



European Union

European Structural
and Investment Funds

**DISCOVER
WITH
PLYMOUTH
UNIVERSITY
MARINE INSTITUTE**

Marine Protected Areas: benthic recovery, storm impacts and lessons learnt.

Dr Emma Sheehan, Dani Bridger, Adam Rees, Sarah Nancollas,
Dr Luke Holmes, **Prof Martin Attrill**



@mjattrill

M.Attrill@Plymouth.ac.uk; emma.sheehan@plymouth.ac.uk

NERC

SCIENCE OF THE
ENVIRONMENT

**SWIFA &
SWFPO**

**Pig
Shed
Trust**

defra
Department for Environment
Food and Rural Affairs

**NATURAL
ENGLAND**

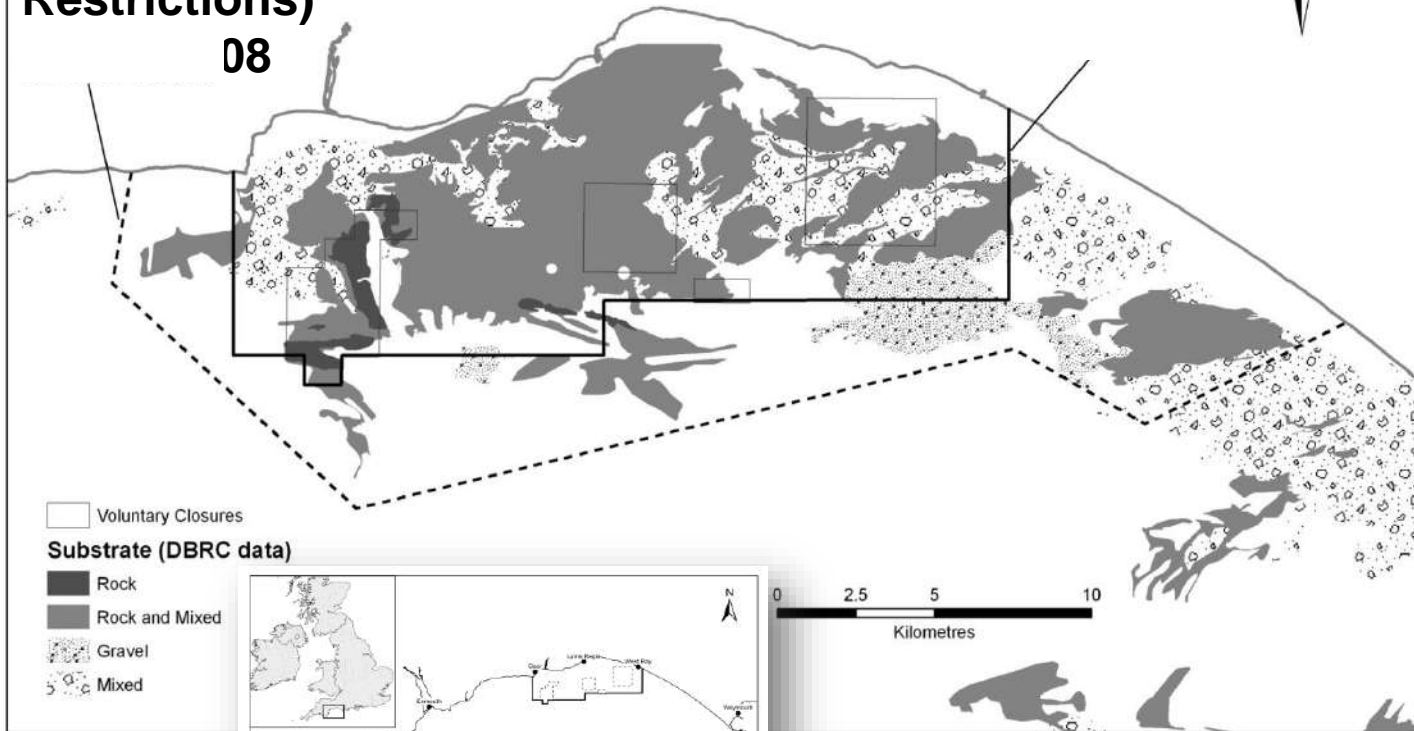
PANACHE
Protected Area Network Across
the Channel Ecosystem

**THE
wildlife
TRUSTS**

Lyme Bay MPA

Statutory Instruments **2008 No. 1584**
Sea Fisheries, England. Conservation
The Lyme Bay Designated Area (Fishing Restrictions)

08



- BTF exclusion
- 200sq km
- 2008+

Ecosystem Services Provided by Lyme Reefs

**DISCOVER
WITH
PLYMOUTH
UNIVERSITY
MARINE INSTITUTE**

Nursery Habitat



Feeding Habitat



Ecosystem Services Provided by Lyme Reefs

**DISCOVER
WITH
PLYMOUTH
UNIVERSITY
MARINE INSTITUTE**

Sediment stability



Spawning/Spat Habitat



(see papers by Sian Rees et al...)



Dredging/Trawling



© Colin Munro

- Known to impact sessile, long lived, slow growing reef species
- Concerns that scallop dredging was not only removing biogenic species but also irreparably destroying mudstone habitat
- Hence closure in 2008

Monitored since 2008

**DISCOVER
WITH
PLYMOUTH
UNIVERSITY
MARINE INSTITUTE**



2008



2009



2010



2011



2012



2013



2014



2015



2016



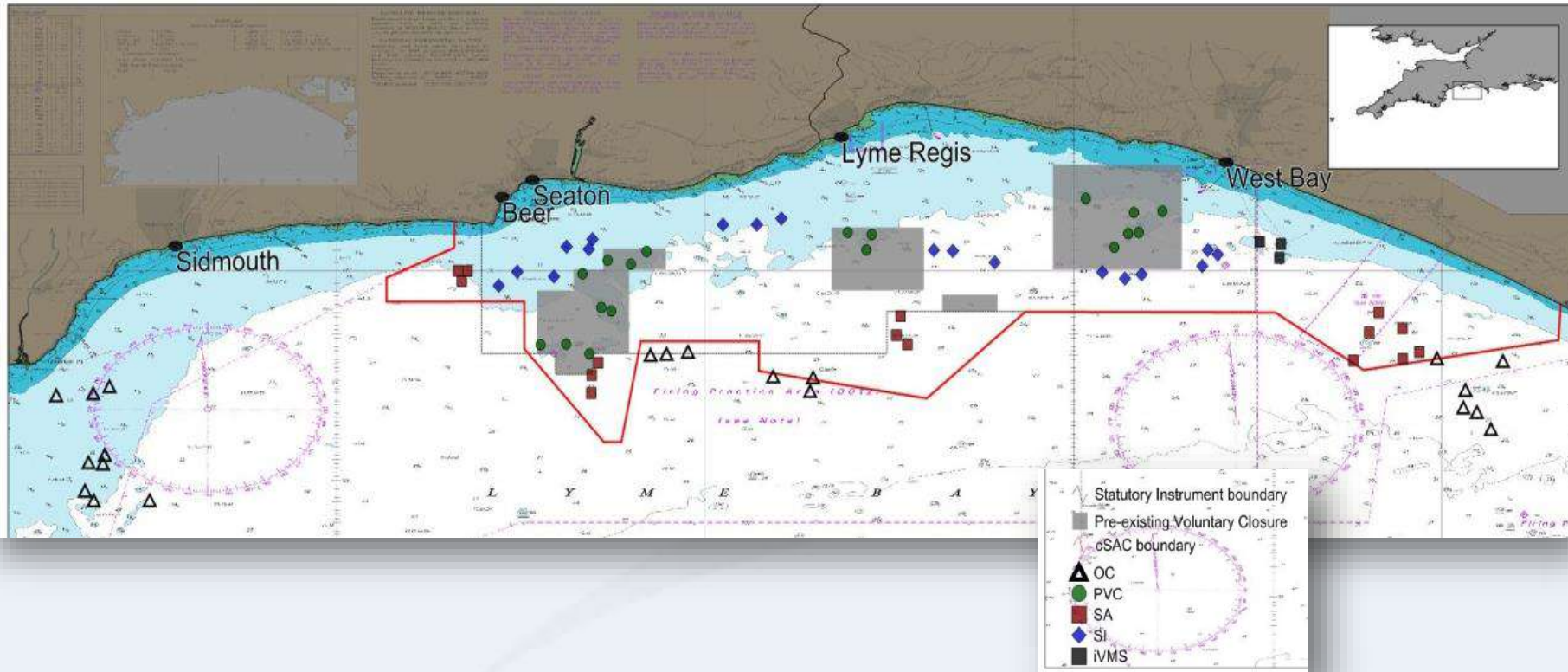
2017



European Union
European Structural
and Investment Funds

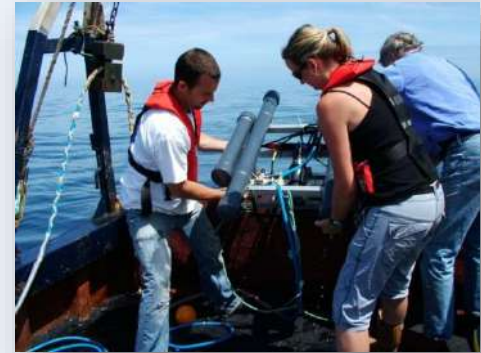
2018

Lyme Bay: survey design



Lyme Bay: sampling

DISCOVER
WITH
PLYMOUTH
UNIVERSITY
MARINE INSTITUTE



- Sheehan et al 2010 PLOS ONE;
- Sheehan et al 2016 Methods in Ecology and Evolution (also baited video...)

299711_4

Pecten maximus
(King Scallop)

Nemertesia antennia
(Sea Beard)

Trisopterus luscus
(Bib)

Amphilectus fucorum
(Shredded Carrot Sponge)

Hemimycale columella
(Crater Sponge)

Hydrallmania falcata
(a hydroid)

Celleporella pumicosa
(a bryozoan)

Cliona celata
(Boring Sponge)

Branching sponge 2

29/07/2011 14:18:00

Signs of recovery after 3 years

Abundance of reef species



3 years
after
Lyme
Bay MPA



Before/
control

Sheehan et al 2013 PLOS ONE


Then...Storms 2013 -2014

**DISCOVER
WITH
PLYMOUTH
UNIVERSITY
MARINE INSTITUTE**

BBC Sign in News Sport Weather iPlayer TV Radio More Search

one The Storms That Shook the South West

Home Clips Galleries



This programme is not currently available on BBC iPlayer

Sam Smith meets the people whose lives and livelihoods took a battering from the worst storms in living memory and asks whether it's time to rebuild or retreat.

29 minutes

Last on
BBC one Mon 12 May 2014
19:30
BBC ONE

BBC Sign in News Sport Weather

NEWS ENGLAND

Home World UK England N.Ireland Scotland Wales Business Politics Health



Storm leaves Dawlish railway line dangling

5 February 2014 Last updated at 12:18 GMT

The railway line at Dawlish in Devon is left hanging in mid-air after storms ripped away supporting ballast, wrecking up to 150ft (46m) of track.

Labour MP for Exeter, Ben Bradshaw has called for the government to

Storms 2013 -2014

**DISCOVER
WITH
PLYMOUTH
UNIVERSITY
MARINE INSTITUTE**



© Richard Austin



© Richard
Austin

Hypotheses



H1: MPA benthos is more resilient (resistant and recovery) than fished benthos



H2: Scallop dredging is equivalent to a bad storm

Visual observations

Site 56: pre-storms (2013)

DISCOVER
WITH
PLYMOUTH
UNIVERSITY
MARINE INSTITUTE



Visual observations

Site 56: post-storms 2014

DISCOVER
WITH
PLYMOUTH
UNIVERSITY
MARINE INSTITUTE



Recovery from storms 2016

Site 56

DISCOVER
WITH
PLYMOUTH
UNIVERSITY
MARINE INSTITUTE

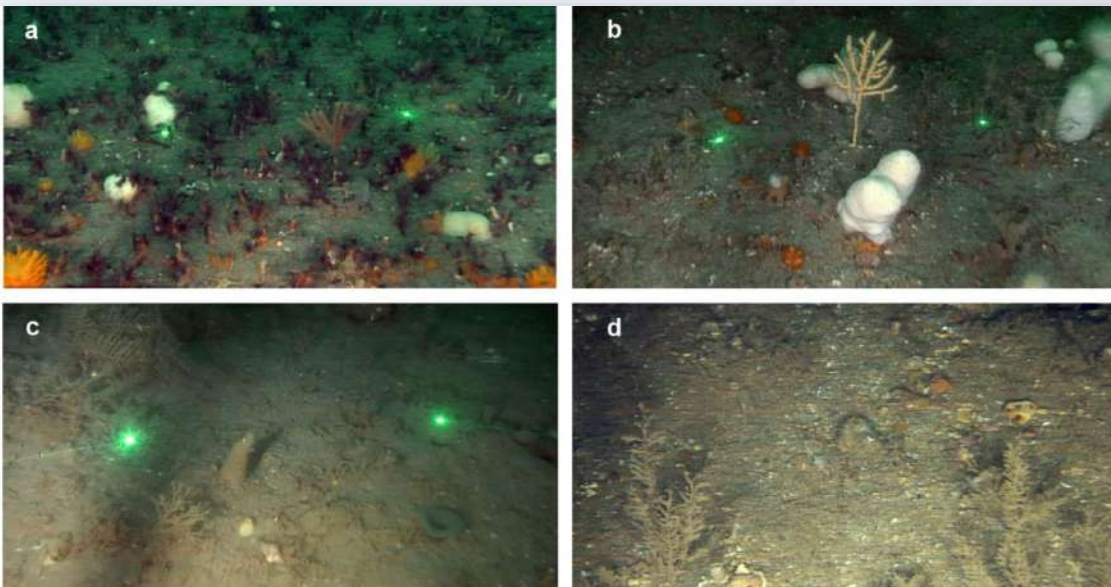


Resilience hypothesis

DISCOVER
WITH
PLYMOUTH
UNIVERSITY
MARINE INSTITUTE

● Why did the storms cause so much damage to the seabed?

Sand scour? Pebbly sand reef!



- Sheehan *et al* 2013 Mar. Poll. Bull.



Marine Pollution Bulletin

Volume 76, Issues 1–2, 15 November 2013, Pages 194–202



Drawing lines at the sand: Evidence for functional vs. visual reef boundaries in temperate Marine Protected Areas

E.V. Sheehan^{a,*}, S.L. Cousens^a, S.J. Nancollas^a, C. Stauss^b, J. Royle^b, M.J. Attrill^a

[Show more](#)

<http://dx.doi.org/10.1016/j.marpolbul.2013.09.004>

[Get rights and content](#)

Under a Creative Commons license

[Open Access](#)

Highlights

- MPAs can either protect all seabed habitats within them or discreet features.
- If discreet features are protected humans have to know where the boundaries are.
- Following 3 years protection, reef fauna indicated expansion of the reef feature.
- MPA management should therefore be site based to allow for shifting baselines.
- Site based MPAs will be more effective at delivering ecosystem goods and services.

Summary

- 5 year old MPA was not resistant to the storms
- Impact similar to trawling/dredging
- But!! Overall recovery from storms may be quicker than recovery from demersal towed fishing (though not for slow growing species)
- Importance of long-term protection and especially monitoring
- Crucial to protect areas of the seabed to future proof our marine ecosystem processes and services from a stormy climate change scenario.

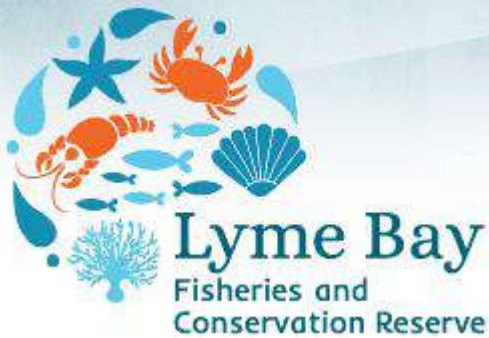


European Union
European Structural
and Investment Funds

RETURN

**DISCOVER
WITH
PLYMOUTH
UNIVERSITY
MARINE INSTITUTE**

Reserve Effects Tested and Understood to validate Return (Blue Foundation – Lyme fishermen)



New website
2 annual surveys
Social media videos



Acknowledgments

- Funders: SWIFA, SWFPO, Defra, NERC, Pig Shed Trust, Natural England, Wildlife trusts, EU
- Lyme Bay fishermen
- Keith Hiscock for lovely pictures!
- Richard Austin for providing storm images
- Statistical support from Marti Anderson and Bob Clarke

