Hells Mouth	**7**	52.80333833	-4.616196667	21.1	Gravel, pebbles, silt, shells	Scallops, hermit crabs
Llyn Hells Mouth	**8**	52.80302167	-4.629961667	20	Gravel, pebbles, gravel waves and cobbles, areas of larger cobbles and large boulders	Scallops, anemones, hydroids, bryozoans, spider crab
Llyn Hells Mouth	**9**	52.79886	-4.63215	24	Shelly gravel and gravel waves areas, cobble and pebbles, areas of boulders and cobbles	Hydroids, bryozoans, urchins, dead mans fingers
Llyn Hells Mouth	**10**	52.794425	-4.631115	24.5	Pebbles, cobbles, sparse boulders. Area of sand	Sponges, dead men's fingers, dogfish, hydroid, red seaweed
Llyn Hells Mouth	**11**	52.79611667	-4.650691667	24.4	Gravel waves, pebbles, sand waves	Red seaweed
Llyn Hells Mouth	**12**	52.79453667	-4.657235	20.2	Cobble reef, large boulders. Area of gravel, pebbles cobble and occasional boulder	Sponges, bryozoans, hydroids, starfish, soft coral
Llyn Hells Mouth	**13**	52.79331833	-4.662013333	25.3	Gravel , pebbles, cobbles. Area of	Hydroids, dead mans fingers,

					cobbles and boulders	bryozoans
Llyn Hells Mouth	**14**	52.80064	-4.66905	14.1	Cobbles, boulders	Kelp, red seaweed, sponges
Llyn Hells Mouth	**15**	52.80857333	-4.608093333	16.2	Gravel, pebbles, occasional cobble	Hydroids, red seaweed, sponge
Aberdaron	**16**	52.7922	-4.684481333	15.4	Boulders, cobbles,	Starfish, dead man's fingers, spider crabs, sponges, anemones
Aberdaron	**17**	52.79144	-4.689571667	11.3	Area of sand then rocky reef	Red seaweed, sponges, mussels starfish, kelp, spider crabs
Aberdaron	**18**	52.78777167	-4.690278333	20	Coarse sand, gravel, pebbles	Red seaweed, crab, dead mans fingers, ross coral, octopus, bryozoan
Aberdaron	**19**	52.7865	-4.69342	14.4	Rock, cobbles, boulders	Starfish, sponges, dead man's fingers, sponge crab, velvet crabs, bryozoans, red seafish
Aberdaron	**20**	52.78386167	-4.697351667	20.2	Rock, boulders	Dead mans fingers, sponges, bryozoa
South Llyn Park Meudwy	**21**	52.79324667	-4.71938	11.1	Areas of mixed ground cobble pebble and sand. Area of boulders and rock	Octopus, red seaweed, scallops, red seaweed, sponges, crabs
Aberdaron	**22**	52.79279333	-4.71451	12.8	Coarse sand and gravel	Starfish, crabs, dead mans fingers, hydroids, sponges, red seaweed
Aberdaron	**23**	52.79013667	-4.71998	14.1	Mixed cobble, gravel, sand	Dead man's fingers, bryozoa, hydroids, sponges, colonial ascidians, red seaweeds
Aberdaron	**24**	52.78722333	-4.726386667	11.7	Boulders and rock	Kelp, red seaweed, hydroids, dead man's fingers, sponges
Aberdaron	**25**	52.78686167	-4.725628333	12.6	Boulders, cobbles, coarse gravel, pebbles	Sponges, kelp, hydroids, fish, bryozoa, dead man's fingers, red seaweed
Aberdaron	**26**	52.786805	-4.724978333	13.4	Boulders, cobbles, coarse gravel, pebbles	Spider crab, fish, red seaweed, sponge, bryozoa, hydroids, kelp
Aberdaron	**27**	52.79083833	-4.689996667	12.9	Boulders, cobbles, gravel, mixed ground	Kelp, red seaweed, spider crab, dogfish, mussel bed, dead man's fingers, sponges
Aberdaron	**28**	52.79041667	-4.687741667	16.1	Rocky ground, cobbles, boulders with areas of flatter mixed ground	Red seaweed, sponges, bryozoans, hydroids, spider crabs, mussels,

						starfish, dogfish, wrasse, dead man's fingers
North Llyn – Porth Colmon	**29**	52.88728667	-4.677446667	14	Boulders, cobbles	Red seaweed, fish, bryozoa, sponges
North Llyn - Horse Mussel Reef area	**30**	52.95864667	-4.616545	28.5	Gravel, cobbles, occasional boulders	Fish, seaweed, dead man's, anemone, bryozoa
North Llyn - Horse Mussel Reef area	**31**	52.95928	-4.612898333	22.4	Gravel, areas of boulder and cobbles	Dead man's fingers, sponges, bryozoa
North Llyn - Horse Mussel Reef area	**32**	52.96716167	-4.595511667	23.9	Gravel, cobble	
North Llyn - Porthdinllaen	**33**	52.94420833	-4.560953333	3.5	Sand	Seagrass, seaweed, fish
North Llyn - Porthdinllaen	**34**	52.94380333	-4.561881667	2.79	Sand	Seagrass, seaweed,
North Llyn - Porthdinllaen	**35**	52.94358167	-4.562961667	2.3	Sand	Seagrass, seaweed, *Sargassum*
North Llyn - Porthdinllaen	**36**	52.94358667	-4.562925	2.2	Sand	Seagrass, seaweed, *Sargassum*
North Llyn - Porthdinllaen	**37**	52.94356167	-4.562803333	2.3	Sand	Seagrass, seaweed, *Sargassum*, bivalves, anemone
North Llyn - Porth Colmon	**38**	52.86564333	-4.69362	5	Sand areas, boulders, bedrock, wreck	Kelp, red seaweeds, fish

3.3. Example screenshots from footage

Figure 10. Mussel bed at Aberdaron with rich associated fauna including brittlestars and crabs

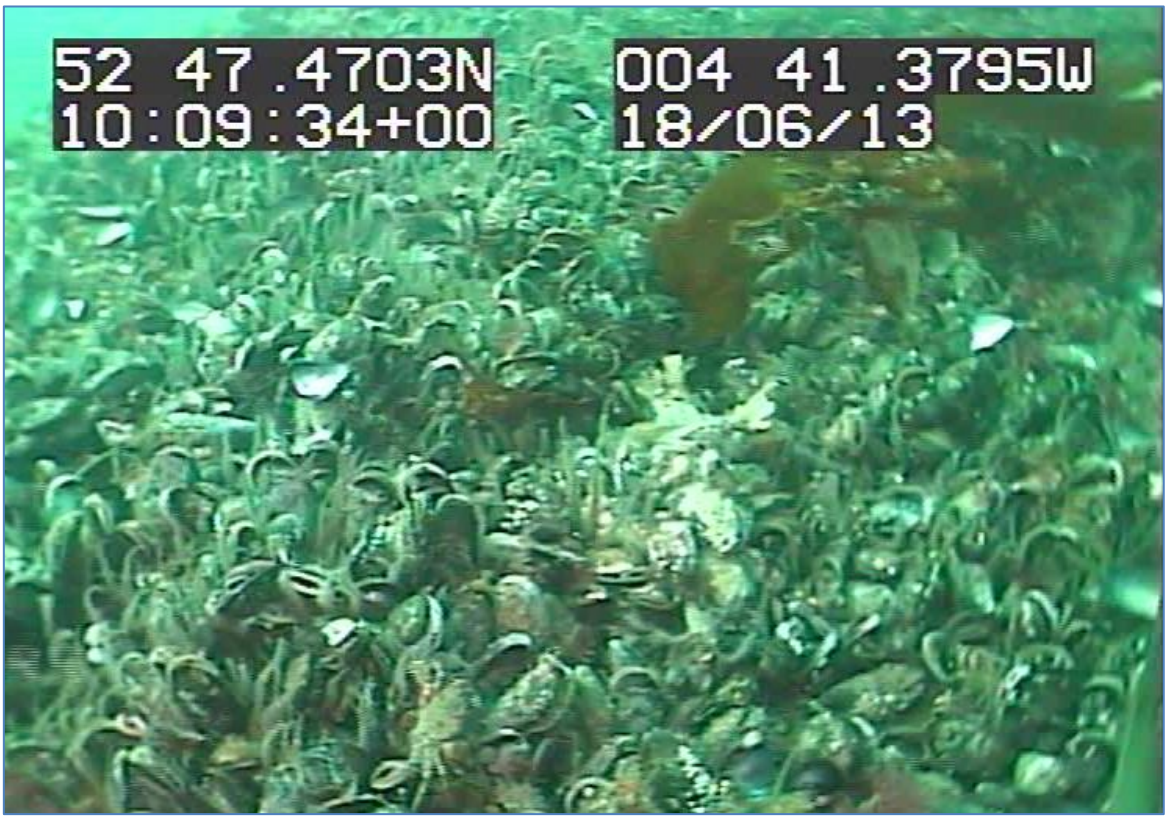


Figure 11. Rocky ground with dead man's fingers, sponges, hydroids and bryozoans off the island at Yny Gwylan-fawr

Figure 12. Mixed rocky ground in deeper water off north Llyn

Figure 13. The seagrass bed at Pothdinllyn (footage from the backup GoPro camera mounted on the towfish)

4. Conclusions

4.1. Operational considerations

The video survey work was successful in gathering high quality video footage of the seabed in the majority of the areas in with information gaps had been identified by NRW. The only constraint encountered was due to unforeseen sea conditions off the North Lynn but survey work was able to continue at fall back sites suggested by the SAC Officer to gather footage to inform and support SAC management.

Using local fishermen and their vessels proved to be a benefit as we were able to draw upon their local knowledge; this ranged from simply the best times to work in different areas in respect of the tide state to fine scale spatial knowledge of seabed features. Both of these aspects are necessary knowledge that the fishermen require for their day to day fishing activity but which when applied to survey work save time and increase the likelihood success. The fine scale spatial knowledge of small uncharted habitat features was surprising; Brett Garner was able to describe a rocky ridge running seaward from a promontory; Sion Willams was able to position the vessel and towfish directly over a small wooden wreck in shallow water at Porth Colmon. It was common that once inside a target area the fishermen would take the lead on positioning of the survey stations directed by their local knowledge and by that passed on by other fishermen. They showed a great deal of interest in the footage and clearly have strong curiosity to discover what is on the seabed.

Practicalities of working on these small vessels required some organisation but a short time spent setting up and siting the video equipment and generator in protected positions proved to be worthwhile. The FV “Lara B”, a 19ft Orkney Fastliner, is the smallest vessel that this equipment has been deployed from and proved to be ideal for working close inshore. Both vessels benefited from a cuddy or open wheelhouse which provides protection from spray and the weather. Working from an open boat would be more difficult as the topside control box does need to be kept dry.

4.2. Relationship building and collaboration

The recent Highly Protect Marine Conservation Zone consultation in Wales caused a degree of conflict between nature conservation interests and marine stakeholders, particularly fishermen. There is a desire amongst practitioners involved in marine conservation and fisheries management to rebuild relationships between fishermen, management bodies and conservation interests. The planning stage of this trial served as an opportunity for some bridge building to take place between NRW officers, SAC officers and the local fishermen who live and work in the Pen Llŷn a'r Sarnau SAC. The dialogue that has taken place during, and subsequent to, this trial has served to strengthen relationships between NRW, SAC officers and the local fishing industry.

The survey work was carried out using a partnership approach with the fishermen utilizing their skills and knowledge working alongside SAC site officers and scientists who brought formal science-based skills. The joint working approach enabled wide-ranging discussions on ecology, management policies and site management issues to take place with the result that all participants were able to develop a better shared understanding.

4.3. Legacy: beyond video surveys

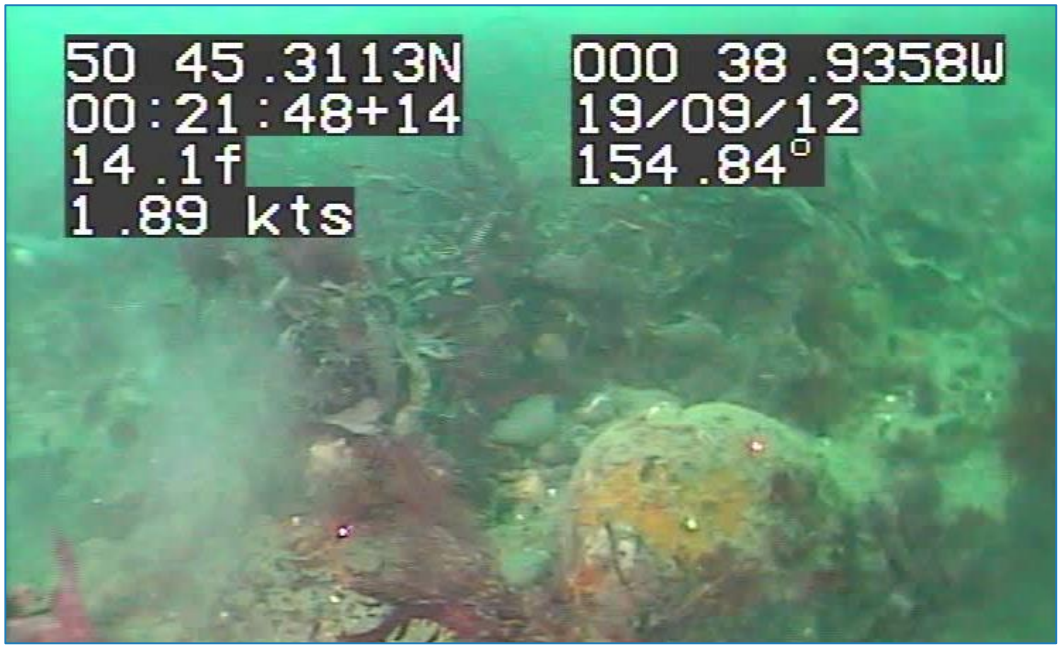
The trial surveys served to build the capacity in terms of skills and experience for the participants to undertake future collaborative seabed surveys without the requirement for outside support. All participants, fishermen, Seafish and SAC officers alike, stated when asked that they would be confident in carrying out similar work in the future. This may be valuable for addressing site specific management issues or requirements for seabed habitat information to inform management.

Site management issues are varied and require more than seabed habitat information to inform them, likewise the requirement for marine monitoring data covers a wide range of information from seawater chemistry to population status of protected species. Discussions during this trial highlighted that fishermen may be able to play a role in gathering information or collaborating with scientists in monitoring and research. Some examples that were suggested were:

- Seasonal observations or sightings of key species e.g. seabird or marine mammals,
- Surveillance and early warning of invasive non-native species,
- Provision of survey platforms for bird surveys,
- Vessels as survey platforms for instrumentation such as temperature or sea water chemistry loggers,
- Climate change surveillance by recording unusual species or changes in behaviour of currently common species,
- Collaborations between researchers and fishermen

The Welsh Fishermen's Association is developing a project to take these ideas forward with NRW in 2014.

Video Survey Handbook



GUIDANCE FOR FISHERMEN INVOLVED IN COLLABORATIVE UNDERWATER VIDEO SURVEYS WITH NATURAL RESOURCES WALES

This document sets out in a clear and step-by-step manner the process of planning and carrying out an underwater video survey of seabed habitats

VIDEO SURVEY HANDBOOK

Guidance for fishermen involved in collaborative underwater video surveys with Natural Resources Wales

Introduction to Basic Seabed Habitats Mapping

Very often there is a lack of detailed knowledge about the habitats and species on the seabed in areas where fisheries operate within Marine Protected Areas. If we are to manage these sites effectively with the minimum impact on the fishing industry whilst protecting sensitive habitats we require better information on the nature and extent of seabed habitats.

FIGURE 1LOBSTER IN BOULDER HABITAT (© ROHAN HOLT, NRW)

The fishermen operating in local fisheries often have extensive local knowledge, skills and technology to enable them to carry out basic seabed surveys. With access to more specialist equipment such as underwater video equipment owned by Seafish you be able to undertake more detailed survey work.

This guidance sheet will take you through the process of carrying out a basic site survey using underwater video equipment to record the location and seabed habitat types.

Information gathering using underwater video surveys is very cost effective compared to other methods of environmental sampling. By the inclusion of GPS coordinates in the underwater video recording you will be able to provide regulators with accurate and verifiable information on the seabed habitats.

What are habitats?

Habitats are quite simply the parts of the environment where plant and animal species live, in this case the seabed type, e.g.

- Razor Clams live in a sand habitat
- Lobsters live in rocky habitats
- Pollock live around seaweed covered rocky habitats

UNDERWATER VIDEO SYSTEMS

Portable underwater video systems have recently been developed specifically designed to enable ease of deployment from small vessels and to generate good quality video footage of seabed habitats. The Seafish system is a development of an earlier design and has been adopted for use by IFCAs and Wildlife Trusts around the UK.

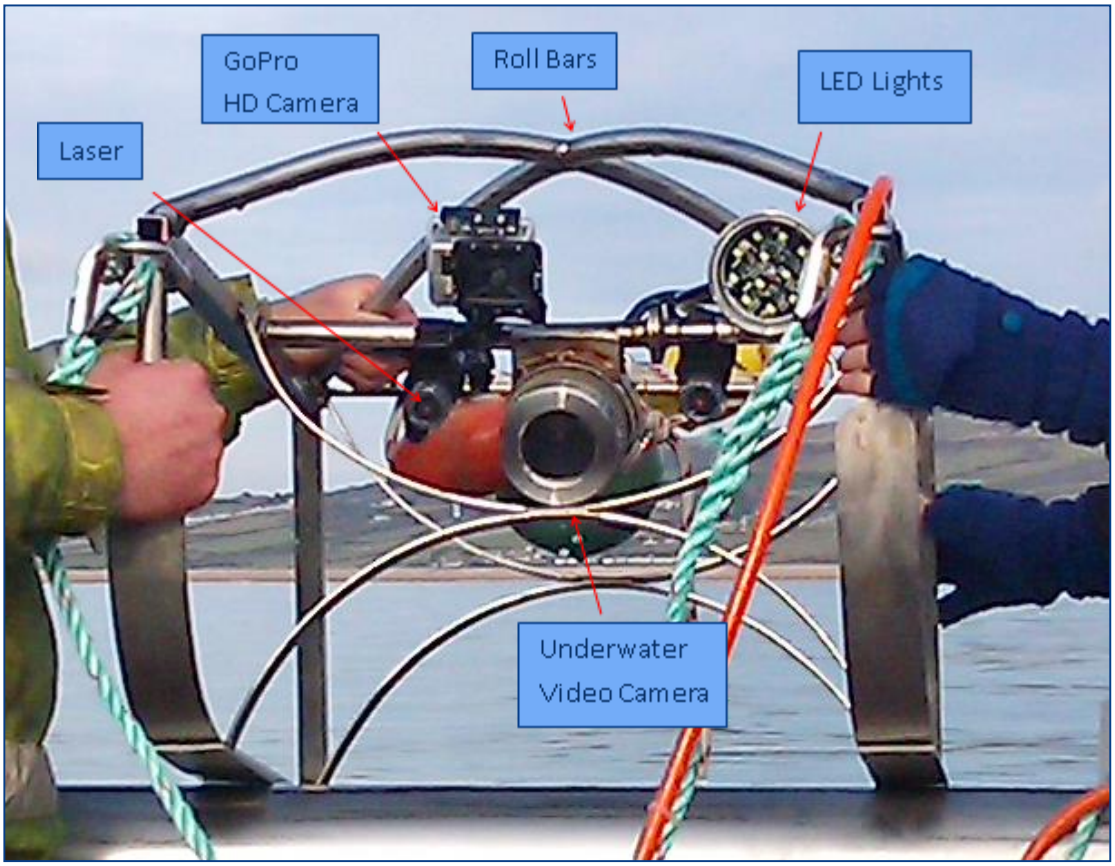
There are two main parts of the video system, the topside control unit and the video sledge on which the cameras and lights are mounted.

The topside control unit: as the name suggests this is where the video and lights are controlled from. The unit is housed in a waterproof case and houses the following:

- The video display
- The GPS overlay circuit. This superimposes a GPS derived position onto the video image which acts to confirm the location of seabed habitats and features.
- A DVD recorder that acts as the main recorder for video footage
- A DVR recorder that provides a lower quality back up of the video footage
- Light controls which enable the lights to be turned on and off and also to be dimmed
- Fuses and power supply

The video sledge: This is houses the cameras and lights for deployment to the seabed. Its key features are:

- Underwater video camera linked to the topside control unit
- Underwater LED lights controlled by the topside control unit
- High Definition GoPro camera producing HD footage to augment standard video camera
- Pair of scaling lasers that projects two points of red laser light onto the seabed that act as a scale from which species and seabed features can be measured
- Stainless steel construction with protective roll bars
- Independent horizontal camera and light adjustment



Step-by-step guide to carrying out seabed mapping

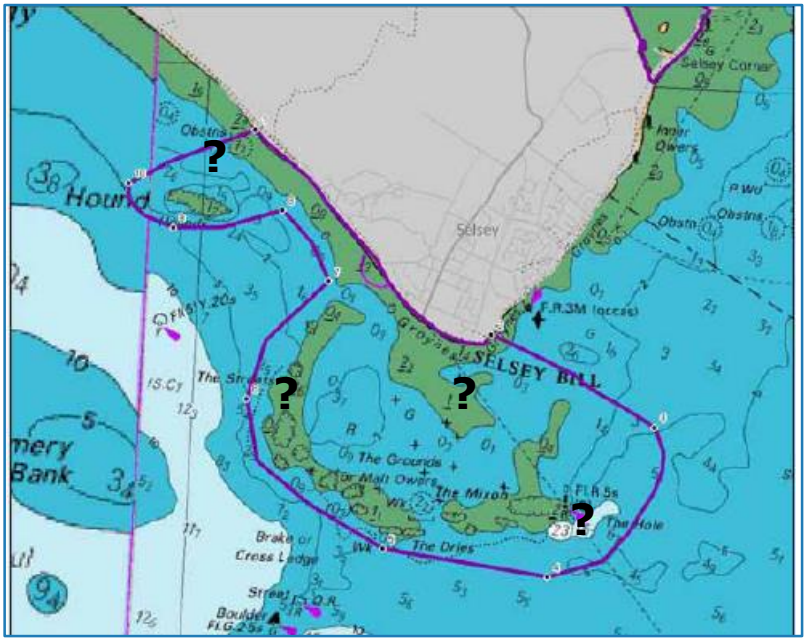
STEP 1 – CONSULTATION AND SURVEY PLANNING

Planning is an essential part of a survey; time spent in preparation will save you time, effort and money when out at sea

Surveys are best carried out with some degree of planning; an hour or two spent identifying the main areas of interest can save days of survey time. Working in collaboration with site managers i.e. NRW advisors and SAC officers, a sensible survey plan can be quickly developed.

Who contributes what?

- NRW staff can provide maps of existing data and identify areas where they lack information
- Fisherman can draw upon your local knowledge to help fill in the gaps and to identify areas of interest or habitats that NRW are not aware of
- Fishermen's knowledge of the effects of wind directions and tidal currents on the site are vital for planning the survey; fast currents and rough seas make surveying difficult



Video Survey Design

The aim of the survey is to find out what types of habitats (mud, sand, rock and living reefs) and species are on the seabed in the areas that you are fishing and to record their location.

Obviously you will not be able to cover every inch of the areas where information is needed but by systematically dropping down the video equipment at a number of places you can build up a picture of the seabed over the site.

The most straight forward survey design to achieve good coverage of your site is called a **grid survey**.

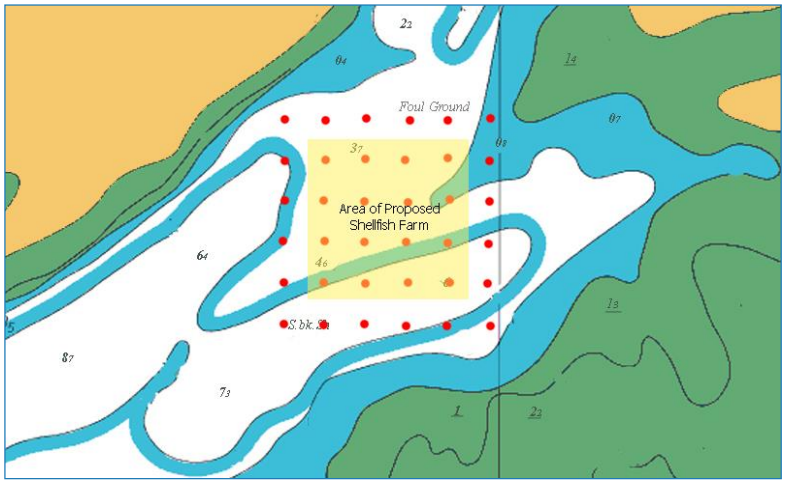
A grid based survey is designed by simply plotting a systematic series of positions on a chart in a grid fashion (known as **'video survey stations'**) and using the underwater video at each of these.

Grid Surveys are the most common survey design used by professional surveyors at sites where there is no prior information on seabed habitats.

Grid Surveys are:

- Systematic
- Easily Plotted
- Straightforward to carry out

For small areas an alternative approach is suggested on the next page.



In this mocked up example an area where fishing takes place has been plotted onto a chart (yellow).

A grid of video survey stations has been placed every 250 m over the 100 ha fishing area and surrounding seabed.

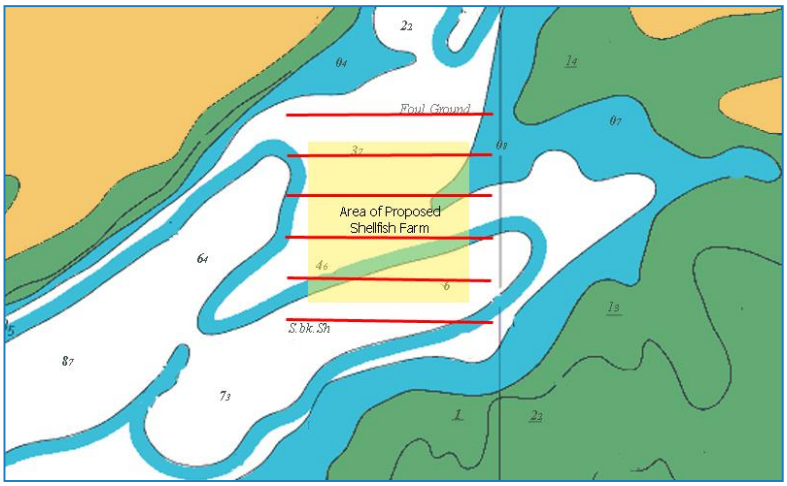
How many video survey stations should you work?

- The number of stations depends on the size of the area and how accurately you can position your vessel, e.g.
- For a small site a grid of 250 m may be possible to work but for larger sites such as in an MPA time constraints will force a far larger grid size

Small Site Approach

An alternate approach for small sites where positioning of a vessel every few metres would be impractical is the use of a series of tracks.

By dropping the camera on one side of the site and then allowing the vessel to drift slowly across it you will collect video footage to help inform the environmental assessment.

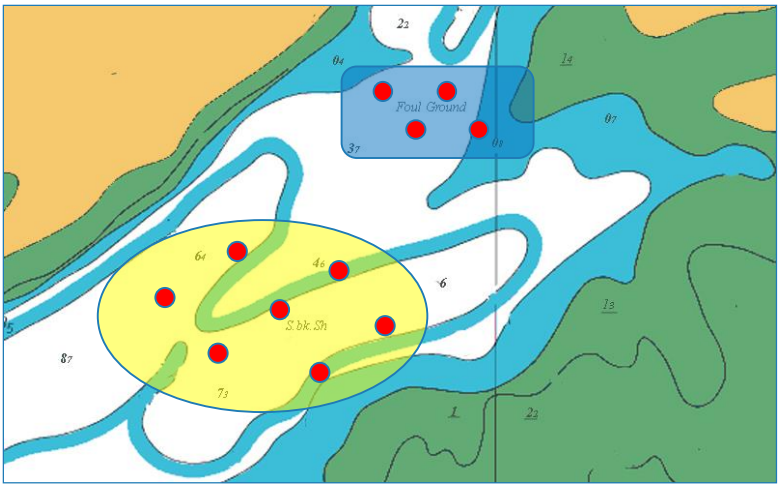


The best video footage is likely to be recorded at very slow vessel speeds of around half a knot.

Using fishermen's knowledge information to guide the video survey ("ground truthing")

Site managers may have existing information of seabed habitat types in the site guide the video survey plan. You the fishermen have a great deal of local knowledge of ground types in the area that you can draw upon. By putting this onto a chart in the planning stage allows the survey effort to be targeted to areas of interest; this is known as a **stratified survey strategy** and surveying these areas as **"Ground Truthing"**.

In this example two areas of seabed that more information is required about have been identified by fishermen and the NRW and a number of video survey stations have been located within each.



Your local knowledge can describe the location and extent of different seabed habitats and the underwater video footage enables you to identify them and more accurately map them.

STEP 2 – THE VIDEO SURVEY

Set up and test the equipment on the vessel

This is best done the day or some hours before you plan to put to sea as this is when you discover problems and being alongside with access to shore facilities can save the day. It may sound like common sense but these are problems that have previously been encountered by professional surveyors.

As you set the video system up ask the following questions:

- Have you got sufficient fuel for the generator or an adequate power supply on the vessel to run all of the equipment and lights?
- Is the recording equipment likely to get wet when you are underway or working?
- Can the cables be routed where they will not be damaged by slamming doors etc?
- Do you have enough DVDs and memory cards to undertake the survey?
- Have you considered how you going to handle the warp and cable (cables are generally not to be used for hauling)?
- Are the camera and lights depth rated for the depth of the site you are surveying?
- Have you remembered the **Video Survey Log Forms**, pens and pencils

When you have the equipment set up test it out alongside in the harbour

Using the underwater video gear for the 1st time:

1. Turn on the topside control unit
2. Check the camera is working and that you have an image on the screen
3. Adjust the camera to give you the best view of the seabed
4. Check that the GPS overlay is producing an accurate position on the screen
5. With the lights turned on lower the equipment into the water and down to the seabed
6. If applicable - check that the lights are angled to give the best image on the screen
   - this may be a process of trial and error
7. Recording some video footage and playing it back

It is a good idea to practice using the equipment during this time as you will very quickly learn how to get the best results from your system

The video survey

It is best to undertake the survey in calm conditions after a period of settled weather and over slack water as visibility is often better.

Follow your survey plan as closely as you can but don't worry overly about positioning – no one expects you to be able to drop the camera exactly on top of each video survey station waypoint

When you arrive at a video survey station follow these actions:

1. Prepare video survey log form filling out station number, coordinates, depth etc.
2. Turn on the video system and check that you have a clear video picture with GPS overlay

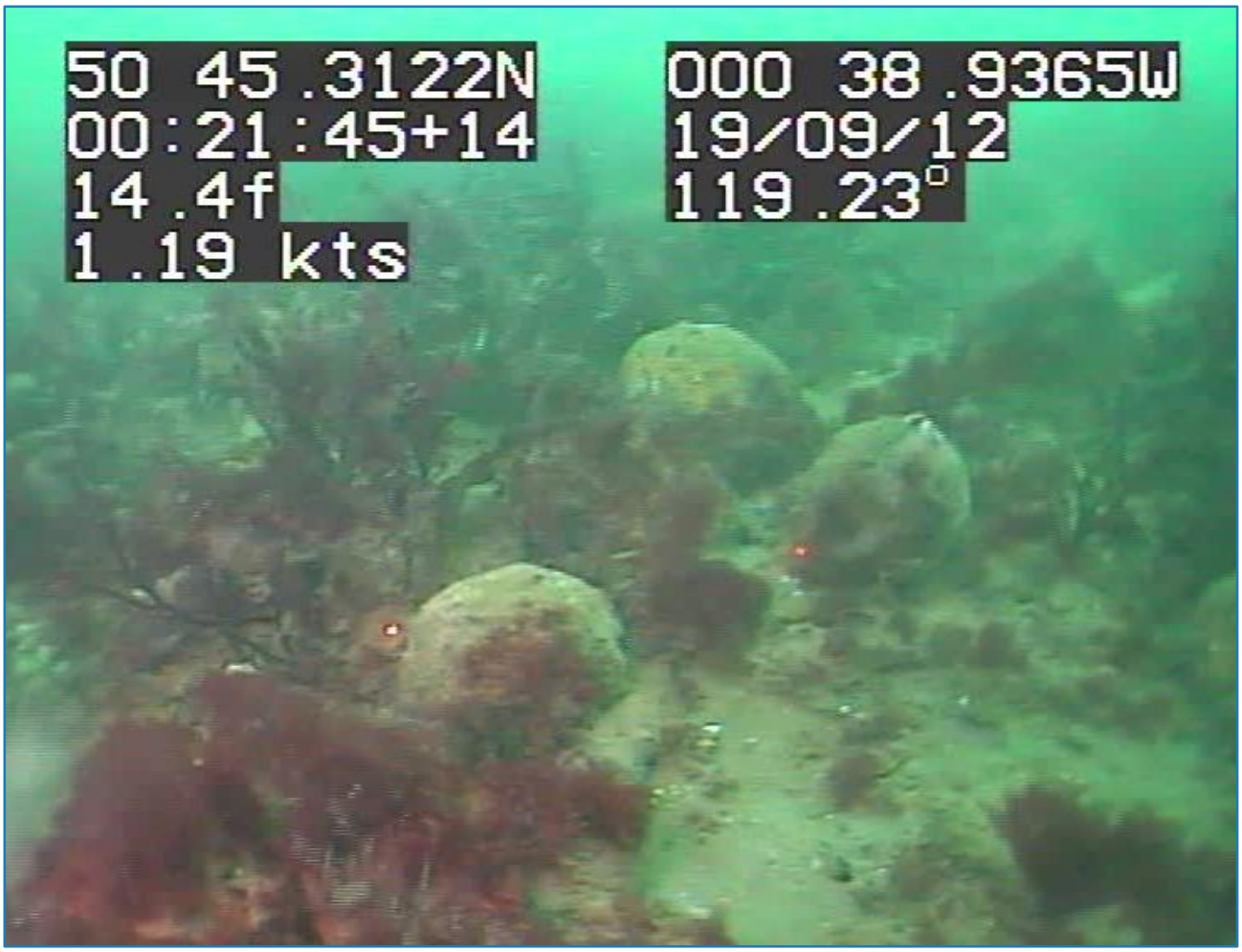
3. Place a "clapper board" in front of the camera with the site name, date and video station number written clearly on it. Ensure that the laser pointers are lined up horizontally and measure them against the scale bar.

4. Ensure the vessel is stationary or not moving at more than **½ knot**
5. Lower video sledge to the seabed
6. Note the start coordinates and depth on the Video Survey Log Form

7. Once the video image has cleared tow the sledge slowly (less than ½ knot) for **10 minutes** if possible. It may be necessary to use the engine to maintain a low speed; every vessel is different so you should experiment on the best approach.
8. During this time fill out the video survey log form describing the seabed type and any seabed marine life covering it
9. Haul the equipment and note the end position and depth on the video survey log form

Keeping the vessel speed low to less than 0.5 knot is probably the most important factor in the survey operation:

– slower the speed the better the footage



Trawl/Tow information	
Location: e.g. North Llyn	
Tow number: e.g. A2_1	
Date:	
Start co-ordinates: e.g. 53° 24.567, -4° 32.473	
Start Time :	
Start Depth:	
Habitat 1	**Time:**
	Sediment:
	Biology:
Habitat 2	**Time:**
	Sediment:
	Biology:
Habitat 3	**Time:**
	Sediment:
	Biology:
End co-ordinate:	
End Time:	
End Depth:	
Ship speed: in knots	
Tide state: e.g. low neap, high spring	
Notes: Any other information that might effect the tow, eg. Bad weather / visibility, equipment failure etc…	
Media number: e.g tape or disc number video recorded onto	