

# Mapping recreational pressures in Marine Protected Areas on the North East Coast

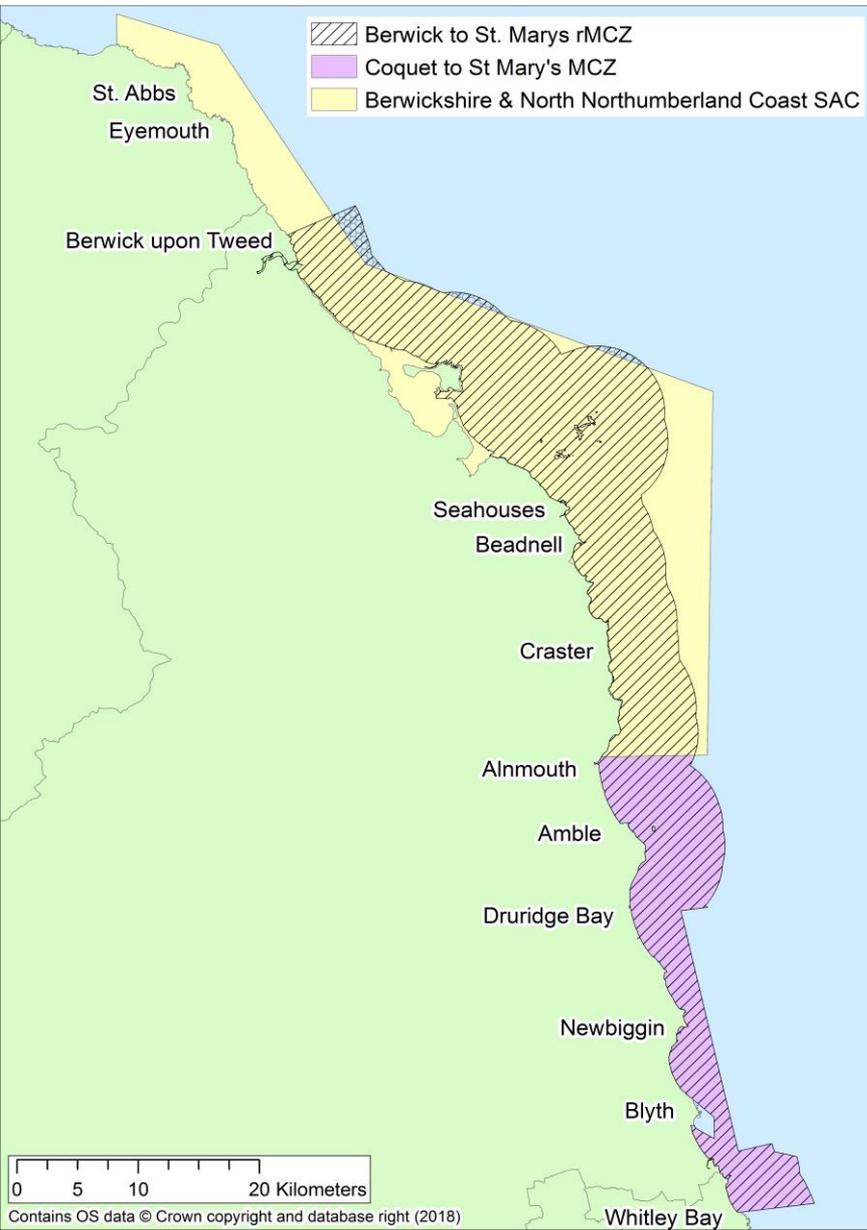


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# Introduction



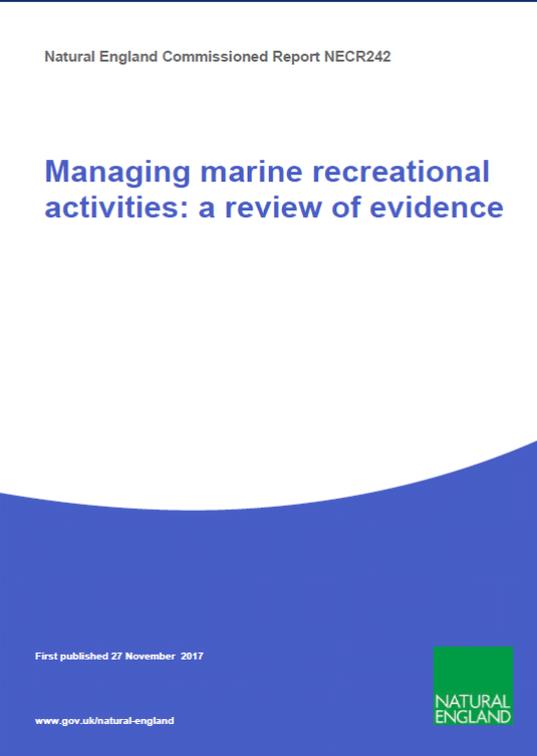
- Recreational activities on the north east coast are largely unregulated and are increasing in duration and intensity.
- Growing need to monitor and possibly manage recreational activities in MPAs.
- Collaborative research by Natural England and Newcastle University to understand:
  - distribution and intensity of recreational activities
  - potential impact on MPA features.
- Study area: Fast Castle Head to St. Mary's Island
- April 2018 to March 2019

# National Context



MMO and Natural England commissioned research into the impact of recreational activities on MPA features and into options for management (2017).

Produced report, management toolkit and evidence information notes.



|                                    |
|------------------------------------|
| MPA Management and Roles           |
| Types of Management Options        |
| Inventory of Options               |
| Case Studies of Management Options |
| Previous case study examples       |
| National Body Resources            |

|  |
|--|
| This tab contains an overview of the legislation which underpins management of marine recreational activities in MPAs and the roles and responsibilities of different authorities involved in management of these activities in MPAs   |
| This tab provides an overview of the types of measures which can be applied to manage marine recreational activities within MPAs   |
| This tab contains site or activity specific examples of management measures being used in the UK. The inventory <u>does not</u> provide a comprehensive list of all management measures currently applied in the UK, but reflects the examples provided by stakeholders during the study. The information shows the type of measure, a description of the measure and the information can be searched by the type of measure being applied within MPAs, or other stakeholders regarding how successful the measures are and the impacts and mitigating impacts |
| For case study examples  |
| Personal Governing Body (or other body exists) and the members to  |

Natural England Evidence Information Note EIN036

### Marine recreation evidence briefing: diving and snorkelling

This briefing note provides evidence of the impacts and potential management options for marine and coastal recreational activities in Marine Protected Areas (MPAs). This note is an output from a study commissioned by Natural England and the Marine Management Organisation to collate and update the evidence base on the significance of impacts from recreational activities. The significance of any impact on the Conservation Objectives for an MPA will depend on a range of site specific factors. This note is intended to provide an overview of the evidence base and is complementary to Natural England's

**Diving and snorkelling**  
Definition  
Swimming either underwater or on the surface using a Scuba or snorkelling Apparatus (Scuba) or snorkelling equipment.

**Distribution of activity**  
Scuba diving and snorkelling are most common in coastal areas, particularly in the south west of England.

In general, there are dive sites along the coast that have rocky reefs, wrecks and wildlife.

**Levels of activity**  
As highlighted above, diving and snorkelling are most common in coastal areas, particularly in the south west of England. In 2012, the Professional Association of Diving Instructors (PADI) certified about 200,000 PADI certified divers from certification numbers, data on diving after certification) (Suzanne)

Natural England Evidence Information Note EIN030

### Marine recreation evidence briefing: wildlife watching

This briefing note provides evidence of the impacts and potential management options for marine and coastal recreational activities in Marine Protected Areas (MPAs). This note is an output from a study commissioned by Natural England and the Marine Management Organisation to collate and update the evidence base on the significance of impacts from recreational activities. The significance of any impact on the Conservation Objectives for an MPA will depend on a range of site specific factors. This note is intended to provide an overview of the evidence base and is complementary to Natural England's

**Wildlife watching**  
Definition

Natural England Evidence Information Note EIN029

### Marine recreation evidence briefing: surfing



This briefing note provides evidence of the impacts and potential management options for marine and coastal recreational activities in Marine Protected Areas (MPAs). This note is an output from a study commissioned by Natural England and the Marine Management Organisation to collate and update the evidence base on the significance of impacts from recreational activities. The significance of any impact on the Conservation Objectives for an MPA will depend on a range of site specific factors. This note is intended to provide an overview of the evidence base and is complementary to Natural England's

Available to download from:  
<http://publications.naturalengland.org.uk/category/4891006631149568>

# National Context



Natural England's **Designated Sites System** provides Advice on Operations, showing:

- What pressures are caused by a particular activity
- Whether the site's features are sensitive to those pressures

Viewing Advice on Operations for: Non-motorised water craft (e.g. kayaks, windsurfing, dinghies)

**Example:**  
Non-motorised watercraft



| Pressure Name  | Annex I habitat |                            |                            |                |                                |                          |                          |                          |               |                            | Annex II species           |                |                                |               |              |             |              |
|--|-----------------|----------------------------|----------------------------|----------------|--------------------------------|--------------------------|--------------------------|--------------------------|---------------|----------------------------|----------------------------|----------------|--------------------------------|---------------|--------------|-------------|--------------|
|  | Estuaries       |                            |                            |                |                                | Mud flats and sand flats |                          |                          |               |                            | River lamprey              | Sea lamprey    |                                |               |              |             |              |
|  | Intertidal rock | Intertidal coarse sediment | Intertidal mixed sediments | Intertidal mud | Intertidal sand and muddy sand | Infra-littoral rock      | Subtidal coarse sediment | Subtidal mixed sediments | Subtidal sand | Intertidal coarse sediment | Intertidal mixed sediments | Intertidal mud | Intertidal sand and muddy sand | River lamprey | Water column | Sea lamprey | Water column |
| <a href="#">Abrasion/disturbance of the substrate on the surface of the seabed</a>                                   | S               | NS                         | S                          | S              | S                              |                          |                          |                          |               | NS                         | S                          | S              | S                              |               |              |             |              |
| <a href="#">Introduction or spread of invasive non-indigenous species (INIS)</a>                                     | S               |                            | S                          | S              | S                              |                          |                          |                          |               |                            | S                          | S              | S                              |               |              |             |              |
| <a href="#">Litter</a>   | NA              | NA                         | NA                         | NA             | NA                             |                          |                          |                          |               | NA                         | NA                         | NA             | NA                             |               |              |             |              |
| <a href="#">Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion</a> | S               | NS                         | S                          | S              | S                              |                          |                          |                          |               | NS                         | S                          | S              | S                              |               |              |             |              |
| <a href="#">Visual disturbance</a>   |                 |                            |                            |                | NS                             |                          |                          |                          |               |                            |                            |                | NS                             |               |              |             |              |

# National Context



Natural England's **Designated Sites System** provides Advice on Operations, showing:

- What pressures are caused by a particular activity
- Whether the site's features are sensitive to those pressures

Viewing Advice on Operations for: Powerboating or sailing with an engine: launching and recovery, participation

**Example:**  
Powerboating

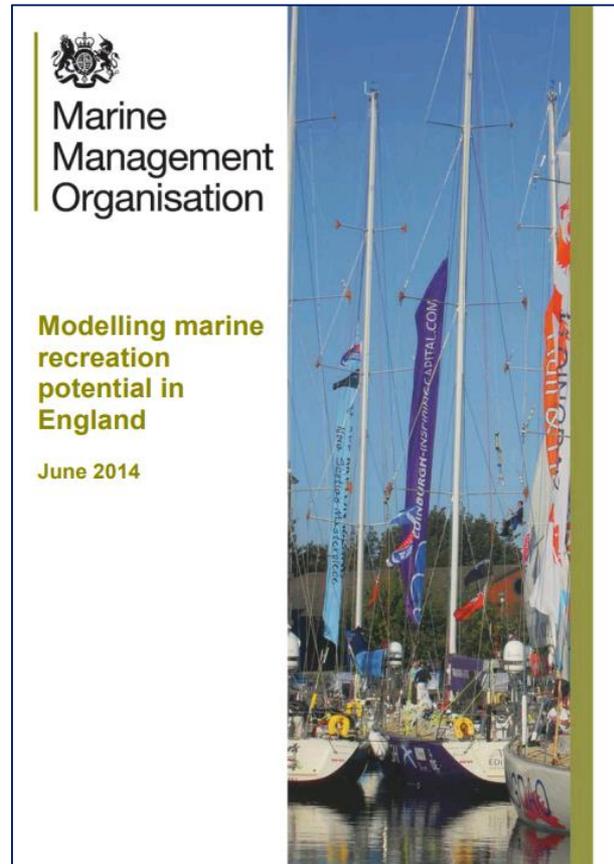
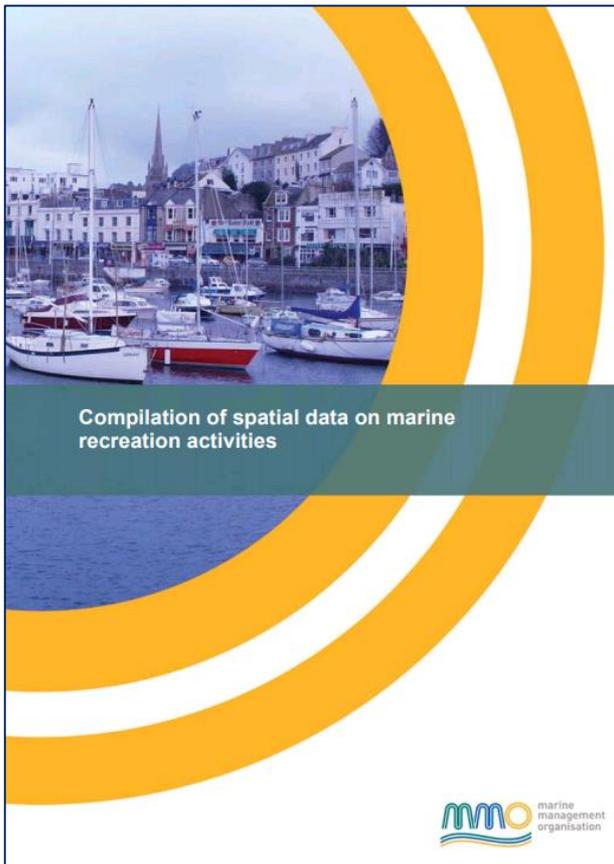


| Pressure Name  | Annex I habitat |                            |                            |                |                                |                    |                          |                          |               |                            |                            | Annex II species |                                |             |         |    |   |
|--|-----------------|----------------------------|----------------------------|----------------|--------------------------------|--------------------|--------------------------|--------------------------|---------------|----------------------------|----------------------------|------------------|--------------------------------|-------------|---------|----|---|
|  | Estuaries       |                            |                            |                |                                |                    |                          |                          |               |                            | Mud flats and sand flats   | River lamprey    |                                | Sea lamprey |         |    |   |
|  | Intertidal rock | Intertidal coarse sediment | Intertidal mixed sediments | Intertidal mud | Intertidal sand and muddy sand | Infralittoral rock | Subtidal coarse sediment | Subtidal mixed sediments | Subtidal sand | Intertidal coarse sediment | Intertidal mixed sediments | Intertidal mud   | Intertidal sand and muddy sand | Sup hab     | Sup hab |    |   |
| <a href="#">Above water noise</a>  |                 |                            |                            |                |                                |                    |                          |                          |               |                            |                            |                  |                                |             |         |    |   |
| <a href="#">Abrasion/disturbance of the substrate on the surface of the seabed</a>                                   | S               | NS                         | S                          | S              | S                              | S                  | S                        | S                        | S             | NS                         | S                          | S                | S                              |             |         |    |   |
| <a href="#">Collision BELOW water with static or moving objects not naturally found in the marine environment</a>    |                 |                            |                            |                |                                |                    |                          |                          |               |                            |                            |                  |                                | S           | S       |    |   |
| <a href="#">Hydrocarbon &amp; PAH contamination</a>  | NS              | NS                         | NS                         | NS             | NS                             | NS                 | NS                       | NS                       | NS            | NS                         | NS                         | NS               | NS                             | IE          | S       | IE | S |
| <a href="#">Introduction of light</a>  | S               |                            | IE                         | NS             | S                              | S                  | IE                       | IE                       | S             |                            | IE                         | NS               | S                              |             | S       |    | S |
| <a href="#">Introduction or spread of invasive non-indigenous species (INIS)</a>                                     | S               |                            | S                          | S              | S                              | S                  | S                        | S                        | S             |                            | S                          | S                | S                              | IE          | S       | IE | S |
| <a href="#">Litter</a>   | NA              | NA                         | NA                         | NA             | NA                             | NA                 | NA                       | NA                       | NA            | NA                         | NA                         | NA               | NA                             | IE          | S       | IE | S |
| <a href="#">Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion</a> | S               | NS                         | S                          | S              | S                              | S                  | S                        | S                        | S             | NS                         | S                          | S                | S                              |             |         |    |   |
| <a href="#">Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals)</a>                   | NS              | NS                         | NS                         | NS             | NS                             | NS                 | NS                       | NS                       | NS            | NS                         | NS                         | NS               | NS                             | IE          | S       | IE | S |
| <a href="#">Transition elements &amp; organo-metal (e.g. TBT) contamination</a>                                      | NS              | NS                         | NS                         | NS             | NS                             | NS                 | NS                       | NS                       | NS            | NS                         | NS                         | NS               | NS                             | IE          | S       | IE | S |
| <a href="#">Underwater noise changes</a>   | IE              |                            |                            |                |                                |                    |                          |                          |               |                            |                            |                  |                                | S           | S       | S  | S |
| <a href="#">Visual disturbance</a>   |                 |                            |                            |                | NS                             |                    |                          |                          | NS            |                            |                            |                  | NS                             |             | S       |    | S |

# National Context



MMO have been conducting research into the spatial distribution of recreational activities at a national level.



- Compilation of spatial data (2012)
- Modelling marine recreation potential (2014)
- Stakeholder consultation by Hull University to map activities and impacts in MPAs (2018)

# Current Project



## Objectives:

- Evaluate predictive modelling as a means of understanding the spatial and temporal distribution of recreational activities in the study area.
- Identify 'hotspots' where recreational activities are likely to occur at high intensity and/or in combination.
- Identify areas which might be vulnerable to impact from recreational activities due to presence of sensitive features.
- Understand how changes to infrastructure or management measures may influence the distribution of recreational activities in the study area.

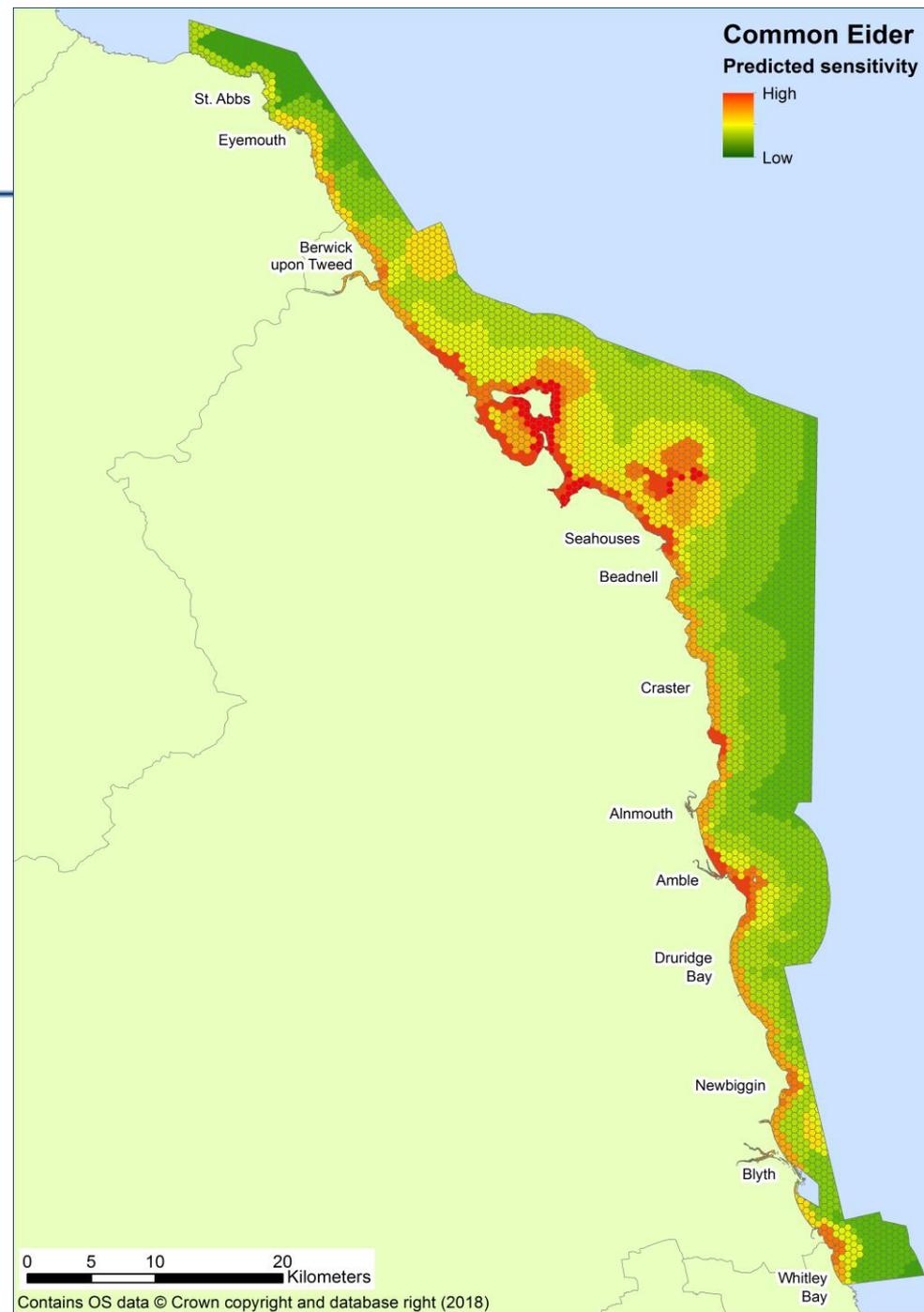
Presentation of methods using Common Eider as an example of a sensitive feature...



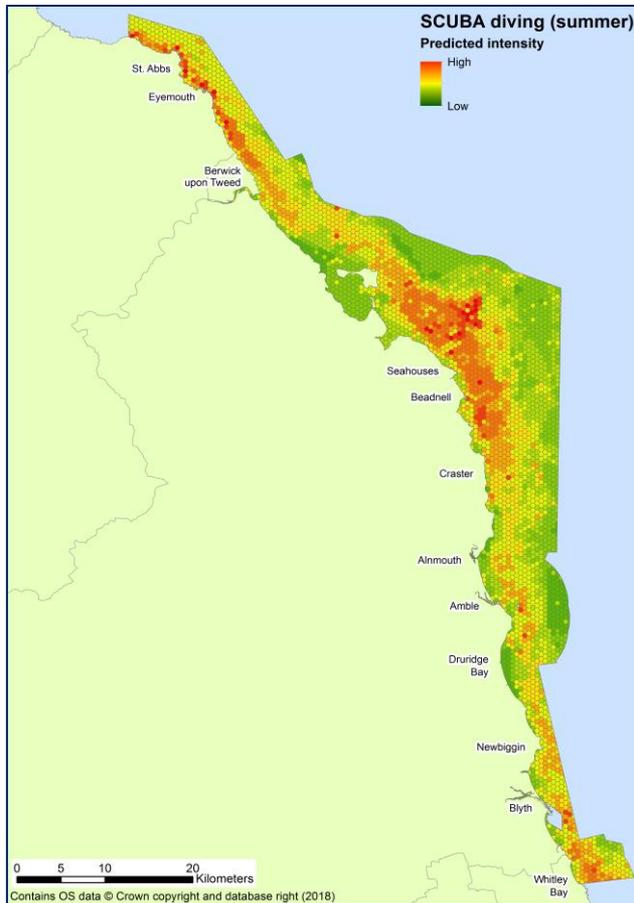
# Sensitivity Map

A sensitivity map for Common Eider was produced using:

- Species occurrence records downloaded from GBIF and the NBN Atlas.
- Data on the distribution of habitats used by Common Eider (e.g. mussel beds).
- Information on important areas provided by local ornithologists.



# Recreational Activity Maps



## Activity List:

- Beach Leisure
- Boating (participation)
- Boating (mooring/anchoring)
- Coastering
- Diving
- Dog walking
- Drone flying
- Horse riding
- Hovercrafting
- Land craft (e.g. kite buggy)
- Light aircraft
- Non-motorised watersports
- Wildfowling
- Wildlife watching on land
- Wildlife watching at sea

- Predictive maps of recreational activities (summer and winter) were created using multi-criteria evaluation in GIS.
- Used data on factors likely to influence the distribution and intensity of the activity.

# Pressure Maps

Activity maps were combined to create pressure maps.

These are based on existing activity-pressure-feature matrices.

Common Eider are sensitive to:

- Above water noise
- Collision below water
- Collision above water
- Introduction of light
- Litter
- Removal of non-target species
- Visual disturbance

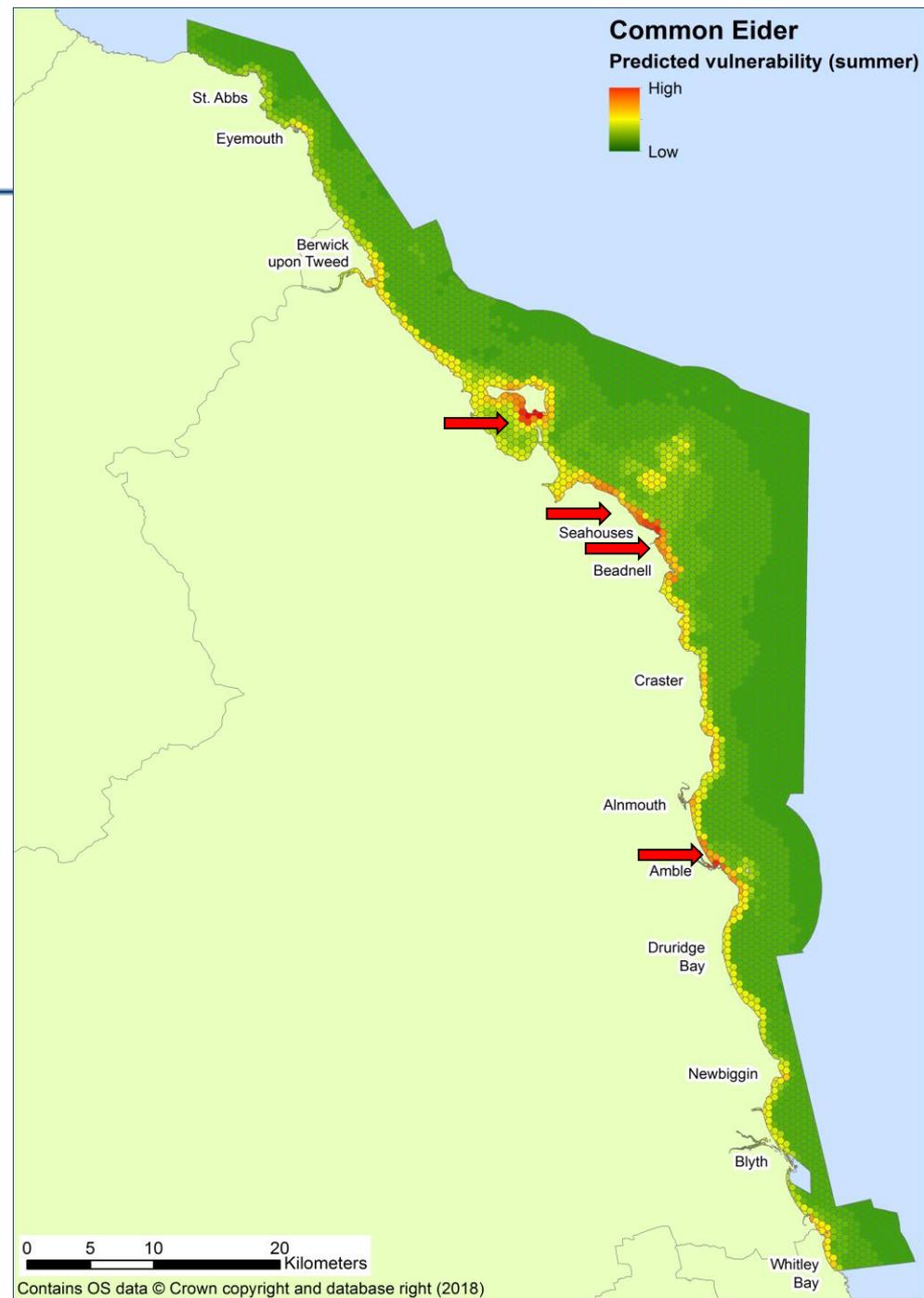


# Vulnerability Maps

Sensitivity maps and pressure maps were combined to produce vulnerability maps.

‘Hotspot’ areas where Common Eider may be vulnerable to impact from recreational activities can be identified:

- Amble
- Beadnell
- Seahouses
- South coast of Lindisfarne.



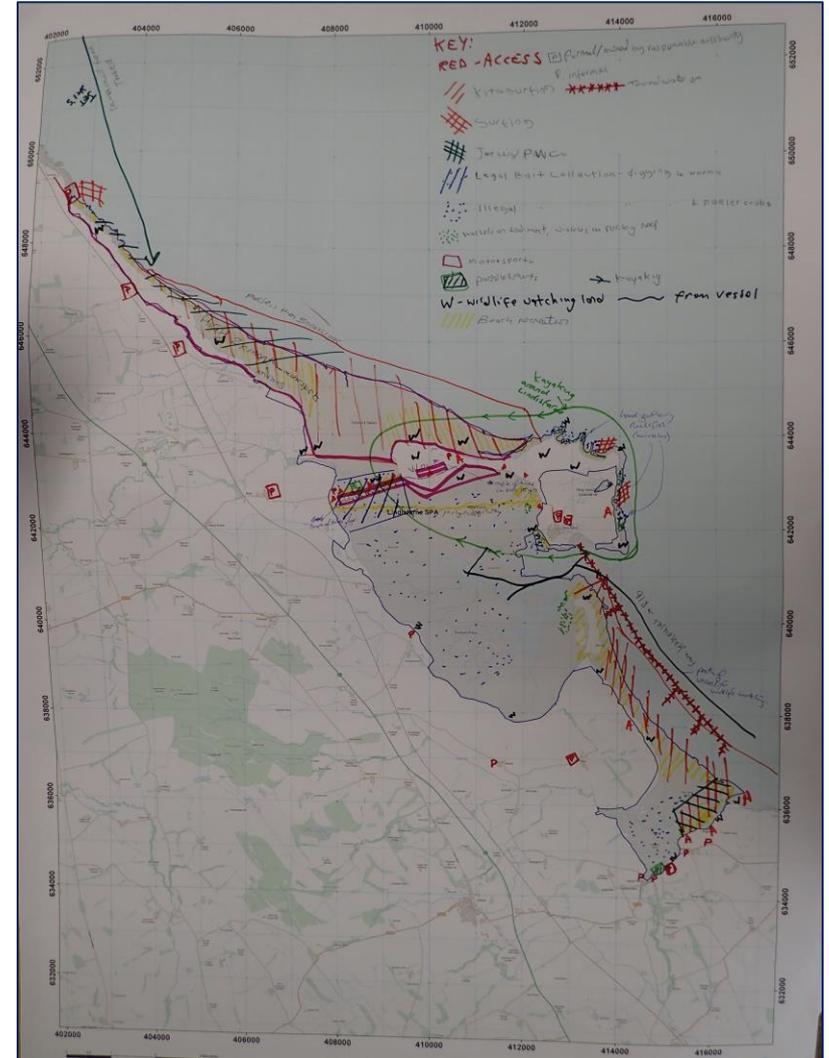
# Validation and Stakeholder Input



Maps were validated and methods improved with input from local stakeholders working in tourism, recreation, conservation and marine management.



Stakeholder Workshop, Dove Marine Laboratory, November 2018



# Validation and Stakeholder Input



## Feedback received (selected examples)

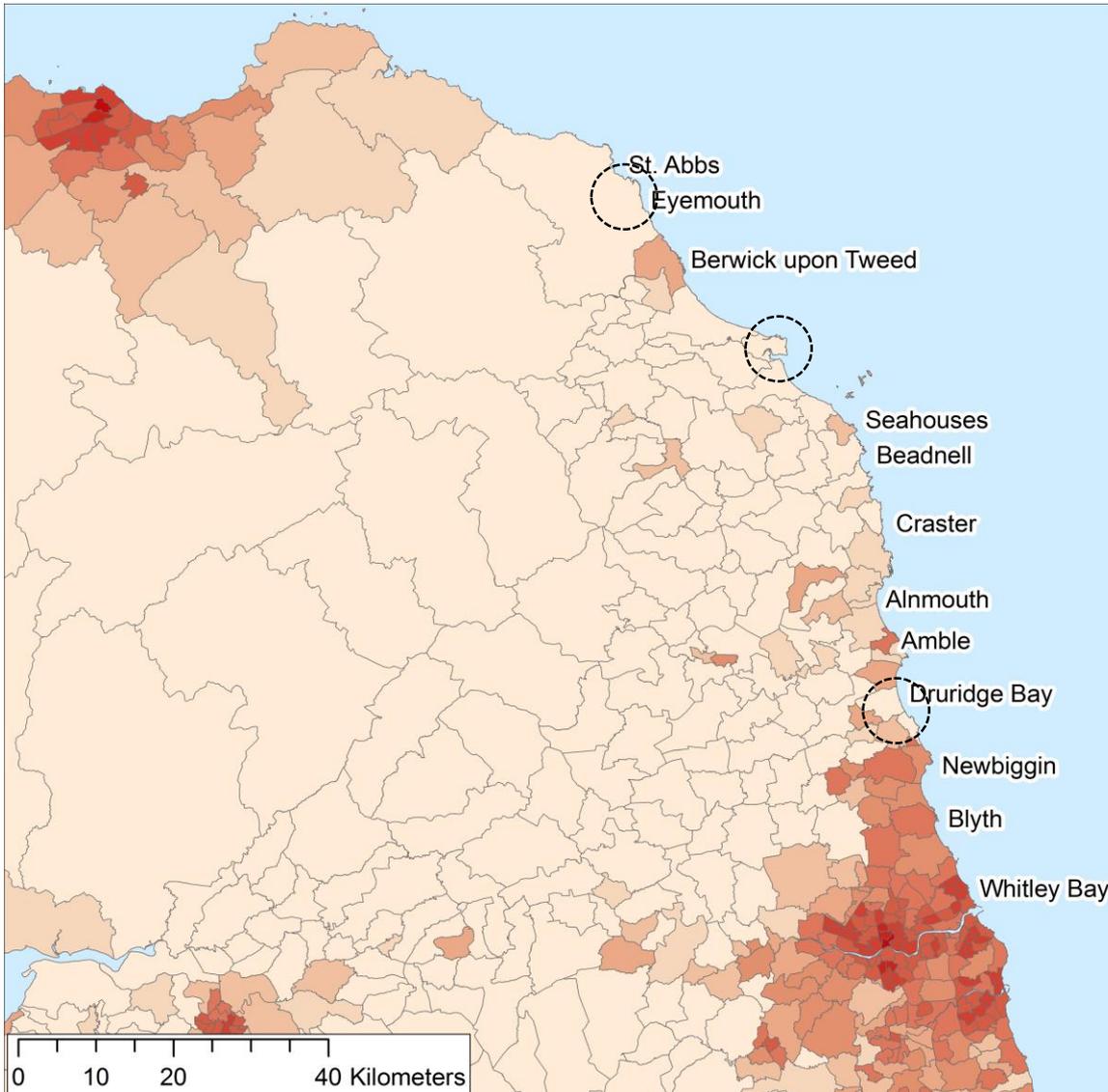
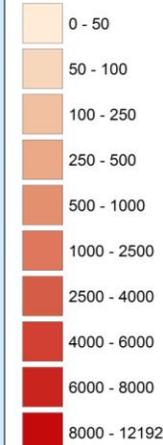
| Action  | Investigate   | Future work  |
|---|---|--|
| <ul style="list-style-type: none"><li>• Use real population data, not urban/residential land cover</li><li>• Contact ERIC NE for more complete and high resolution species occurrence data</li><li>• Add shipping data (negative influence) and seals (positive influence) to diving model</li><li>• Remove AONB/heritage coasts from beach leisure model</li><li>• Get precise boundaries of wildfowling permit areas</li><li>• Use visitor centres as an influencing factor for wildlife watching</li><li>• Change symbology to show zero occurrence where applicable</li></ul> | <ul style="list-style-type: none"><li>• Are spatial data available on refreshment facilities?</li><li>• Are spatial data available on holiday accommodation (besides caravan sites)?</li><li>• Try using Blue Flag beaches and life guarded beaches as influencing factors</li><li>• Are spatial data available on bird hides?</li><li>• Investigate influencing factors on anchoring – contact RYA</li><li>• Are spatial data available on coastal farms (influencing factor for horse riding)?</li><li>• Are spatial data available on land-based wildlife watching activity providers?</li></ul> | <ul style="list-style-type: none"><li>• Model at higher spatial and temporal resolution at key sites e.g. Lindisfarne, Farne Islands.</li><li>• Include data on car park size</li><li>• Include data on port/harbour/marina size, tidal access and traffic levels</li><li>• Try to establish absolute rather than relative activity intensity values, e.g. no. of participants, duration of activity.</li><li>• Use Local Area Plans to predict future changes in intensity.</li></ul> |

# Integrating Population Data



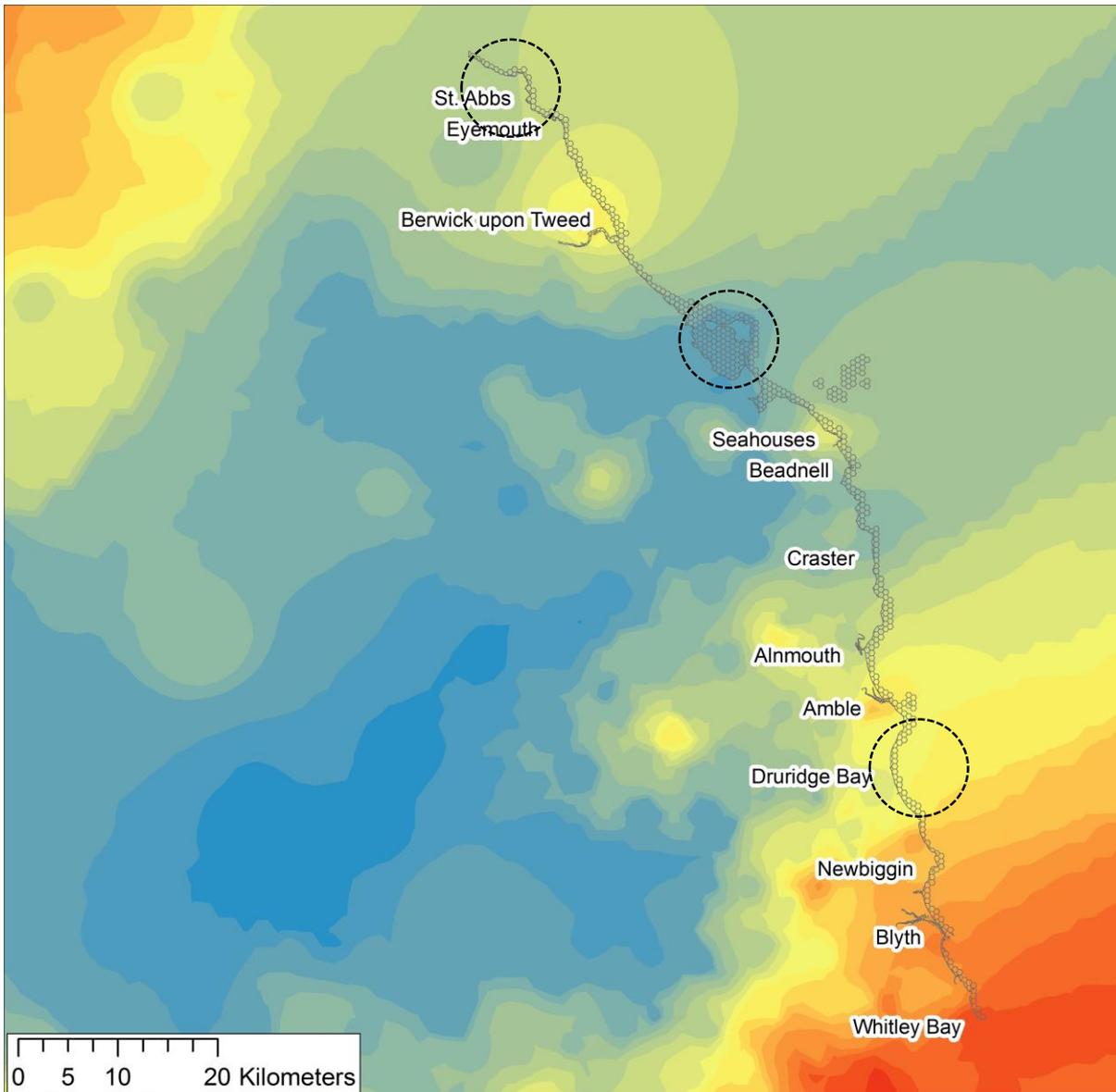
- Population data obtained from Office for National Statistics.
- Ward and Parish Boundaries downloaded from data.gov.uk
- Total population (2017) added to each boundary and population density per km<sup>2</sup> calculated.
- But data are not 'model-ready'. St Abbs, Lindisfarne and Druridge Bay all have similar values...

Population Density (per km<sup>2</sup>)



# Integrating Population Data

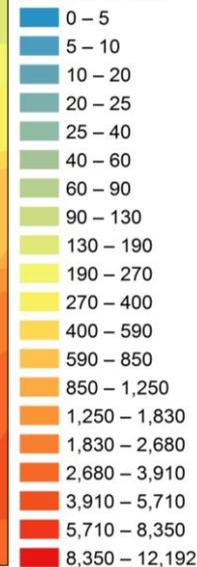
- Population density interpolated onto a smooth surface.
- Druridge Bay > St Abbs  
St Abbs > Lindisfarne, due to their relative proximity to densely populated areas.



Inverse Distance Weighting  
Prediction Map

[Population\_NE].[Density]

Filled Contours



# Integrating Population Data



Population density data added to the intertidal modelling grid.

Likely to have a strong influence on:

- Beach leisure
- Dog walking

May have a moderate influence on

- Non-motorised watersports
- Wildlife watching

# Next Steps



- Refine activity models based on stakeholder input.
- Create vulnerability maps for other designated species and habitats:

| Broadscale Habitats        | Priority Habitats                    | Species          |
|----------------------------|--------------------------------------|------------------|
| Intertidal coarse sediment | Intertidal mussel beds               | Ringed Plover    |
| Intertidal mixed sediments | Intertidal seagrass beds             | Little Tern      |
| Intertidal mud             | Intertidal under boulder communities | Purple Sandpiper |
| Intertidal rock            | Peat and clay exposures              | Turnstone        |
| Infralittoral rock         | Coastal lagoons                      |                  |
| Circalittoral rock         | Salt marsh                           |                  |
| Subtidal coarse sediment   | Sand dunes                           |                  |
| Subtidal mixed sediments   | Sea caves                            |                  |
| Subtidal mud               |                                      |                  |
| Subtidal sand              |                                      |                  |



# Conclusions



- Multi-criteria evaluation is a rapid and repeatable method which can be refined as new or better data become available.
- This method reliably identifies 'hotspots' where recreational activities occur at high intensity or in combination.
- This has considerable potential as a decision-support tool to aid marine management and conservation, for example:
  - Identifying areas where species or habitats may be particularly vulnerable to impact from recreational activities
  - Providing additional evidence to target management of recreational activities at sensitive locations, particularly during bird breeding seasons.





**Thank you!**

**Any Questions?**

