

South West Marine Ecosystems 2015

13th March - PML Plymouth

Delegate Notes – Objectives, Programme and Contacts

Introduction and Objectives

The 2015 South West Marine Ecosystems Meeting (SWME) meeting will take place in the new lecture theatre at the Plymouth Marine Laboratory (PML <http://www.pml.ac.uk/Contact-us>) on Friday March 13th. The format and content will be similar to previous years with a mix of long and short presentations and good time for discussion and networking. Thanks to the generosity of PML the price will remain the same at £15 to help attract the widest range of people and in particular volunteers, students interested this area of work.

The objectives of the meeting include:

1. **Networking** To provide a networking opportunity for a wide cross section of people to meet and exchange views on south-west marine ecosystems; this would include active support for volunteer observations and schemes (citizen science), marine science and research interests, managers and a range of sea users including nature conservation, fishing, tourism etc.
2. **To assess the annual events – ecological and oceanographic - of the previous year** that have affected the south west marine ecosystems – making the linkages between environmental and biological phenomena e.g. SST on plankton or mackerel and cetaceans. We will be asking delegates to contribute their observations on 2014.
3. **Ecology of marine species** To explore research studies that throw particular light on aspects of ecology of marine species, planktonic, benthic and 'mobile' species (fish, birds, mammals, turtles) and the ecosystem that supports them and to understand the status of populations of marine species in the south west and how they are responding to environmental and anthropogenic pressures
4. **Management and southwest marine ecosystems** To understand the linkages between science to managing human activities the marine environment with a view to supporting and promoting the health of southwest marine ecosystems

There are two main innovations this year to the meeting hopefully making it more valuable:

- i) A annual report on the events and observations of 2014; this is a logical development from past work and the report idea is elaborated on page 3 and 4
- ii) The focus on a single species – this year the porpoise – to try and bring the expertise in this network to bear on what we know and don't know about this important south-western species.

The programme and delegate notes are set out below in the running order of the programme.

Programme

Session 1 Weather, Events & Observations in 2014, Oceanography

- 8.45 Registration and refreshments
- 9.30 **Welcome to PML** **Manuel Barange**
Introduction to the Events & Observations **Bob Earll**
- 9.35 **Events & observations in 2014: Delegates will be invited to bring along and comment on the events and their observations of 2014 using structured approach,**
facilitated by **Duncan & Hannah Jones** Marine Discovery
- 10.00 **Update on SW Plankton** **Abigail McQuatters-Gollop** SAHFOS
- 10.15 **Jellyfish Records – Citizen Science** **Stephen Pikesley** Exeter University
- 10.30 **Ocean front metrics for understanding foraging locations of gannets and basking sharks** **Peter Miller** PML and **Kylie Scales** PML/Univ. Plymouth/NOAA-ERD, Monterey, US
- 10.45 **Results of the multiple remote vehicle trial to measure multi-trophic level interactions**
Russell Wynn NOC
- 11.00 -11.20 Discussion with the previous four speakers
- 11.20 -25 **The south west Fulmar project** **Alice Trevail** SW Fulmar Project / NOC
- 11.25 -30 **The Coastal Code Practical guidance for south-west coastal species**
Carolyn Waddell Cornwall Wildlife Trust
- 11.30 First break: Sandwiches and refreshments

- 12.10 Session 2 **Fish and sea bed ecology** Chair: **Martin Attrill, Plymouth University**
- 12.10 **Overfishing and the replacement of demersal finfish by shellfish: an example from the English Channel** **Carlotta Molfese & Jason Hall-Spencer** Plymouth University
- 12.30 **Skate populations in the south-west** **Cat Gordon & John Richardson** Shark Trust
- 12.50 **The status of basking sharks in the south-west** **Tom Horton** CWT & Marine Discovery
- 13.10 **Storm impacts on the seabed in protected and fished areas** **Emma Sheehan**
Plymouth University
- 13.30 **Intertidal discovery – results of the recent survey** **Carolyn Waddell, CWT**
- 13.50 **The ecology of porpoises in the south-west – what's left to find out? An interactive session with audience and organisational inputs** Facilitated by **Bob Earll** CMS
- 14.20 – 15.00 Second break: Cakes and refreshments

- 15.00 Session 3 **Using science to inform marine management** Chair: **Matthew Witt,**
Environment & Sustainability Institute, Exeter University
- 15.00 **The developing outcomes of rat eradication programmes on south-west Islands**
Paul St Pierre RSPB
- 15.20 **Seals and shipping noise** **Clare Embling** Plymouth University
- 15.40 **From observations to action....using research data to inform global campaign – the impacts of lost fishing gear on grey seals** **Sue Sayer** Cornwall Seal Group & **Bex Allen**
Cornwall College Newquay, Centre of Applied Ecology
- 16.00 **What is site integrity? Applying current ecological knowledge to evolving marine policy**
Sian Rees Plymouth University
- 16.20 **Inspiring images!** **Hannah Jones** Marine Discovery
- 16.30 Close and refreshments

Events & observations in 2014: Delegates will be invited to bring along and comment on the events and their observations of 2014 using structured approach

Duncan & Hannah Jones Facilitating & Bob Earll Introduction

One of the themes of the SWME events has been to consider the events of the previous year and it's highlighted in the meeting objective:

'2.To assess the annual events – ecological and oceanographic - of the previous year that have affected the south west marine ecosystems – making the linkages between environmental and biological phenomena e.g. SST on plankton or mackerel and cetaceans. We will be asking delegates to contribute their observations on the year in question'

Delegates have been asked to think about their observations from 2014 (and event sheet is available). Delegates will be asked to record interesting events and categorise them. After the conference these will be typed and circulated to delegates. You can see the events from 2013 in the ecosystems archive. <http://coastal-futures.net/ecosystems/south-west-ecosystems-2015>

Producing a Report on the events and observation of 2014

1.Introduction

This is an interesting challenge. Quite a lot of groups produce annual reports of what they see and do although these often come out during the following year. Lots of people keep lists of the relative abundance of their records for the year. If summaries and relative abundance lists were edited/collated into one document it would be useful way of getting a more rounded picture of events in the south west in any one year. It provides the logical final point of the process we have developed realising objective 2 of the meeting. We use the events section as an ice-breaker at the meeting, getting the audience to contribute their observations. In 2013 for the first time we asked delegates to complete observation forms we then collated these (250+) in an excel spreadsheet in discrete categories which is available in the archive. Many of the presentations and the delegate notes reflect on events in the previous year. Producing an annual report is the logical last step.

This note develops some thoughts on the process.

2.Categories

Those in the events form are as follows:

Weather - Oceanography (including plankton) – benthos – fish – birds – seals – cetaceans – Management issues

The categories above are 'lumped' ... but if expanded might include:

- Weather – Oceanography – Plankton (including jellyfish)
- Benthos including intertidal
- Fish – including sharks, basking sharks and sun fish
- Birds - including turtles – (yes, I know turtles aren't birds!)
- Seals
- Cetaceans
- Management issues – including fisheries, mpas, other impacts – bird wrecks PIB, oil etc

3. Some Admin criteria & rules

- The process would be designed to minimise the burden on any one person – clear tasks shared across lots of people – with the idea that tasks would change every year - against clear time limited deadlines
- The report would only be electronic and would sign-post and point to existing reports and links
- There would be no intellectual claim on the material – authors would retain their rights and it wouldn't pre-empt publication elsewhere
- There would be a clear timetabled process – with outputs circulated to the wider SWME address group and archived

4. Process

Event observations would be typed up after the event – these and delegate notes would be made available to all and archived 30 days after the event

Keith Hiscock of the MBA has agreed to act as the 2014 reports overall editor

Editorial groups would be called for at the event – editors would be selected for each group among the group (annually)

Editors would prepare a rough / incomplete draft [2 pages max] by 60 days after the event and circulate to editorial group

Responses would be expected by 90 days. After that the editor would have complete editorial freedom to finish by day 120 and send to the Report editor.

Report editor would pull it all together and post by 150 days after the event.

It would be then circulated to the entire SWME group (275+) and archived on the Coastal Futures Website.

If you have any thoughts on this email bob.earll@coastms.co.uk

Update on SW plankton

Abigail McQuatters-Gollop, David Johns, George Graham, Rowena Stern

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Climate change is resulting in warming temperatures, declining ocean pH, decreasing sea ice, shifts in biological communities, and alterations to marine physical regimes. At the base of the marine food-web, plankton are tightly linked to their environment and offer insight into pelagic responses to change in the marine system. Understanding of open sea plankton dynamics is crucial for interpreting sub-regional observations in the southwest and aiding the separation of responses to climate from those driven by anthropogenic pressures. Continuous Plankton Recorder (CPR) data have revealed novel information about shifts in primary production; changes in harmful algal bloom dynamics; alterations to plankton community composition and diversity; phenological changes; biogeographical range shifts; introductions of non-native species; and changes in biodiversity. The taxonomic breadth and

long time-series of the CPR survey has also highlighted recent occurrences of unusual plankton taxa in the southwest while the routine deployment of our Water and Microbial Sampler (WaMS) has revealed hidden diversity in the pelagic habitat of the region. The capabilities of the CPR survey are being expanded with the addition of new instrumentation to capture the environmental data required to better understand observed changes in southwest plankton. When combined, CPR research and observational data provide important evidence needed for policy decision making and sustainable management of southwest waters.

For more information see:

<http://www.sahfos.ac.uk/research/publications/annual-report.aspx>

McQuatters-Gollop, A., Edwards, M., Helaouët, P., Johns, D.G., Owens, N.J.P., Raitos, D.E., Schroeder, D., Skinner, J. and Stern, R.F., Submitted. The Continuous Plankton Recorder survey: how can long-term phytoplankton datasets deliver Good Environmental Status? Estuarine, Coastal and Shelf Science.

‘Jellyfish’ in UK coastal waters: analysis of a ‘Citizen Science’ database

Stephen Pikesley

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https://www.researchgate.net/profile/Stephen_Pikesley

Concern has been expressed over future bio geographical expansion and habitat capitalisation by species of the Phylum Cnidaria, as this may have negative implications on human activities and ecosystems. There is a paucity, however, of knowledge and understanding of jellyfish ecology, in particular species distribution and seasonality. Recent studies in the UK have principally focused on the Celtic, Irish and North Seas, but all in isolation. In this presentation we present data from a public driven sightings scheme, across UK coastal waters (2003 to 2011; 9 years). Data were recorded by the Marine Conservation Society (MCS, UK) national 'Jellyfish' Survey database and were analysed with the aim of increasing knowledge on spatial and temporal patterns and trends. We describe inter-annual variability, seasonality and patterns of spatial distribution. With appropriate data management and interpretation, citizen science recording schemes can provide for large-scale coverage that would otherwise be logistically and financially unattainable. These schemes may also contribute to baseline data from which future changes in patterns or trends in local and regional ecosystems might be identified.

Publication:

Pikesley, S.K., Godley, B.J., Ranger, S., Richardson, P.B. & Witt, M.J. (2014) Cnidaria in UK coastal waters: description of spatio-temporal patterns and inter-annual variability. *Journal of the Marine Biological Association of the United Kingdom*, **94**, 1401–1408.

<http://dx.doi.org/10.1017/S0025315414000137>

Ocean front metrics for understanding foraging locations of gannets and basking sharks

**Peter I. Miller¹, Kylie L. Scales^{1,2}, Simon N. Ingram³,
David. W. Sims⁴, Stephen C. Votier⁵**

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5. Environment and Sustainability Institute, University of Exeter, Cornwall Campus, Penryn, UK

Understanding the mechanisms linking oceanographic processes and marine vertebrate space use is critical to our knowledge of marine ecosystem functioning, and for effective management of populations of conservation concern. We have studied the influence of thermal and chlorophyll fronts on basking shark and northern gannet habitat use in the UK southwest approaches, using satellite Earth observation (EO) data. We have confirmed that surface frontal activity is a predictor of basking shark presence, over both seasonal timescales and contemporaneously, and revealed the scale and variability of these associations. (Miller, Scales *et al.*, in press; Archival Global Location Sensing (GLS) tags, random walk simulations, Generalised Linear Mixed Modelling (GLMM)). After tracking 66 breeding gannets from a Celtic Sea colony over two years, we found no evidence that they adjust their behaviour in response to contemporaneous fronts. However, foraging was more likely to occur within spatially predictable, seasonally persistent frontal zones; this suggests that gannets rely on learnt strategies for their broad scale foraging. (Scales *et al.*, 2014; GPS tags, Area Restricted Search (ARS), Generalised Additive Models with Generalised Estimating Equations (GEE-GAM)).

Our results demonstrate that composite front mapping is a useful tool for studying the influence of oceanographic features on animal movements, and highlight frontal persistence as a crucial element of the formation of pelagic foraging hotspots for mobile marine vertebrates. These studies increase the evidence base for applying EO front frequency maps as a tool to assist the designation of marine protected areas (Miller and Christodoulou, 2014).

Miller, P.I., Scales, K.L., Ingram, S.N., Southall, E.J. & Sims, D.W. (in press) Basking sharks and oceanographic fronts: quantifying associations in the north-east Atlantic. *Functional Ecology*. doi: [10.1111/1365-2435.12423](https://doi.org/10.1111/1365-2435.12423)

Miller, P.I. & Christodoulou, S. (2014) Frequent locations of ocean fronts as an indicator of pelagic diversity: application to marine protected areas and renewables. *Marine Policy*. 45, 318–329. doi: [10.1016/j.marpol.2013.09.009](https://doi.org/10.1016/j.marpol.2013.09.009)

Scales, K.L., Miller, P.I., Embling, C.B., Ingram, S.N., Pirodda, E. & Votier, S.C. (2014) Mesoscale fronts as foraging habitats: composite front mapping reveals oceanographic drivers of habitat use for a pelagic seabird. *Journal of the Royal Society Interface*, 11(100), 20140679. doi: [10.1098/rsif.2014.0679](https://doi.org/10.1098/rsif.2014.0679)

Satellite data (e.g. SST, Chl-a, fronts) available from NEODAAS: www.neodaas.ac.uk

The MASSMO project: using robot vehicles to measure the marine environment and ecosystem off southwest UK

Dr Russell Wynn

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A fleet of up to seven marine robotic vehicles, including submarine gliders and unmanned surface vehicles was deployed off southwest UK in autumn 2014. This was the most ambitious deployment of multiple marine robotic vehicles yet attempted in UK waters, and was featured on BBC TV News.

During the first phase of the project the robot fleet travelled from the Isles of Scilly to a fixed mooring 180 km offshore. An initial transect across a tidal-mixing front northwest of the archipelago highlighted the transition from tidally mixed to stratified waters, and elevated levels of primary productivity at the front itself. Two severe storms occurred during the deployment, leading to dramatic changes in both the oceanography and biology of surface waters.

The second phase of the project saw three unmanned surface vehicles tracking tagged fish in and around Marine Protected Areas off Plymouth. The vehicles successfully located several of the released fish, including plaice and thornback ray, providing new insights into their movements and habitat preferences.

GoPro cameras mounted on the unmanned surface vehicles during both phases successfully captured images of marine litter, human activity, several seabird species, and video of surfacing harbour porpoise. Further deployments are now planned for 2015/16 to further test the capability of these vehicles.

Details of the project are at:

<http://www.bbc.co.uk/news/science-environment-29464273>

<http://projects.noc.ac.uk/exploring-ocean-fronts/>

NOC research shows importance of southwest UK waters for threatened marine life

Russell Wynn

A series of new scientific papers by researchers at the National Oceanography Centre (NOC) have highlighted the importance of southwest UK waters for endangered and threatened marine life, including seabirds and porpoises. The results are being used to support marine conservation policy and showcase novel techniques and technologies for monitoring mobile species. The research programme at NOC has been co-ordinated by Dr Russell Wynn, supported by a previous PhD student and Postdoctoral Researcher Dr Alice Jones, and current PhD student Lavinia Suberg.

The first paper reveals that the region is of international importance for the critically-endangered Balearic shearwater, and involved the collection of several thousand hours of observational data to get a better understanding of foraging and migratory hotspots for the species in UK waters. The results show that up to 2% of the global population of Balearic shearwater now regularly feed in Lyme Bay, or undertake sporadic movements around the coasts of southwest England. In addition, large aggregations comprising up to 20% of the global population were found in northwest Brittany, making them potentially vulnerable to threats such as oil spills. The paper, led by Dr Alice Jones, is published open access in the journal *Endangered Species Research* and can be downloaded [here](#).

The second paper used land-based surveys, high-resolution seabed maps and 3D imaging of tidal flows to identify important sites for the harbour porpoise off southwest England. Intensive observations from a headland on the Land's End peninsula showed that porpoises were

found in greater numbers around a series of rocky pinnacles about a mile offshore, which were imaged using detailed seabed maps. Vessel-based surveys showed that tidal flows interacting with the pinnacles create enhanced turbulence and other hydrodynamic features in the water column that appeared to be attractive to porpoises. The paper is published open access in the journal Progress in Oceanography and can be downloaded [here](#).

The third paper shows how novel combinations of sensors deployed on submarine robots can be used to collect information on mobile species and their surrounding environment. In late autumn 2013, two submarine gliders from NOC's Marine Autonomous and Robotic Systems (MARS) facility were launched from the Isles of Scilly, carrying instruments that enabled them to simultaneously collect data on oceanographic conditions (e.g. temperature), chemical pollutants, plankton concentrations, locations of fish shoals, and clicks and whistles emitted by porpoises and dolphins. The two gliders collected data over 1000 km in a 40-day period in difficult weather conditions, revealing concentrations of plankton and fish tens of metres below the surface and detecting both dolphins and porpoises. Speaking about the glider study, Dr Russell Wynn said: "Satellite imaging can help us identify large-scale features such as oceanic fronts that may be important biodiversity hotspots, but we still need in situ data to confirm presence of mobile species such as fish and cetaceans. Using new glider technology allows us to collect these data at lower cost than can be achieved using research ships." The paper is published open access in the journal Methods in Oceanography and can be downloaded [here](#).

Studying marine litter around the southwest coasts using fulmars as an indicator species

Alice Trevail

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Marine litter is a well-documented problem, likely to persist given the continual increase in plastic production. The South West Fulmar Project is a new initiative to quantify marine litter around the southwest coasts. The project relies on volunteers collecting beached fulmars to quantify plastic ingestion. Data can then be compared to other regions in the northeast Atlantic as well as marine litter policy.

This talk will cover the suitability of fulmars as an indicator species, what we have learnt about plastic pollution in other areas from fulmar monitoring, and a call for help with collecting fulmars from beaches!

Cornwall Marine and Coastal Code Group – the Marine Disturbance Register

Caz Waddell

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Cornwall Wildlife Trust has joined forces with the RSPB, Cornwall Seal Group, National Trust, Marine Stranding Network and the British Divers Marine Life Rescue (BDMLR), Cornwall

Council, Devon and Cornwall Police Marine & Coastal Policing Team, the Marine Management Organisation (MMO) and Natural England to tackle the important issue of marine wildlife disturbance and raise awareness of the need to protect our coastal wildlife. To report an incident of marine wildlife disturbance or harassment please call the Marine Disturbance Hotline (24-hours) on 0345 201 2626.

Reports from the front line of the current mass extinction: ocean acidification, fisheries and ecocide

Carlotta Molfese & Jason Hall-Spencer

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Since the 1950s there has been a human population explosion with widespread coastal habitat damage exacerbated by our ever increasing use of hydrocarbon reserves. Within the past 100 years fishing using internal combustion engines has completely changed the ecology of coastal waters, it has damaged nursery areas and homogenised seabed habitats. We have also fished-down coastal food-webs, removing large long-lived fish (like cod and hake) to the benefit of invertebrates (like scallops and cuttlefish).

Despite this marine ecocide, we can turn things around. Evidence of the widespread damage caused to cold-water coral reefs by trawls in 2002, forced governments to take action. Several High Seas and EU closures are now in force and satellite vessel tracking data indicate that they are working effectively, with good compliance by international fleets.

A key solution to securing Good Environmental Status is obvious: reduce the footprint of the most destructive practices to allow recovery of coastal systems but attention has recently turned to the question of whether these efforts can really work, given that the temperature, chemistry and biology of the oceans is changing rapidly. Underwater CO₂ vents show why we need to factor acidification and warming into marine management plans and provide realistic insights on which flora and fauna are able to thrive in high CO₂ environments, forewarning those people that are reliant on aquaculture, fisheries and coastal tourism.

This talk uses case studies on inshore fisheries, deep-water coral reefs and ocean acidification to show that we have our work cut out if we are to achieve 'Good Environmental Status' anytime soon. But, if we are sensible, we can limit on-going damage. <https://theconversation.com/profiles/jason-hall-spencer-131492/articles>

Hall-Spencer JM, Tasker M, Soffker M, Christiansen S, Rogers S, Campbell M, Hoydal K (2009) The design of Marine Protected Areas on High Seas and territorial waters of Rockall. *Marine Ecology Progress Series* 397, 305-308

Jackson EL, Davies A, Howell KL, Kershaw PJ, Hall-Spencer JM (2014) Future-proofing Marine Protected Area networks for cold water coral reefs. *ICES Journal of Marine Science*. doi: 10.1093/icesjms/fsu099

Molfese C, Beare D, Hall-Spencer JM (2014) Overfishing and the replacement of demersal finfish by shellfish: an example from the English Channel. *PLoS ONE* 9(7), e101506.

Skate populations in the Southwest

Cat Gordon and John Richardson

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The waters surrounding England's Southwest present an array of hydrographic regimes, bathymetry and substrate: from the shallow, muddy Severn Estuary to deeper continental shelf and slope waters of the Celtic Sea. The diversity of habitat created by these environmental variables hosts an equally impressive diversity of skate species, ranging from the enigmatic, large-bodied White Skate *Rostroraja alba* (max TL ~200cm) to the more diminutive Cuckoo Ray *Leucoraja naevus* (max TL 75cm).

Often overlooked in favour of their more charismatic shark relatives, skate occupy key roles within the Southwest's marine ecosystems. At the same time, skate have long been an important component within commercial fisheries, where they are caught using a variety of gear and continue to be landed into ports throughout the region. As a group, skate demonstrate a mixed resilience to commercial fisheries – although, as with all chondrichthyans, a suite of conservative biological traits make them significantly more vulnerable to over-exploitation. This is reflected in conservation status, with some larger-bodied species assessed as Critically Endangered, while those exhibiting reproductive rates more able to sustain fishing mortality are listed as Least Concern.

In this talk, the Shark Trust will describe skate assemblage in Southwest waters, with a focus on distribution and abundance. Species' varied roles and behaviour within the marine ecosystem will be discussed, as will differing vulnerability to fishing mortality. The extent of commercial fisheries will be outlined, including the relatively recent emergence of fisheries management. Finally, the Shark Trust's involvement in the move towards more sustainable, managed fisheries will be covered, as will the Trust's projects designed to raise public awareness of this often neglected group.

The status of basking sharks in the South-West

Tom Horton

Cornwall Wildlife Trust and Marine Discovery

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The Southwest is viewed as the UK's principal 'hotspot' for the world's second largest fish. Sightings of basking sharks in shoals of up to 80 individuals have previously been relatively commonplace, and these ocean giants are strongly associated with the region during the summer months. A multitude of datasets detailing basking shark abundance exist in the Southwest and all, despite differences in sampling protocols, show a marked decline in basking shark abundance in previous years.

This presentation will focus on effort-based data collected by Marine Discovery (2007-2014) detailing this recent decline, but will also comment on trends observed in other datasets collected by Seawatch Southwest, Cornwall Wildlife Trust, the Marine Conservation Society and the Shark Trust. This is the first stage of a broader-scale project that seeks to elucidate environmental drivers behind observed trends.

Furthermore, the presentation will highlight the importance of long-term public recording datasets and comment on how Seaquest Southwest – Cornwall Wildlife Trust's public sightings scheme, aims to focus survey effort in order to better monitor regional mobile species' hotspots.

Storm impacts on the seabed in protected and fished areas

E.V. Sheehan, Bridger, D., Nancollas, S., Cousens, S., Holmes, L. & Attrill, M.J.

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The recovery of the Lyme Bay reefs (south west UK) have been annually monitored since they were protected from towed demersal fishing in 2008. Marine Protected Areas (MPA) are thought to be more resilient against natural disturbance. NERC, Pig Shed Trust, SWIFA and SWFPO funded a survey to compare protected and non-protected reefs following the storms with data from the previous summer.

The benthic community in the MPA was significantly affected by the storms. The number of species and individuals decreased. The population of many indicator taxa decreased such as branching sponges, sea squirts *Phallusia mammillata*, scallops *Pecten maximus*. Taxa that were not affected were those best adapted for disturbance such as common starfish *Asterias rubens*, gobies and hermit crabs *Pagurus* spp. Clearly some species were more resilient than others. While pink sea fans *Eunicella verrucosa* were still present, many were fouled and had black bases, but of most concern was that only two of the habitat building Ross corals *Pentapora foliacea* were observed in approximately 12,000 m of video transects.

The opportunity now exists to assess whether recovery from storm disturbance is quicker than from human disturbance to assist with future climate change management and mitigation.

Unlocking the secrets of Cornwall's North Coast; results of the Intertidal Discovery Project

Caz Waddell

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Between 2012 and 2014 Cornwall Wildlife Trust (CWT) together with the Environmental Records Centre for Cornwall and the Isles of Scilly (ERCCIS) ran a ground breaking project to map the intertidal habitats along 370 miles of Cornwall's north coast. Surveys were undertaken using innovative mobile GIS technologies and conducted to recognised scientific standards produced by the JNCC. In total 3,190 hectares of intertidal habitat were surveyed; including every major outlying rock/island within 1 mile of the coast, and extending inland to the tidal limit on the major estuaries.

Results showed that 111 different intertidal biotopes (habitat types) were present on the North coast, and 32 of these were BAP and/or FOCI habitat types. Approximately 1200 hectares of rocky habitats were surveyed (of which 6.5% was BAP habitat), and 1850 hectares of sediment habitats were surveyed (of which 24% was BAP habitat). Detailed species records of over 200 intertidal species, including non-natives, were also obtained.

With the project now complete, results are already being put to use in the field of marine conservation - most notably in support of tranche II Marine Conservation Zones currently under public consultation. Results are also in the public domain; available to download via the interactive webmap. Our hope is that this resource will ensure information is accessible to anyone with an interest in marine conservation, and inspire others to learn more about Cornwall's diverse coastal habitats.

The Ecology of South West Marine Species – What we know and what we don't

Bob Earll

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Introduction to the Idea

I'm a relative newcomer to the south-west and enjoy sea watching as a pastime. Through the meetings like SWME, and the CWT's Strandings conference and through visits with other people one can begin to piece together the story about the species one sees. Our records of species are often made by different projects, often using different methods, in different sites and areas of sea. It is clear we also *share* many of our species with the French, Welsh and Irish. Clearly all this information contributes to the pool of human wisdom and then periodically, often in an *ad hoc* way, it will be drawn together. Whilst one can gain an impression of what we know by word of mouth there appears to be lack of a collective mechanism to pool what we know about single species. This idea provides a systematic way of making information available and accessible to a much wider audience.

This is interesting because whilst we clearly know a lot about the commoner species there is clearly a lot we don't know. We used a simple approach to this at MCS when working on the basking shark project in the early 1990's – in essence one defines ecological and biological headings and then tries to rank knowledge on a scale. You can end up with a spoke (amoeba) diagram which not surprisingly revealed in that case some huge knowledge gaps. These gaps are the stuff of new research projects and innovations in methodology that prompt new understanding.

The SWME conferences bring a huge body of experience together in terms of the people in the room and we can use the meeting to facilitate a process which helps pool what we know about common species.

For 2015 we have chosen the harbour porpoise but it could have been any of a dozen or more common south west species.

I have liaised with Duncan Jones, Ruth Williams, Niki Clear and Dave Jenkins to bring together the presentation which they will speak to. We have produced a set of headings and Duncan Jones has produced the first version and started the ball rolling of the report on south-west porpoises. The text will be developed iteratively as a collective effort as it passes to those who know about porpoises in the south-west. The publication will be available on the Ecosystems page of the Coastal Futures website <http://coastal-futures.net/> for the next newcomer to the area to inspire their understanding and future research on the porpoises in the south west.

Next year we will pick another species – any offers?

The ecology of porpoises in the south west – what we know and what we don't

Hannah & Duncan Jones, Bob Earll, Dave Jenkins

Version 5th March 2015 This is the first draft of this 'living document' which will be developed

with inputs from colleagues over time. It highlights what we know and what we don't.

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Methodologies

There will be a set of points on methodologies, observing and recordings porpoises from shore and boat based work as well as strandings observations.

Dave Jenkins 'I have been observing marine life on the North Devon coast for many years, but more systematically for the last 20 years. Porpoise are difficult to see and can only be seen in winds of less than force 2; in these conditions observations of porpoise are frequent throughout the year (approximately 90% of visits). I watch the porpoise from local headlands, and animals are visible on tidal races further offshore, as well as reefs very close in. One key indicator of likely porpoise presence is gannets feeding in the vicinity. The series of photographs presented to SWME14 illustrates some of the interesting behaviours I have observed in that time. Most of the photographs were taken with a Nikon 5000 with a 70/300mm telephoto lens. Frequency: I visit headlands in North Devon three or four times a week throughout the year. Locations: The main locations I watch from are the headlands of Bull Point, Morte Point and Baggy Point, in the Morte Bay, Woolacombe area.'

Description of the species

The harbour porpoise is one of six species of porpoise found in the world and is the only porpoise species resident in the UK. It is the UK's smallest cetacean with adults ranging from 1.4m to 1.9m in length. They are thought to live for between 12 and 20 years. Harbour porpoises are distributed widely across the northern hemispheres shelf seas in both the Pacific and Atlantic oceans as well as in the Black Sea. They are recorded north of the Arctic Circle and in the Atlantic as far south as the Moroccan Coast. The IUCN considers them to be of least concern as they are abundant in much of their range, although they are critically endangered in some areas.

Geographic distribution re the south west [Expectations]

In the South West they are distributed widely across the Celtic Shelf and also in the English Channel. There are notable densities off the Pembrokeshire, Irish, Cornish and Devon coasts. There is a good chance of seeing them from the coast if a watcher goes to the right places.

Bob Earll But what the right places? I have routinely watched areas of sea in ideal viewing conditions [in excess of 50 hours during various states of the tide over the last 4 years] off a number of headlands at Bolt Tail, Bolt Head, Prawle Point and Start Point. Although I have seen porpoises with Dave Jenkins off North Devon on 3 different visits (3/3) and in 2014 within 5 minutes of setting up at Strumble Head, Pembrokeshire, I have yet to see a single porpoise off these south Devon headlands. This begs the question about porpoise distribution at these inshore sites; how long do you have to record zero observations / hour to register this as a real absence?

Population size [Relative abundance. How many? How do the animals we see relate to the wider population?]

The world population is considered to be around 700, 000 and the UK population somewhere between 341,000 and 385,600. The Celtic Shelf population is thought to be 80,600 and the English Channel has around 40,900 Evans PGH and Prior JS (2012).

Population movements [Migrations? Seasonality]

Harbour Porpoises seems to exhibit seasonal migrations. The Spring finds them widely spread out over shelf areas while the Summer sees them aggregating along the coastlines and focusing in particular areas. These aggregations seem to peak in the late summer and early Autumn and they seem to be recorded in high numbers along the coastline right through the Winter months.

Breeding ecology (courtship and social interactions)

Breeding and peak socialising seems to be observed consistently in the late Summer and early Autumn. The animals are seen in large aggregations up to hundreds of animals and multiple breaches along with high energy behaviour is seen. This behaviour appears to form part of their courtship.

Dave Jenkins In the slide sequence shown here a group of three porpoise were very close to the shore and engaging in what looks like sexual activity (July 2011). This is the only time I have seen this activity, making it a very rarely photographed occurrence.

Feeding ecology and interactions with physical environment (seabed topography and oceanography)

Harbour Porpoises seem to have a wide diet feeding on a variety of species and employ a wide range of foraging techniques. They can be seen foraging singly or in small pods but are also seen feeding in large pods corralling fish much like common dolphins. They often appear to forage in the mid to lower water column but also can herd fish to the surface and feed in co-operation with gannets. Foraging often appears to take place in predictable locations and these appear to be governed by underwater features such as steep slopes, underwater pinnacles, prominent wrecks and around the edges of areas of strong tide.

Russell Wynn and co-workers have recently (2014) described the association of sightings and foraging behaviour at the Runnelstone reef off Gwennap Head (Lands End) in Cornwall as follows.' The second paper used land-based surveys, high-resolution seabed maps and 3D imaging of tidal flows to identify important sites for the harbour porpoise off southwest England. Intensive observations from a headland on the Land's End peninsula showed that porpoises were found in greater numbers around a series of rocky pinnacles about a mile offshore, which were imaged using detailed seabed maps. Vessel-based surveys showed that tidal flows interacting with the pinnacles create enhanced turbulence and other hydrodynamic features in the water column that appeared to be attractive to porpoises. The paper is published open access in the journal Progress in Oceanography and can be downloaded [here](#).'

Interaction with other species (Bottlenose dolphins, seals, co-feeding)

Harbour porpoises can be seen feeding alone and in co-operation with other species. They are often observed feeding in the same area as minke whales and basking sharks. It is sensible to assume this relates to frontal activity and plankton aggregating small prey species for the porpoises and minke whales. They can also be seen feeding in similar regions, even within a few hundred metres, to common dolphins but we have never witnessed co-feeding (H&D Jones).

Gannets seem to associate strongly with porpoises and when in transit will always circle when passing over porpoises. Porpoises feeding on fish close to the surface will in most instances be accompanied by diving gannets. Feeding gannets are always a good indicator of the presence of porpoises (Hannah & Duncan Jones). Dave Jenkins: I watch the porpoise from local headlands, and animals are visible on tidal races further offshore, as well as reefs very close in. One key indicator of likely porpoise presence is gannets feeding in the vicinity. The gannets and porpoise follow a distinct pattern of movements, often at specific times and tidal races - suggesting that the gannets are looking for signs of porpoise feeding (co-

feeding). Gannets are often observed feeding in tidal races associated with specific reefs; state of the tide is an important factor. The gannets can see the porpoise chasing the fish bringing them nearer the surface. The two pictures shown illustrate a gannet with two large fish from one dive and a gannet on a very shallow dive for fish near the surface.

Bottlenose dolphins Strandings data from the CWT scheme find regular occurrences of bottlenose dolphin caused mortality for porpoises.

There have been a number of witnessed incidences of bottlenose dolphins attacking and killing harbour porpoises around the UK and several recorded off the South West coasts. Ian Kitto of Padstow Sealife Safaris witnessed this occurring on two occasions off Padstow over the summer of 2014.

Grey seals In 2014 evidence from a number of different areas in the North Sea and in Pembrokeshire demonstrated that grey seals were causing porpoise mortalities. This link covers this; a more synoptic paper is expected from ZSL vets in collaboration with European marine scientists in 2015. <http://www.newscientist.com/article/dn26617-seals-found-guilty-of-brutal-porpoise-attacks.html#.VPialGdyapo> The CWT strandings programme may well be able to shed more light on this behaviour.

Interactions with man

Harbour porpoises are generally considered to be shy and to avoid approaching boats. This certainly appears to be the case with regards to fast moving boats. However many interactions with slow moving and stationary boats have been witnessed. These interactions generally involve smaller boats such as drifting fishing punts and other small vessels travelling slowly or stationary. There have been occurrences where porpoises have bow ridden, ridden the pressure wave of a moving boat. They have also been witnessed repeatedly positioning themselves in order to ride the wake behind passing fishing boats.

By-catch is the negative side of these interactions with man. The nets that seem to cause problems for harbour porpoises are gillnets and this is likely to be because they are set in areas of key feeding habitat. Nets set for bass, hake, cod and haddock are the ones which encroach the most on porpoise feeding habitat, as they are set in areas of high sandeel abundance or around wrecks and reefs where whiting and other white fish aggregate. These features are also used as tools by porpoises to aid efficient foraging, which further drives this conflict.

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Jones, A.R. et al (2014) Fine-scale hydrodynamics influence the spatio-temporal distribution of harbour porpoise at a coastal hotspot. *Progress in Oceanography* 128, Nov 2014, pp30-48 It can be downloaded [here](#).

The developing outcomes of rat eradication programmes on south-west Islands

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Globally islands support 20% of the world's flora & fauna in less than 5% of the land mass. Sixty-four percent of extinct and 45% of critically endangered species (IUCN) live or have lived on islands. Non-native invasive species, after habitat loss, are the single most important reason for biodiversity loss worldwide and the single biggest threat to seabird diversity.

This issue is becoming more widely recognised. Up to 2011 – 664 island restoration projects have been carried out in 33 countries including 10 successful rat removal projects in the UK. In the south west of England there are two important seabird colonies where projects are being carried out to restore their seabird populations; Lundy (a partnership between RSPB, Land Mark Trust, National Trust, and Natural England) and Isles of Scilly (a partnership between RSPB, IoSWT, Duchy, IoS AONB, Island Rep and Natural England which is funded by LIFE Nature and HLF). The Lundy project completed successful removal in 2004 and the St Agnes and Gugh project is still in the monitoring phase. The main beneficiaries of the projects are Manx Shearwater *Puffinus puffinus* and Storm Petrel *Hydrobates pelagicus*, both of which the UK has special responsibility and which are conservation priorities for the RSPB.

The project on Lundy has seen a tenfold increase in the Manx Shearwater *Puffinus puffinus* population within 10 years and the first ever confirmed breeding of Storm petrel *Hydrobates pelagicus* in 2014. On the Isles of Scilly the targeted islands of St Agnes and Gugh saw the first recorded fledging of Manx shearwater *Puffinus* in living memory in 2014 and an increase in lesser white toothed (Scilly) shrew activity in the first summer after the removal phase.

For island restoration projects the short-term challenge is the complete removal of the non-native species involved. Maintaining appropriate bio-security measures is the longer-term challenge. Neither project would have been successful without the support of volunteers and the communities on the islands. In the case of St Agnes and Gugh it is currently the largest community based rat removal project for seabirds attempted globally to date.

Seals and shipping noise in a dynamic sea: seasonal changes in shipping noise exposure experienced by diving seals

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Shipping noise is a major contributor to anthropogenic noise in the sea, which is now classed as pollution in accordance with the Marine Strategy Framework Directive (MSFD). However, we know little about how it impacts marine organisms. In this study we investigate potential shipping noise experienced by grey seals (*Halichoerus grypus*) in the Celtic Sea by overlaying their GPS tracks and dive data, over a state-of-the-art ocean (POLCOMS) and acoustic (HARCAM) propagation model populated with real-time AIS shipping data in summer and winter. Our results show a clear influence of the seasonal thermocline (April-November) on shipping noise propagation. In summer the areas of high noise exposure were situated below the thermocline when the ship was located on the onshore side of oceanic fronts, and above the thermocline when the ship was on the offshore side of oceanic fronts. The difference in sound level between the top and bottom of the water column was as high as

~20dB. Shipping noise propagated much further (tens of kilometres) in winter than in summer. Furthermore, our study shows strong step changes of sound perceived by seals during their descent/ascent through water column. Since grey seals tend to be benthic foragers, the step-change in sound exposure may have negative impacts on their foraging behaviour. It is only through a more realistic understanding of exposure of animals to ship noise that we can set appropriate management and mitigation targets.

Observations to action: Research to global campaign - Ghost gear impacts and grey seals in the SW UK

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Cornwall Seal Group (CSG) volunteers have been recording entangled seals since 2000 and published data on their findings up to 2010 in the Marine Pollution Bulletin (2012). This attracted the attention of World Animal Protection who were planning a global Sea Change Campaign (SCC) tackling ghost fishing gear. World Animal Protection's CSS is bringing together governments, businesses and fishing organisations to protect sea life and move towards a future free from the threat of ghost fishing gear. Their strategy has three strands – bringing together partners to stop gear being abandoned, supporting new ways to remove ghost gear and replicating successful local sea animal rescue efforts on a global scale. World Animal Protection commissioned CSG to undertake two projects – to update and report on all their seal entanglement data to 2014 and to undertake boat and land based ghost gear surveys. The first will form part of a major World Animal Protection report on entanglement out in June 2015. CSG's first three months of ghost gear surveys are now complete. Sue Sayer, Bex Allen and Kate Williams will summarise these and the contribution they make to World Animal Protection's global campaign.

A legal and ecological perspective of 'site integrity' to inform policy development and management of Special Areas of Conservation in Europe.

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The European Union Habitats Directive (92/43/EEC) provides for the designation and management of Special Areas of Conservation (SACs) and requires that impacting activities are subject to 'an appropriate assessment' of their implications for the 'integrity' of the site. We define the term 'site integrity' from a legal and an ecological perspective. We demonstrate that 'site integrity' is the maintenance of ecological processes and functions that support the wider delivery of ecosystem services. 'Site integrity' can be influenced by SAC management. Management that seeks to support 'site integrity' may include the use of buffer zones or connecting areas that extend beyond the SAC site's designated features. We

conclude that 'site integrity' and 'favourable conservation status' are powerful legal terms that if fully transposed into the law and policy of Member States can enable the achievement of broader European and International goals for marine conservation.

Archive – SWME 2014 Presentations

These are on the Coastal Futures – Ecosystem page <http://coastal-futures.net/ecosystems/south-west-ecosystems-2015> This also includes the Delegate Notes and Excel file on observations and events in 2014

Events & observations in 2013: Delegates will be invited to bring along and comment on the events and their observations of 2013 using structured approach, including the effects of the storms of 2014
Facilitated by **Bob Earll** CMS

View from the Western Channel Observatory – 2013: a year on the edges of the envelope
Tim Smyth Western Channel Observatory, PML

Satellite observations of SW oceanography in 2013, and developments in using fronts to describe ecological interactions
Peter Miller PML

Results of a multi-trophic level study in 2013
Lavina Suberg NOC

“Marine top predators and oceanographic fronts: are fronts used as foraging habitats?”
Kylie Scales PML/Plymouth University

Fine-scale physical controls of top predator foraging? **Samantha Cox** Plymouth University

***Calanus helgolandicus* trends in the English Channel over 25 years** **Jacqueline Maud** PML
Storm events and the impacts on sea populations **Dan Jarvis** Cornwall Sea Group
New NERC/Defra Marine Ecosystems research in the south-west **Paul Somerfield** PML
Marine wildlife natural history from north Devon – Dave Jenkins – presented by Bob Earll

Fish productivity in the south west – assessing small pelagic fish populations
Jeroen van der Kooij Cefas

Seal site variability revealed by sustainable citizen science – a perspective of seal sites in the south-west
Sue Sayer Cornwall Seal Group

Gannets: at-sea distribution and origins of birds in the south-west **Steve Votier** Environment and Sustainability Institute, University of Exeter, Cornwall Campus

Polyisobutene and the south west bird wreck **Niki Clear** Cornwall Wildlife Trust

CWT Seaquest work which has included the basking shark surveys this past year
Abby Crosby Cornwall Wildlife Trust

Great Eggcase Hunt; using citizen science to enhance our understanding of species diversity and distribution
Cat Gordon Shark Trust

Angler Recording Project; do records from recreational anglers accurately reflect known diversity?
John Richardson Shark Trust

The Marine Strategy Framework Directive and the Celtic Seas Partnership **Natasha Barker Bradshaw** Celtic Seas Partnership - WWF-UK

'The future is bright, the future is yellow. Result of the Banana Pinger Trial' **Ruth Williams**, Marine Conservation Manager for Cornwall Wildlife Trust

Bottlenose dolphin conservation – a critical assessment **Simon Ingram** Plymouth University

What criteria should we use to assess the importance of areas for mobile marine wildlife in coastal and open sea situations **Nigel Symes** MARINElife

Observations on porpoise ecology and images from the work of Marine Discovery
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