ETIPOCEAN

European Technology & Innovation Platform for Ocean Energy

Minimising negative environmental impacts

29 August 2017 – ETIP Ocean

Agenda

Moderator: Kasparas Kemeklis, Ocean Energy Europe, ETIP Ocean

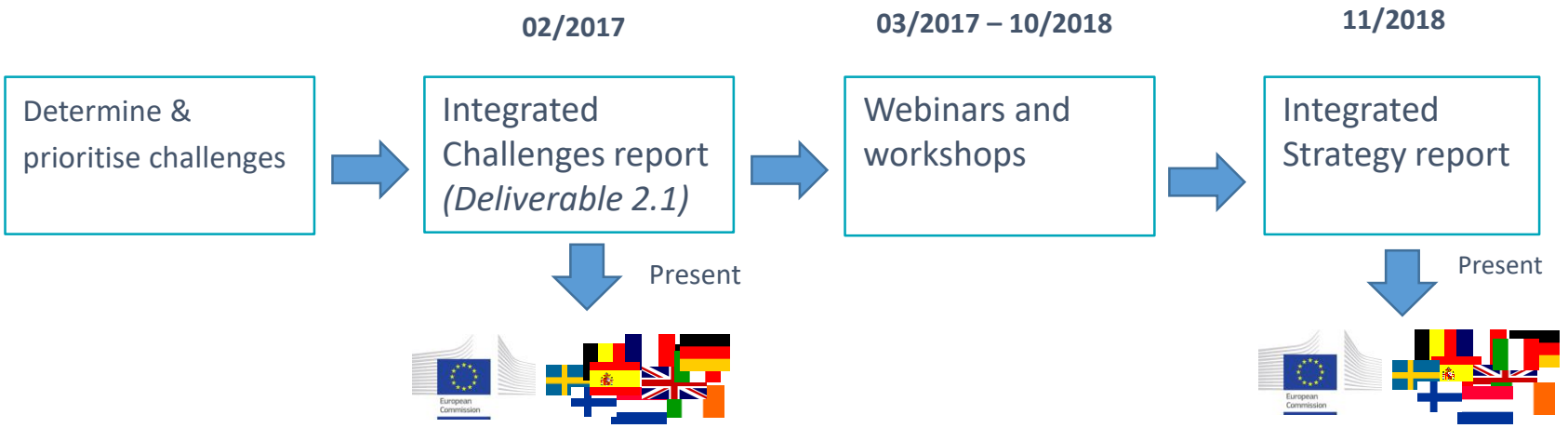
Presentations:

François Batifoulier, Sabella

Caitlin Long, EMEC

Q&A session with the audience

ETIP Ocean, objectives and timeline



Questions from the Secretariat

The **Ocean Energy Forum** advocates the use of a “risk-based approach” by consenting authorities.

What is ***your*** opinion?

How to make this come about?

- How to best explain assessment technique requirements and processes to aid developers secure applications?
- Can/should there be a EU-wide approach/coordination/guidelines?
- Does a one-stop-shop approach create efficiencies in this process?

Minimising negative environmental impacts of ocean energy systems: example of Sabella D10 tidal turbine

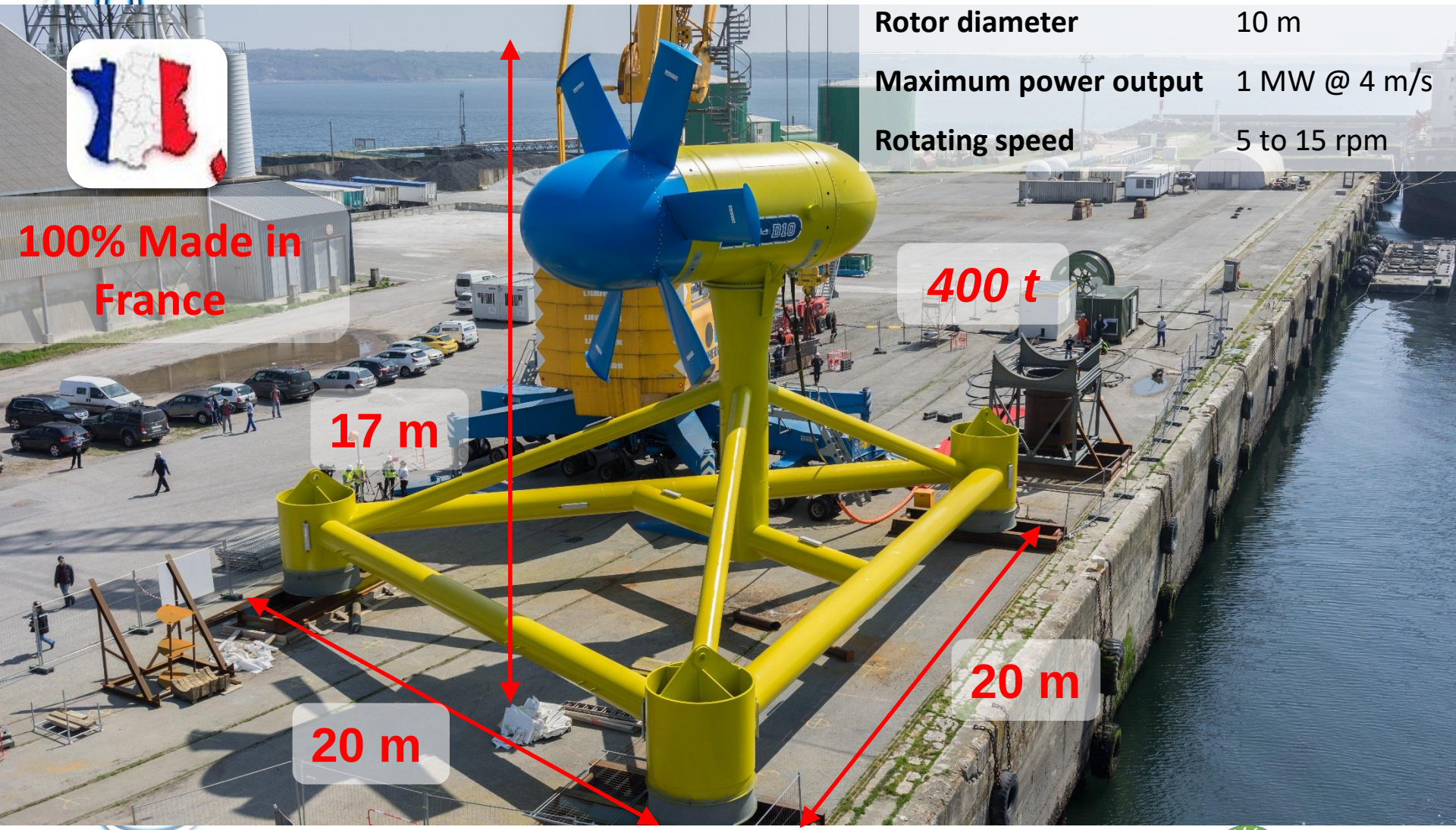
Ocean Energy Europe

- A credo inherited from the Oil & Gas: **technological ruggedness** guaranteeing the **reliability of underwater equipment** for a **continuous power production**
- Differentiating design drivers:
  - **horizontal axis rotor** (efficiency)
  - **gravity-based foundation** (environment/cost-efficiency)
  - **fixed symmetrical blades** (ruggedness/reliability)
  - **direct drive permanent magnet synchronous generator** (no wearing component)
  - **modularity** (dissociation of the turbine – light part with occasional maintenance needs – and the heavy gravity-based foundation without maintenance)

- Installation on the seabed in order to **avoid use conflicts** and swell-related damages.
- **30-year lifetime / maintenance every 10 years**

D10: flagship tidal project

- **First and sole full scale tidal turbine grid-connected in France**



Rotor diameter	10 m
Maximum power output	1 MW @ 4 m/s
Rotating speed	5 to 15 rpm

Sabella D03: a first return on experience

- Sabella D03, immersed in Bénodet 2008-2009: follow-up of environmental impact
- Demonstration of environmental innocuousness towards ichtyofauna
- Low rotation speed of the blades

A step-by-step process

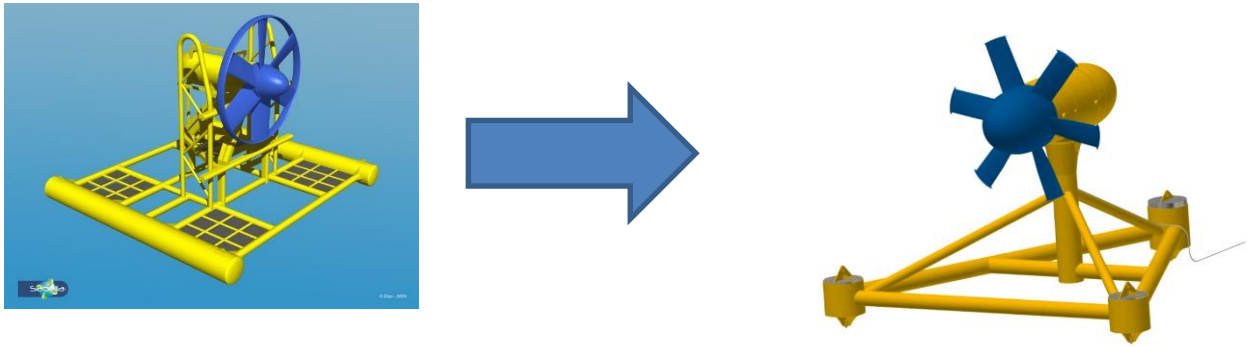
- Relevant demonstration path to progressively assess environmental impacts:

prototype (D03) => demonstrator (D10) => pilot farm (Eussabella) => commercial farm

- Monitoring and study of environmental impacts at each step and implementation of mitigation measures before going to the next step

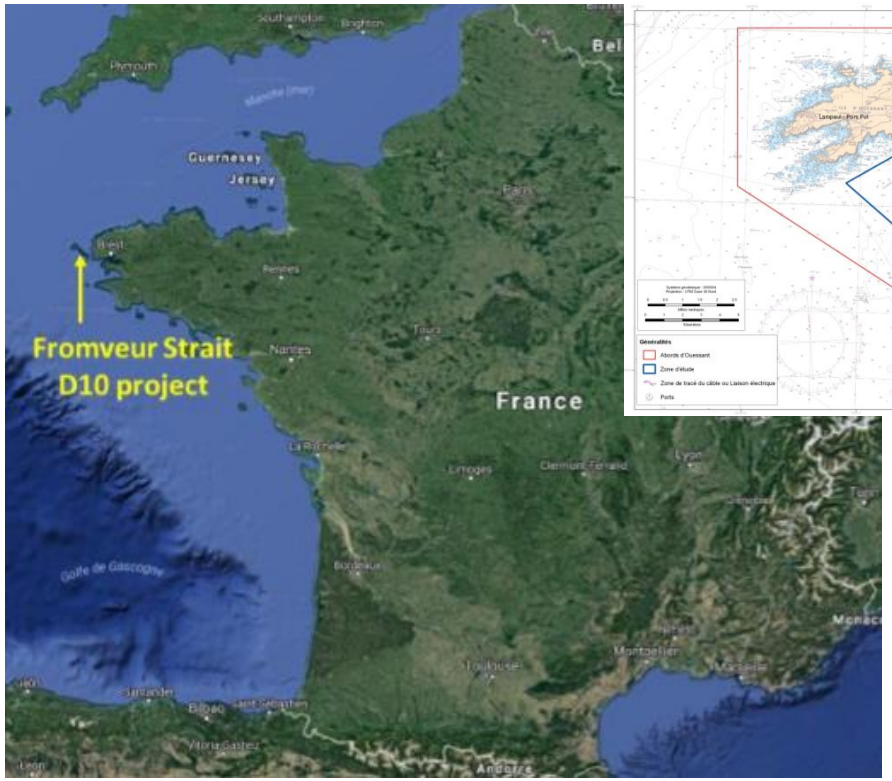
- Gravity-based foundation: less impacts on marine fauna and flora

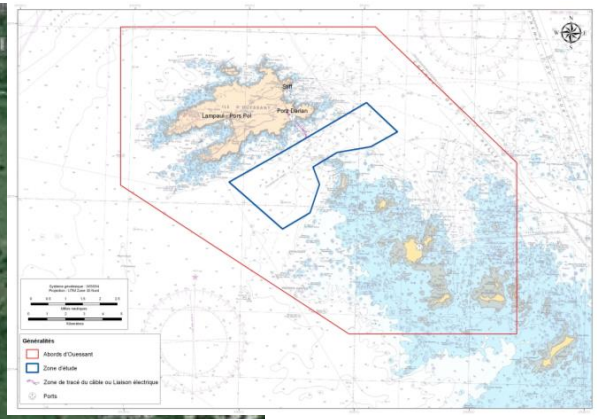
Following recommendations from Iroise Marine Nature park, change of the foundation design



- Seabed-mounted technology: minimization of collision risks with other sea users, no landscape impact
- Low rotation speed: less perturbations towards ichtyofauna

Location of the Fromveur Passage

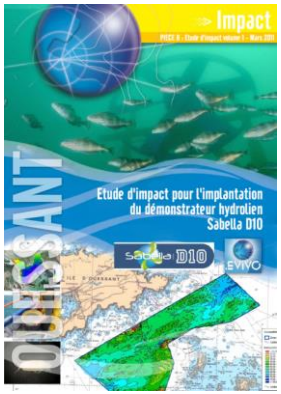


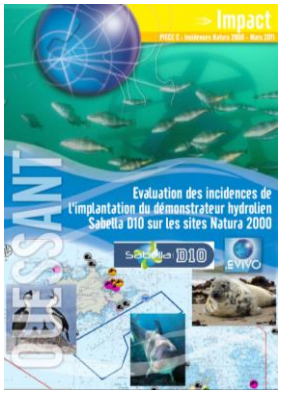


- Near Ushant island
- Many environmental protection layers

A thorough Environmental Impact Assessment

- Aims:
  - Frame of environmental legislation (impact assessment, Natura 2000)
  - Qualification of the environment (environmental receptors)
  - Identification of the environmental stressors
  - Determination and prioritization of the potential impacts
  - Monitoring measurements



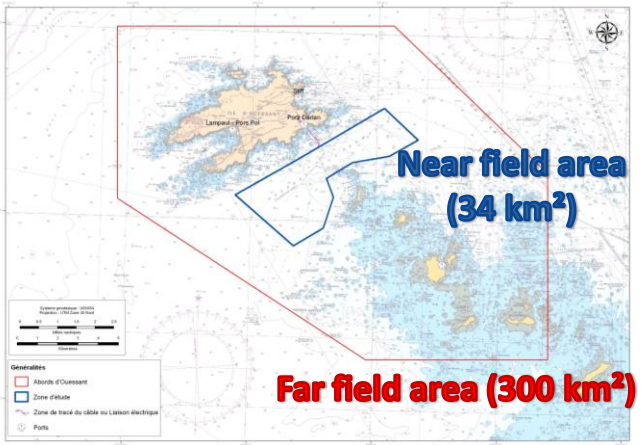


A thorough Environmental Impact Assessment

- Environmental legislation:
  - Temporary occupation of the public maritime domain

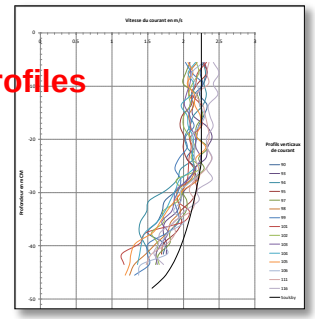
    => EIA and Incidence Notice (Natura 2000 areas)
  - Standardized framework (French environmental Code)

- Environmental qualification – initial state:
  - Far field area: Bibliography / littérature / databases / institutional data
  - Near field area: bibliography + field measurements



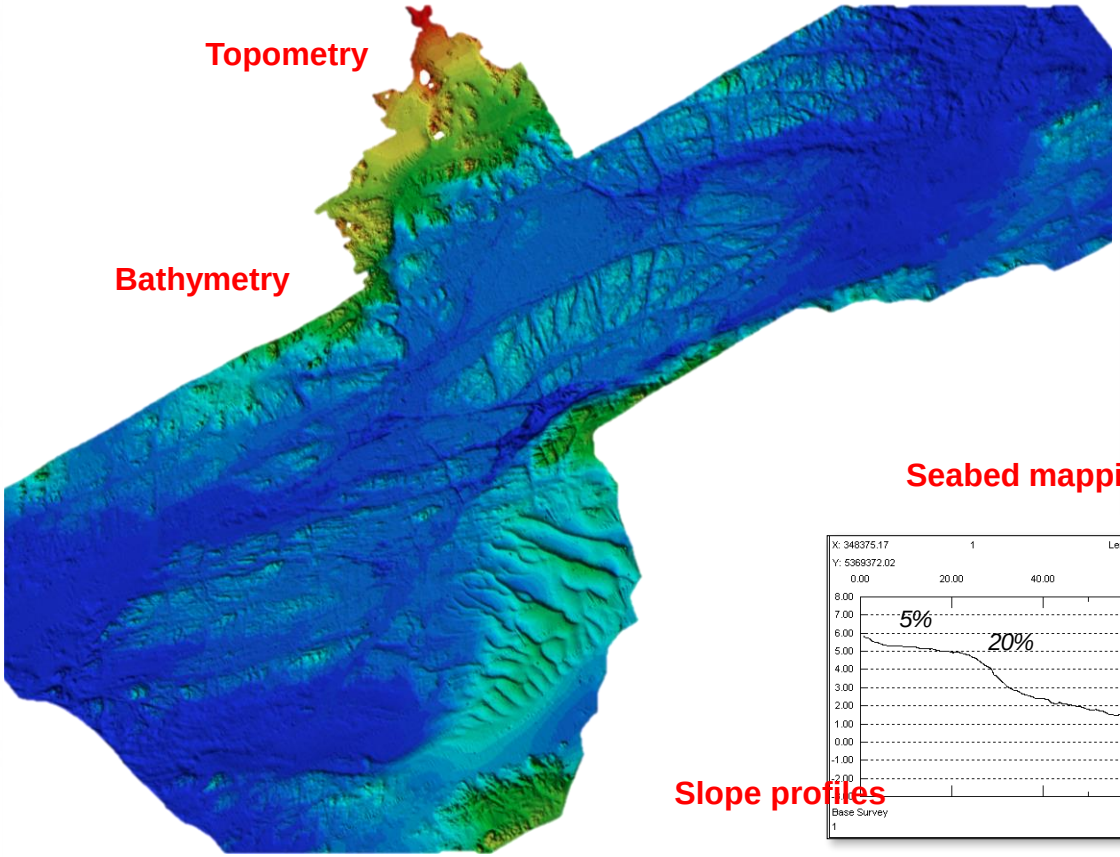
- Environmental qualification – initial state:
  - Physical environment

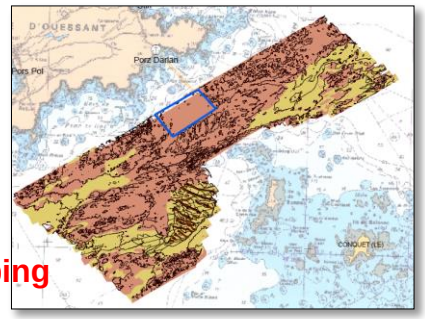
Current profiles



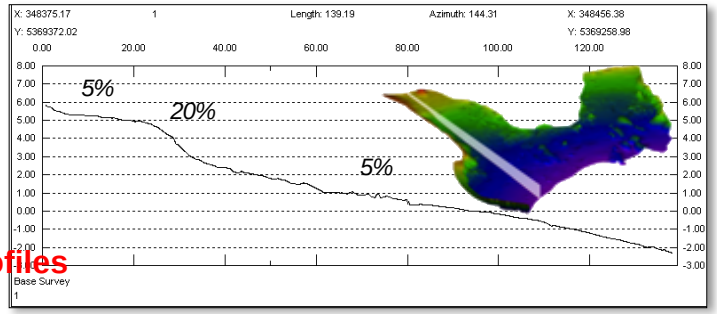
Topometry

Bathymetry





Seabed mapping

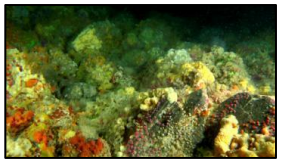


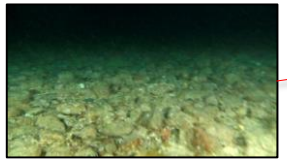
Slope profiles

- Environmental qualification – initial state:
  - Biological environment

Ecological description (landing area)

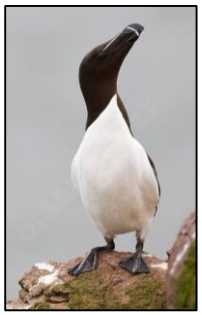
Benthos characterization (sampling based)





Habitat characterization (video based)

- Environmental qualification – initial state:
  - Biological environment: marine mammals and seabirds – study based on bibliography (local expert support)


- Environmental stressors:
  - Distinction between project phases : installation

Light
(birds)

Surface activities
(maritime trafic, fishermen)

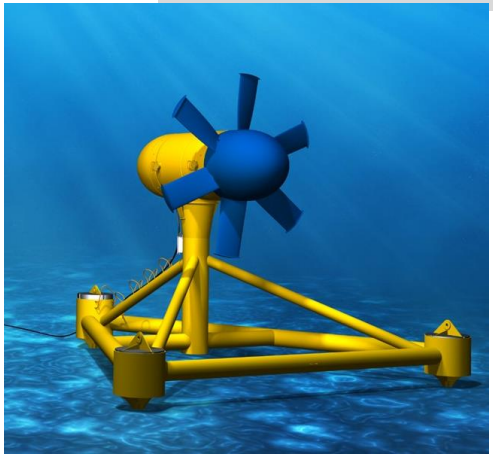
Noise
(mammals and fishes)

Export cable route
(protected areas, birds, soft seabed)

Disturb seabed (D10 + export cable)
(benthic species)

- Environmental stressors:
  - Distinction between project phases : exploitation

Static and dynamic effect
(benthic species, mammals, fishes, seabirds, Hydrodynamics)



Noise
(mammals and fishes)

Electromagnetism
(fishes)

footprint
(benthic species)

- Impacts:
  - Some uncertainties remained due to lack of knowledge and REX
  - Conservative approach of the impact levels

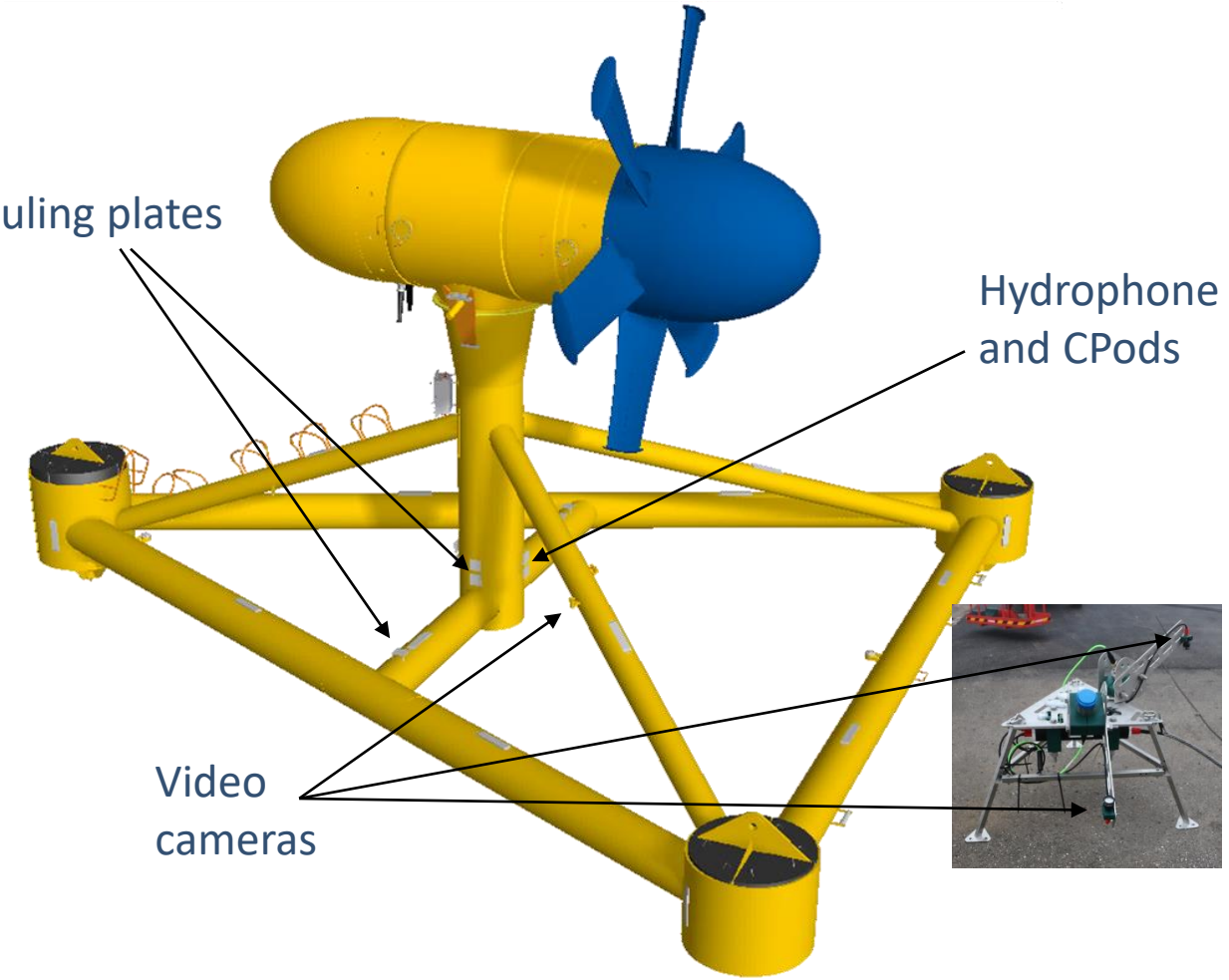
  => Quite low footprint

  - But gap between environmental impacts at pilot scale and at commercial scale
    - increase environmental effects (cumulative) and uncertainties on impacts levels
    - => Interest / necessity to acquire more data (pilot instrumentation)

An in-depth environmental monitoring

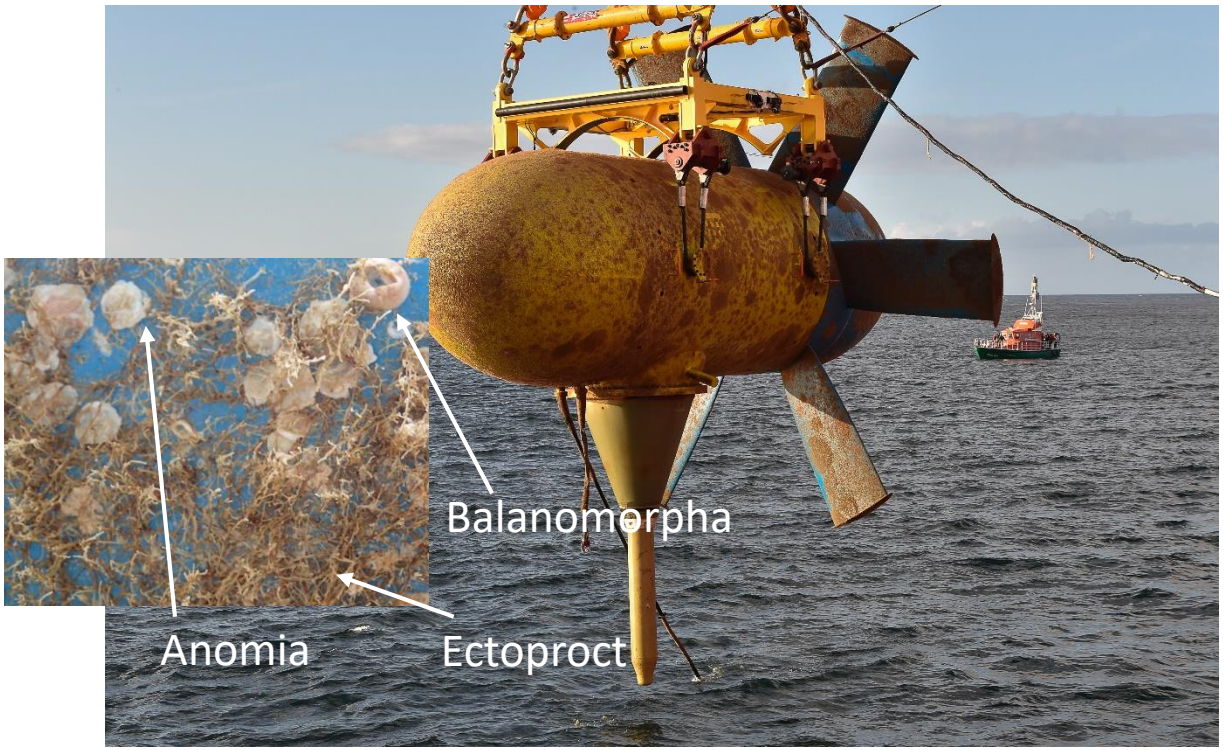
- Pursuance of studies carried out for D03
- Early involement of all stakeholders: Iroise Sea Marine Nature Park, sea professionals, environmental and sea users associations, local authorities, scientific community, etc.
- Close collaboration with Iroise Marine Nature Park
- Environmental monitoring protocol to follow impacts in a very protected area
- Full instrumentation to study all impacts: video cameras, C-pods, hydrophones, ADCPs, fouling plates, etc.

- A comprehensive environmental monitoring

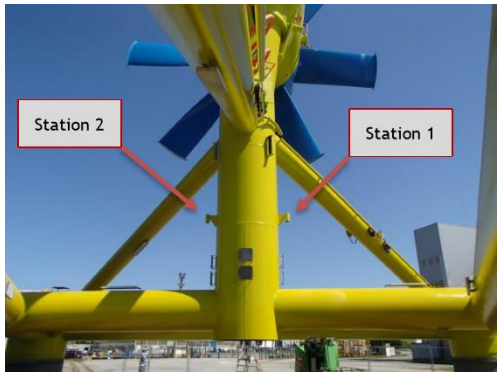


REX on the turbine:

- Good protection of the anodes from corrosion
- Low abrasion => fouling



REX on the environnement:



- Detection of mammals with CPODS

Station 1 : 128 days of measurements
Station 2 : 158 days of measurements

- Turbine at rest:

Numerous detections of dolphins, less for porpoises (range of detection of 2-3 km for dolfins and 300 m for propoises).
Seasonlity, dolphins from june to august, propoises in october

- Turbine functioning

CPODS measured from june 2015 (D10 installation).
Turbine connected and functionning in november, 135 days later.
=> not enough measurments to conclude.

THANK YOU FOR YOUR ATTENTION

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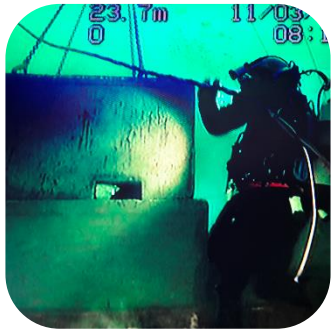

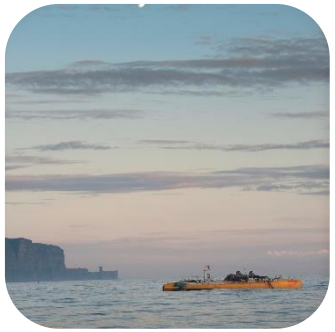

ETIP Ocean: Minimising Negative Environmental Impacts

Caitlin Long

Overview

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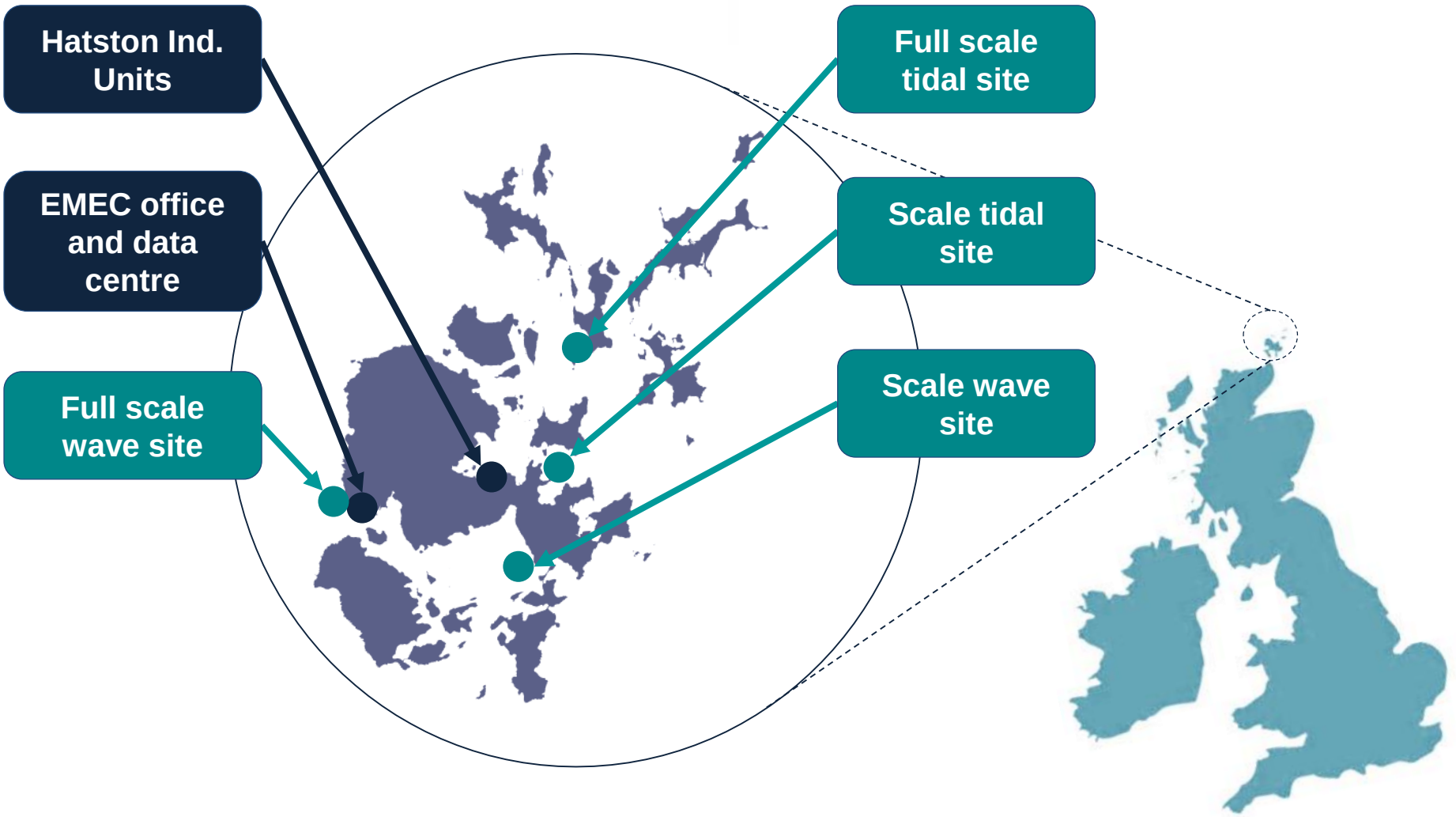

Environmental risks

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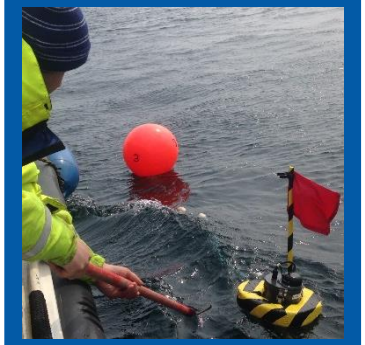
Collision

Potential for physical interactions

Displacement

Potential for marine wildlife displacement from habitual waters



Noise emissions

Noise emitted underwater by installation and operation

Leisure and commercial activities

Notably fishing

Navigational safety

Clear device marking

Coordinated approach to engage stakeholders and efficiently deliver

Wildlife Observation Programme

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- Environmental baseline
- Long-term dataset
  - Fall of Warness (11 yrs)
  - Billia Croo (6 yrs)
  - Scapa Flow (2 yrs)
  - Shapinsay Sound (2 yrs)
- Over 18,000 hours of observations completed
- Purpose – To reduce environmental monitoring burden on developers

Wildlife Observation Programme

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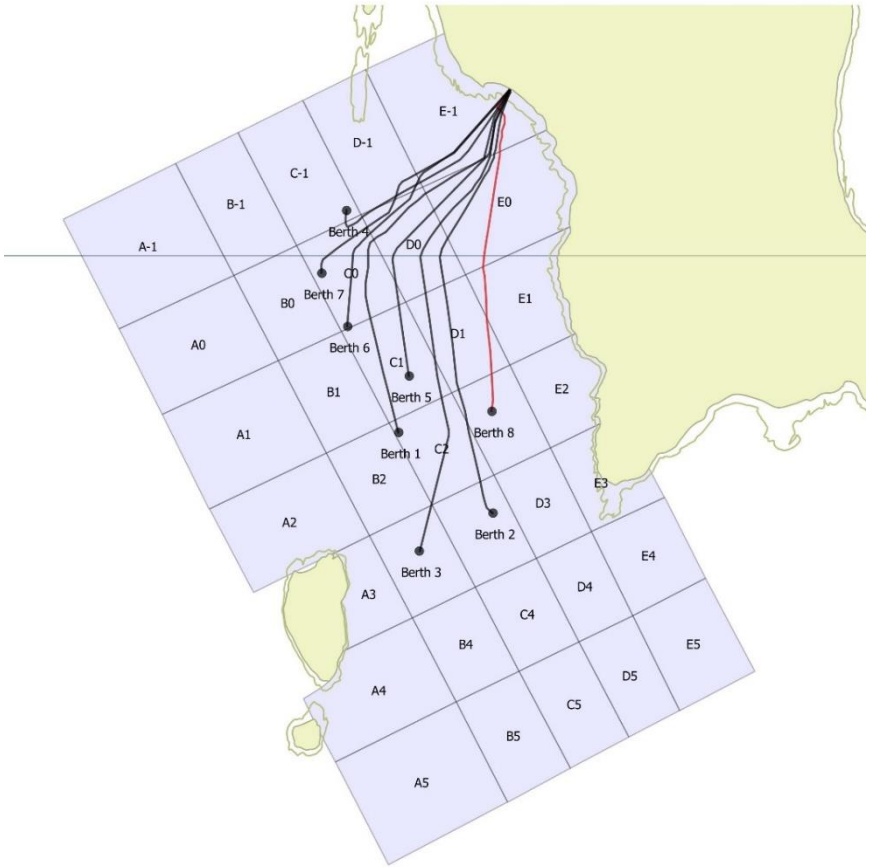
Fall of Warness

- Vantage Point: Ward Hill
- Team of local observers
- 5 x 4hr watches per week
- Grid squares approx. 500m^2
- Sightings:
  - Regular sightings of grey and harbour seals
  - Sporadic sightings of cetaceans during summer months
  - Diving birds frequently observed



Wildlife Observation Programme

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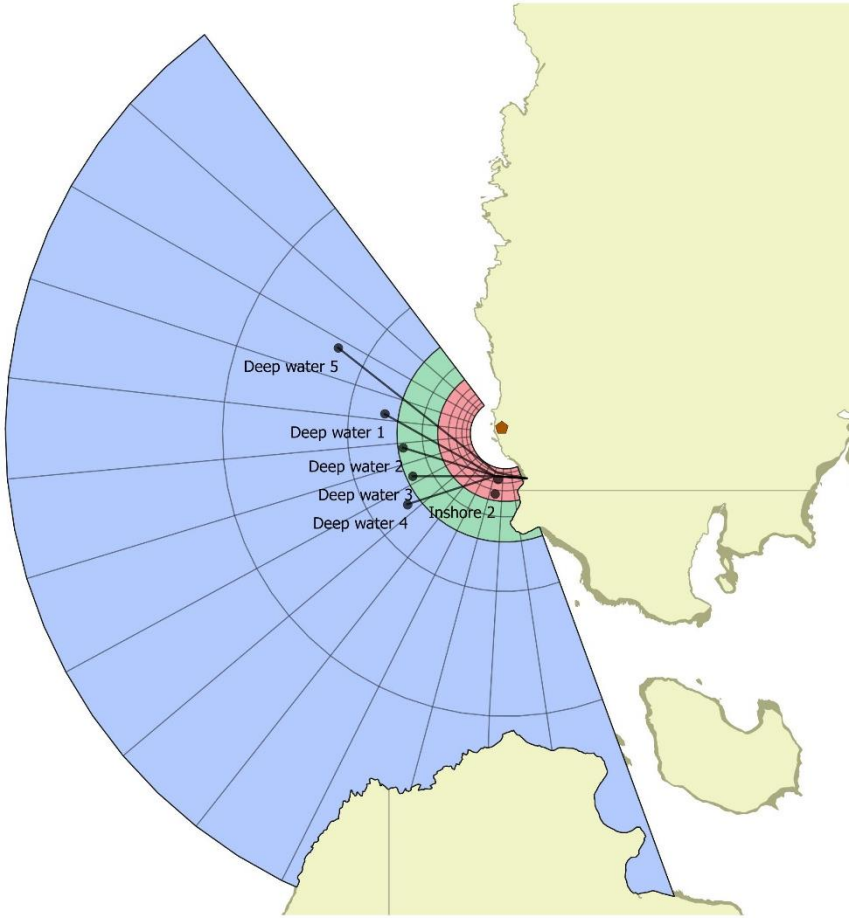

Billia Croo

- Vantage Point: Black Craig
- Two observers
- 5 x 4hr watches per week
- Inner, mid and outer sweeps
- Sightings:
  - Majority of seal sightings are grey seals
  - Cetaceans tend to occur in late summer
  - Diverse range of marine birds

Wildlife Analysis Project

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- 3 year project funded by Scottish Natural Heritage, Marine Scotland and Scottish Government
- Research Question: Is there any evidence of wildlife displacement with the operation of marine energy devices?
- Aim: To analyse the possible displacement of key wildlife species relating to marine energy converter systems
- Predict if there are any spatially-explicit changes in species distribution or abundance associated with changes in device operational status across the test sites

Data

- Wildlife Observations Programme
- Device Operational Data
  - Commercial confidentiality
  - Site-wide operational status was used
- Using MRSea package in R developed by CREEM – University of St Andrews

Analysis Methodology

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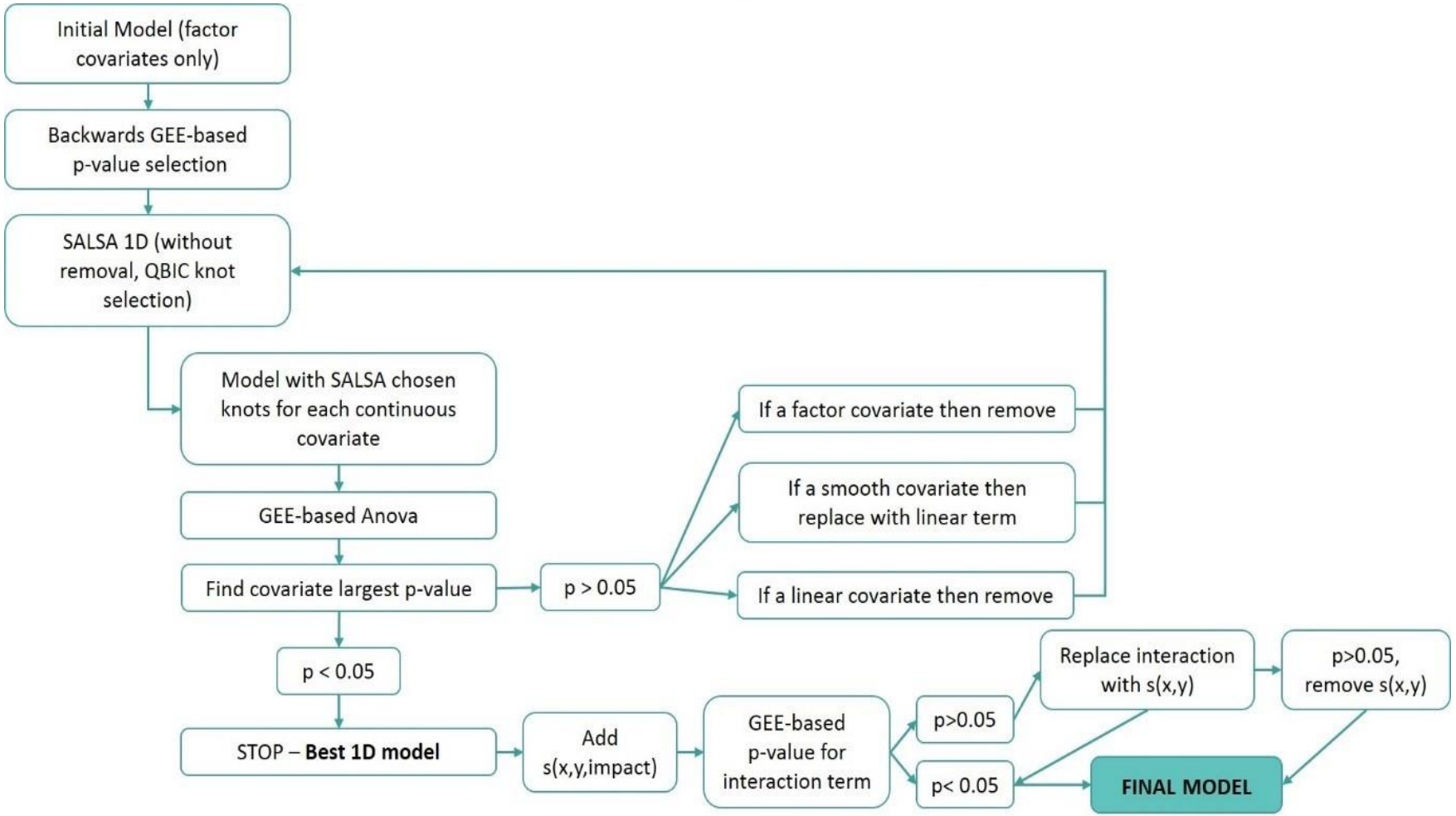

Power Analyses

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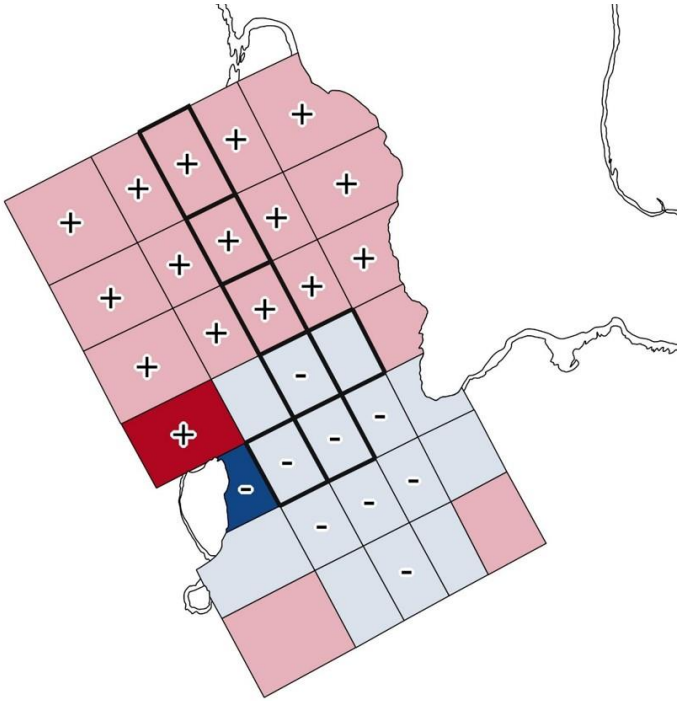

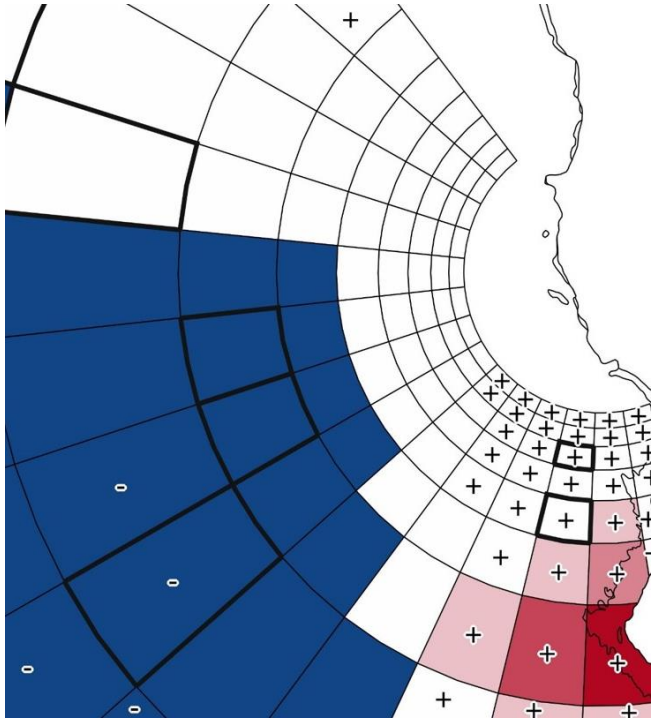

- Fall of Warness analyses much more successful than Billia Croo due to difference in survey areas
- Generally, more wildlife sightings at Fall of Warness resulted in greater certainty in the models

Results - Seals

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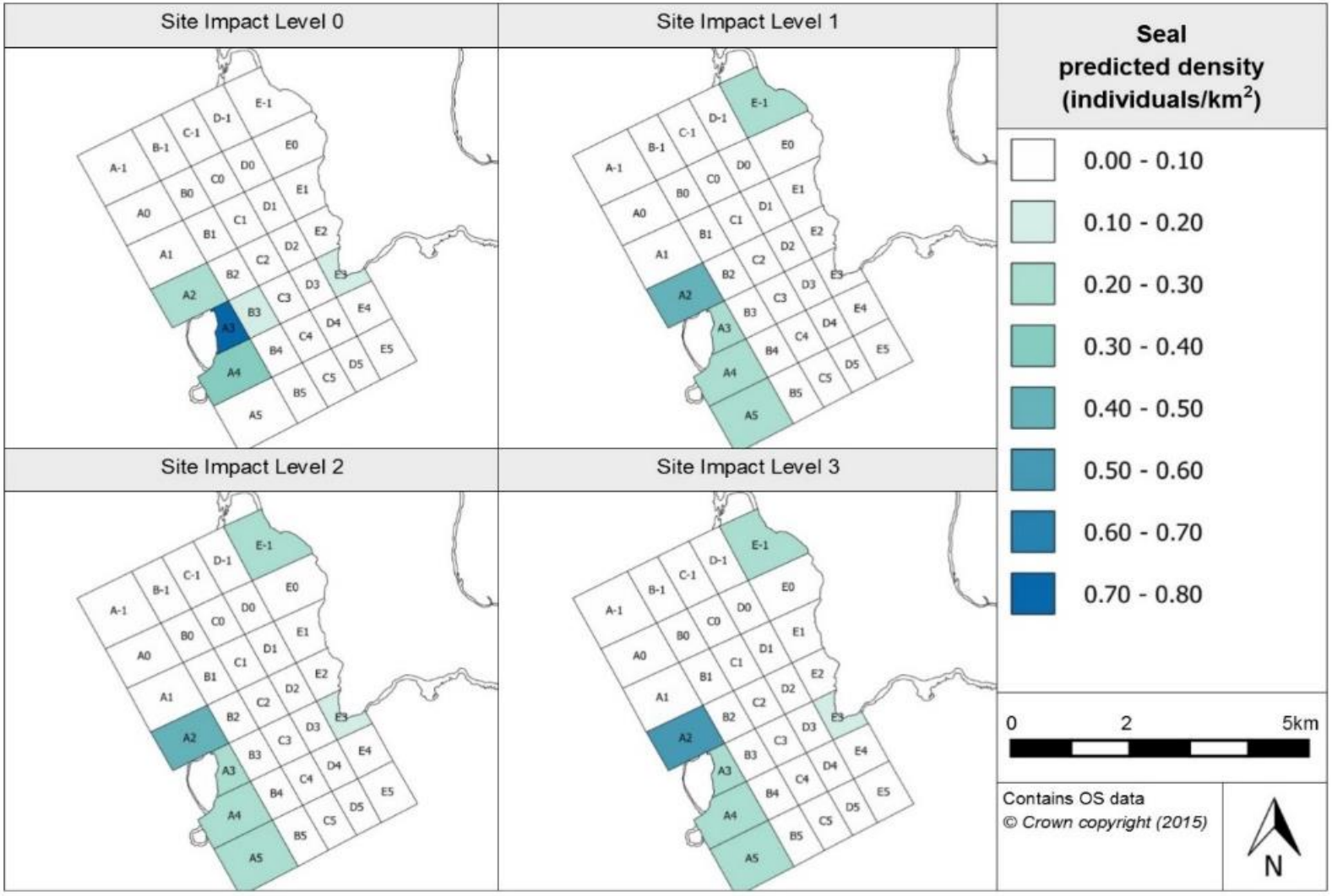

Results - Seals

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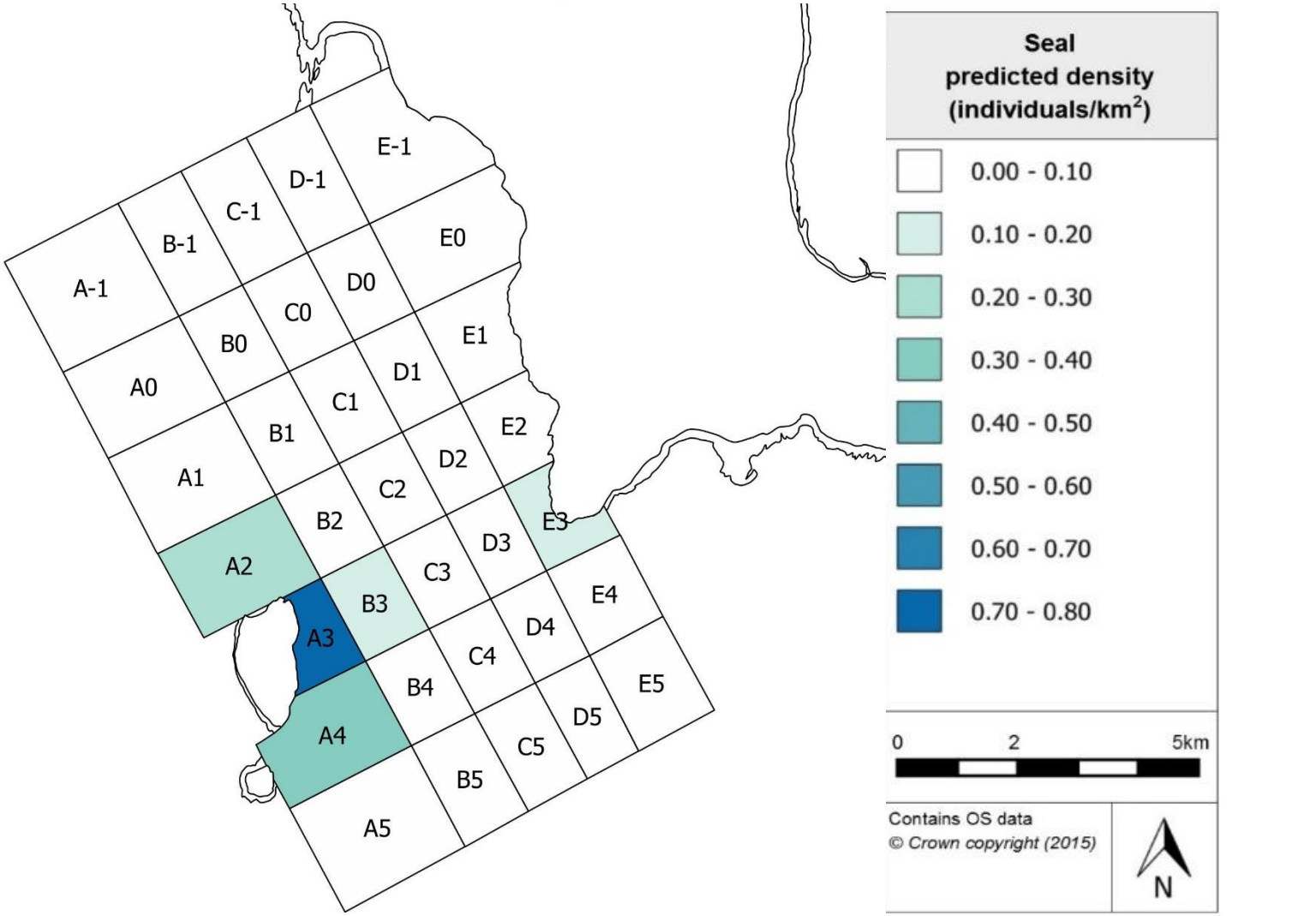

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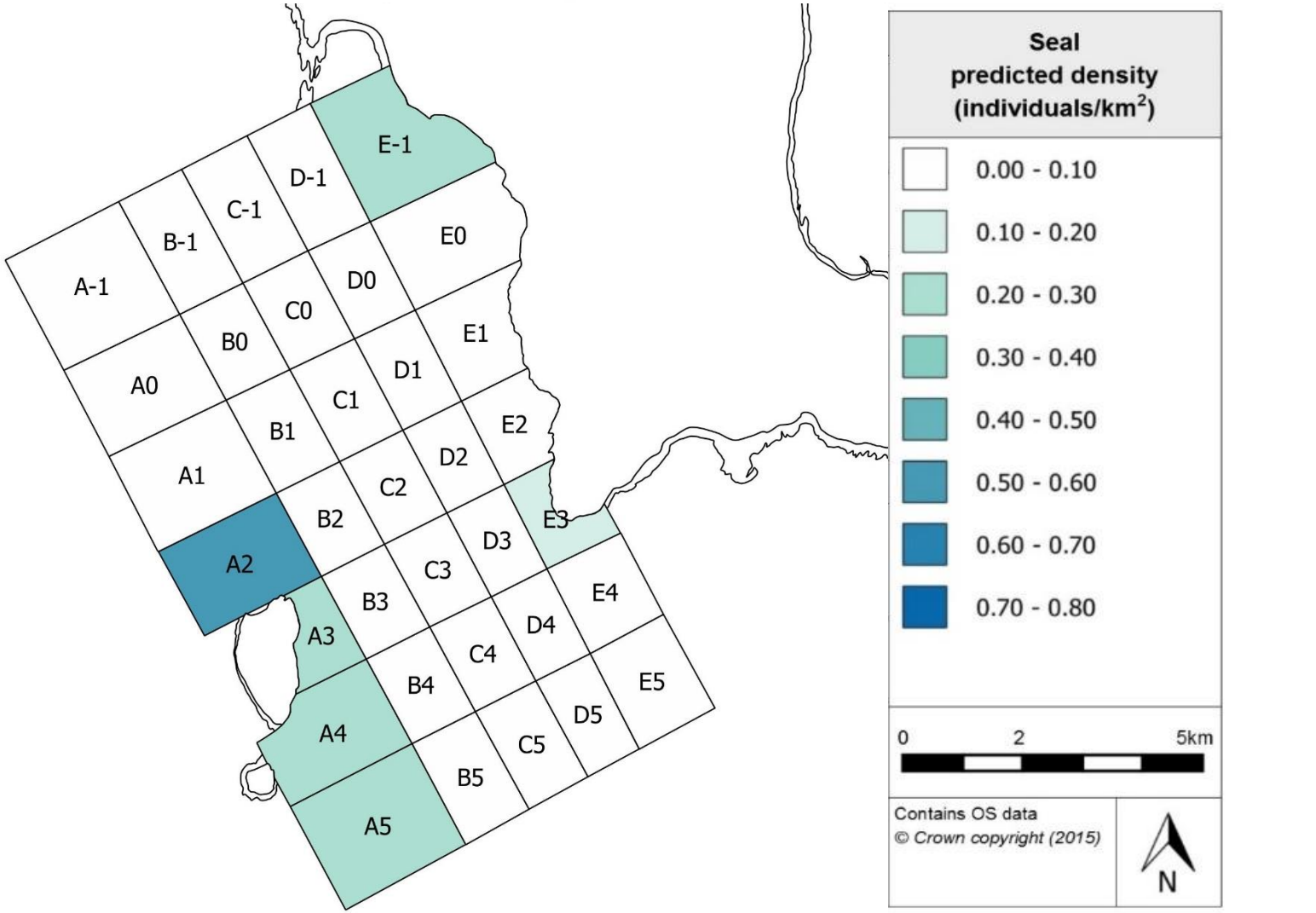

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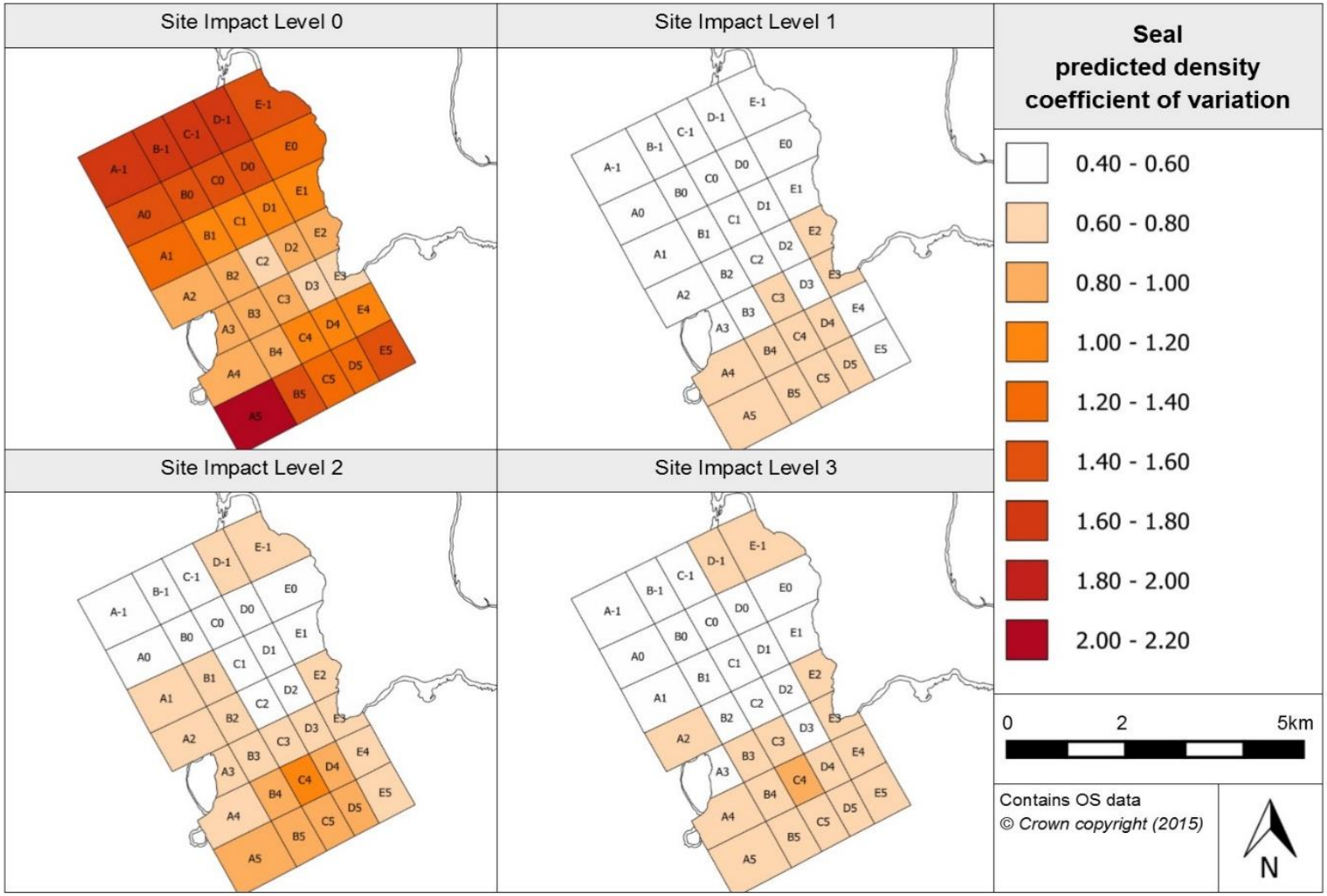

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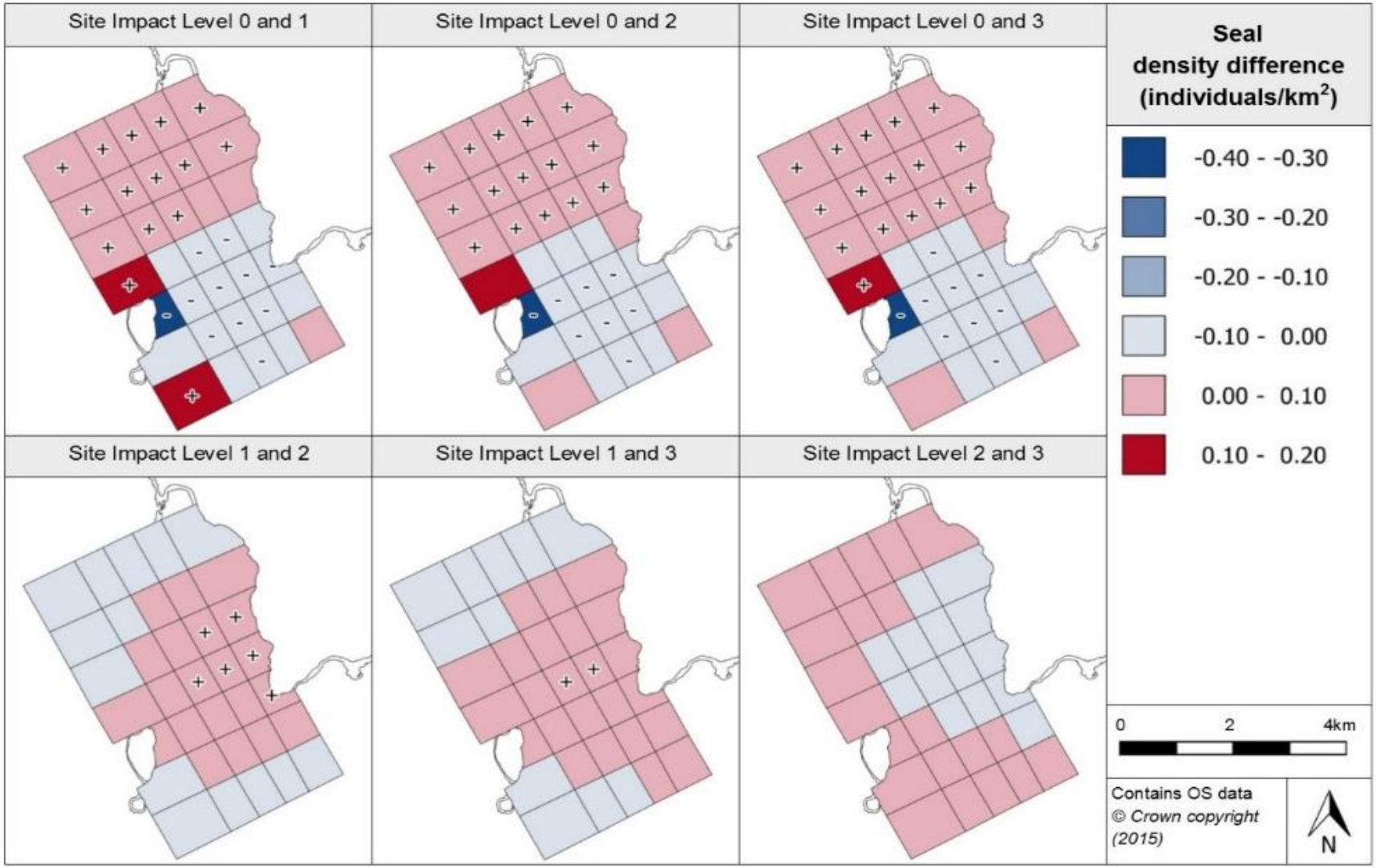

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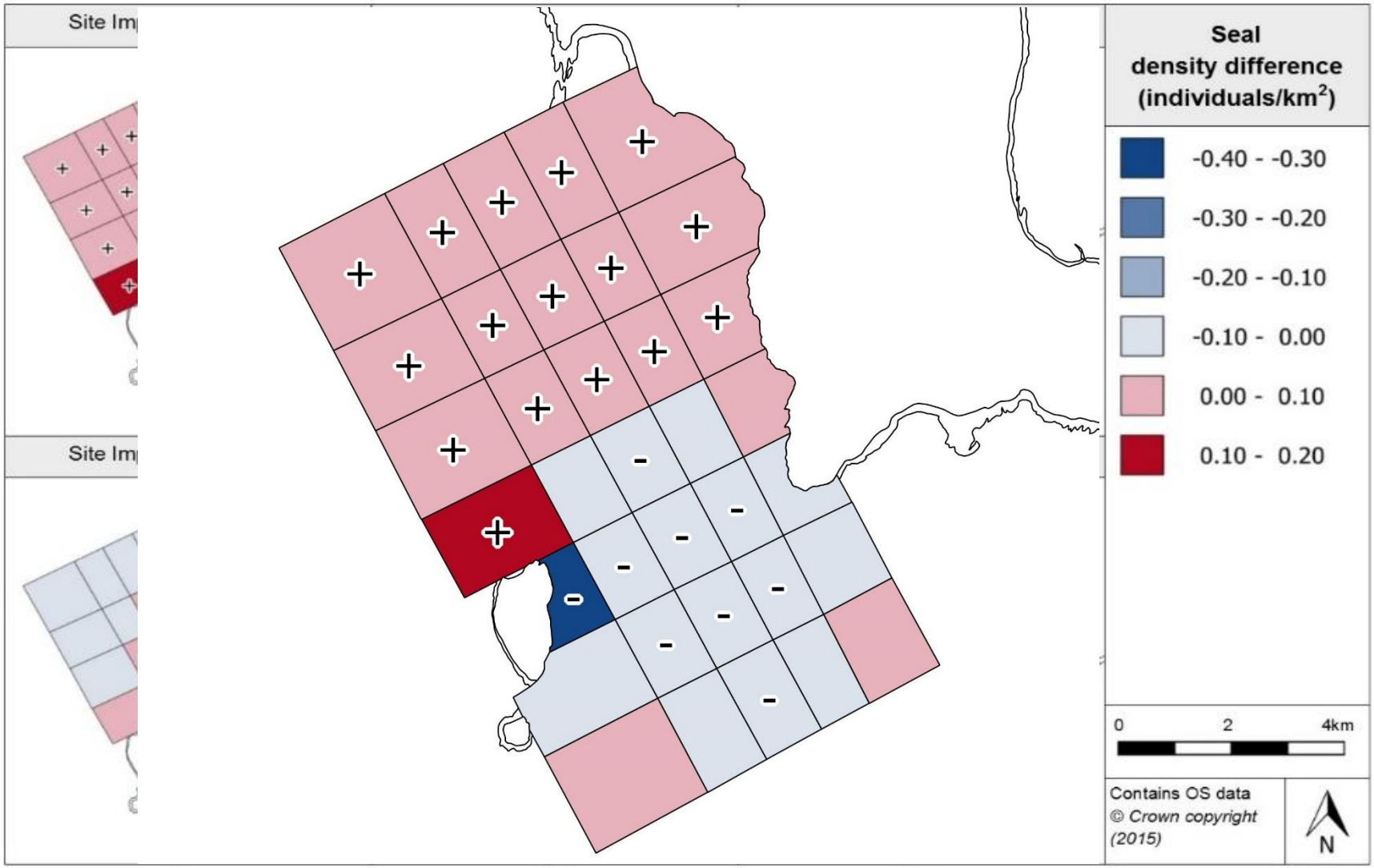

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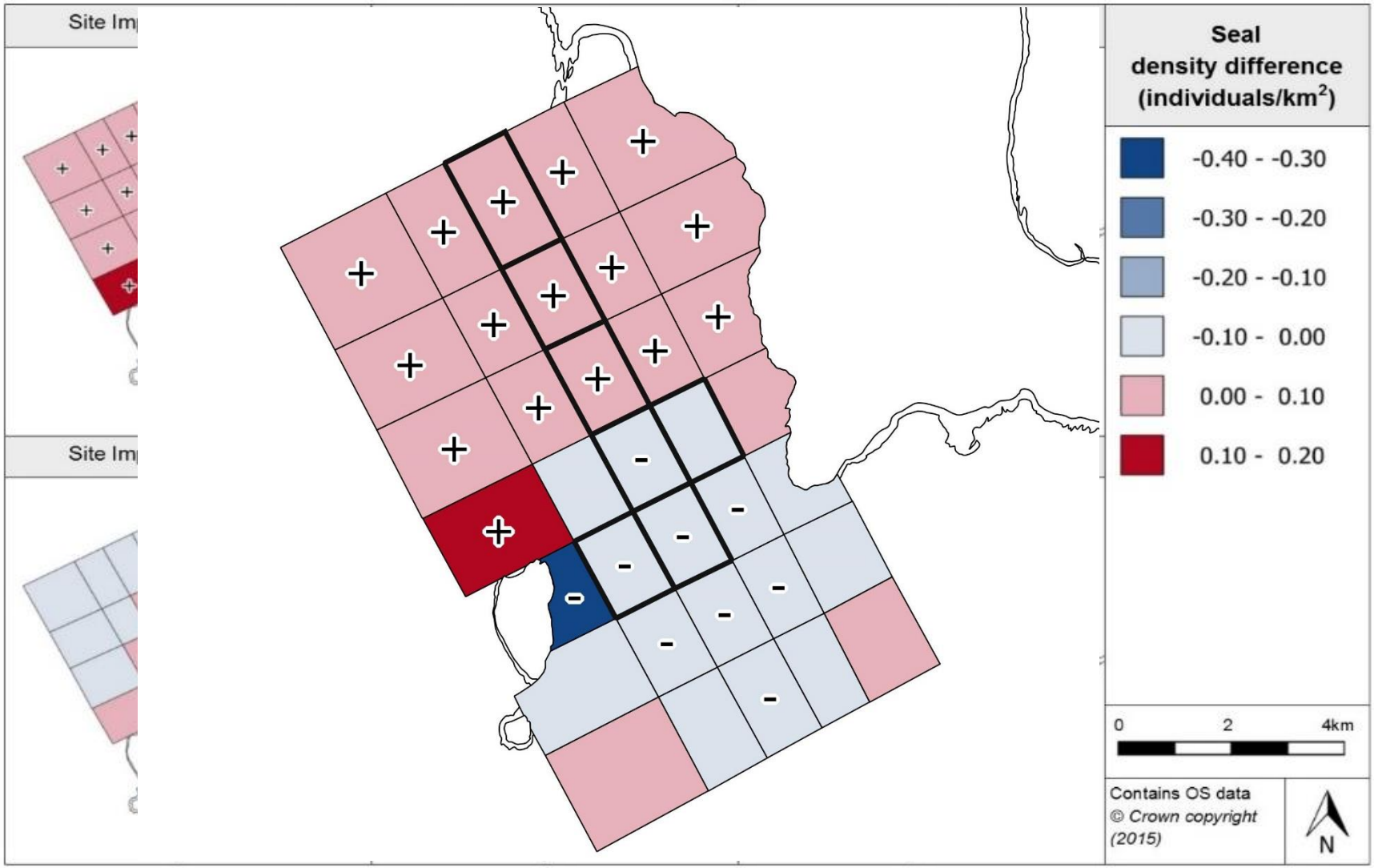

Results and Conclusions

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- Greatest changes in abundance/distribution tended to occur with installation of device-associated infrastructure, e.g. foundation, mooring systems
- When devices were operational, changes in abundance were less noticeable
- This could be a response to changes in vessel traffic on site
- Report published by Scottish Natural Heritage, see: **SNH Commissioned Report 947**

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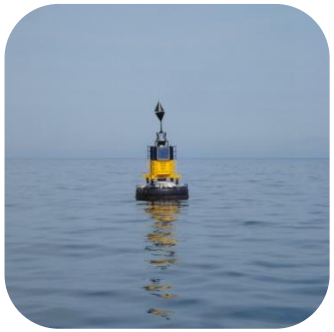


Thank you. Any questions?