



**Marine Ecosystems  
Research Programme**



Department  
for Environment  
Food & Rural Affairs

## **MERP Policy Briefing for Natural Resources Wales (NRW) & Welsh Government (WG) 1<sup>st</sup> December 2016**

***In attendance:** Kirsten Ramsay (NRW), Paul Somerfield (MERP), Tom Webb (MERP), Mike Heath (MERP), Michaela Schratzberger (MERP), Peter Evans (MERP), Kelly-Marie Davidson (MERP), Matty Murphy (NRW), Tom Stringell (NRW), Kirsty Lindenbaum (NRW), Helen Bloomfield (NRW), Rowland Sharp (NRW), Kathryn Monk (NRW), Rhys Jones (NRW), Louise George (WG), Sharon Davies, (WG), Kathryn Raymond (WG).*

**This is a summary of the proceedings of the Skype meeting, chaired by Kirsten Ramsay (NRW).**

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## Purpose of the briefing

*(For the full briefing document please refer to 'MERP NRW briefing note 18.11.16')*

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The purpose of this briefing was to discuss MERP research activities with policy customers at NRW and Welsh Government and highlight some examples of existing and planned policy-relevant MERP outputs.

The meeting aimed to provide opportunities for policy-makers to influence the direction MERP science is taking, to examine the utility of MERP science outputs to policy-makers, to help the MERP consortium maximise the policy-relevance of research products (i.e. to ensure that appropriate and accessible outputs are delivered) and to identify opportunities for the MERP consortium to provide scientific advice proactively to policy-makers.

## Briefing agenda

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### 1. Setting the scene

- Introductions and welcome (Kirsten Ramsay, NRW)
- The Welsh context (Kirsten Ramsay, NRW)
- The Marine Ecosystems Research Programme: better understanding connections to address evidence needs (Paul Somerfield, Plymouth Marine Laboratory)

### 2. Examples of ongoing and planned work within MERP

- Linking and enriching biodiversity data to assess the state of marine ecosystems (Tom Webb, University of Sheffield)
- Developing virtual marine ecosystems for conducting management scenario experiments (Mike Heath, University of Strathclyde)
- Top Predators in Time and Space: understanding environmental drivers and anthropogenic pressures (Peter Evans, SeaWatch Foundation and Bangor University)
- Overview of Marine Ecosystem Services (Paul Somerfield, Plymouth Marine Laboratory)

### 3. Discussion session

## Summary

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### 1. Setting the scene

KR gave a brief outline of NRW purpose, which focuses on sustainable management and using natural resources sustainably. The NRW's marine environment remit is quite wide including: advising on development and implementation of marine legislation and strategies; monitoring; reporting; licencing; marine protected areas; flood risk and coastal erosion; fisheries management; access and recreation, and marine planning.

Hot topic areas include:

- Tidal lagoons (4 proposed)
- Tidal stream energy
- Sustainable management of natural resources
- Biophysical resilience (biodiversity, extent, connectivity, condition)
- Habitat creation and restoration
- Growth of the capacity and resilience of aquaculture
- Sustainability and impact of fisheries on MPA features and wider ecosystems (Wales is currently assessing all fishing activities and associated impacts)

Highlight questions were:

- What makes an ecosystem resilient?
- What reduces resilience?
- What are the tipping-points?
- What can be done to support resilience?
- What intervention(s) should be advised?

NRW are currently looking at marine biodiversity evidence needs, which fed into the early development of MERP through the Stakeholder Advisory Group (SAG), on which KR sits. The outcome of this project will be a list of marine biodiversity evidence needs.

Welsh Government (WG) deals with fisheries management apart from two cockle fisheries. The Welsh Government, supported by NRW, are currently undertaking a structured approach to determine the impacts from current and potential fishing activities, from licensed and registered commercial fishing vessels, on the features of Welsh Marine Protected Areas. Welsh Government

intend to bring forward new adaptive management measures for a range of species, based on sustainability and informed by evidence. For example, a new scallop management Order for Cardigan Bay SAC to be implemented later in 2017 and new fishery management measures for whelks, cockles and bass in the near future. Lobster and crab are key fisheries in Wales, which do not fall under EU regulations.

PS gave an overview of MERP and its objectives, highlighting how the programme wants to ensure that its outputs are useful to stakeholders. Data, knowledge and models are not joined up with ecosystem services understanding and application; MERP is trying to address this and provide a system to predict the ecosystem services consequences of different management actions at a range of scales. MERP is focusing on: food provision; bioremediation of waste (waste processing, nutrient cycling and benthic processes); leisure and recreation, and biological checks and balances (resilience, resistance and trade-offs).

It was noted that WG are leaning towards the term 'multiple benefits' rather than 'trade-offs', reflected by the Environment Act. Also 'optimising' is preferred over 'maximising'.

## **2. Examples on ongoing and planned work within MERP**

TW gave an overview of MERP data activities, highlighted new data that has been made available through MERP, explained the process of turning 'difficult data' into 'easy data' and highlighted other data portals that are available. Data mobilised through MERP include Seabird biometrics and diet data; Fish diet; Cetacean distribution, abundance and diet; Benthic invertebrate distribution data; and Body size and other trait data ([https://www.sciencedaily.com/terms/trait\\_\(biology\).htm](https://www.sciencedaily.com/terms/trait_(biology).htm))

Highlighted data portals include:

- Species datasets: World Register of Marine Species (WoRMS), Ocean Biogeographic Information System, Defra, Cefas
- Geographic: marineregions.org, JNCC
- Environmental layers: EMOdNET, NOAA, ERSEM
- Next step: adding human pressures (TW speaking to JNCC about the human pressure layers that have been developed) and working with BODC on making data more accessible

Datasets can be combined to generate information on:

- Seasonal distribution of species
- Distribution in relation to diet to track predator/prey change

- Local species lists or food webs
- Hotspots of sensitive species

Gradients of conditions or pressures can be included in model outputs (i.e. not just a presence or absence of a particular pressure but a degree of pressure).

MERP has a commitment to allow access to its data and data products; suitable routes and approaches are being investigated. However 3<sup>rd</sup> party dataset licencing has to be respected so may not be openly available.

TW gave a summary of MERP's Work Package 3/Topic 2 (WP3/T2: cumulative impacts and the management of marine ecosystems. Within WP3/T2 there is a focus on the application of MERP science and there will be 2 case study areas; South West England and Cardigan Bay (co-ordinated by Bangor partners).

- Using established indicators of ecosystem state (i.e. Marine Strategy Framework Directive)
- In a position to take suggestions and requests for other indicators that may be of use in particular circumstances.
- Building on MERP data and modelling expertise, working with the MERP and SAG community.
- Looking to feed MERP data and knowledge into MERP models to increase understanding of 'multiple benefits' of various management initiatives.
- Keen to work with SHs from the outset to understand format, content and ways to promote such products to end-users so outputs are as useful as possible.

SD commented that policy developers may find running real-life scenarios useful in the early planning stages of developments.

MH gave an overview of the advanced ecosystem modelling work within MERP. Ecosystems are often viewed as linear, however, everything is interconnected, which increases the complexity of marine ecosystem management. A change in an input/output/function/process in one area ripples through the ecosystem, termed a cascade effect, and can create multiple impacts that again have their own set of consequences. When a change happens, the ecosystem reacts and eventually settles in the new state. By creating a more simplified, computerised version of an ecosystem, the MERP models are trying to forecast what the new state will look like and how it will behave; a highly complicated and challenging goal.

Models used in MERP include (for full list see [http://www.marine-ecosystems.org.uk/Research/Ecosystem\\_Models](http://www.marine-ecosystems.org.uk/Research/Ecosystem_Models)):

- ERSEM (European Regional Seas Ecosystem Model): biogeochemistry, plankton and benthos.
- Ecopath with Ecosim (EwE): focuses on the upper half of the food web (large plankton to top predators) representing the living component of the ecosystems in terms of biomass.
- Strathclyde end-to-end ecosystem model (StrathE2E): represents living components (large plankton to top predators) in terms of nitrogen mass and includes biogeochemistry, nutrient cycling, conditions and inputs with species being grouped as being functionally similar.

StrathE2E has been used to review the bookends of discard scenarios: land everything = no waste but no conservation benefits, improved selectivity = increased conservation benefits politically and economically challenging.

MH gave a summary of WP3/T1, which looks at trade-offs (“multiple benefits”? It is not easy to compare results between models as they use different components. MERP ecosystem models will be grouped as an ensemble, which will also include price dynamics, social values and economic factors. This will help compare the value of a fish in the sea (in supporting ecosystem services) vs. the value of a fish on the plate. The climate change community also use an ensemble approach, as some models are better than others in different areas, and the approach works well to give a collective view. This ensemble approach has proved to be effective so will be applied in MERP.

The ecosystem modellers are always keen to run the models on real-life scenarios as they provide a great opportunity to test the performance of the models and establish if the scientific understanding of the processes is sufficient to explain observations and/or changes, such as the reduction in herring gulls since the prawn fishery closure.

The cost of species moving may also be a societal issue. If gulls cannot nest in a particular / traditional area they will seek other areas to nest, which may be in urban areas and bringing with them further issues (people bothering, mess, displacing other species). Research has shown a shift in the herring gull diet over the last 100 years from a predominately marine diet to a more terrestrial diet as they scavenge on urban waste, landfill sites etc.

PE gave an overview of top predator distribution. Modelled maps have been produced for:

- Density of top predators
- Dietary data for marine mammals and seabirds

- Environmental conditions
- Prey distribution
- Temporal trends in spawning
- Hotspots of predators and prey
- Next step: to produce predictive management maps with pressure layers

Tracking studies of breeding birds, in collaboration with Centre for Ecology & Hydrology (CEH) and RSPB, are underway. CEH also studying relationships between predator and prey, alongside environmental drivers of change. Marine litter is being monitored informally.

An aim of WP3 will be to produce risk maps, with management applications, to incorporate the trait data that has been collected and the sensitivities each species has relating to different pressures. This will then be modelled to see the cumulative impacts.

The impact of scallop dredging on benthic communities in Cardigan Bay alongside habitat modelling of bottle nosed dolphins has been investigated, to establish the effects of moving the dredging around the Bay. In addition, a socio-economic study was conducted to understand the potential costs and benefits of the different options.

Ecosystem services studies have aimed to get a better understanding of how much money is going into a particular service, to try to derive estimates of the overall value of a service and what happens if the service was to change. Studies will also try to understand thresholds i.e. the threshold at which the quality of a whale sighting outweighs the quantity.

PS gave a summary of MERP's ecosystem services work, focused around food provision, bioremediation of waste (waste processing, nutrient cycling and benthos processes), leisure and recreation and biological checks and balances (resilience, resistance and trade-offs). The objective of this work is to improve understanding of the processes and structure that support ecosystem goods and services as well as develop a framework to generate predictions on how ecosystem services will change in different environmental and management scenarios. MERP is working with stakeholders to understand the different languages used in different sectors and how best to exchange this knowledge with those who would benefit. MERP needs to move from linear models of ecosystem service provision to models focused around networks, relationships, connections and interactions, linking biodiversity and ecosystem work with ecosystem services work, alongside policy indicators and management activities, to better represent the complexity of marine ecosystems and to help understand potential changes.

### 3. Discussion

PS stated that MERP has an objective to be useful so please contact the project office if you would like to find out more or have feedback about a particular area of MERP science.

TS commented that an area that stood out to be useful is the ability to model losses in habitat and resulting implications for top predators. Another useful aspect is greater understanding of prey, such as sprat, their distribution and seasonality, alongside the impact of changes in their habitat and the implications for the wider area, including effects on sediments and top predators.

KR said it would be interesting to understand the complexities of doing impact modelling for something like tidal lagoons.

- Is it practical to ask a [infrastructure] developer to do something like this and if so, where would we go?
- Can we inform developers of the availability of these tools and request that they are used?
- The developers generally pay for environmental assessments so this would require them to pay a third party.

MH replied that this is not addressed in MERP. First changes in the physical dynamics needs to be understood then the ecological element can be applied. Current projects include Economic and Social Research Council's (ESRC) SuperGen Swansea Bay lagoon project, looking at sediment transport and distributions.

TW commented that MERP is looking to use environmental risk analysis approaches to help address some of these questions in WP3. The plan is to pull in information from a range of sources to establish the chains of impact that propagate up to the food-web indicators that MERP is interested in. Only when you understand the reach of an impact can you establish the ecological and other risks.

MERP is looking at local and regional seas scales, including protected areas and fishing impacts. It is key for the programme to look at a range of scales, to understand their relative importance of various activities and impacts, and this influences the choice of model. MERP is not developing a particular model, for a particular job at a particular scale but will be developing a toolbox that can be used at different scales.

Wales could be different to other parts of the UK when considering discards. There are more recreational discards than commercial as there is not a lot of trawling and bottom gear in Welsh



waters. If discards were studied on a national scale, it probably would not be applicable to Wales. MH replied that it was feasible to set up a bespoke model for Welsh waters. MERP has access to models that look at the whole of the North Sea, West of Scotland and Celtic sea; each behave in different ways, due to temperature, water currents, different types of fishing gear, different patterns of discards and capture.

Species mobility is something that needs to be considered as changes in discards may affect the feeding grounds of species, such as gannets. The CEH team have been looking at the issues surrounding mobility and identifying where a pressure is occurring and then which colony the individuals who are experiencing that pressure are coming from. It is interesting, when looking at the disconnect between pressures and ecology, how mobility brings them together. The smaller the scale of the model, the more important mobility is, but mobility is challenging to incorporate.

MERP's habitat modelling will give insights into the impact of certain actions and will provide a forecast of where species may go if habitat is removed. MERP also provides expert judgement on these models and combines data and information from a wide range of sources to help understand the possible outcomes of an action.

Further discussion is needed to understand what models can help address what sort of questions. It seems that a very clear question and parameters are needed then a model is developed from that. It would be good to know where the data is to incorporate into future case work and whether the impact of an impact or a change in behaviour can be modelled.

WP3 aims to focus more on modelling specific impacts and actions. If there is a defined human activity, the models could run the potential impacts. Overall it would be on a case-by-case basis so if there is a particular impact in mind then MERP would be happy to consider the options. MERP would be keen to run real-life scenarios.

PE mentioned it is hoped that underwater noise will be incorporated into models in the near future. Noise mapping is improving and should be available towards the end of the programme.

Stakeholders were keen to know the ways in which MERP can support case work that show potential dramatic change as a result of human activity, at small and national scales.

The advantage of the ensemble approach is that a suite of tools can be used to answer a specific issue or question.

It is interesting to understand where the top predators may move in relation to their prey.

Areas of interest to the Welsh Government (WG):

- Understanding the relationships between decisions and the whole system. Also how does that relate to real-world issues and the decisions they have to make.
- Would like to hear more about the Cardigan Bay case study.
- Keen to see the outputs of MERP work.

A specific welsh model will not be produced. However, welsh-specific work will be incorporated into the models and outputs will be of use to Wales.

A challenge for NRW/WG has been understanding the extent at which ecosystem services may or not be at risk in Wales. Wales has a new Environment Act and restoration is a key element of that. For the terrestrial environment there is a lot of mention of managing land in different ways so this links to the MERP approach.

Tracking where monetary values end up would be interesting. In the case of Wales, an ecosystem service may generate £xx but that money may not end up in the local economy.

The toolbox needs a clear strategy and its limitations will need to be communicated to end-users.

This is the start of a dialogue process.

## Actions

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- KR to discuss data availability further with Tom Webb.
- Further discussion is needed to understand what models can help address what sorts of questions.
- To give targeted seminars to stakeholders at the end of the programme.
- Keep WG informed about the Cardigan Bay study.
- MERP to develop a strategy for the tool box including clear information on its limitations and any data gaps.
- Please pass to MERP anything that may be of interest to the programme.
- MERP and NRW to produce a list of key people and contact details.
- Modelled scenarios would be on a case-by-case basis so if there is a particular impact in mind then MERP would be happy to consider the options. Please contact the Programme Office ([marine.ecosystems@pml.ac.uk](mailto:marine.ecosystems@pml.ac.uk)) to discuss further.

- For general information please visit the MERP website ([www.marine-ecosystems.org](http://www.marine-ecosystems.org)), follow MERP on Twitter (@merp\_updates) or contact the Programme Office ([marine.ecosystems@pml.ac.uk](mailto:marine.ecosystems@pml.ac.uk)). For more detail please contact the relevant MERP scientist ([http://www.marine-ecosystems.org.uk/Contact/MERP\\_Scientists](http://www.marine-ecosystems.org.uk/Contact/MERP_Scientists)) or contact the Programme Office.