# *MPAs to help save Scottish seas: the NGO perspective*


Calum Duncan, Head of Conservation Scotland

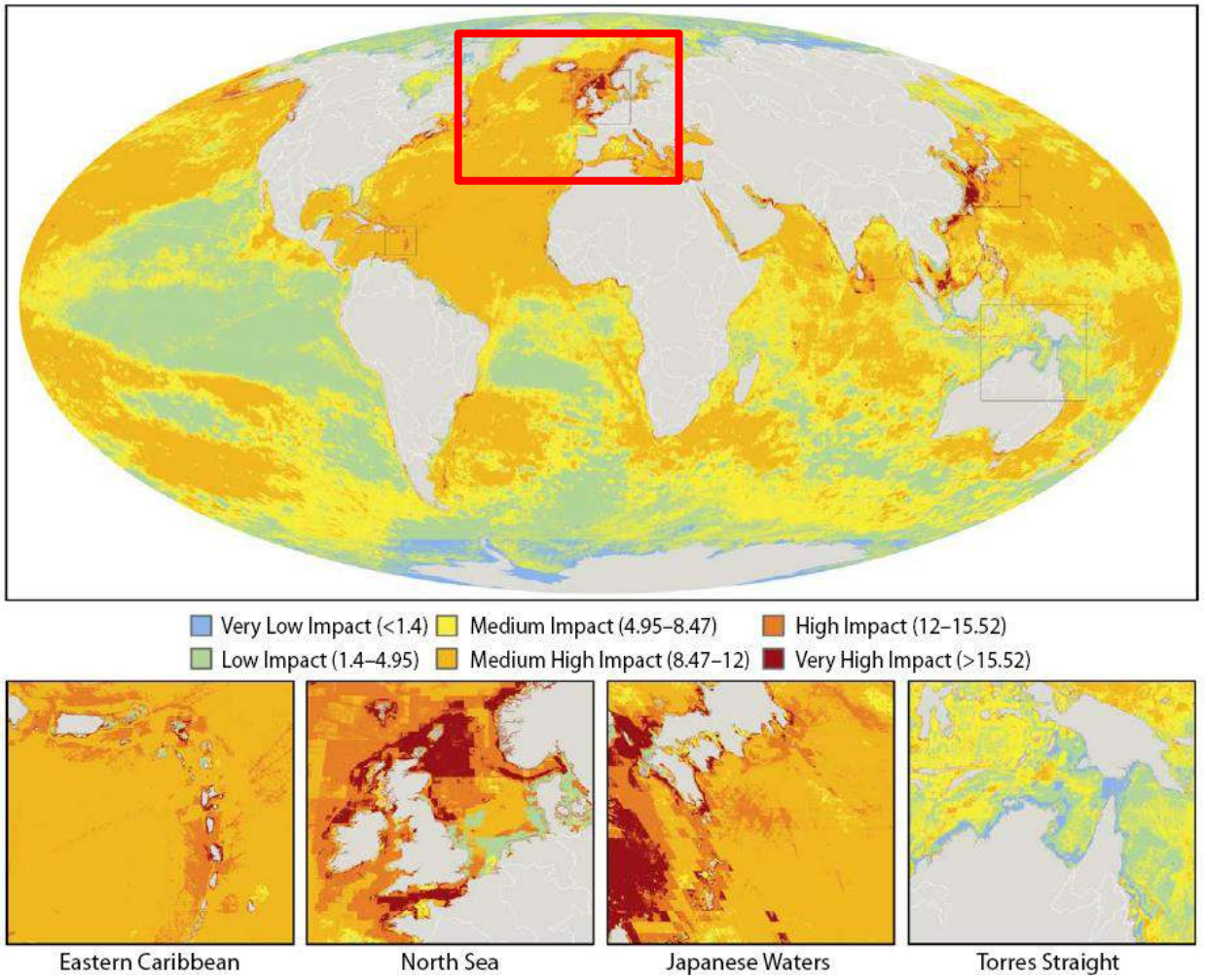
Marine Conservation Society

# Overview

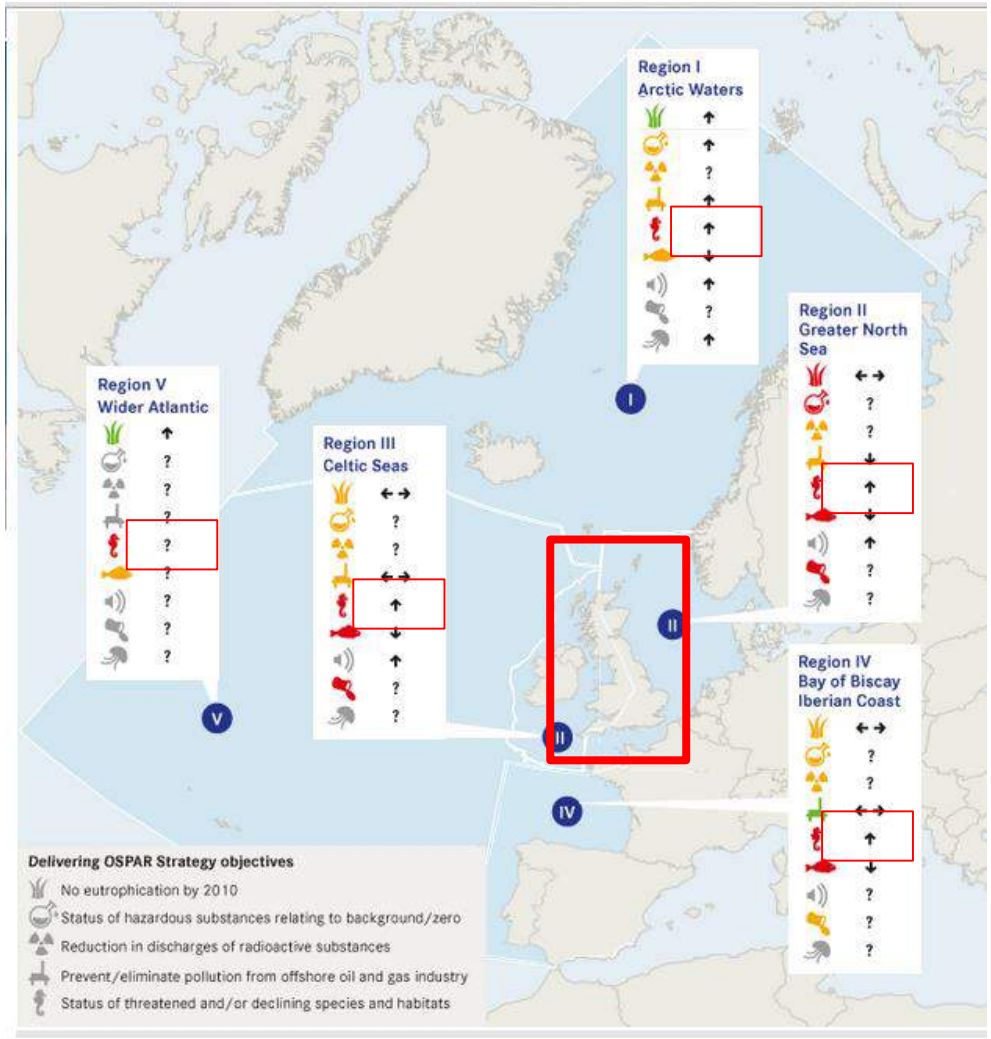
- **Scotland's seas in context**
- What MPAs are for
- Why we supported June 2015 proposals
- Remaining concerns post Dec 2015
- Next Steps

# UK in a global context

Benjamin S. Halpern, *et al* (2008).
**A Global Map of Human Impact on Marine Ecosystems**
*Science* **319**, 948



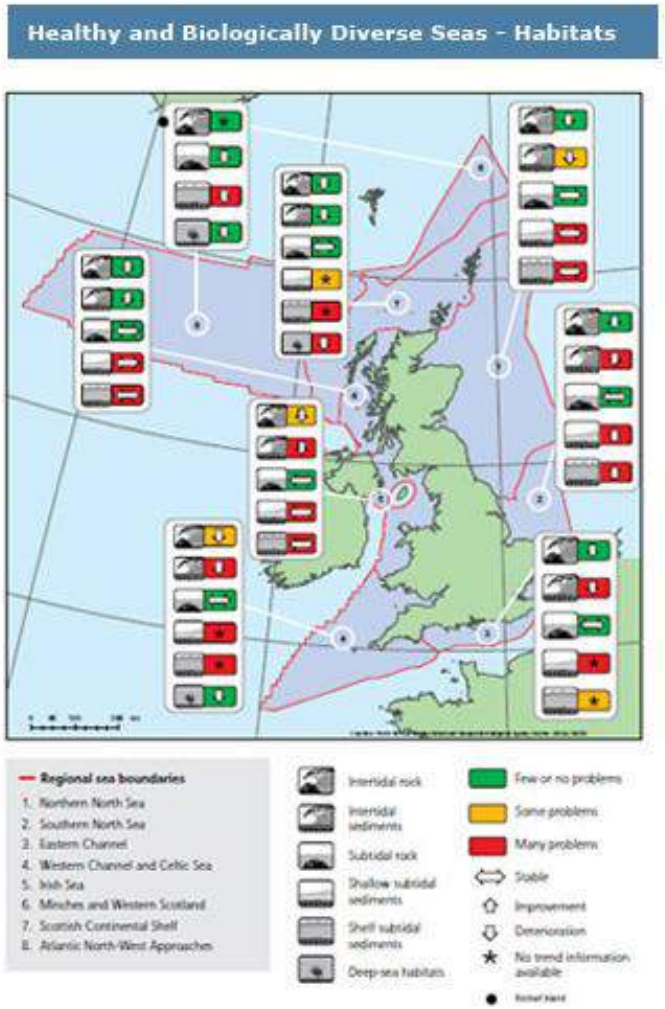
# OSPAR Quality Status Report 2010




"OSPAR's actions are clearly helping to reduce pollution of the marine environment, but many problems persist. **The most widespread impacts on ecosystems result from fishing**, and the emerging impacts of climate change cause serious concern."

Many **Th/D spp/habitats**
Pressure expected to **increase**

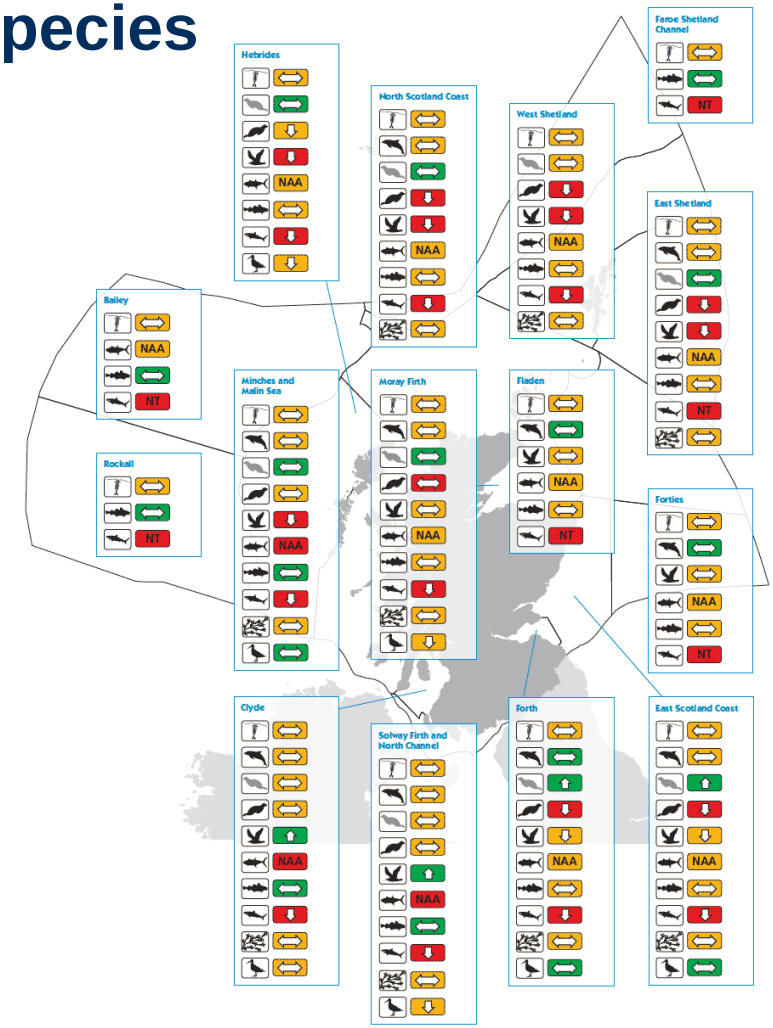
# Charting Progress 2 (2010)



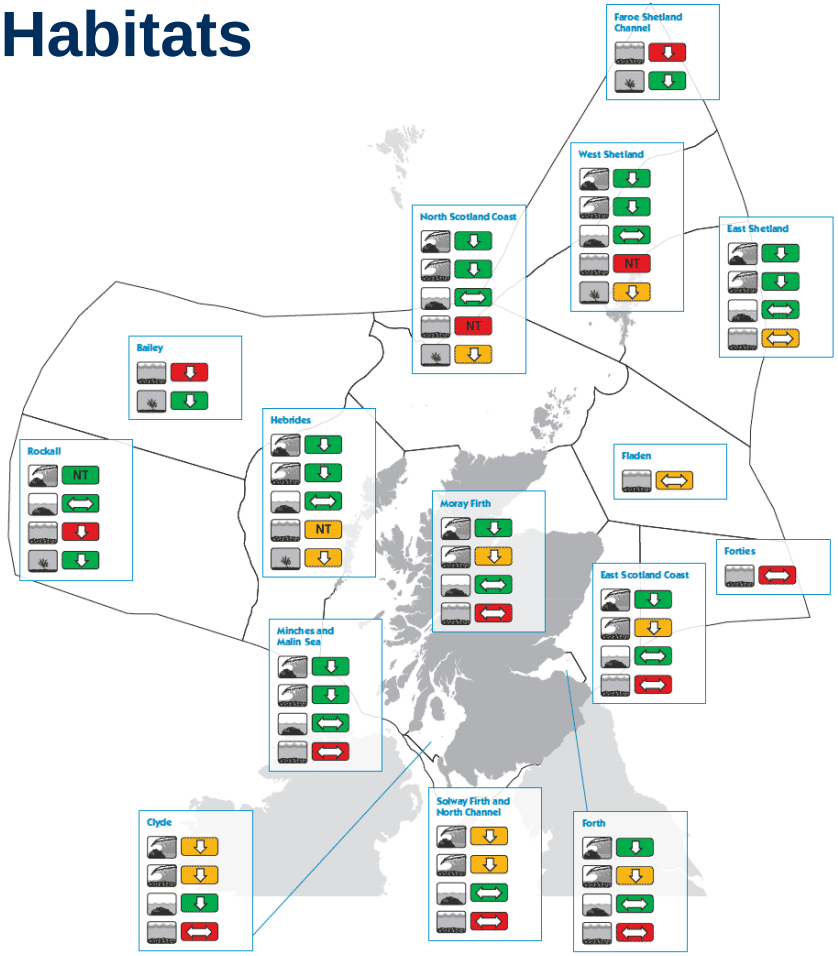

"Many seabed sedimentary habitats in large areas of the North Sea, the Western Channel and Celtic Sea, and the Irish Sea have been adversely affected, particularly by mobile fishing gears."

# Scotland's Marine Atlas (2011)

## Species



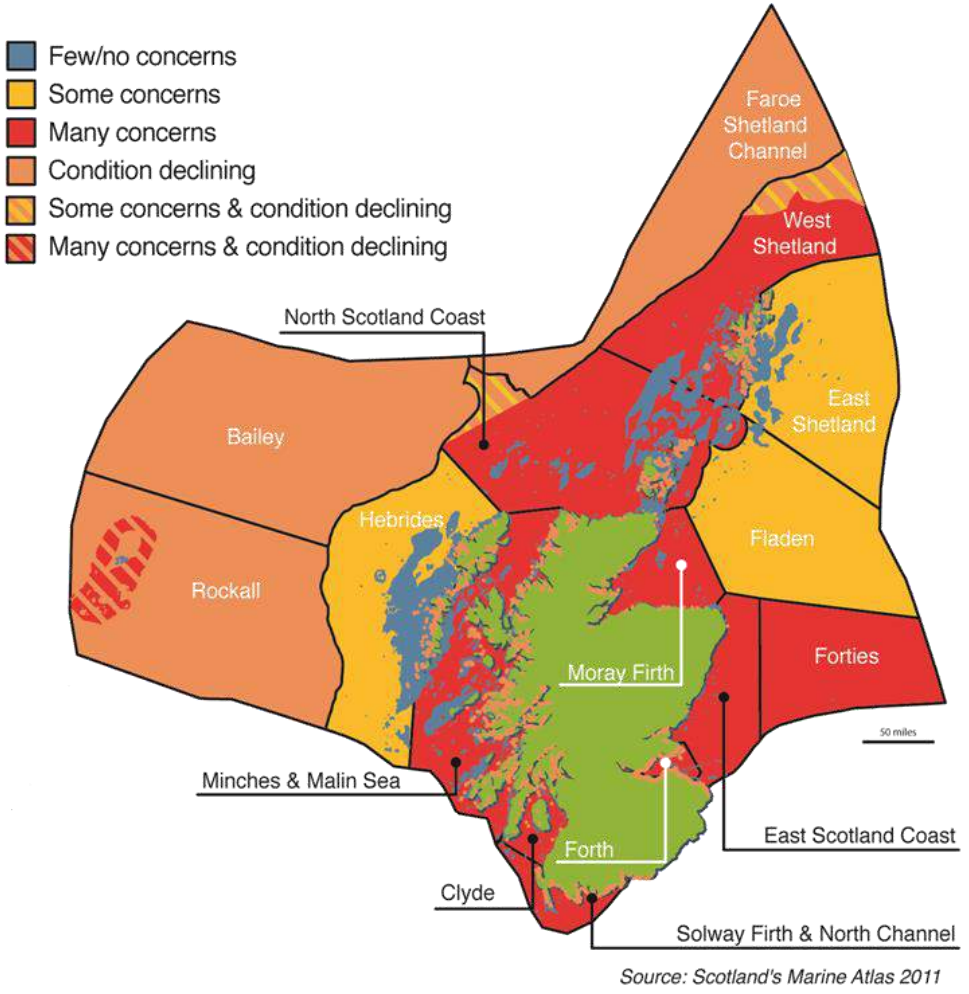

## Habitats



# The habitats picture made plain

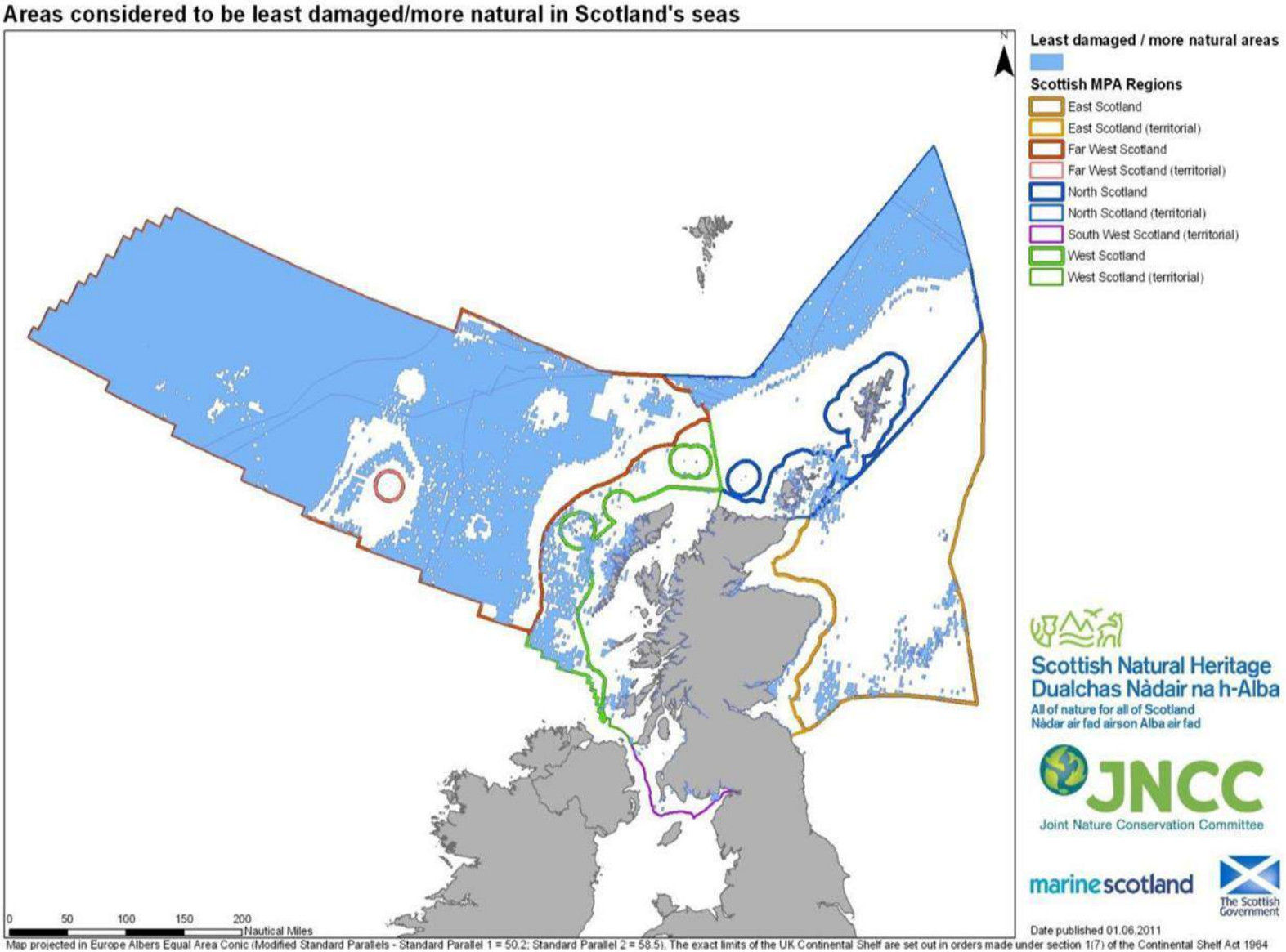
“There are two significant pressures on the Scottish marine area which are widespread:

- Human activity contributing to **climate change**
- **Fishing**, which impacts on the seabed and species”

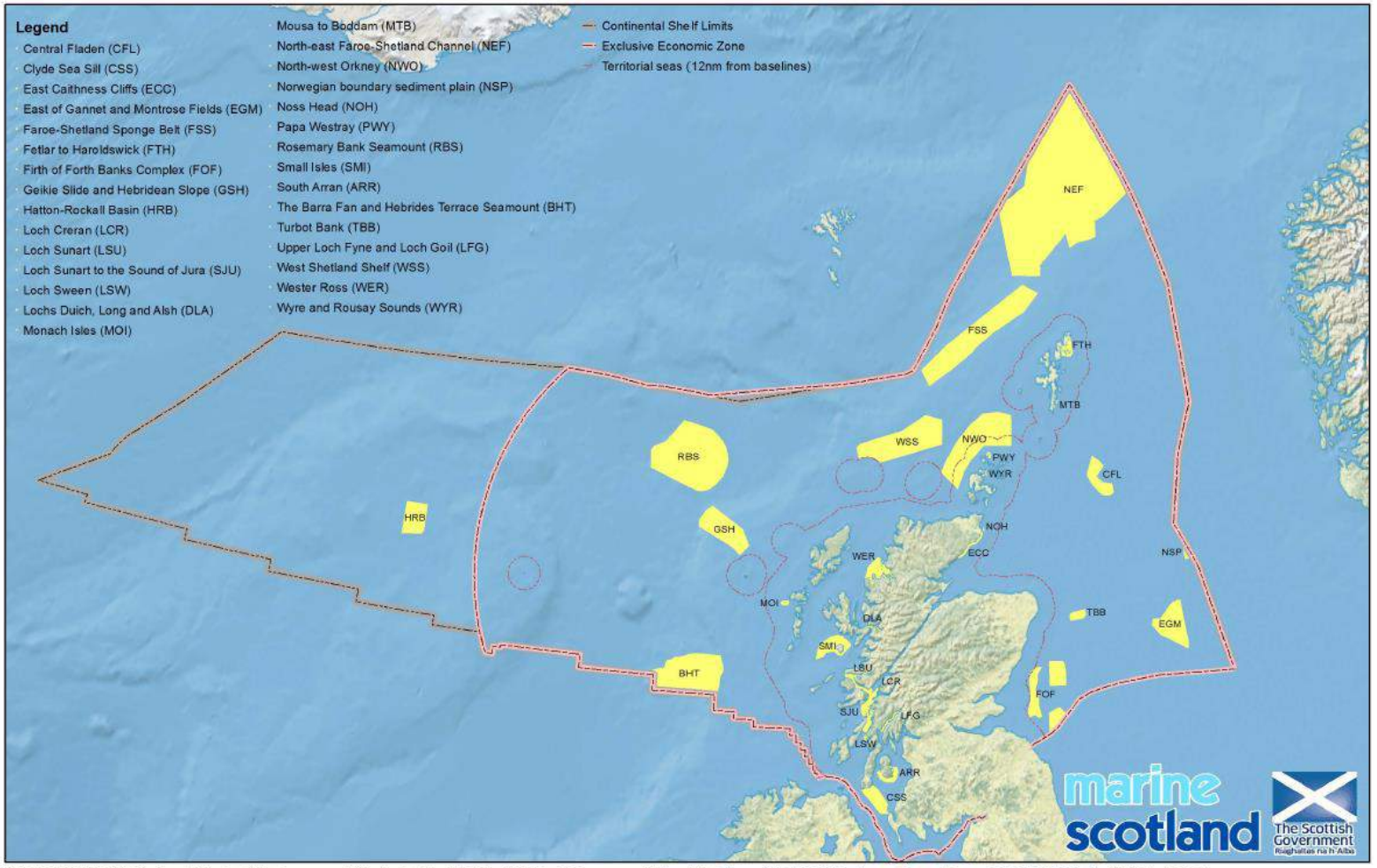



*Source: Scotland's Marine Atlas 2011*

# Blue = Least Damaged/Most Natural



# 24 July 2014 - 30 new Scottish MPAs

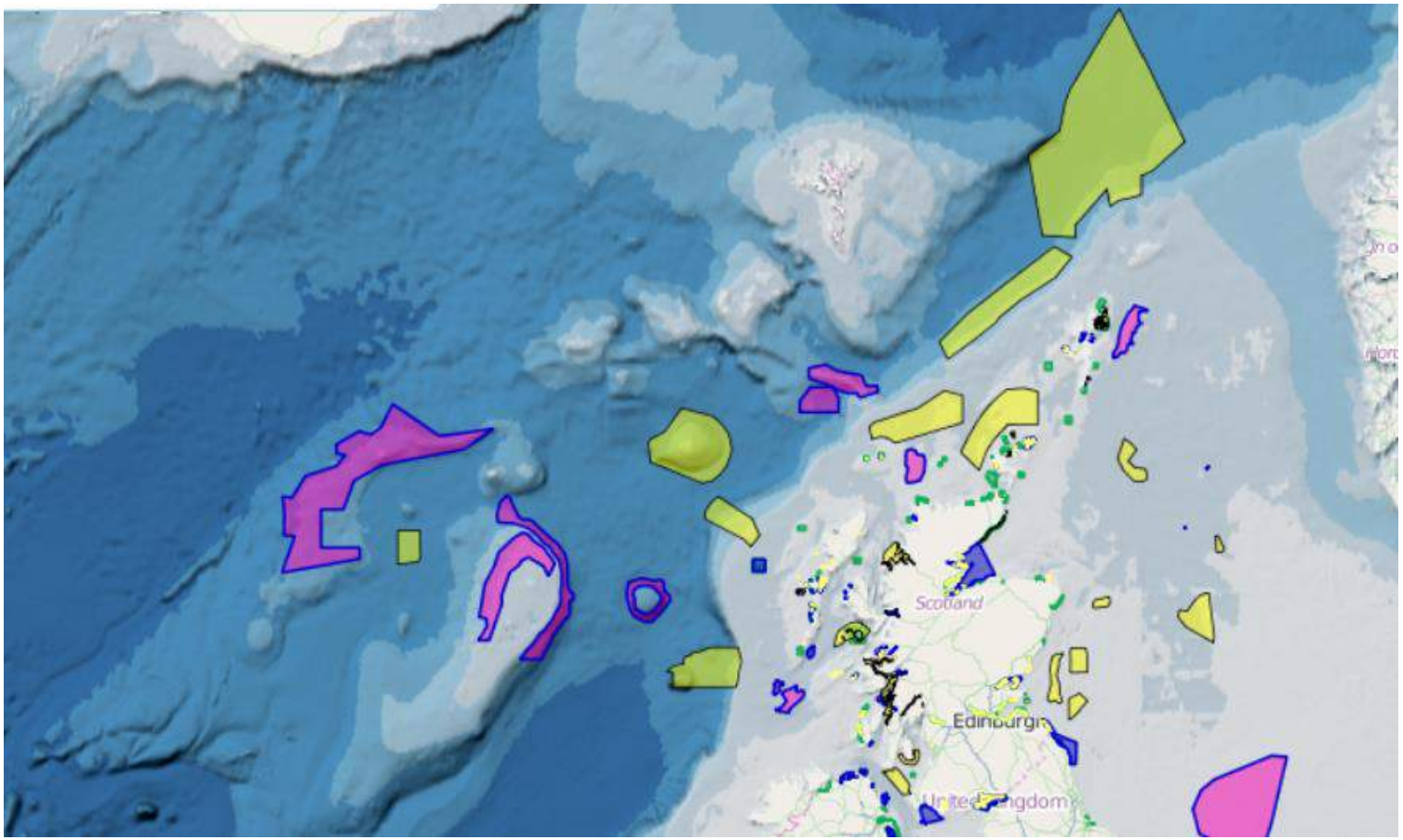



NOT FOR NAVIGATION. Created by Scottish Government (Marine Scotland) 2014. gj07800 . © Crown copyright and database rights (2014) Ordnance Survey licence 100024655. Made with Natural Earth.
Projection: Europe Albers Equal Area Conic. Datum: WGS1984. Scale 1:6,500,000 .

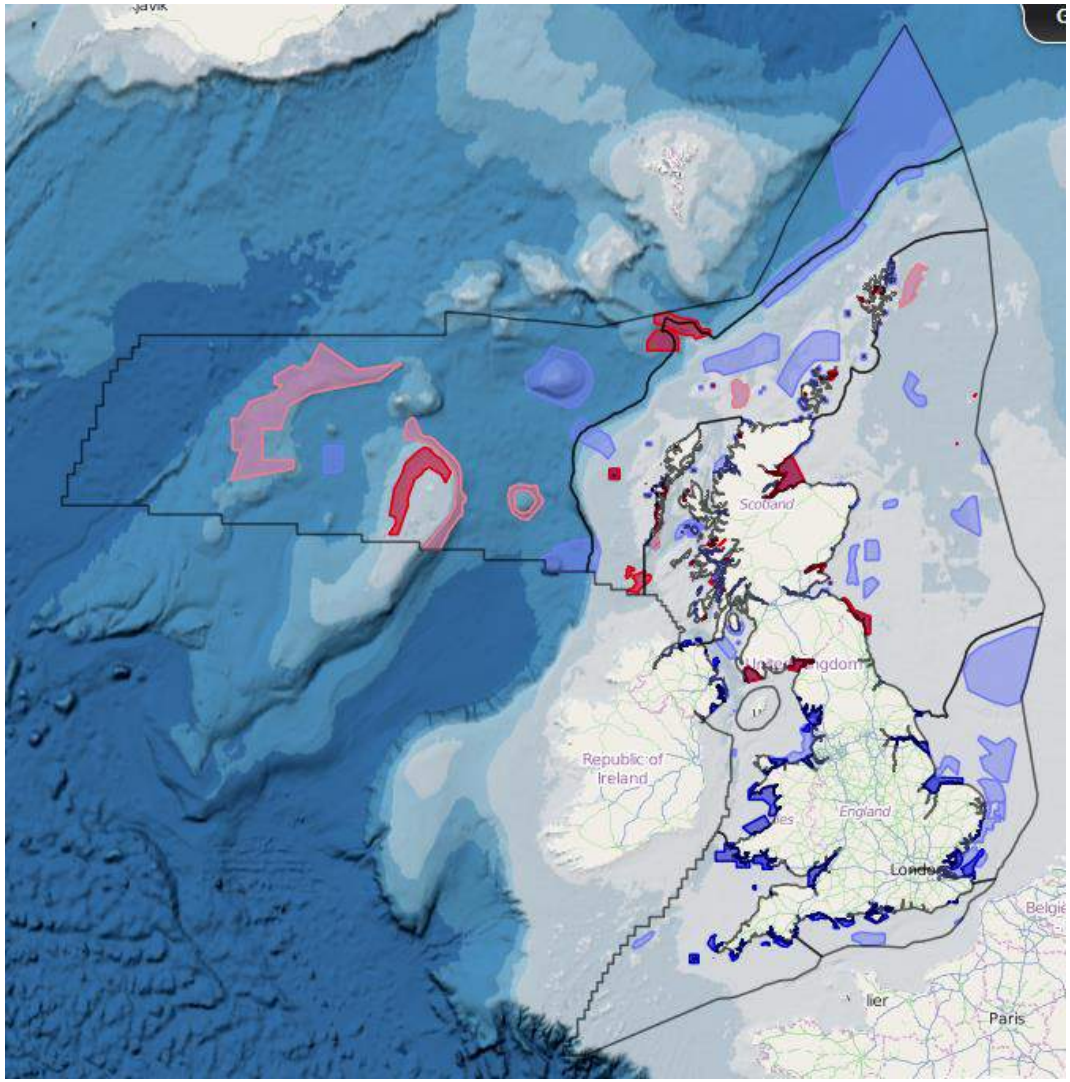
JNCC
Joint Nature Conservation Committee

Scottish Natural Heritage
All of nature for all of Scotland

# Scotland's MPA Network



# Scottish sea area = 61% UK seas



# Living within Environmental Limits

# Overview

- Scotland's seas in context
- **What MPAs are for**
- Why we supported June 2015 proposals
- Remaining concerns post Dec 2015
- Thoughts and next Steps

# Marine (Scotland) Act 2010

## Duties on Scottish Ministers to:

- ❑ **Protect and enhance health of Scottish seas** ✓
- ❑ **Establish a National Marine Plan** ✓
- ❑ **Deliver a network of Marine Protected Areas** ✓

**OSPAR** convention

**W**orld **S**ummit on **S**ustainable **D**evelopment (2012)

EU **M**arine **S**trategy **F**ramework **D**irective

# What MPAs are for…

- ***Protecting & recovering*** marine biodiversity
- Supporting and enhancing ***ecosystem goods and services*** e.g. seafood productivity, climate regulation, nutrient cycling, aggregates & recreation
- Boosting ***recovery*** in the health of our seas

# …as part of a three-pillar approach to conservation


**SITES**
ncMPAs e.g. South Arran
SACs e.g. East Mingulay
SPAs
SSSIs

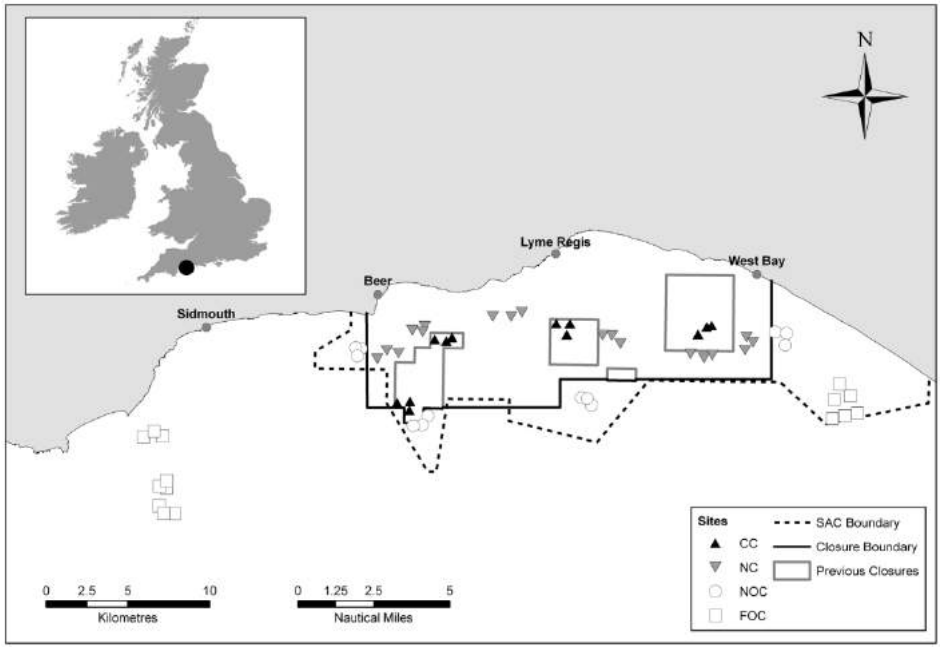
**SPECIES**
WCA / NC(S)A
EU Birds/Habitats
OSPAR/IUCN

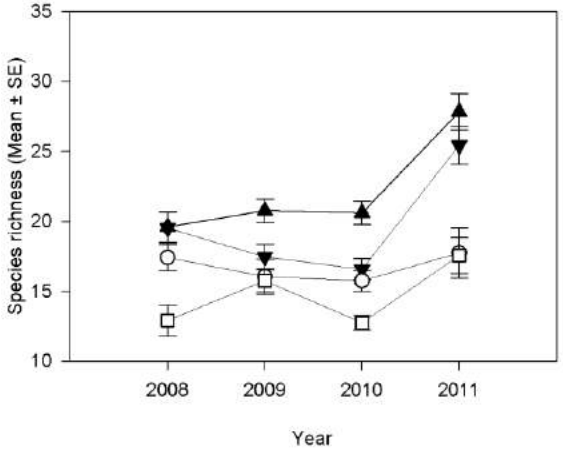
**WIDER SEAS**
Marine Planning
Fishery regulation
Licensing

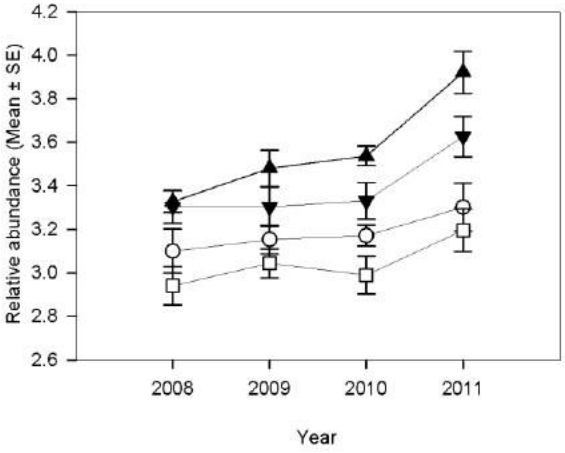
# Recovery!

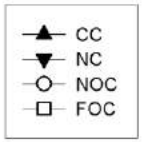
- Recover spatial ***extent*** of a habitat
- Recover ***biodiversity*** of a habitat
- Recover ***ecosystem function*** of a habitat
- Recover ***population number*** of species

# Recovery in extent – Lyme Bay SAC





Species richness (Mean ± SE)
35
30
25
20
15
10
2008
2009
2010
2011
Year


Relative abundance (Mean ± SE)
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2008
2009
2010
2011
Year


CC
NC
NOC
FOC


(C) Colin Munro Photography
www.colinmunrophotography.com

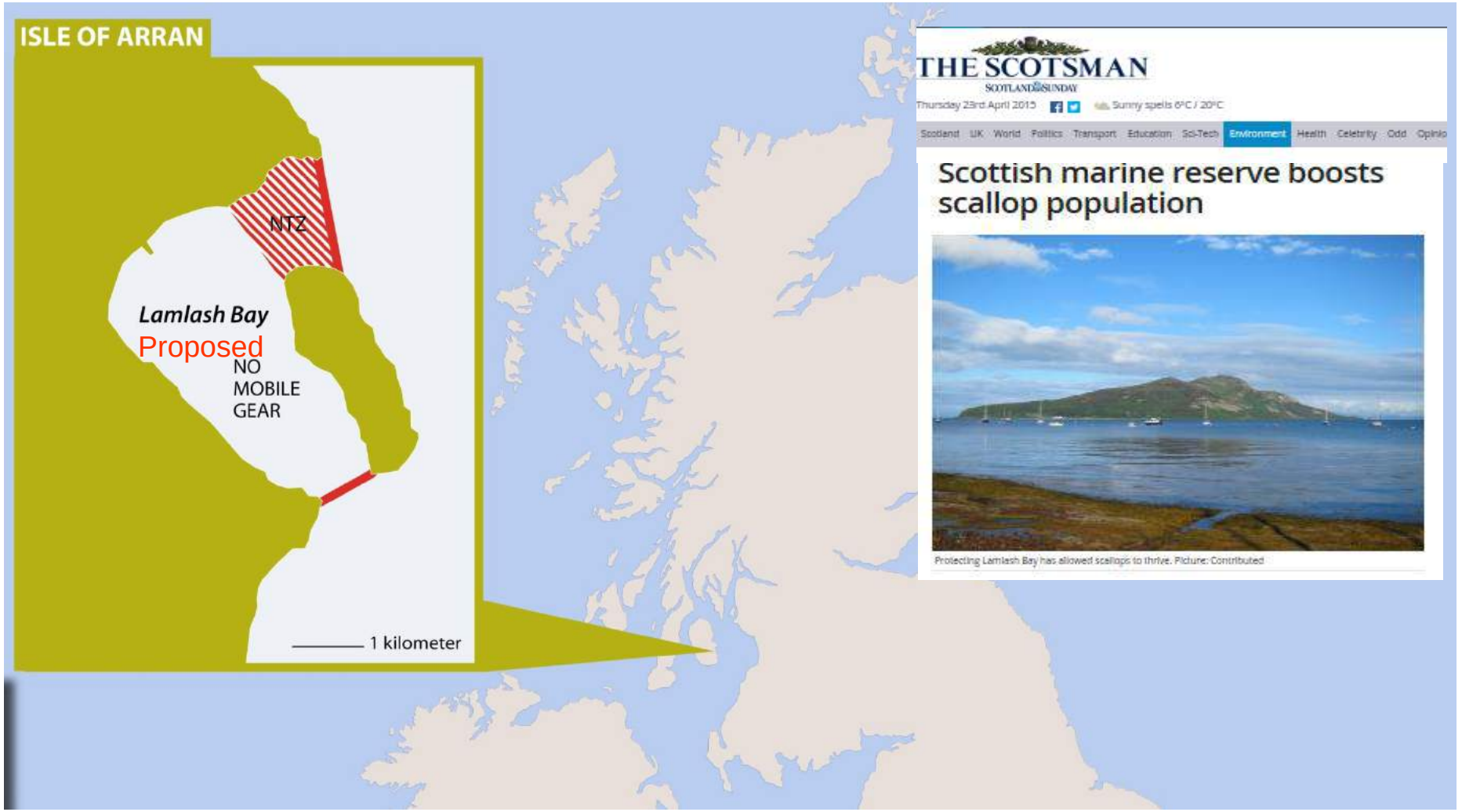
# Supporting ecosystem services

*"**Recovery of marine biodiversity increases productivity fourfold**…We conclude that marine biodiversity loss is increasingly impairing the ocean's capacity to provide food, maintain water quality, and recover from perturbations. Yet available data suggest that at this point, these trends are still reversible."*

**Worm *et al* (2006), 'Impacts of Biodiversity Loss on Ocean Ecosystem Services, Science, Vol 314**

COAST
Community Of Arran Seabed Trust

# Scotland's first No-Take Zone est. Oct 2008




THE SCOTSMAN
SCOTLAND ON SUNDAY
Thursday 23rd April 2015 Sunny spells 6°C / 20°C
Scotland UK World Politics Transport Education Sci-Tech Environment Health Celebrity Odd Opinio

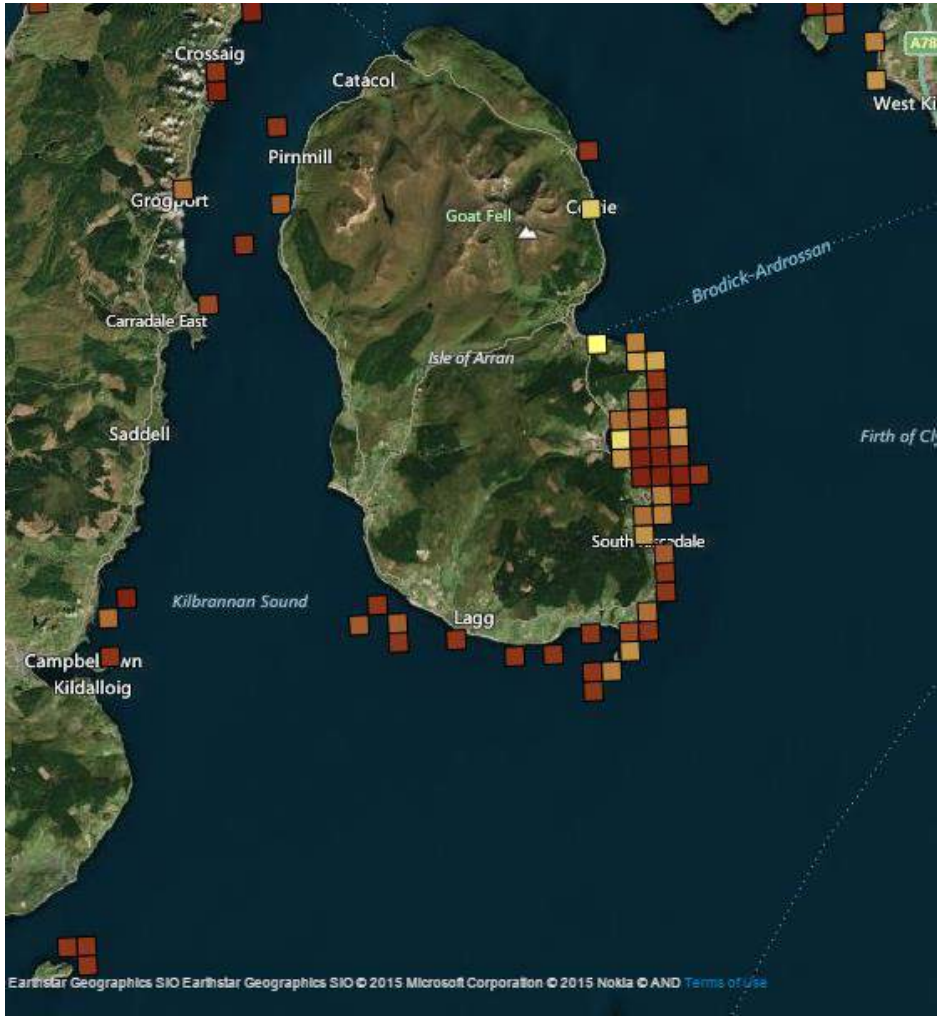
## Scottish marine reserve boosts scallop population



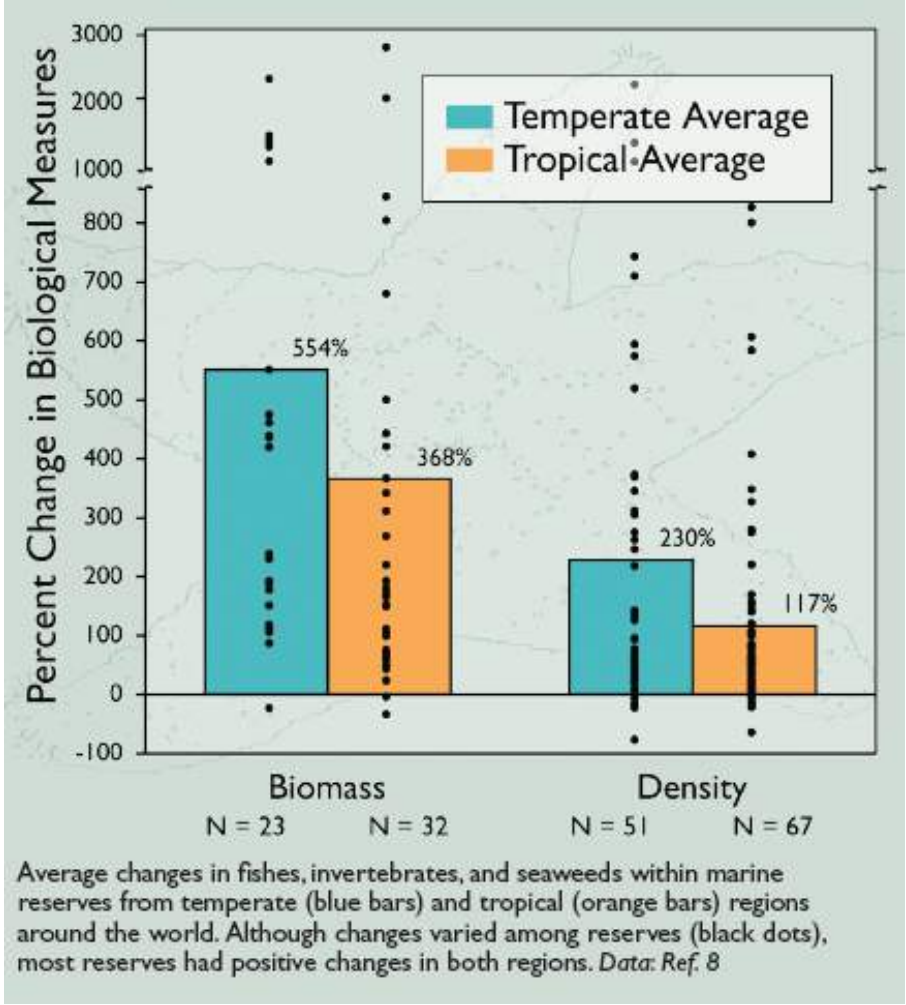
Protecting Lamlash Bay has allowed scallops to thrive. Picture: Contributed


"…ecological communities within Lamlash Bay are ***more diverse and more abundant within the NTZ than outside***, and that **scallop populations within the NTZ are made up of older, larger and a greater number of individuals.**" Leigh Howarth

# 2003-2014 Seasearch diving

# Temperate hpMPAs are more productive

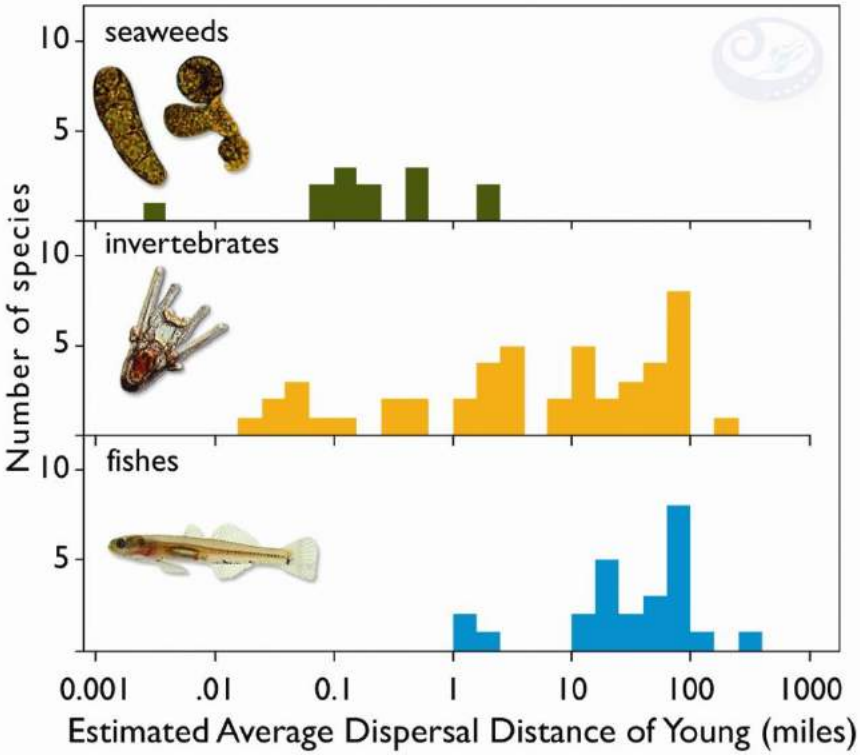



Average changes in fishes, invertebrates, and seaweeds within marine reserves from temperate (blue bars) and tropical (orange bars) regions around the world. Although changes varied among reserves (black dots), most reserves had positive changes in both regions. *Data: Ref. 8*

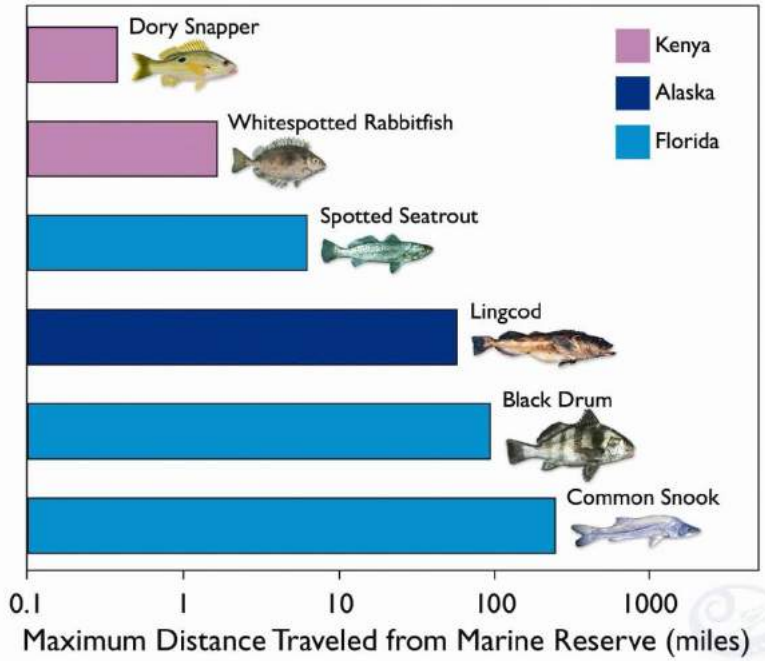
- Fishes, invertebrates, and seaweeds typically have grown 28% bigger and have become 166% more abundant inside marine reserves.
- On average, diversity has increased 21% and biomass has increased 446% inside marine reserves.
- Both temperate and tropical marine reserves have been effective.
- The bigger fishes and invertebrates in marine reserves can produce more young than smaller animals outside reserves.
- In existing marine reserves, many species increased, particularly those that were fished, and some species decreased, such as those that are prey to fished species.

**www.piscoweb.org/topics/marine-protected-areas**

# …supporting spillover effects

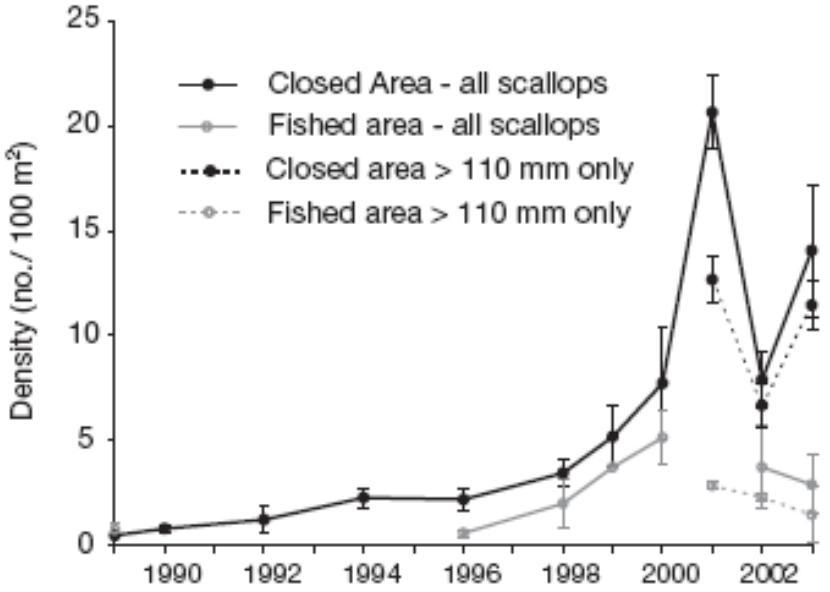


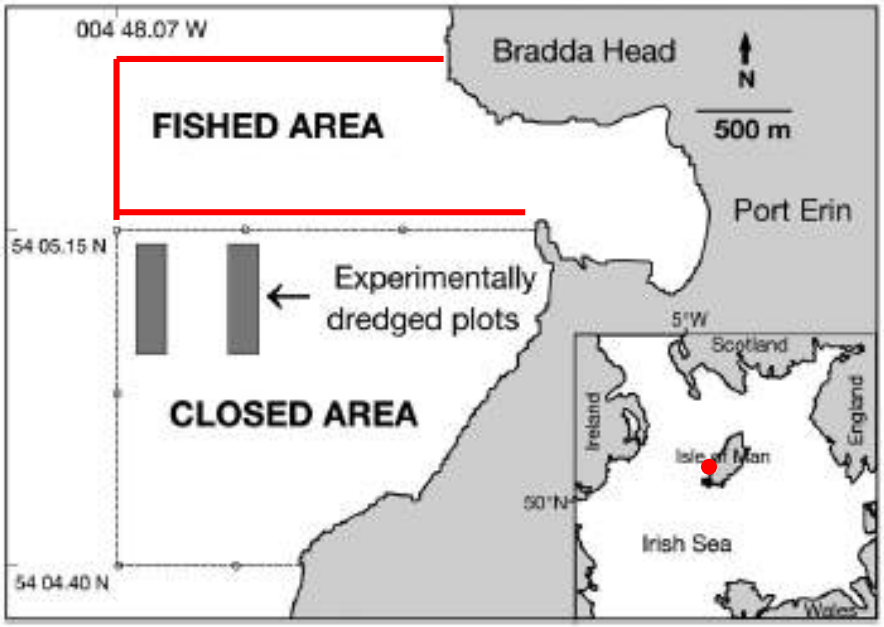

The estimated average distances traveled by young invertebrates (51 species), fishes (26 species), and seaweeds (13 species) prior to settling at their adult homes. Distances are based on genetic analysis of species around the world. *Data: Kinlan & Gaines (2003) Ecology*

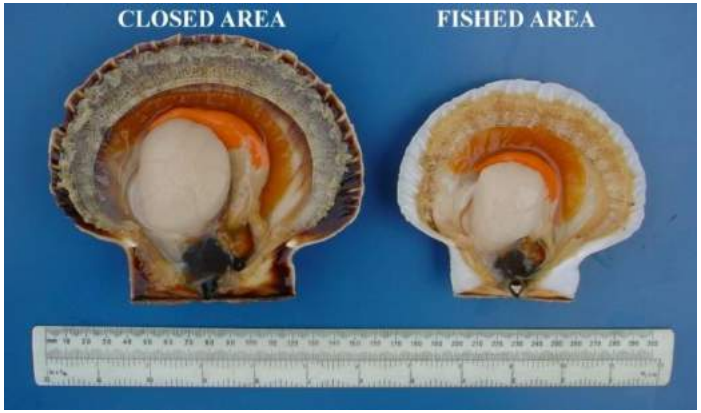



This graph shows the maximum distances that tagged fishes traveled from marine reserves in Kenya (violet), Alaska (navy), and Florida (turquoise). These studies provide direct evidence that fishes spill over from marine reserves into surrounding waters. *Data: Kaunda-Arara & Rose (2004) Environmental Biology of Fishes; Johnson et al (1999) North American Journal of Fisheries Management; Starr et al. (2006) Canadian Journal of Fisheries and Aquatic Sciences*

# Isle of Man productivity increase



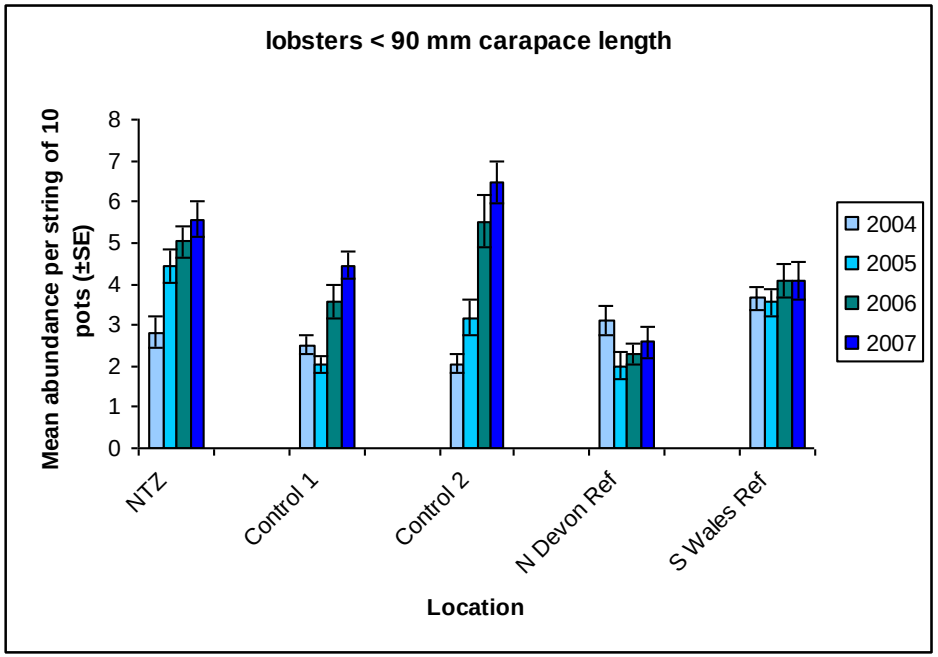



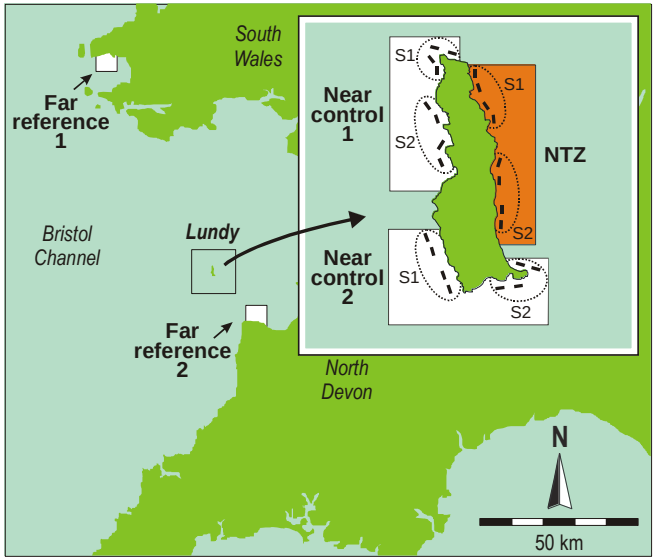

In eight years:

2.5 to **22** scallops/100m$^2$

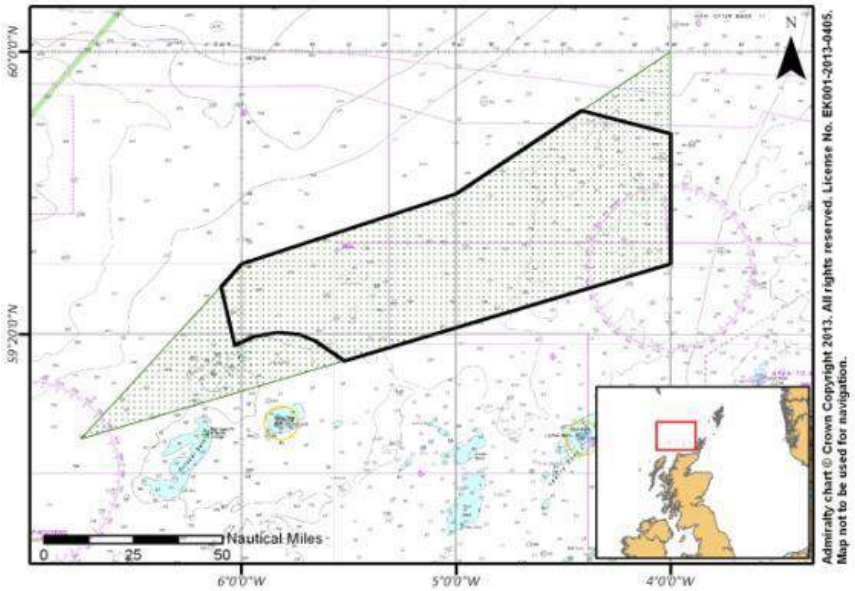
# Lundy Island No-Take Zone

- 6 x more lobsters inside NTZ
- Spillover of juveniles onto fishing grounds?



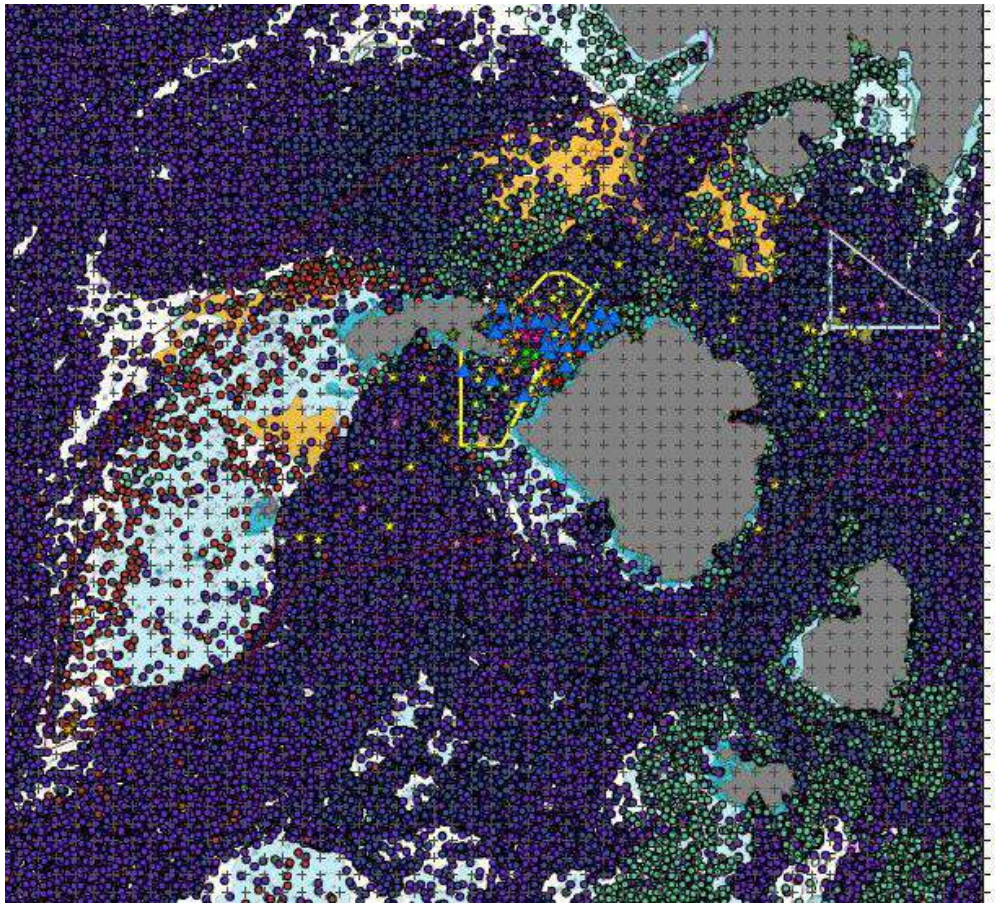

# Windsock Closure


- lesser spotted dogfish, as well as other elasmobranchs, **increased markedly**
- **beneficial effects on large fish** in the closed area (such as cod and large anglerfish)

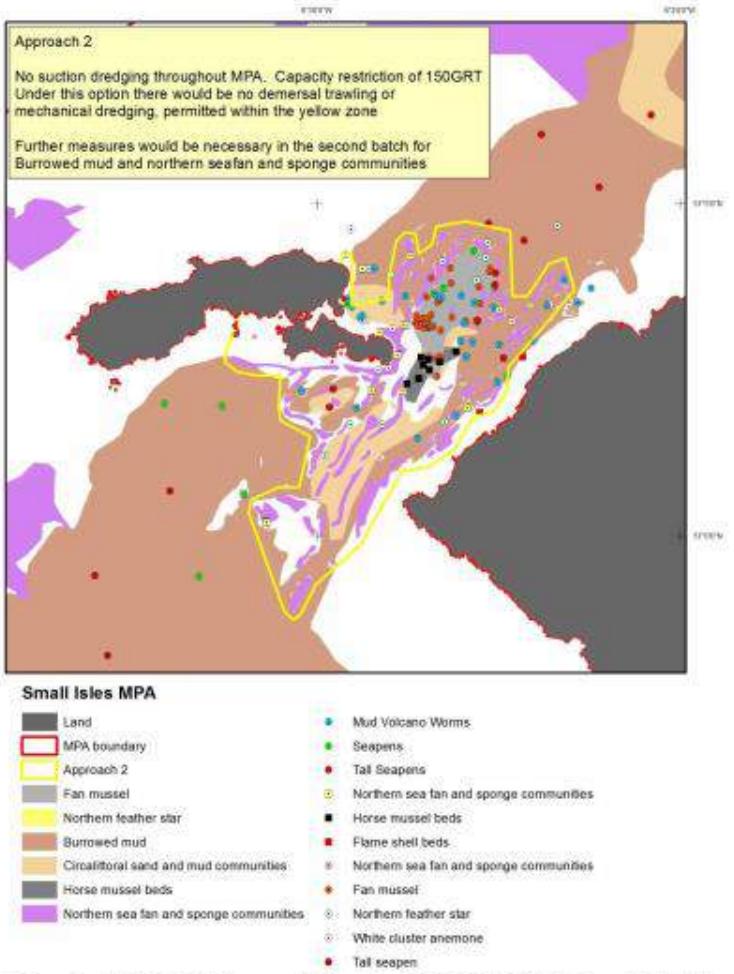
- Scotland's seas in context
- What MPAs are for
- **Why we supported June 2015 proposals**
- Remaining concerns post Dec 2015
- Thoughts and next Steps

# Limited scope for recovery



- 11/30 ncMPAs = LDMN
- Only 4 recovery zones
- 8% of Small Isles
- <3% of inshore waters
- ‘patch’ management

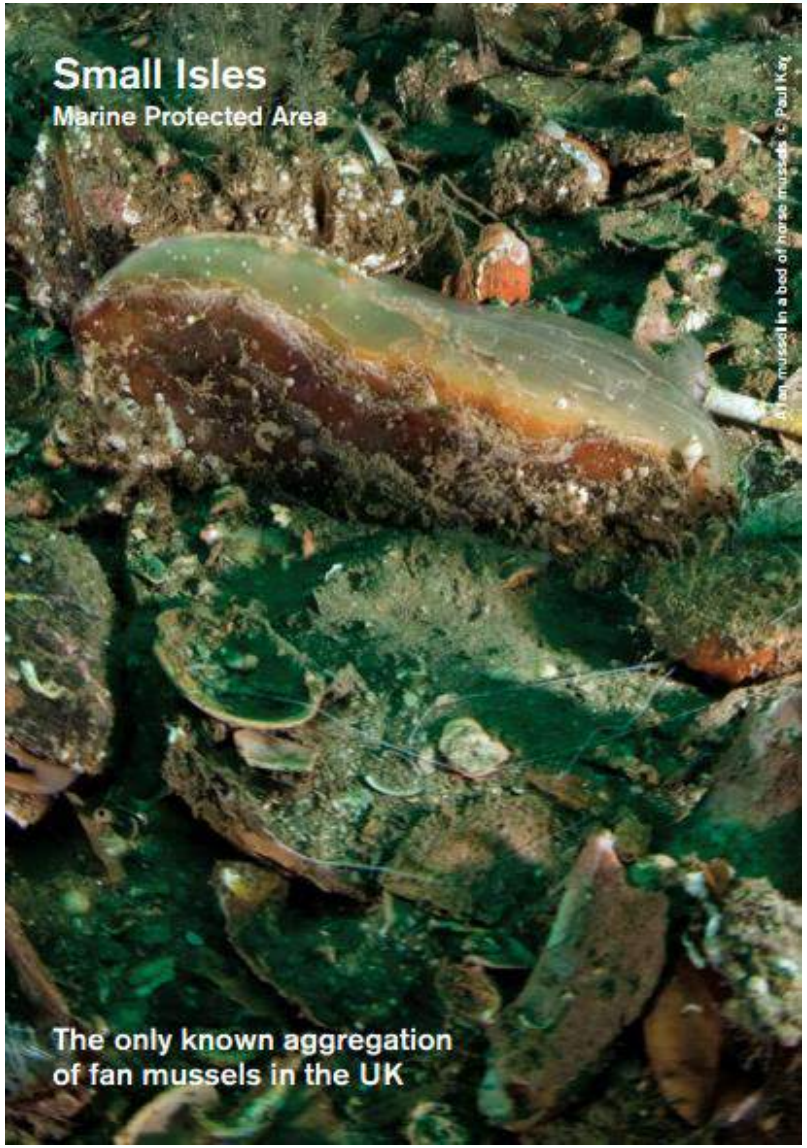
# Small Isles MPA





Using Geodatabase of Marine Features Adjacent to Scotland (GEMS i12 - May 2014).
Projection: Mercator Datum: WGS 1984 Standard Parallel: 57°N Scale 1:100,000

**Figure K4: Map of zonal measures in Sound of Canna proposed under approach 2**



# Simple MPA management schematic

Hypothetical historic extent

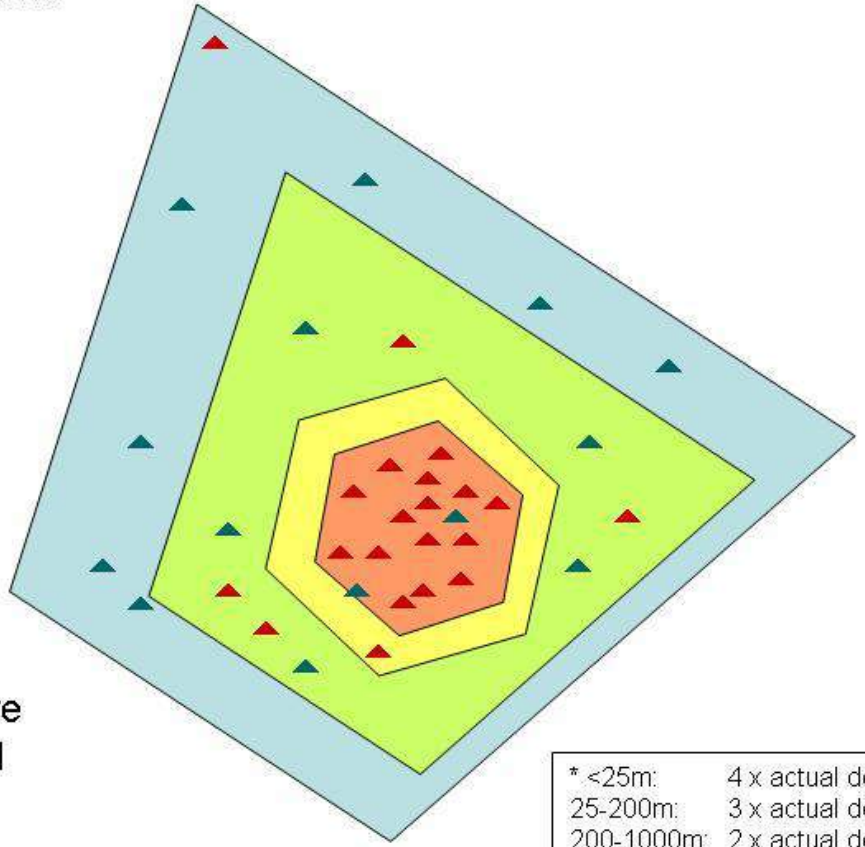
Current extent

Proposed 'official' boundary to mobile gear*

Boundary allowing scope for study of and actual recovery

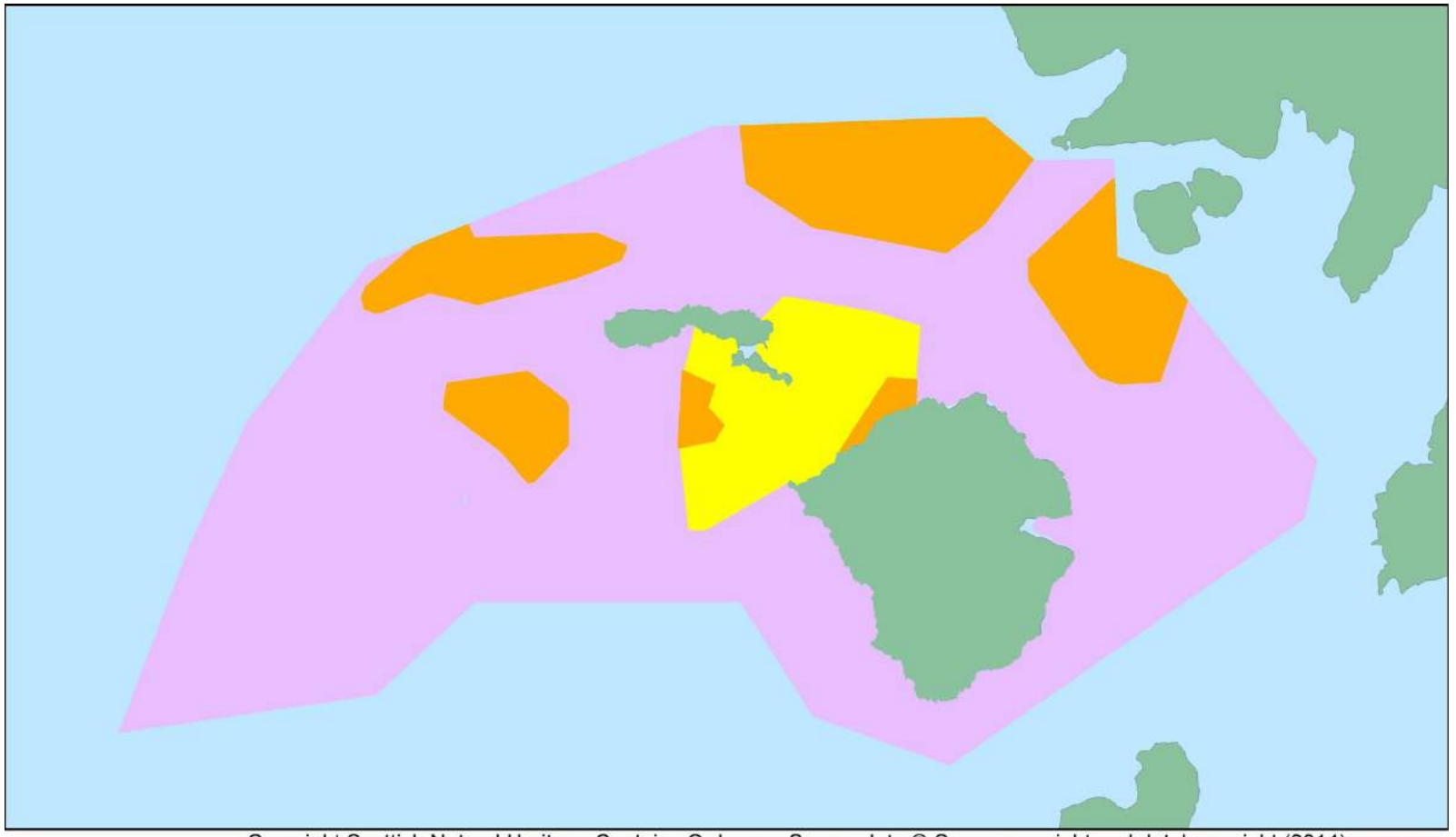
MPA search feature e.g. flameshell bed

Non MPA-search feature e.g. cobbles, sands and gravels



| | |
|---|---|
| * <25m: | 4 x actual depth |
| 25-200m: | 3 x actual depth |
| 200-1000m: | 2 x actual depth |

Credit: Calum Duncan/MCS



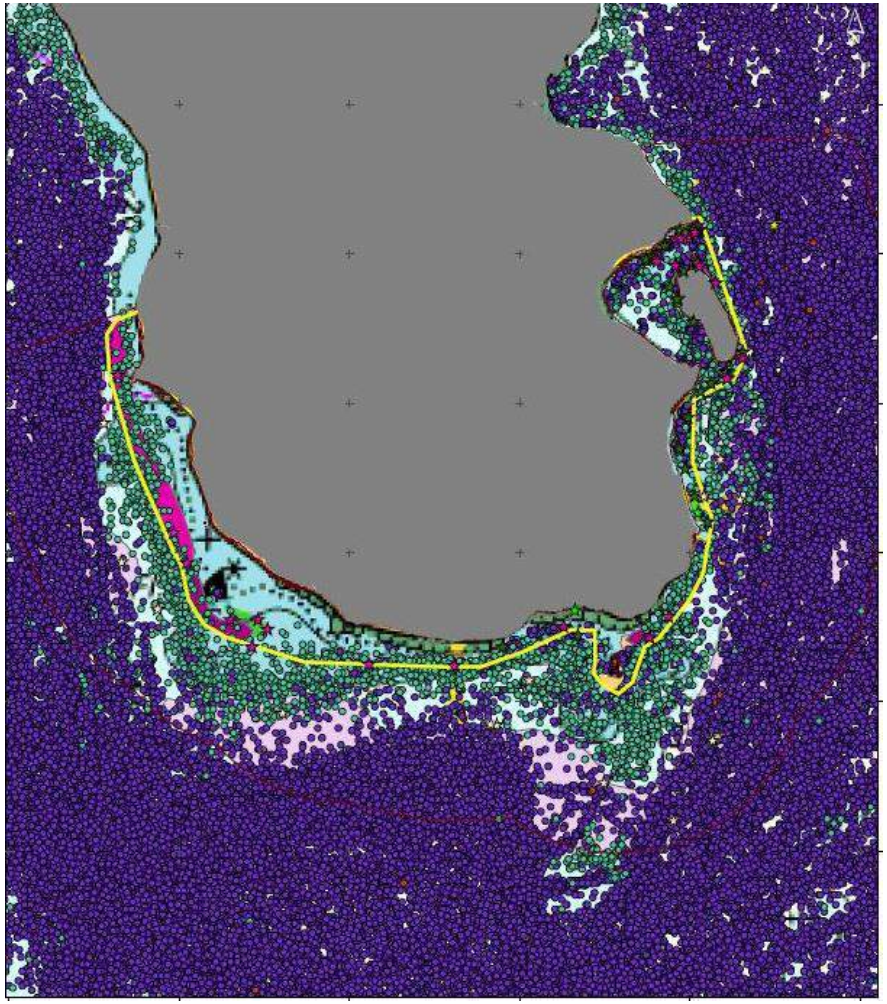


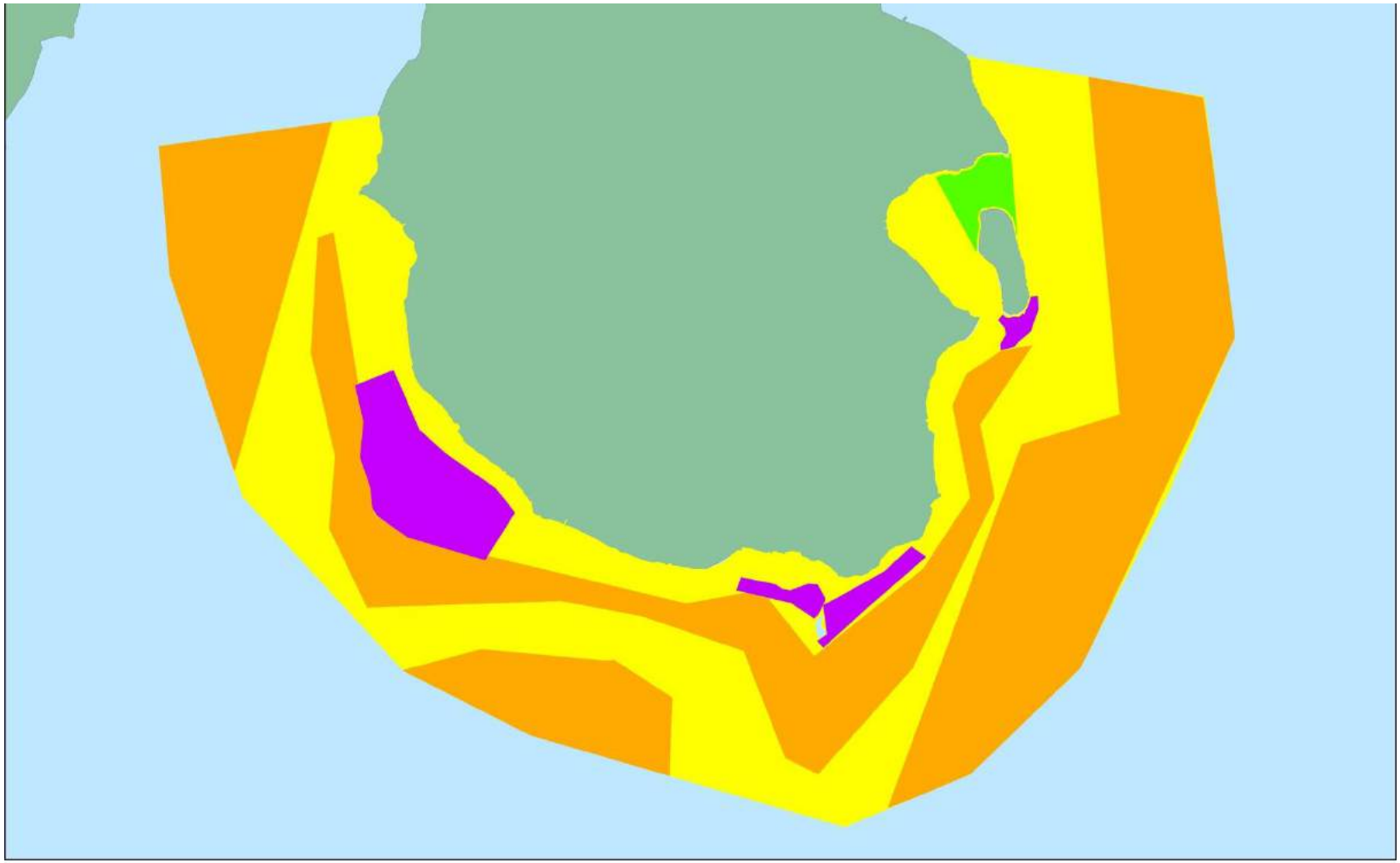
**Legend**

- NCMPA
- Proposed no bottom-towed fishing zone (Marine Scotland)
- Suggested additional no bottom-towed fishing zones (LINK)
- Land
- Ocean

Scottish Environment LINK

# South Arran MPA





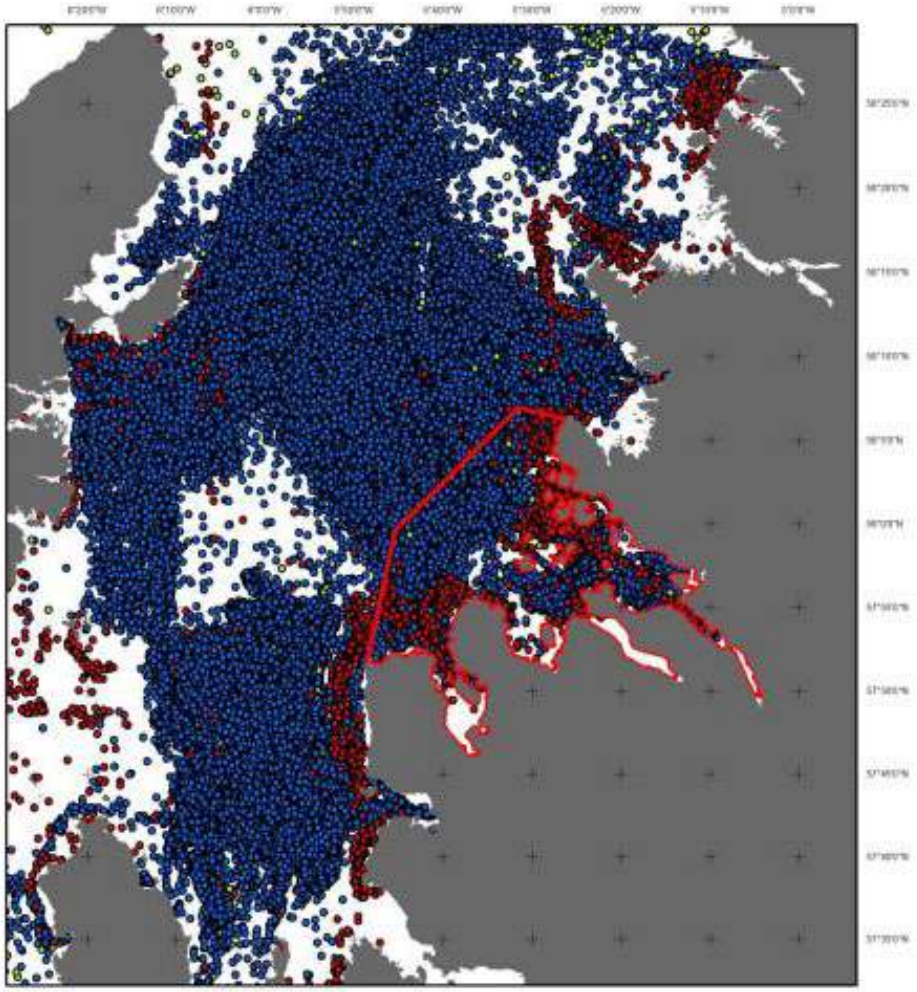


**Legend**

- Lamlash Bay No Take Zone
- Maerl recovery areas
- Proposed no bottom-towed fishing zones (Marine Scotland)
- Suggested additional no bottom-towed fishing zones (LINK)
- Land
- Ocean

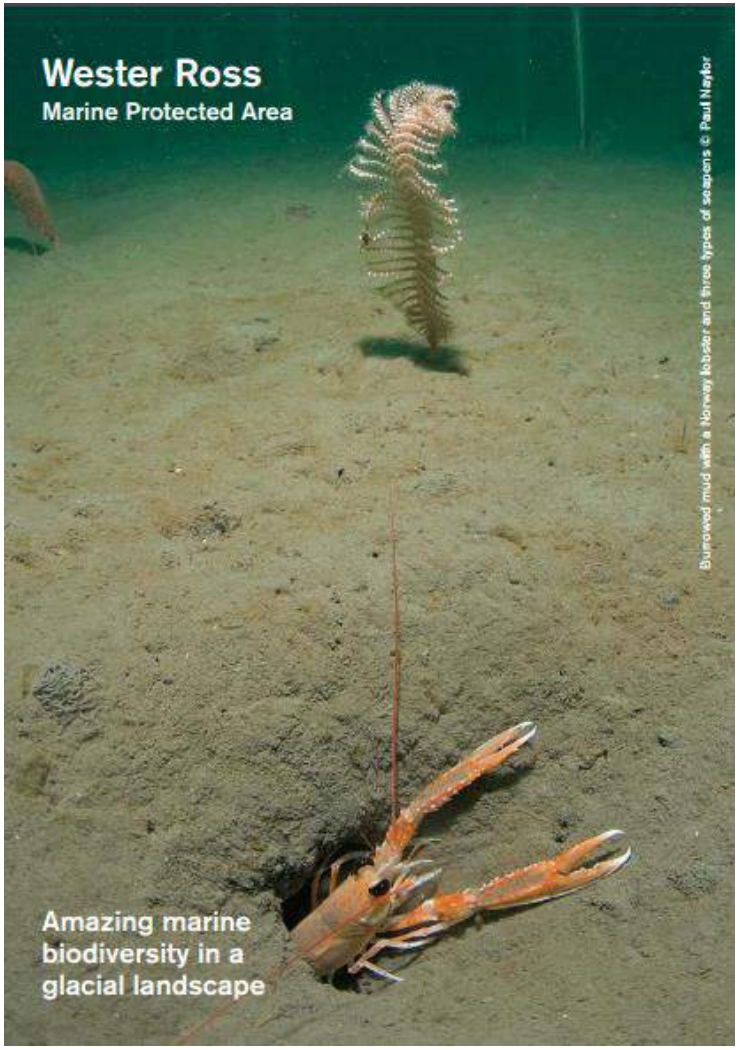
Scottish Environment LINK

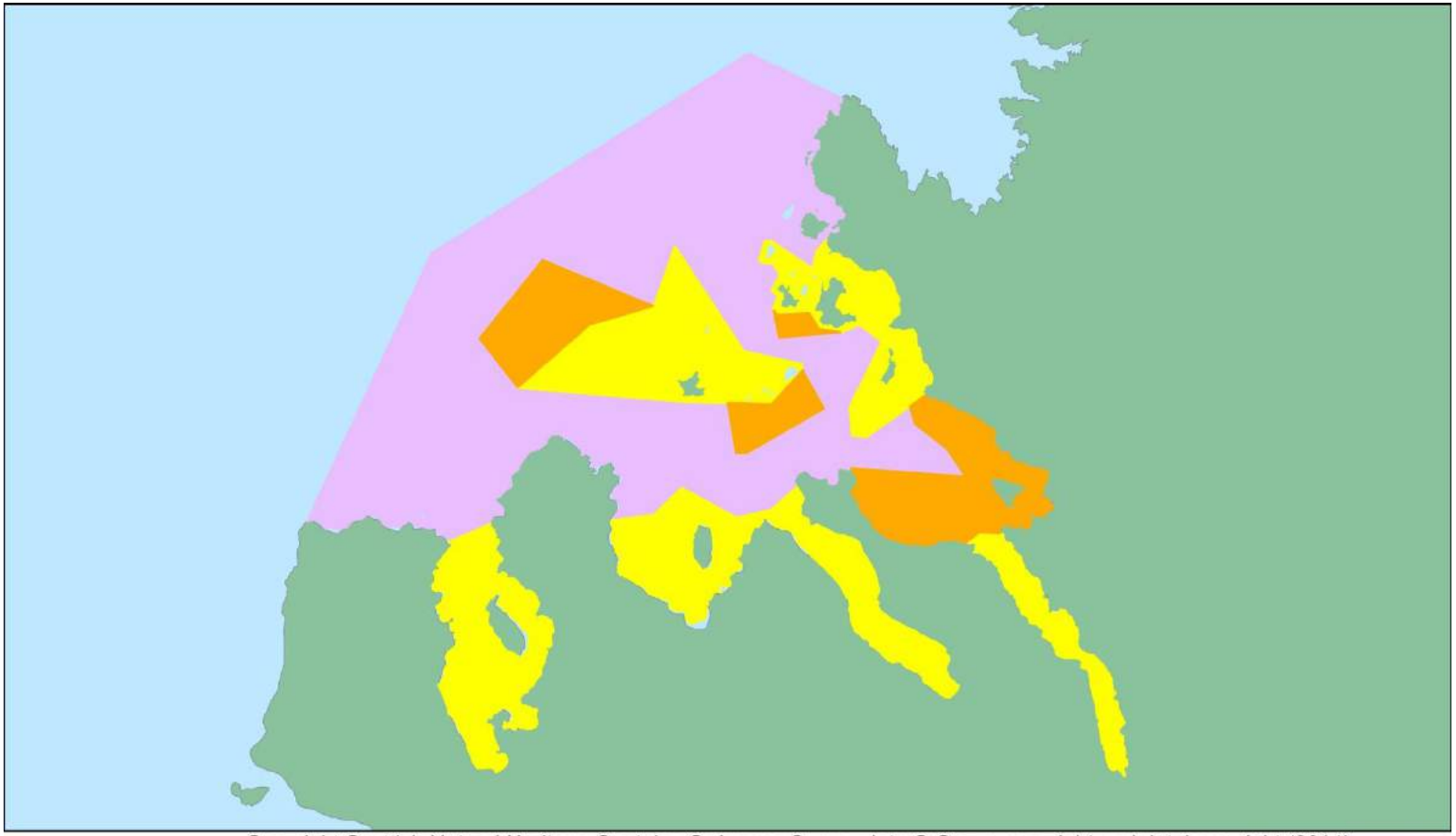
# Wester Ross MPA



**Wester Ross pMPA**
**Showing VMS data from 2007 to 2013**

Land
MPA Boundary
Trawls
Static





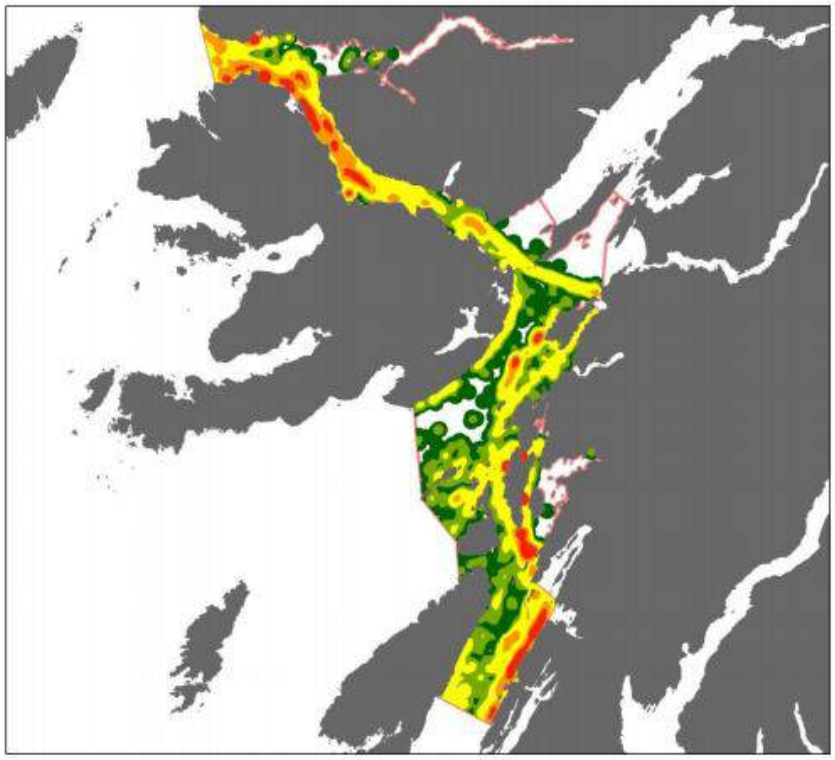


**Legend**

- NCMPA
- Proposed no bottom-towed fishing zone (Marine Scotland)
- Suggested additional no bottom-towed fishing zones (LINK)
- Land
- Ocean

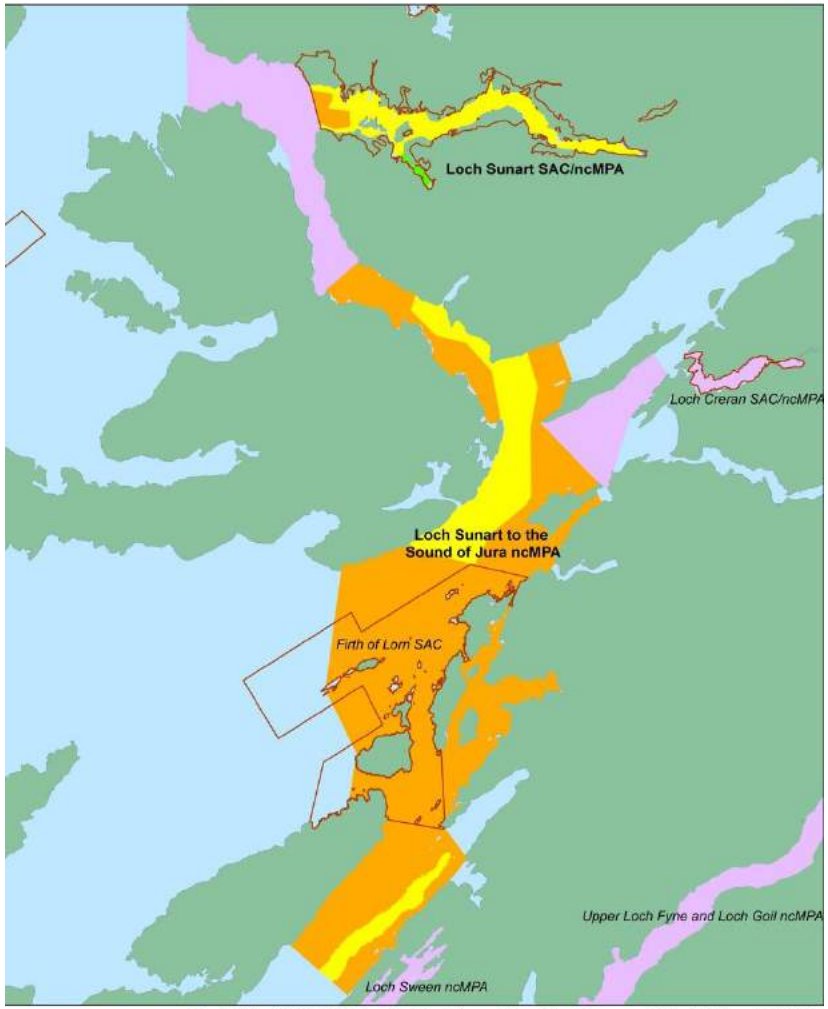
Scottish Environment LINK

# Loch Sunart to Sound of Jura MPA



Loch Sunart to Sound of Jura MPA Incorporating Loch Sunart MPA and Loch Sunart SAC
Showing scallop dredge VMS density (2007 - 13)

Land
LSJ Boundary
Very low
Low
Medium
High



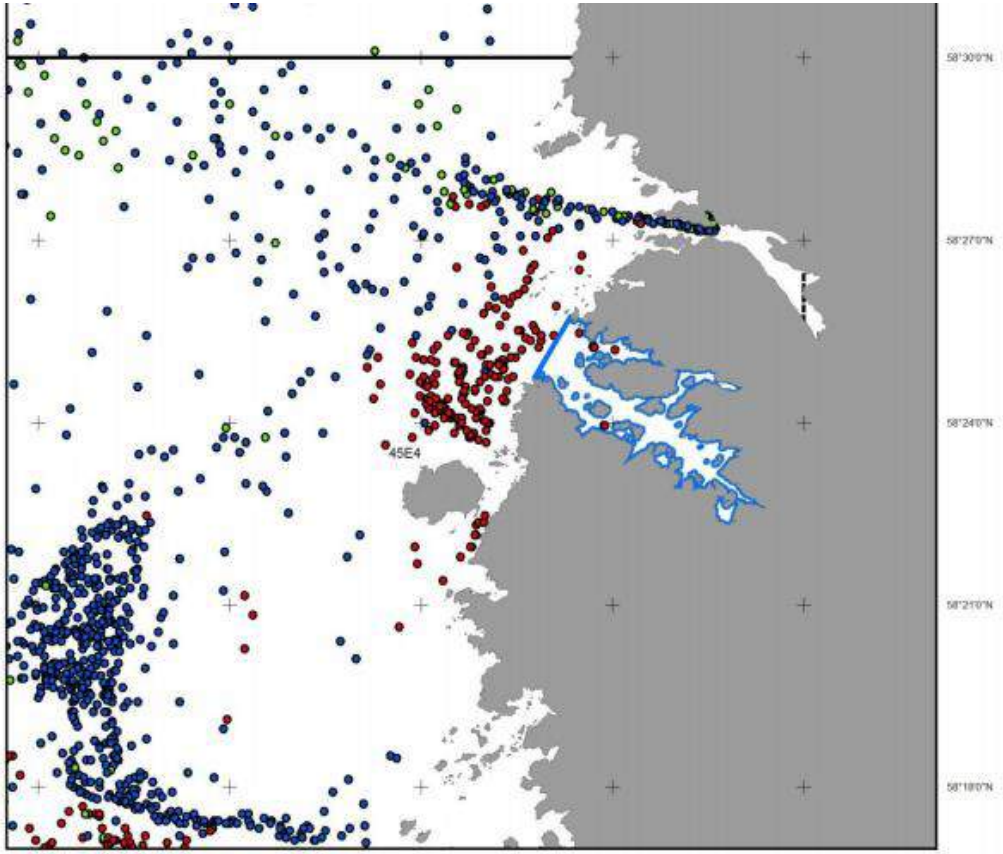



**Legend**

- SAC
- NCMPA
- No Take Zone
- Proposed no bottom-towed fishing zone (Marine Scotland)
- Suggested additional no bottom-towed fishing zones (LINK)
- Land
- Ocean

Scottish Environment LINK

# Less dense areas




**Loch Laxford SAC**
**Showing VMS data from 2010 to 2013**

Land
SAC boundary
ICES rectangle
Trawls
Dredge
Static

# Save Scottish Seas




## Don't Take the P out of MPAs -> take action here

Share:


Thanks for showing interest in the campaign. Our online action has just closed (11.59pm, 2nd February

### News

**Dedicated Arran conservationist wins global award… and backs real MPAs**

# An Ecosystem approach

"the site's overall conservation objectives will **extend beyond an isolated consideration of the Annex I habitats** and Annex II species (or relevant bird species) contained within the site and **take account of the wider ecological context of the site as a whole in terms of its effects on the designated features**"

http://www.clientearth.org/reports/natura-2000-site-integrity-briefing.pdf

**83 Duties of public authorities in relation to certain decisions**

(1) This section applies where—

(a) a public authority has the function of determining an application (whenever made) for authorisation of the doing of any act, and

(b) the act is capable of affecting (other than insignificantly)—

(i) a protected feature in a Nature Conservation MPA,

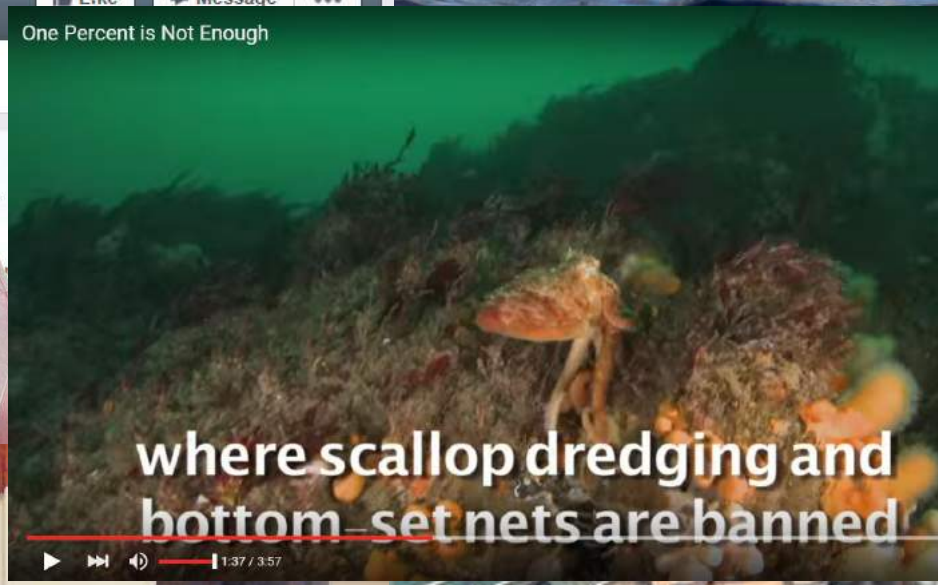
(ii) a stated purpose for a Demonstration and Research MPA,

(iii) a marine historic asset in a Historic MPA,

(iv) any ecological or geomorphological process on which the conservation of any protected feature in a Nature Conservation MPA, or on which the stated purpose for a Demonstration and Research MPA, is (wholly or in part) dependent.


Sea Change Wester Ross
Community
Like
Message
Timeline
About
Photos
Likes
Videos

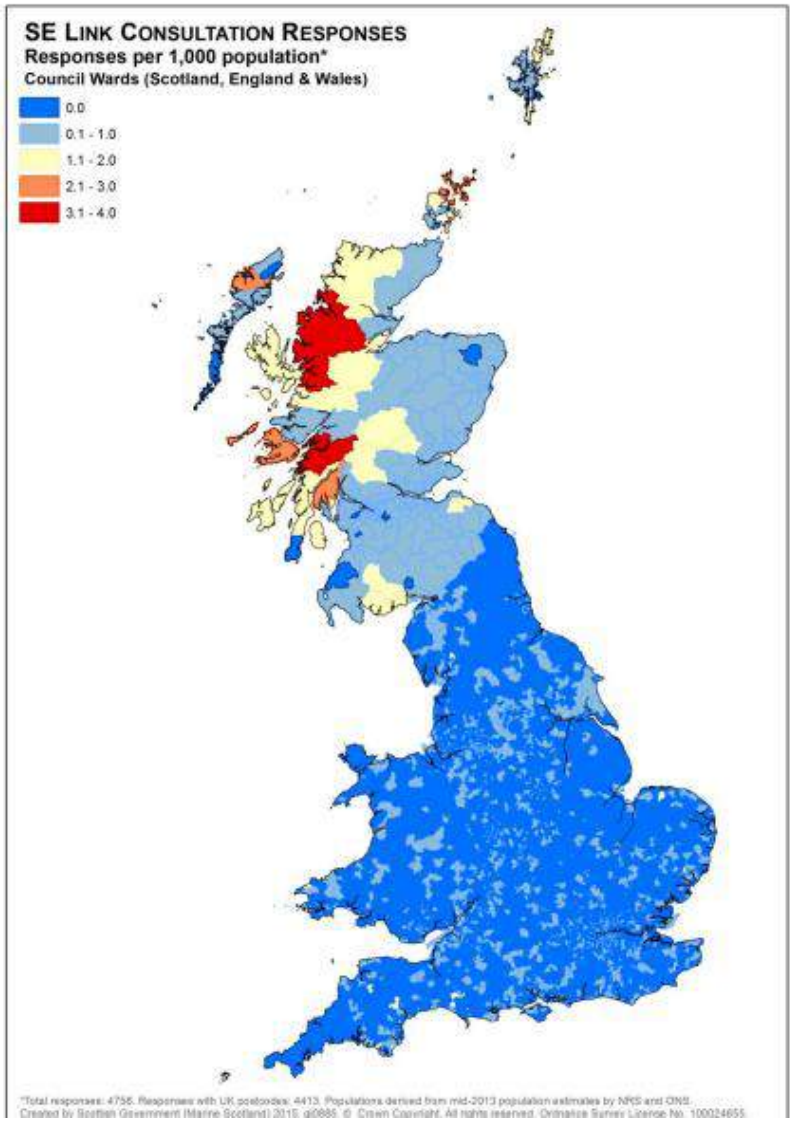

3750
pledges for our seas


One Percent is Not Enough
where scallop dredging and
bottom-set nets are banned
1:37 / 3:57


STOP
DREDGING
GIVE
FISH
A
CHANCE!
DON'T
TAKE THE
'P'
OUT OF
ARRAN'S
MPA
REAL MPAs
NOT
PAPER PARKS!
KEEP THE 'P'
IN ARRAN'S
MPA
Isle of Arran
C.O.A.S.T
NO DREDGING

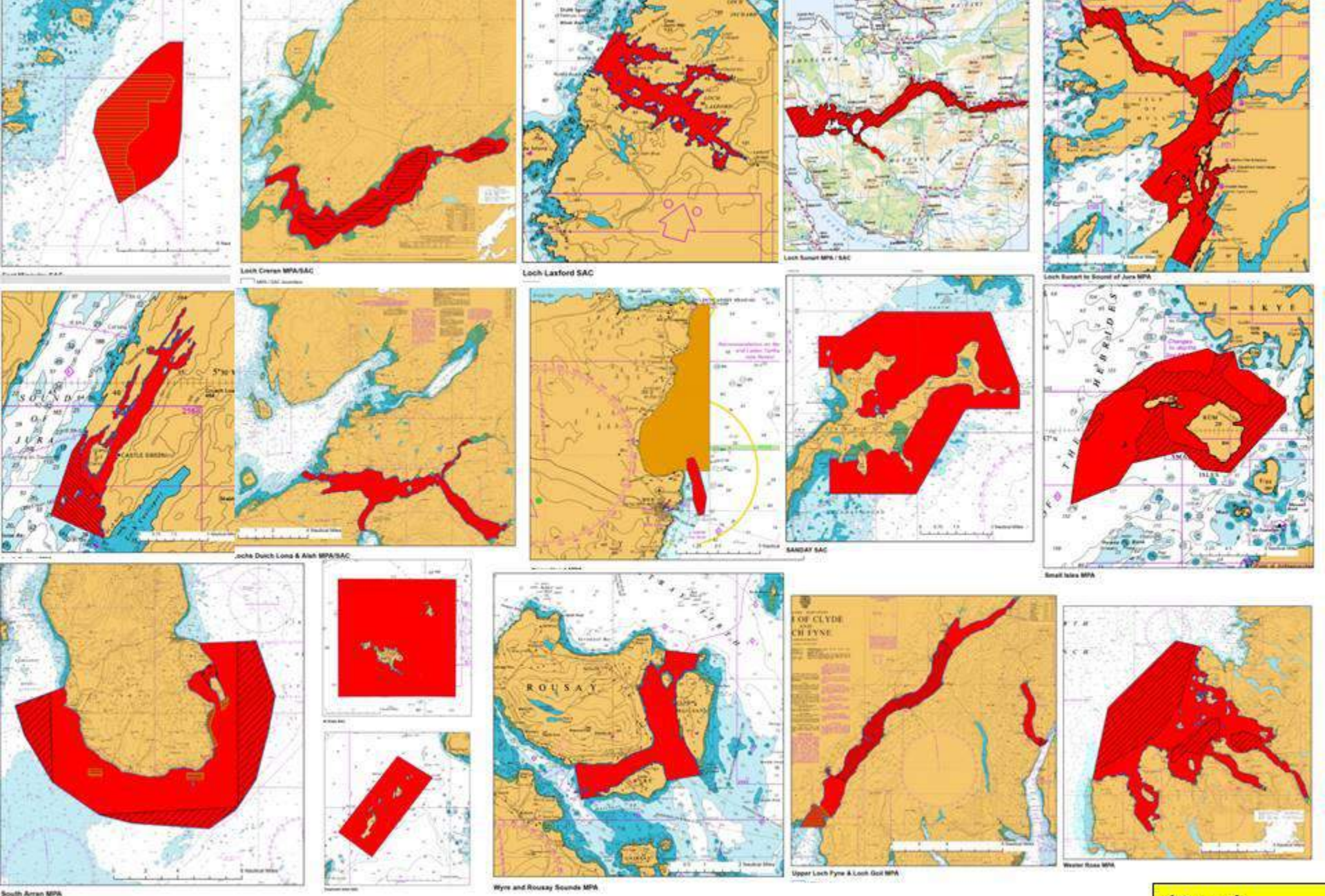

SAVE

Figure A3.1 – Distribution of responses




# 4,758 respondents

- 4,611 individuals
- 43 on behalf of groups


Loch Creran MPA/SAC
Loch Laxford SAC
Loch Sunart MPA / SAC
Loch Sunart to Sound of Jura MPA
Loch Duich Lona & Alsh MPA/SAC
SANDAY SAC
Small Isles MPA
South Arran MPA
ROUSAY
Wyre and Rousay Sounds MPA
Upper Loch Fyne & Loch Goil MPA
Wester Ross MPA
No dredging or trawling
Mobile derogations*
Creeling derogations*
No dredge, trawl or creel
*Rough guide: maps vary a little

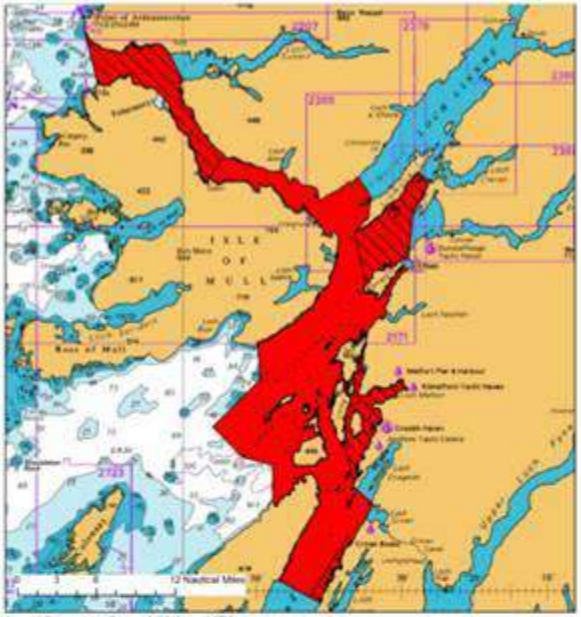
# Inshore MPA / SAC management – Phase 1 proposed measures
# Proportion of sites where activities are to be prohibited

| Site | Site Area | protected from beam trawling and suction dredging | % protected from beam trawling and suction dredging | Protected from mechanical dredging | % Protected from mechanical dredging | Protected from demersal trawling | % Protected from demersal trawling | Protected from set nets | % Protected from set nets | Protected from long lines | % Protected from long lines | Protected from creels | % Protected from creels | Protected from hand gathering | % Protected from hand gathering |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East Mingulay SAC | 114.89 | 114.89 | 100 | 114.89 | 100 | 114.89 | 100 | 57.72 | 50 | 57.72 | 50 | 57.72 | 50 | 0 | 0 |
| Loch Creran MPA / SAC | 12.26 | 12.26 | 100 | 12.26 | 100 | 12.26 | 100 | 12.26 | 100 | 12.26 | 100 | 7.77 | 63 | 0 | 0 |
| Loch Laxford SAC | 12.21 | 12.21 | 100 | 12.21 | 100 | 12.21 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Loch Sunart MPA / SAC | 48.8 | 48.8 | 100 | 48.8 | 100 | 48.8 | 100 | 48.8 | 100 | 48.8 | 100 | 1 | 2 | 0 | 0 |
| Loch Sunart to Sound of Jura MPA[1] | 770.18 | 770.18 | 100 | 549 | 71 | 549 | 71 | 770.18 | 100 | 770.18 | 100 | 0 | 0 | 0 | 0 |
| Loch Sween MPA | 40.65 | 40.65 | 100 | 24.13 | 59 | 24.13 | 59 | 0 | 0 | 0 | 0 | 0 | 0 | 24.13 | 59 |
| Lochs Duich Long and Alsh MPA / SAC | 40.93 | 40.93 | 100 | 40.93 | 100 | 40.93 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Noss Head MPA | 7.54 | 7.54 | 100 | 7.54 | 100 | 7.54 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sanday SAC | 109.8 | 109.8 | 100 | 109.8 | 100 | 109.8 | 100 | 109.8 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Small Isles MPA | 803.25 | 803.25 | 100 | 456.74 | 57 | 456.74 | 57 | 803.25 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| South Arran MPA | 279.87 | 279.87 | 100 | 279.87 | 100 | 177.72 | 64 | 7.35 | 3 | 7.35 | 3 | 7.35 | 3 | 2.66 | 1 |
| St Kilda SAC | 245.35 | 245.35 | 100 | 245.35 | 100 | 245.35 | 100 | 245.35 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Treshnish Isles SAC | 18.55 | 18.55 | 100 | 18.55 | 100 | 18.55 | 100 | 18.55 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Upper Loch Fyne and Loch Goil MPA | 87.65 | 87.65 | 100 | 87.65 | 100 | 43.1 | 49 | 7.11 | 8 | 7.11 | 8 | 7.11 | 8 | 0 | 0 |
| Wester Ross MPA | 599.19 | 599.19 | 100 | 599.19 | 100 | 360.41 | 60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wyre and Rousay Sounds MPA | 16.2 | 16.2 | 100 | 16.2 | 100 | 16.2 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTALS** | **3207.32** | **3207.32** | **100** | **2623.11** | **82** | **2237.63** | **70** | **2080.37** | **65** | **903.42** | **28** | **80.95** | **3** | **26.79** | **1** |
| | | | | | | | | | | | | | | | |
| % of Scottish Territorial Waters | 3.5 | 3.5 | | 2.9 | | 2.5 | | 2.3 | | 1 | | 0.1 | | 0.03 | |
| % of Scottish EEZ | 0.7 | 0.7 | | 0.6 | | 0.5 | | 0.5 | | 0.2 | | 0.02 | | 0.01 | |
| % of Scottish WFD area | 6.6 | 6.6 | | 5.4 | | 4.6 | | 4.3 | | 1.9 | | 0.17 | | 0.05 | |

All areas are in square kilometres
All % are rounder to the nearest whole number
[1] Includes the Firth of Lorn SAC but excludes the Loch Sunart MPA / SAC.

| | |
|---|---|
| Estimated area of Territorial waters | 90,404 |
| Estimated area of Scottish EEZ | 462,263 |
| Estimated area of WFD waters | 48,710 |

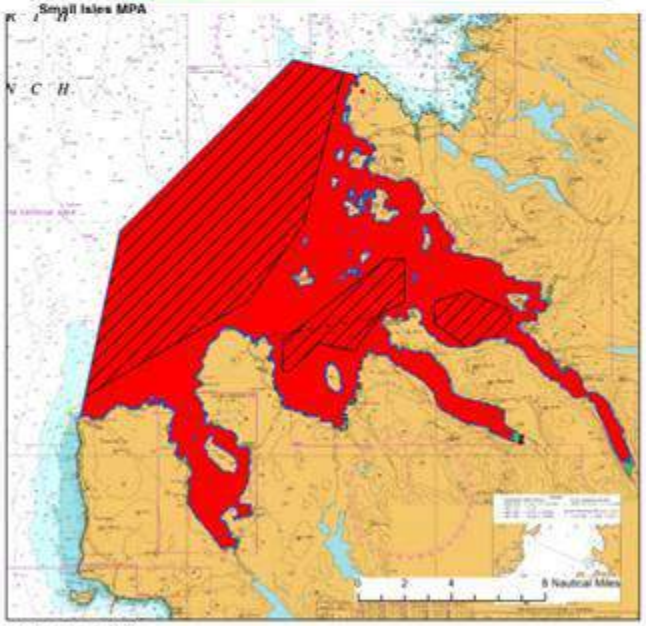
Scottish Territorial Waters - This is measured from shore to 12nm beyond baselines




Loch Sunart to Sound of Jura MPA
incorporating Firth of Lorn SAC but excluding Loch Sunart MPA / SAC


Small Isles MPA

South Arran MPA



Wester Ross MPA

No dredging or trawling

LSSoJ/SI – some trawl/dredge
SA/WR – some trawling

No dredge, trawl or creel

# An Ecosystem approach

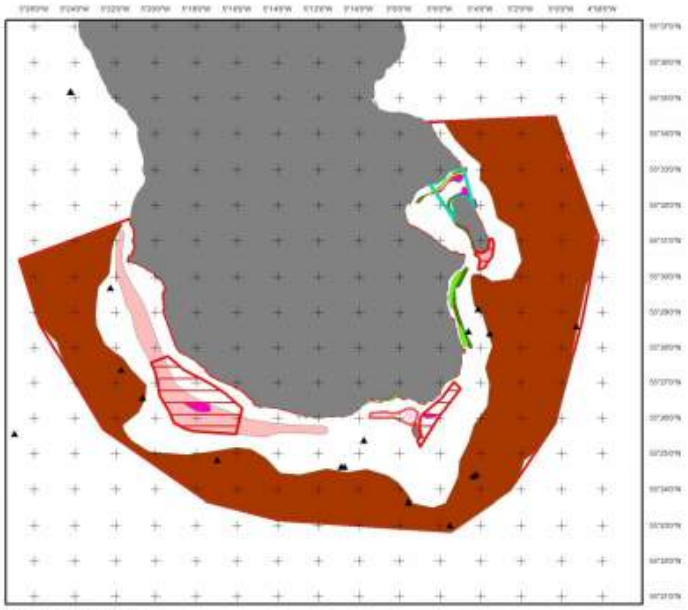



**Figure L2: General measures and maerl recovery areas**

**Table A17.5 – Priority Marine Feature Added Value Assessment[46] - Protected from suction dredge, mechanical dredge, and beam trawls**

| Other PMFs | Feature Records | | Records Included | % Included |
|---|---|---|---|---|
| Burrowed mud or Inshore deep mud with burrowing heart urchins | Count | 4 | 4 | 100% |
| Fan mussel | Count | 1 | 1 | 100% |
| Kelp beds | Count | 8 | 8 | 100% |
| Native oysters | Count | 1 | 1 | 100% |

**Table A17.6 – Priority Marine Feature Added Value Assessment[45] - Protected from demersal trawls**

| Other PMFs | Feature Records | | Records Included | % Included |
|---|---|---|---|---|
| Burrowed mud or Inshore deep mud with burrowing heart urchins | Count | 4 | 1 | 100% |
| Fan mussel | Count | 1 | 1 | 100% |
| Kelp beds | Count | 8 | 8 | 100% |
| Native oysters | Count | 1 | 1 | 100% |

**Table A17.7 – Other Marine Habitat Added Value Assessment[46] - Protected from suction dredge, mechanical dredge, and beam trawls**

| Other Habitats | Feature Records | | Records Included | % Included |
|---|---|---|---|---|
| Rocky reef communities | Count | 31 | 31 | 100% |
| Sandbank communities | Count | 54 | 54 | 100% |
| Infralittoral mixed sediment communities | Count | 16 | 16 | 100% |
| Circalittoral sandy mud communities | Count | 39 | 39 | 100% |
| Infralittoral fine mud communities | Count | 1 | 1 | 100% |
| Infralittoral sandy mud communities | Count | 1 | 1 | 100% |
| Circalittoral mixed sediment communities | Count | 66 | 66 | 100% |
| Infralittoral mixed sediment communities | Count | 16 | 16 | 100% |

[45] Using Geodatabase for Marine Habitats and Species in Scotland (GeMS i15)

# Valuing the benefits: MPAs and wellbeing

**£6.3-£10 billion/20 yrs**


**Divers/anglers**

25 Scottish pMPAs **~£67–117m/yr**

One-off non-use value **£125–255m**

# Valuing the benefits of MPAs

*Table 3: Costs and Benefits of MPAs in Scotland*

| **Costs** | **Lower £m** | **Upper £m** |
|---|---|---|
| Commercial Fishing (Mobiles) | £1.78 | £49.62 |
| Energy | £0.11 | £2.84 |
| Oil and Gas | £1.20 | £33.83 |
| Other | £0.80 | £1.80 |
| **Total Costs** | **£3.89** | **£88.09** |
| **Benefits** | | |
| Commercial Fishing (Statics) | Not Estimated | |
| Sea Angling | Not Estimated | |
| Other Direct and Indirect Users (Sub-Aqua, Water Sports, Wildlife Watching) | Not Estimated | |
| Non User | £239 | £583 |
| **Total Benefits** | **>£239** | **>£583** |

**http://www.scottish.parliament.uk/S4_RuralAffairsClimateChangeandEnvironmentCommittee/20151023_Scot_Env_LINK_letter_on_MPAs.pdf**

## Why we supported June announcement

- **Holistic** ecosystem approach
- **Simple** management boundaries
- Proportionate **precaution**
- Already some **compromises** (e.g. Upper Loch Fyne, South Arran, Loch Sween)

# 11th June 2015


"The impact in the vast majority of cases will mean modest changes to fishing patterns with very limited economic impact given the ability of vessels to fish elsewhere.

**The people of Scotland want our precious marine environment safeguarded** and I welcome the views of everyone who responded to the consultation."

**Richard Lochhead, Environment Secretary**

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5 July 2015 by Keith

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Fishing chief Bert

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By David Miller
BBC Scotland environm

6 August 2015 Scotla

The Marine Protected A

Fishermen's leader

https://www.h

Thi

## Fishing I Areas co

Written by Liam Kirka

Claims that MPAs w majority of industry

Claims that Marine P

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# Dredging banned in Wester Ross Marine Protected Area

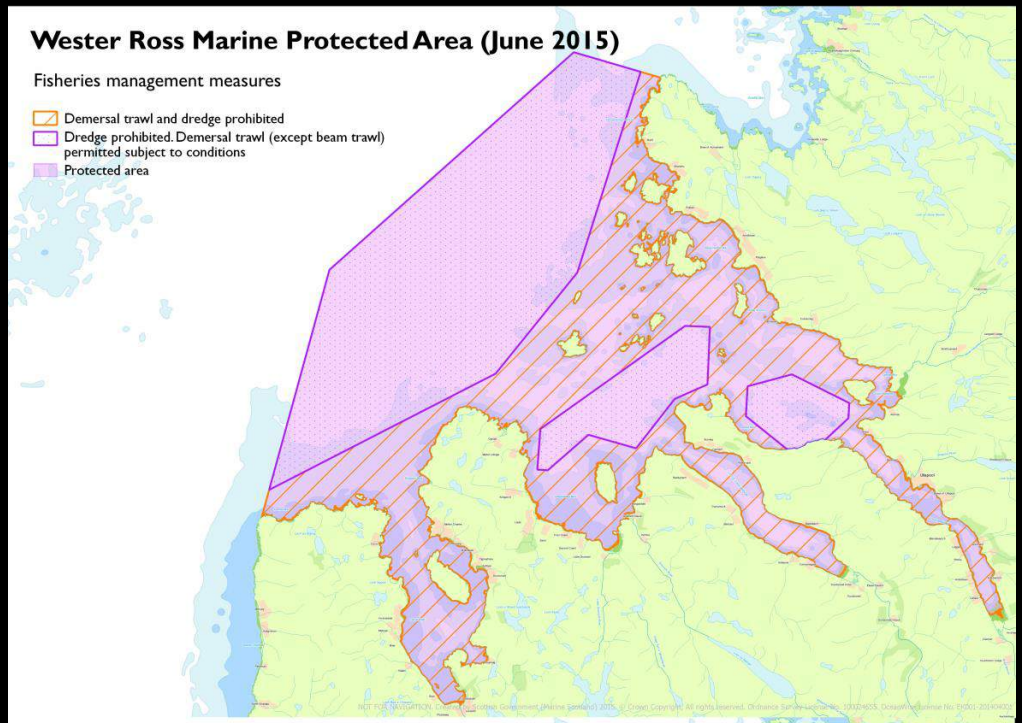
18 August 2015 Highlands & Islands

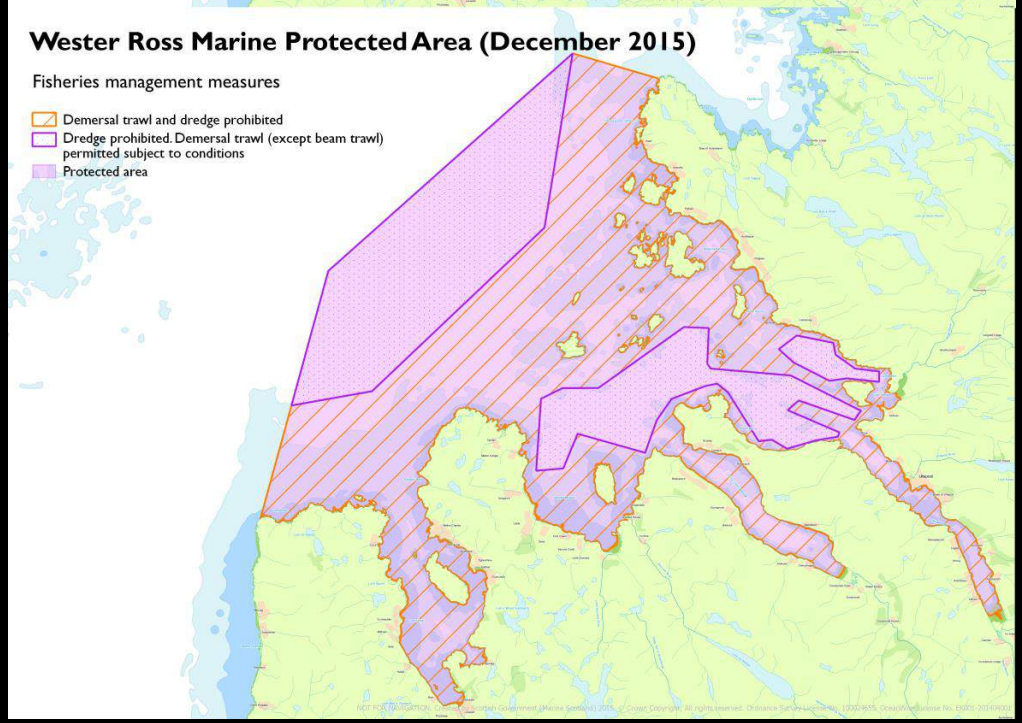
A sea cucumber on a maerl bed

**All forms of dredging has been banned in an area of seabed off the west Highlands coast.**

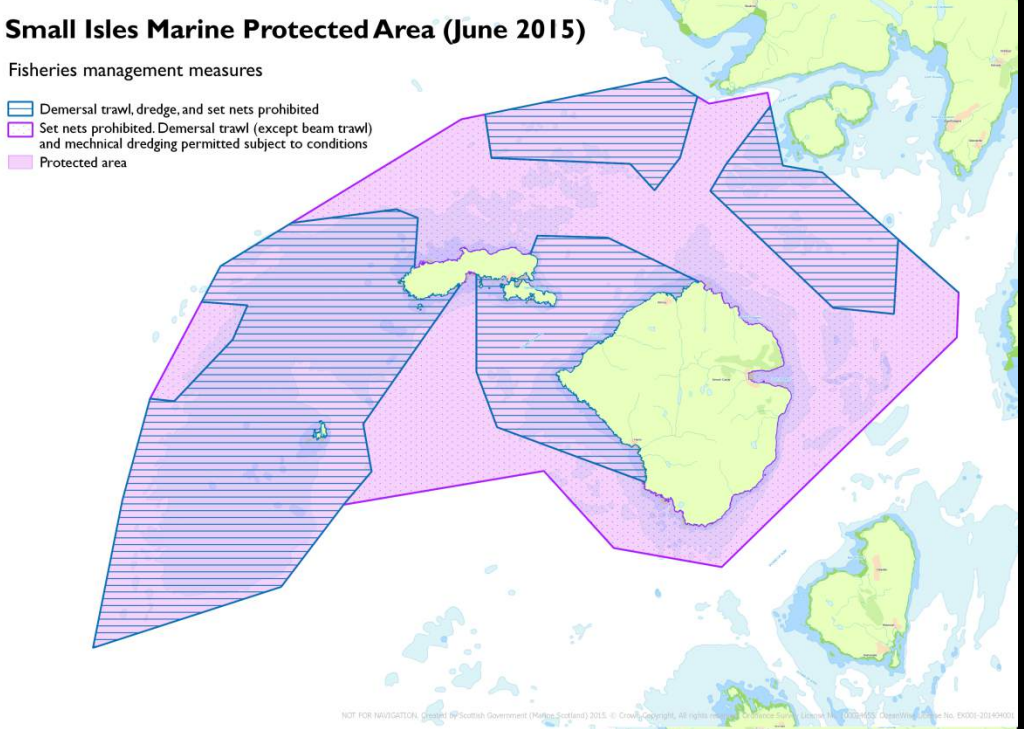
The Scottish government introduced an urgent marine conservation order to cover

- Scotland's seas in context
- What MPAs are for
- Why we supported June 2015 proposals
- **Remaining concerns post Dec 2015**
- Thoughts and next Steps

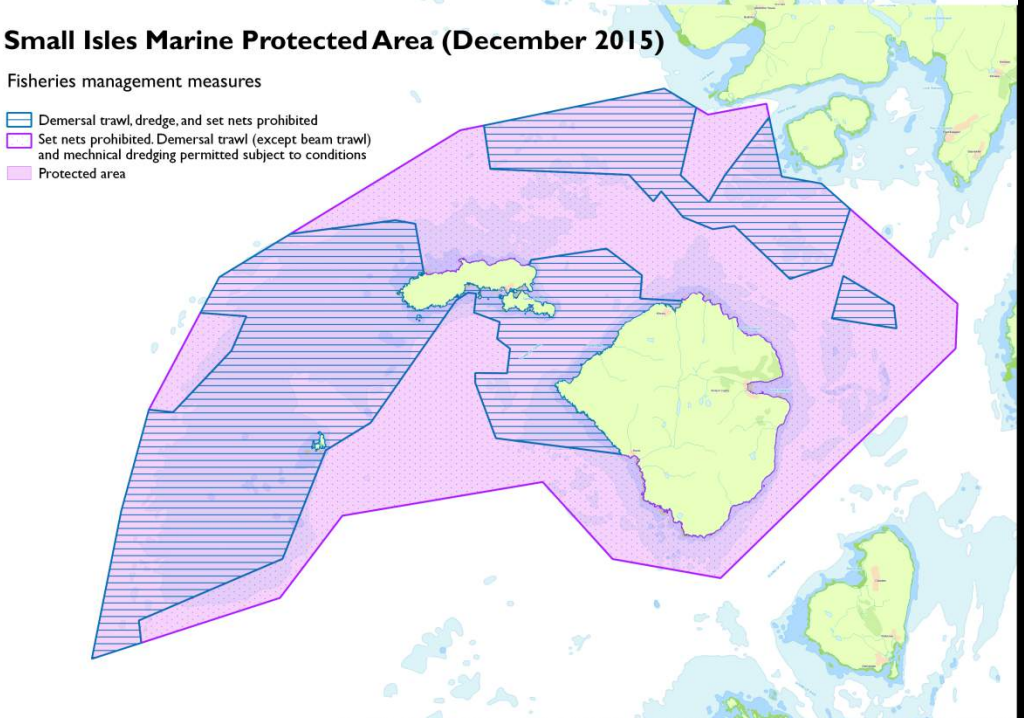

Wester Ross Marine Protected Area (June 2015)
Fisheries management measures
Demersal trawl and dredge prohibited
Dredge prohibited. Demersal trawl (except beam trawl) permitted subject to conditions
Protected area

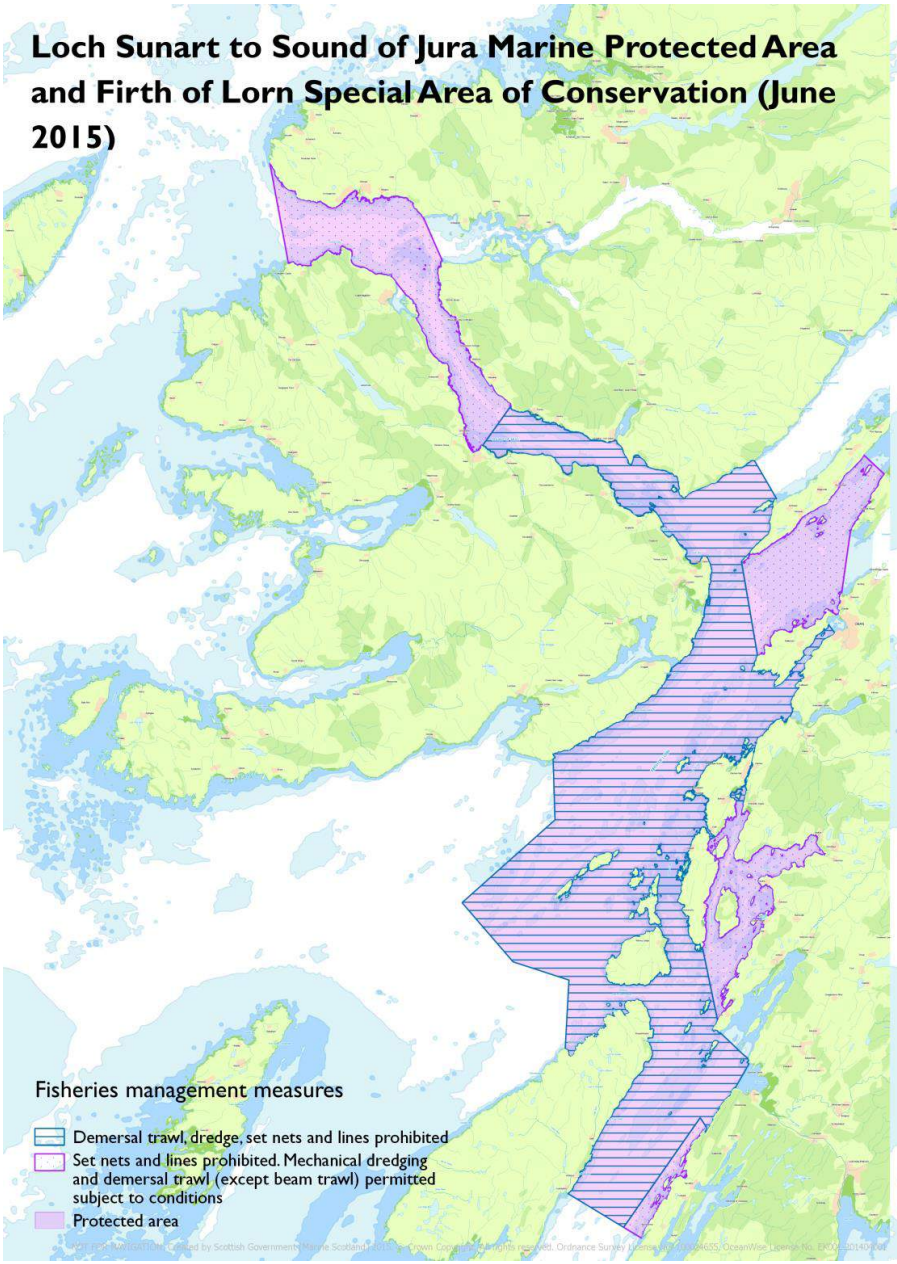

Wester Ross Marine Protected Area (December 2015)
Fisheries management measures
Demersal trawl and dredge prohibited
Dredge prohibited. Demersal trawl (except beam trawl) permitted subject to conditions
Protected area

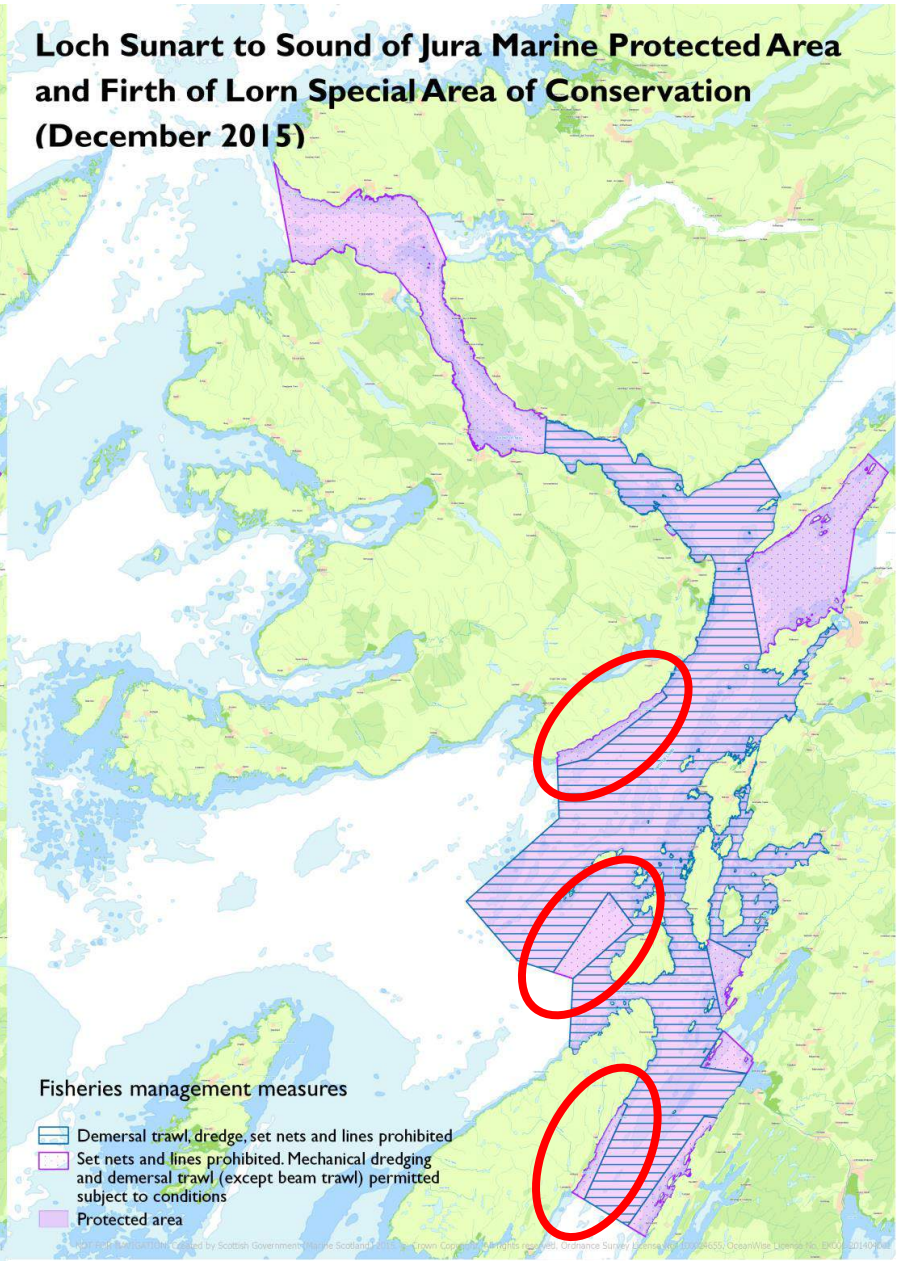
## Small Isles Marine Protected Area (June 2015)




## Small Isles Marine Protected Area (December 2015)



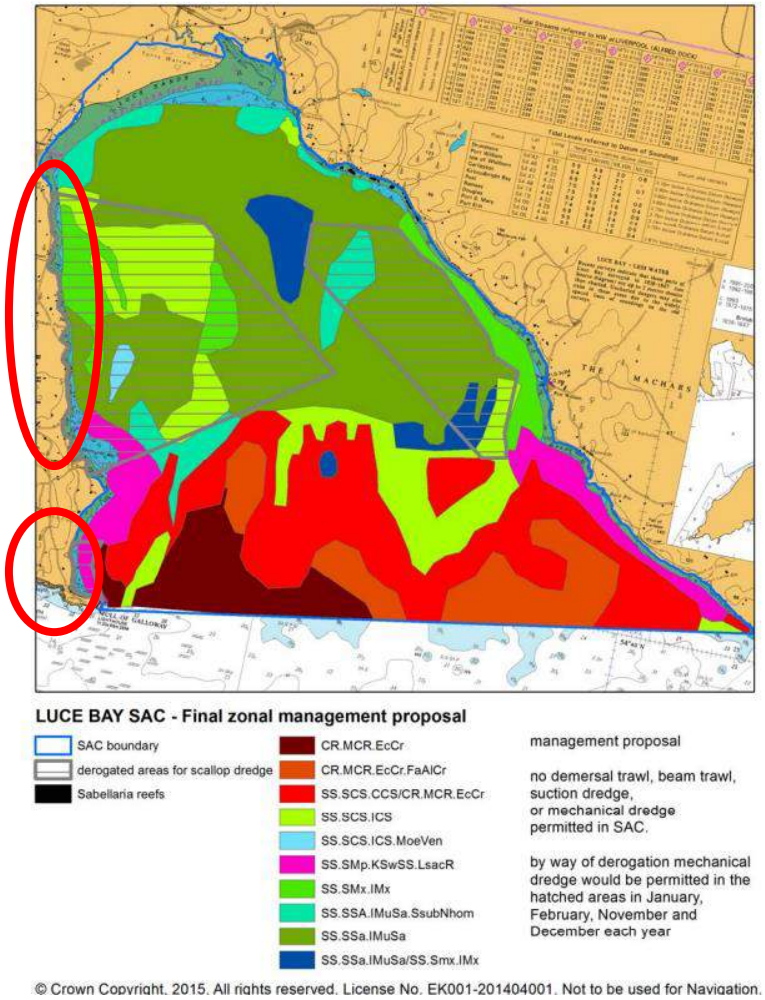


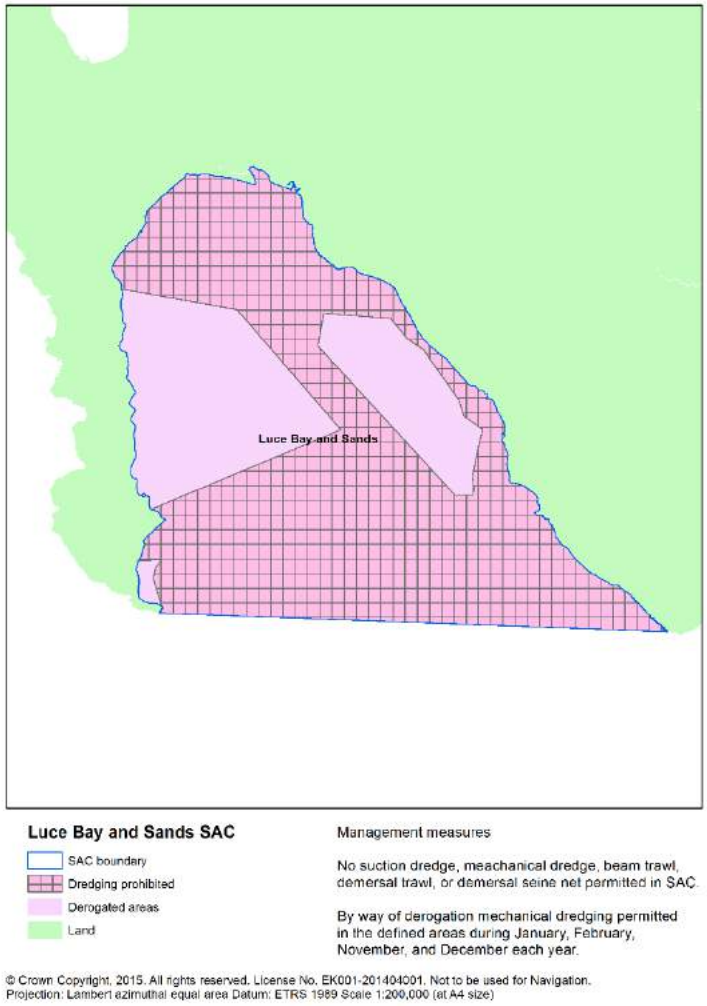




# 6-205m depth

Neat, F., Pinto, C., Burrett, I., Cowie, L., Travis, J., Thorburn, J., ... & Wright, P. J. (2014). Site fidelity, survival and conservation options for the threatened flapper skate (Dipturus cf. intermedia). Aquatic Conservation: Marine and Freshwater Ecosystems.

**Appendix E**



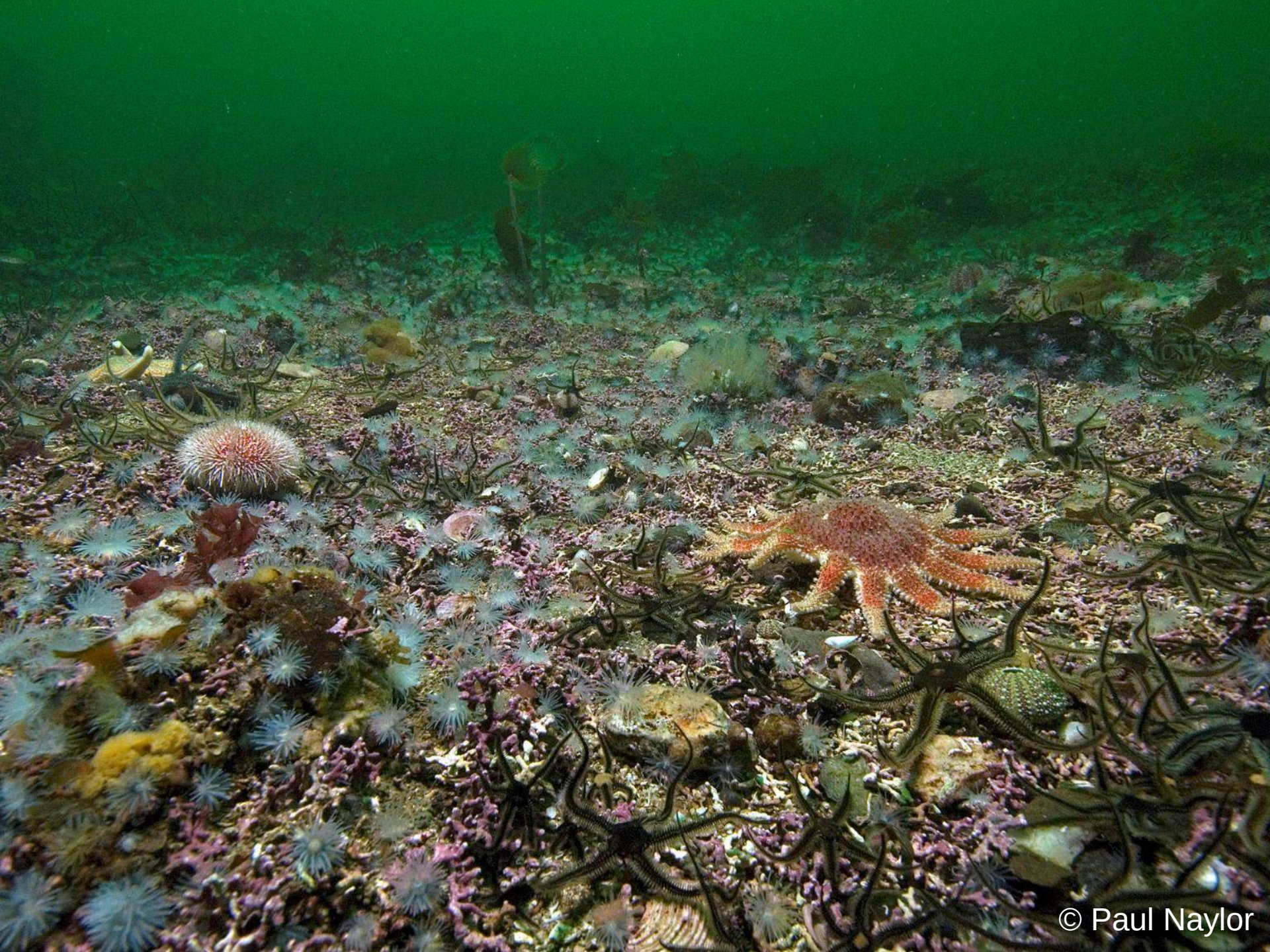




*Moerella* spp. with venerid bivalves in infralittoral gravelly sand
*Laminaria saccharina* and red seaweeds on infralittoral sediments
Reef?

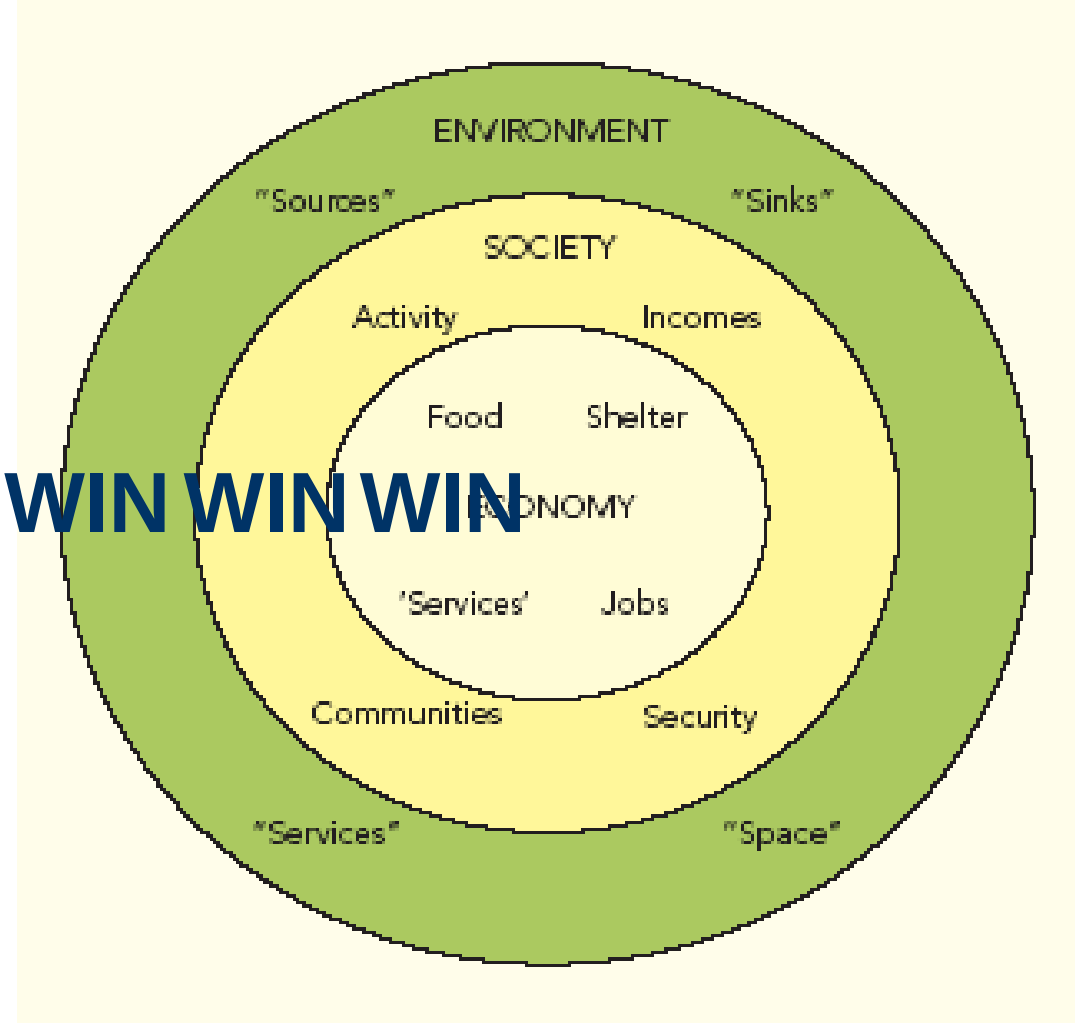
# Next steps

- **Environment Committee** consider annulments
- Spatial management for **Inshore no.2** and **Offshore MPAs**
- MPA community **co-management** (e.g. Sound of Barra & South Arran)
- Indirect and Non-Use **Benefits** of MPAs
- Spatial management of fisheries outside MPAs
  - **Priority Marine Feature** Protection
  - Gear conflict
  - value creation (cf. Shetland)
- Contribution to **MSFD**?
- **'Sea Scotland'** 15-16 June 2016, Dundee


© Paul Kay


© Paul Naylor

# Healthy seas benefit all




**WIN WIN WIN**

Life support
Intrinsic value

Environmental services

Employment
Revenue


…Planet Earth is blue and there's
[something we must] do…