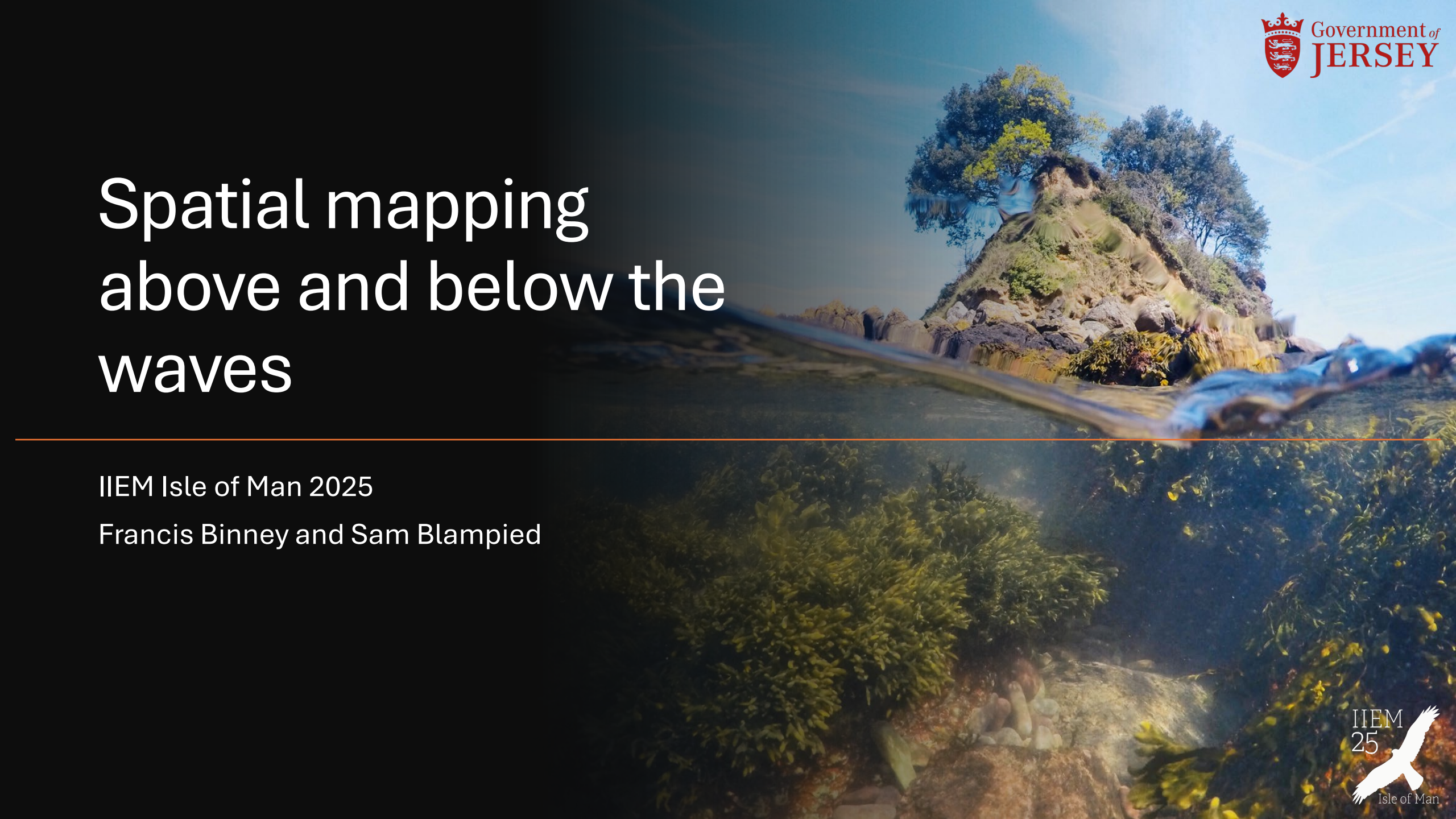
Spatial mapping above and below the waves



IIEM Isle of Man 2025

Francis Binney and Sam Blampied

Spatial issues – Stakeholders and Activities

- Harbours - Gorey, La Rocque, etc.
- Unregistered moorings
- Leisure boating
- Unpowered craft: kayaking, kite surfing, surfing, windsurfing
- Dangerous inshore activities: jet skis, water skiing
- Swimming, snorkelling, diving
- Sedentary tourism, sunbathing, cafés
- Active tourism: walking, co-steering
- Watersports companies
- Dog walking, horse riding
- Commercial fishing activity
- Recreational angling
- Low water fishing/foraging
- Guided tours and Jersey Heritage accommodation
- Oyster and mussel farming
- Electricity and telecommunication cables
- Sea defences and other infrastructure
- Environmental monitoring/pollution
- Water outfalls
- Commercial species and fishing gear
- Protected species and key habitats (biodiversity)
- Non-native species
- Background species and habitats
- Deposits at sea (FEPA)
- Mineral extraction
- Sites of Special Interest (SSIs)
- Cultural, biological archaeological, geological heritage
- Wildlife watching

- Everyone wants to be able to do what they want, when they want and where they want.

- Many of these activities are contradictory.

- Jersey is one the most densely populated places on Earth.

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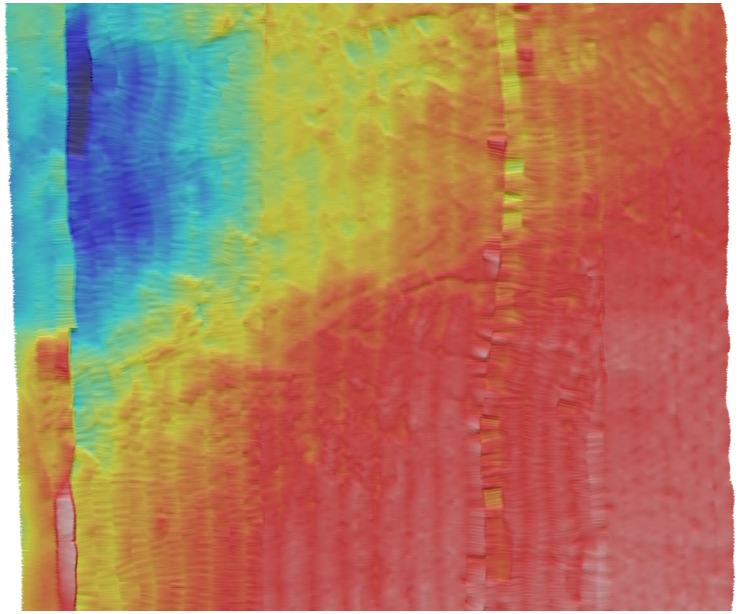
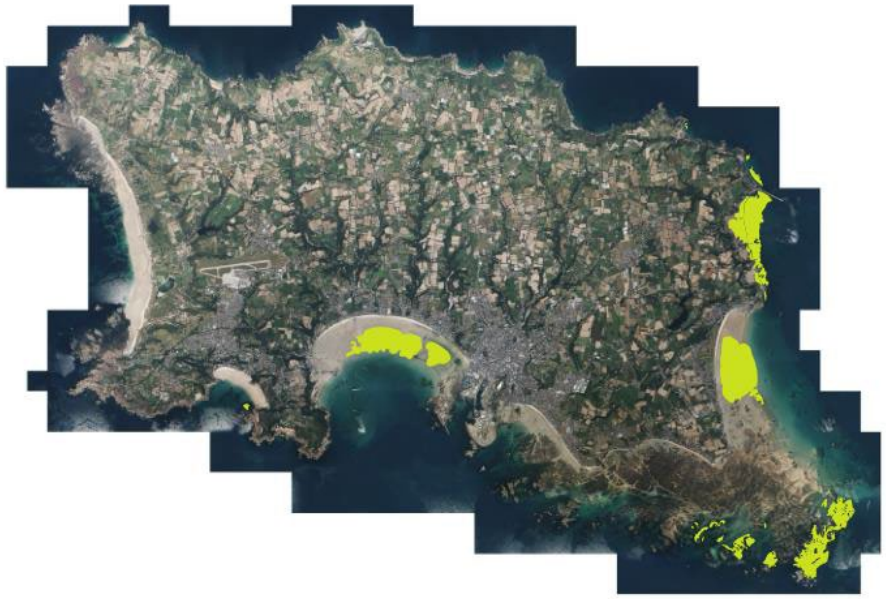
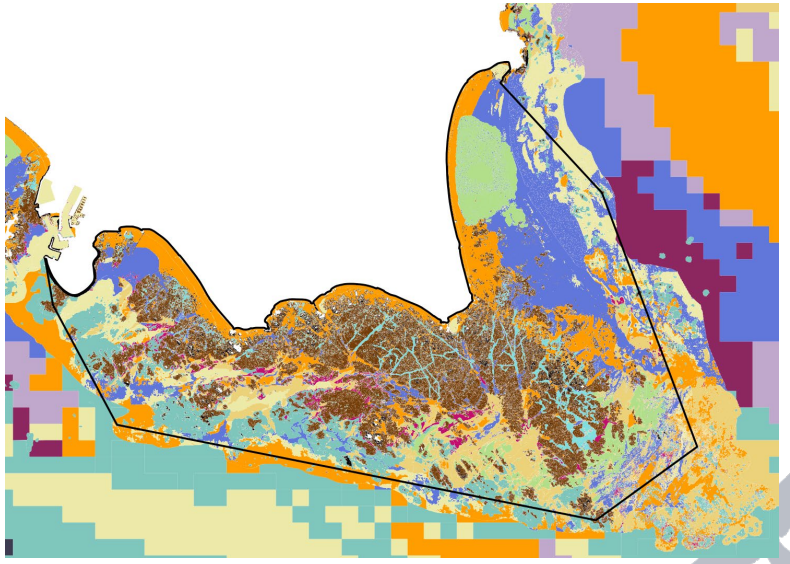
IIEM 25 Isle of Man

Spatial data

- Aerial images
- Habitat modelling
- Marine spatial planning
- Tracking species
- Seabed topography
- iVMS







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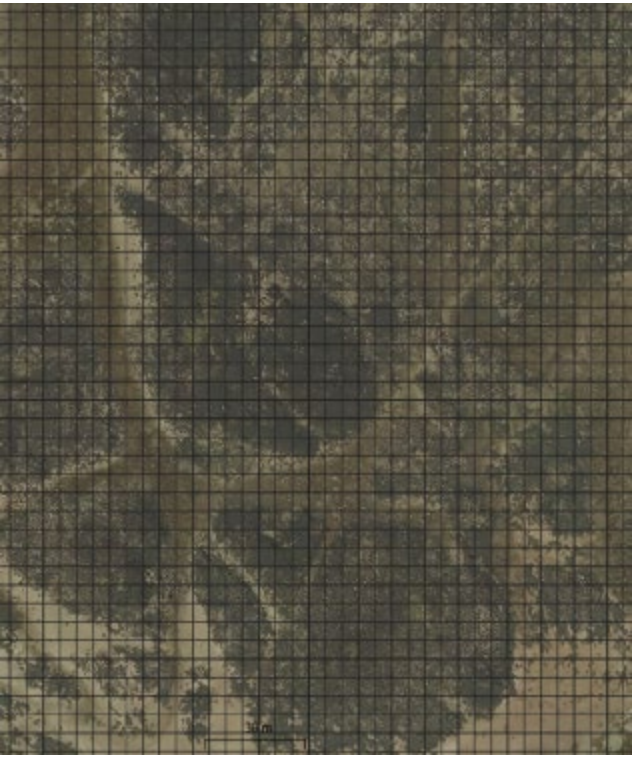
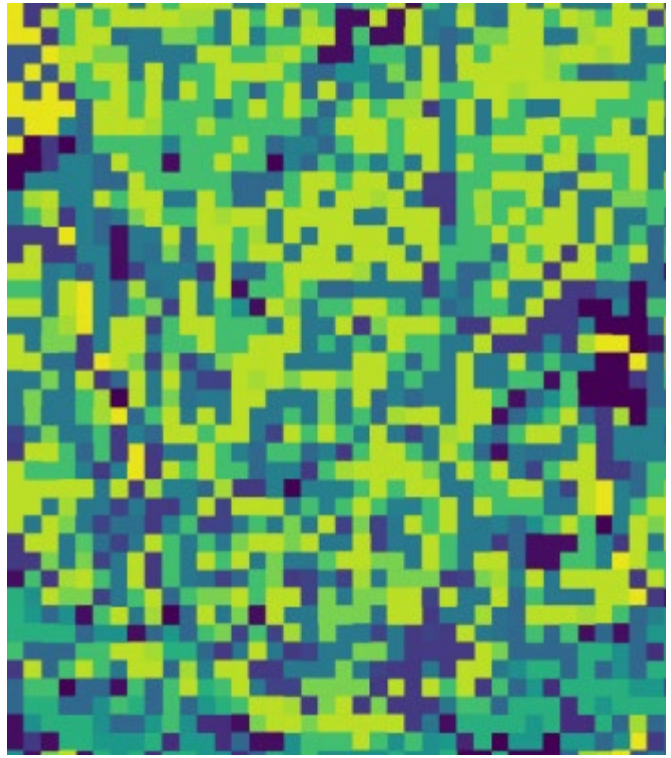
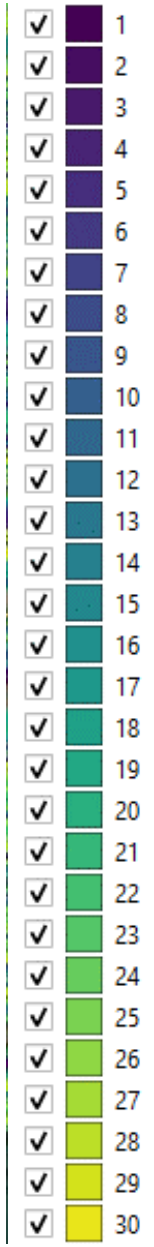
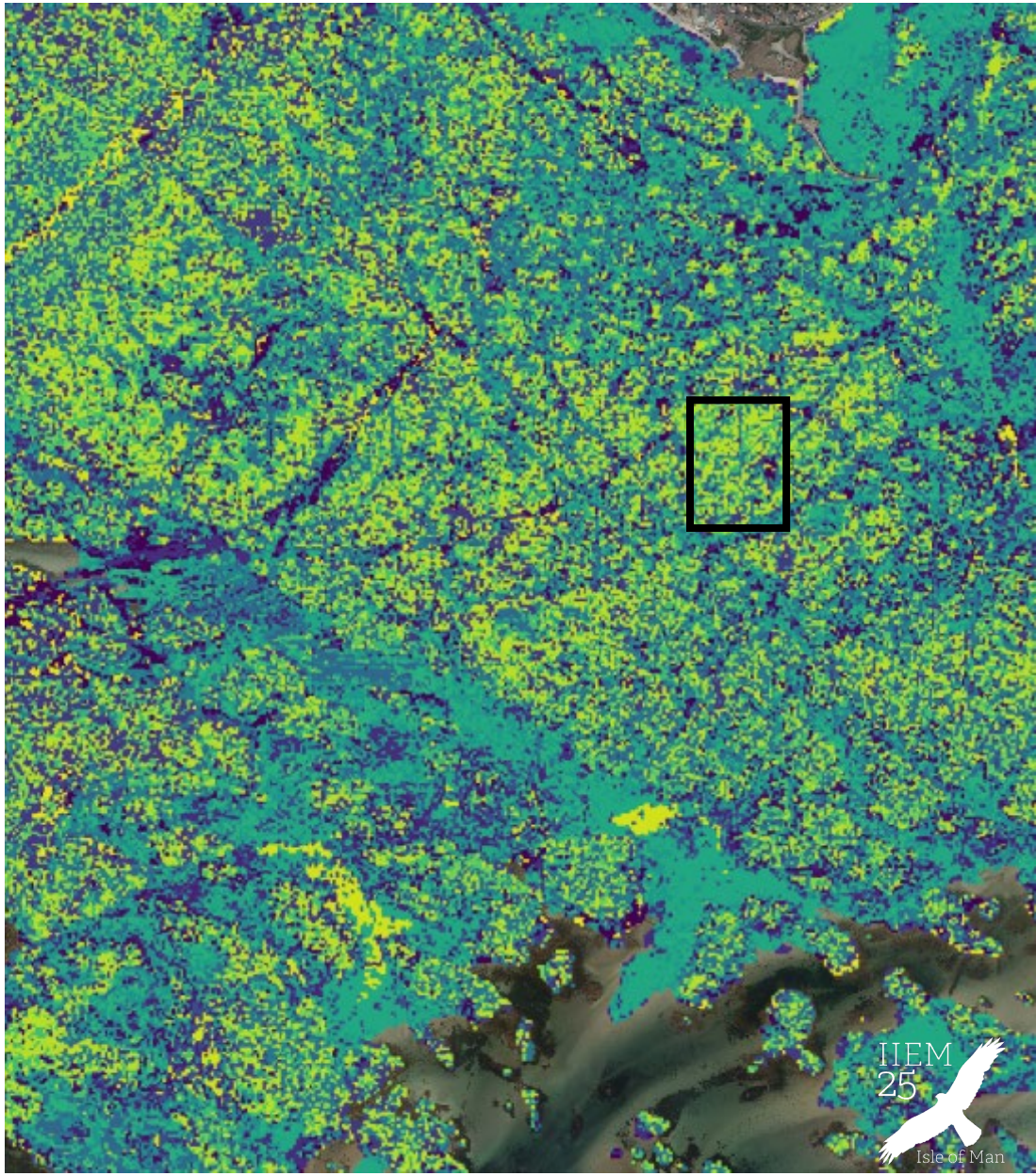
Isle of Man

Classification of intertidal habitat through machine learning



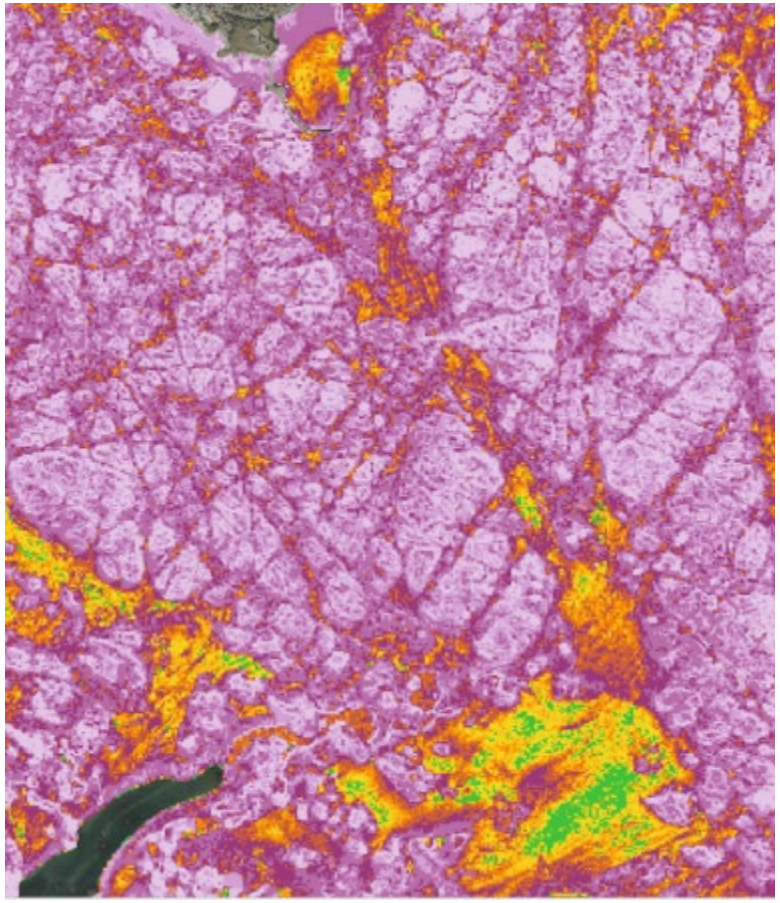




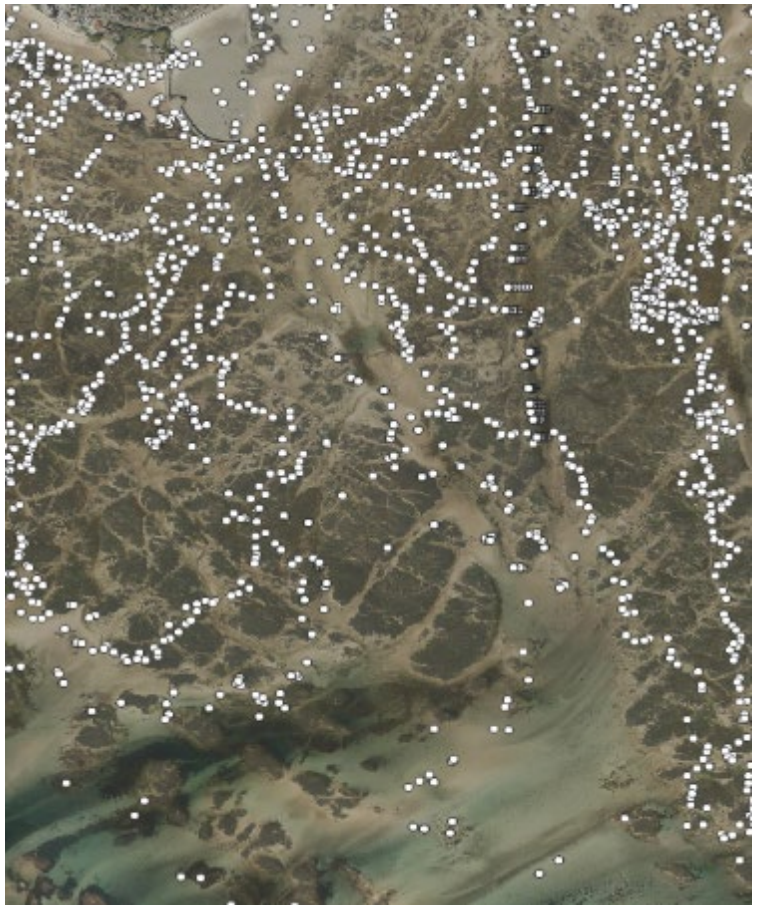


- Training dataset had 408,000 records and 110,000,000 data points
- Cluster analysis on training dataset: 30 clusters
- The cluster results were used to ‘train’ a k-nn machine learning algorithm to recognise the colour profile for the 30 clusters
- The algorithm was then fed the colour profile for 1.5 million 5 x 5 polygons from the whole aerial image
- The algorithm matched each polygon to one of the 30 clusters based on its analysis of the training dataset

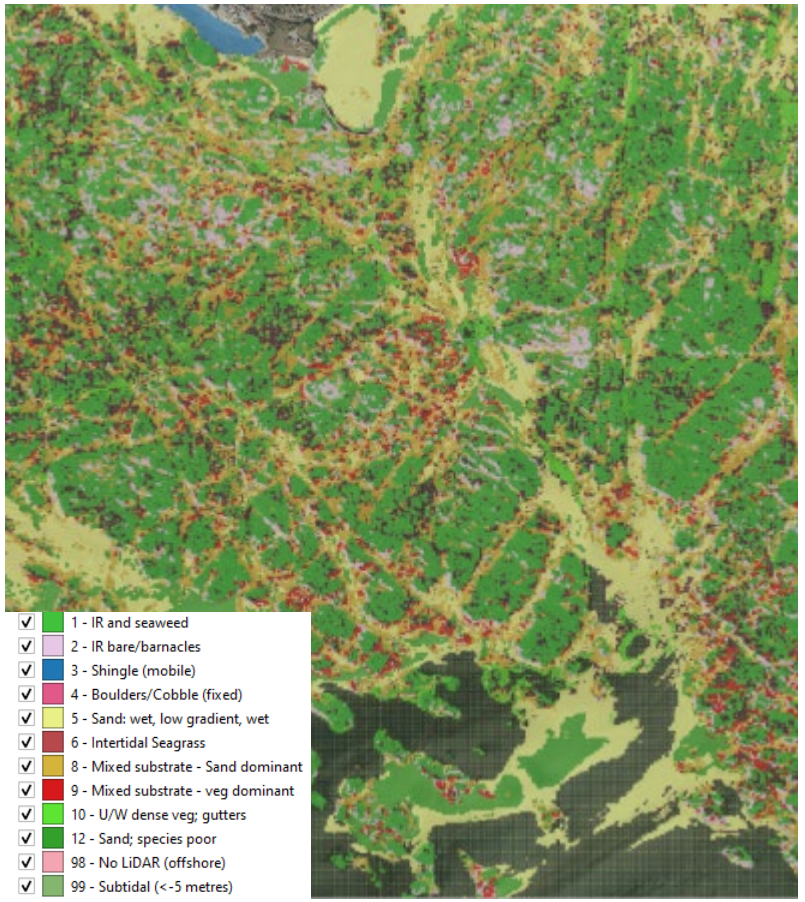
Introduction of other datasets



- Use LiDAR data (2020) used to identify substrate: rock, sand, water
- Also calculated ruggedness and slope
- Obtained height data for each polygon

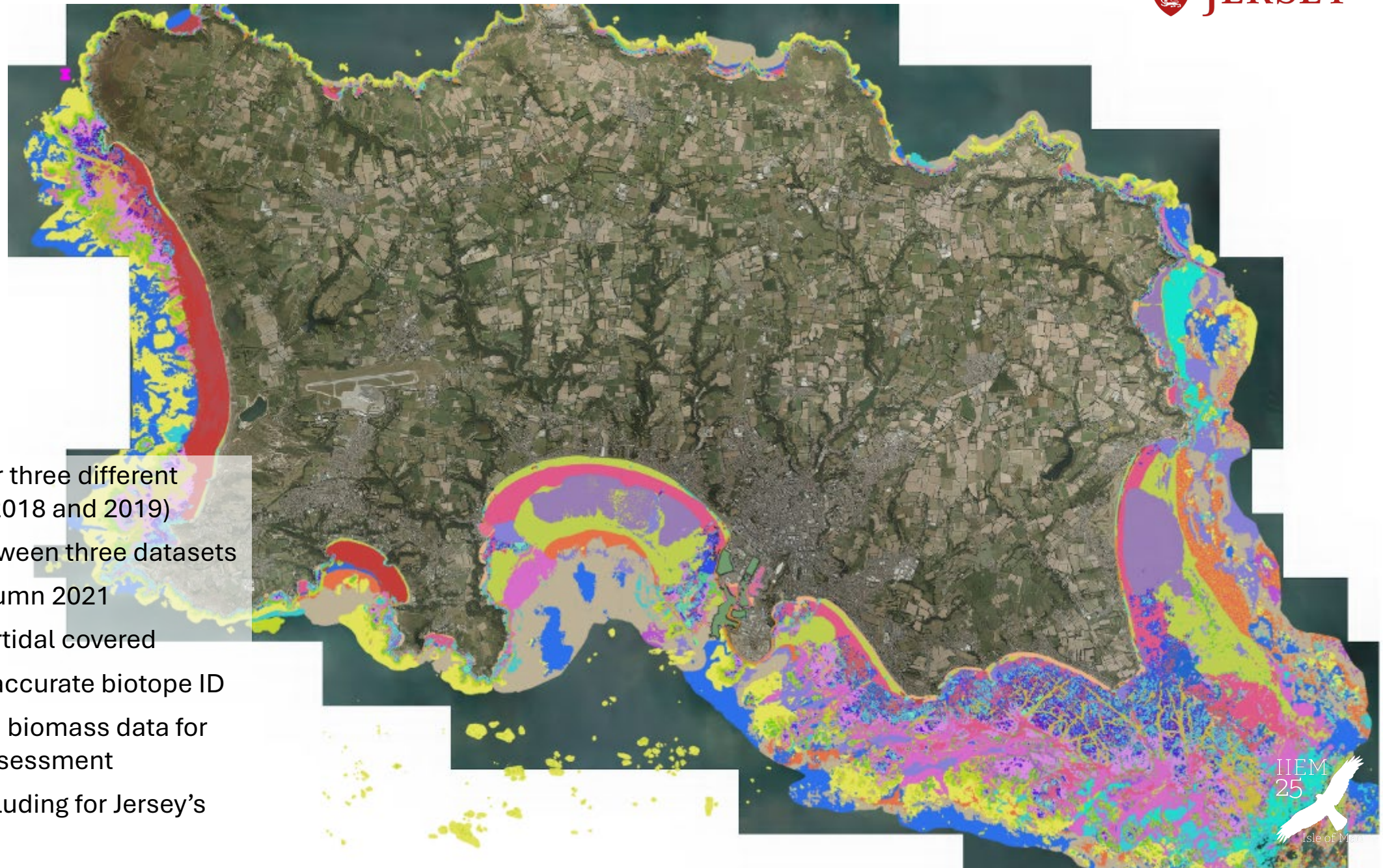


- Compare clusters and field data
- Identify key colour profiles for bare rock, wrack, sand (wet and dry), seagrass, rockpools, etc.
- JNCC/EUNIS classification used



- Using all data, start to combine clusters to create general habitat classifications
- Refine general habitat classifications using colour properties and field data

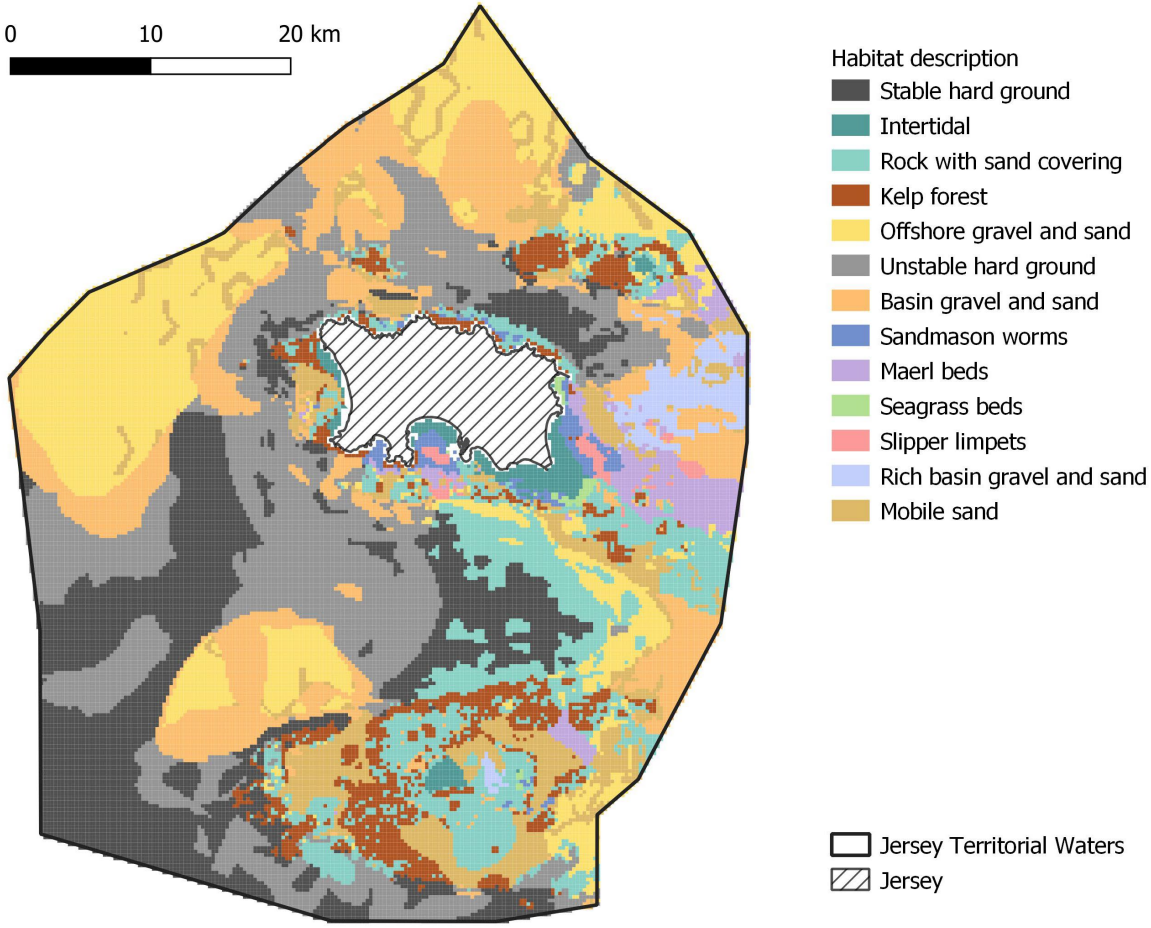
Final Intertidal Map!

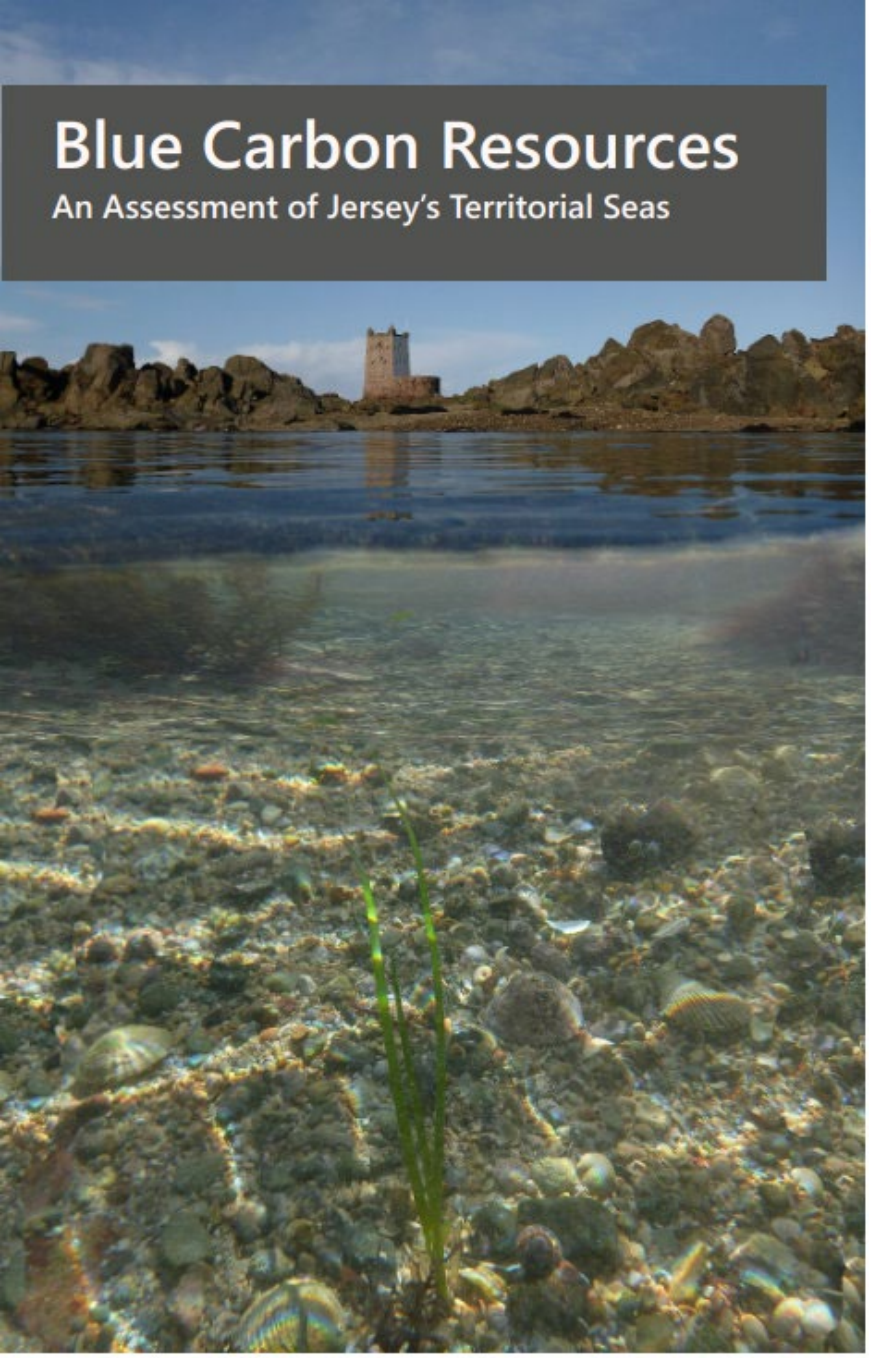


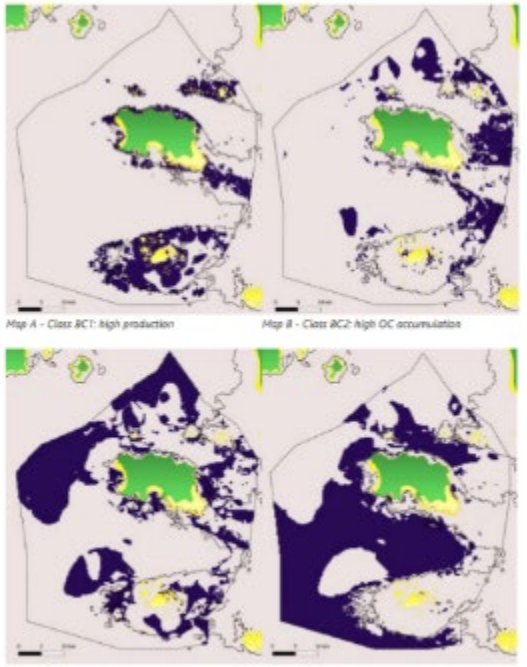
- Process repeated for three different aerial images (2003, 2018 and 2019)
- Cross-reference between three datasets
- Final map ready autumn 2021
- Whole of Jersey intertidal covered
- Fieldwork suggests accurate biotope ID
- Later combined with biomass data for use in blue carbon assessment
- Many other uses including for Jersey's Marine Spatial Plan

Subtidal habitat mapping

- The initial stage selected key parameters used by the JNCC: water depth, substrate and exposure to wave energy.
- The dataset was cross-tabulated to identify individual parameter combinations and, for each of these, the number of grid squares represented by them.
- This process produced a list of 35 different parameter combinations which could be matched to broad benthic habitat types most of which could be matched to at least level 3 of the JNCC biotope scheme.
- This information has enabled many other research streams.







Map A - Class BC1: high production

Map B - Class BC2: high OC accumulation

Map C - Class BC3: high IC accumulation

Map D - Class BC4: low production

Figure 17 - Four charts showing the geographic extent for each of the BC classes in Figure 16.

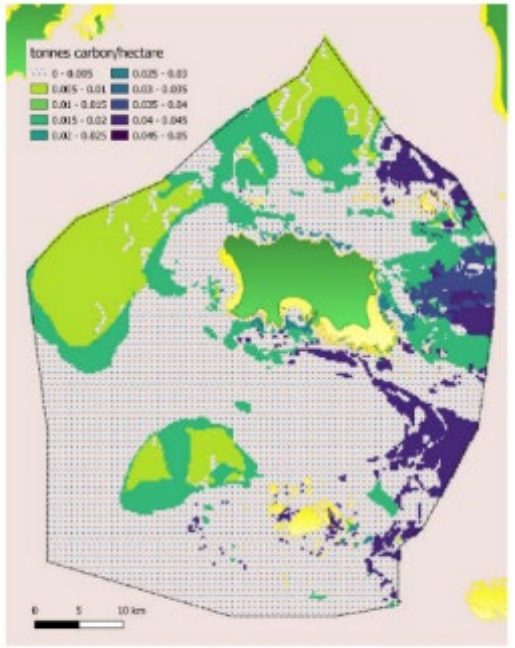


Figure 15 – Annual carbon accumulation (tonnes/ha) in Jersey's territorial seas. Accumulation potential reflects a combination of biodiversity, production and sedimentation with the highest rates being concentrated in the three sedimentary basins indicated in Figure 3. Lower rates of accumulation are associated with offshore areas of unstable sand and gravel where production and burial rates are lower.

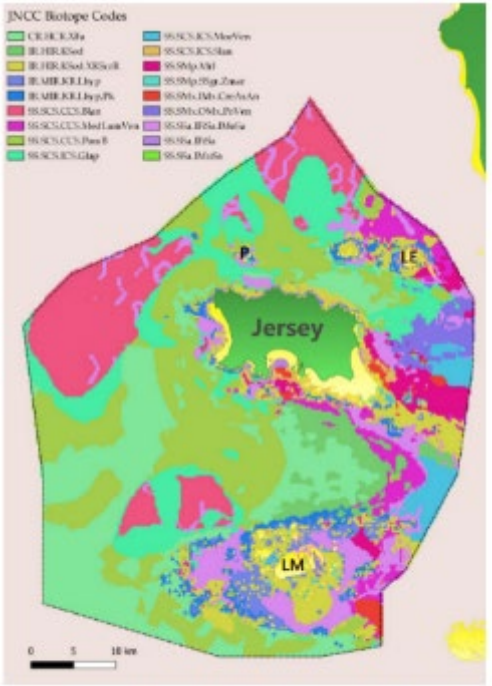


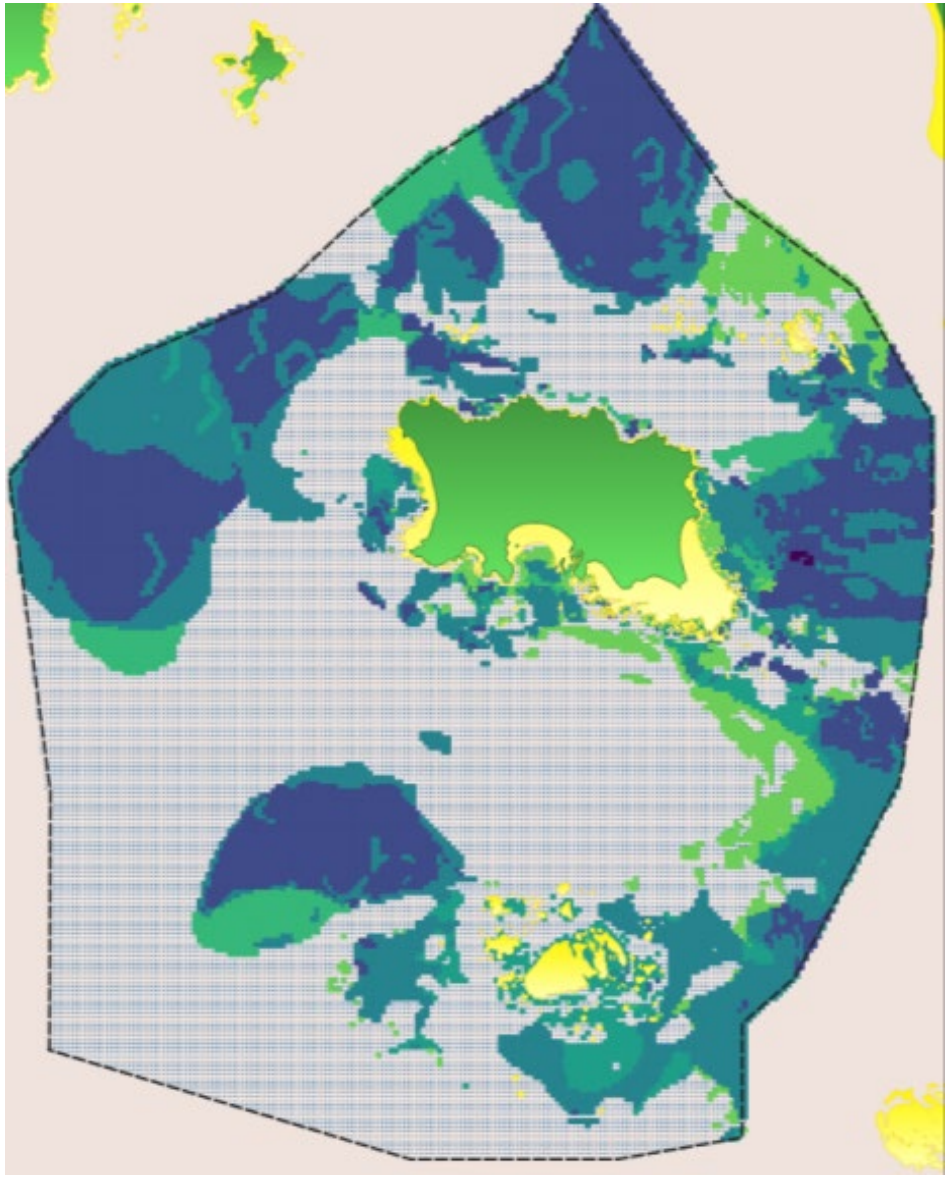
Figure 7 – A chart showing the extent of JNCC marine biotopes identified for Jersey's offshore territorial seas. For an explanation of the biotope codes see Table 3 and Appendix E. For a simplified chart based on a general seabed habitat description for see Figure 25. LM = Les Minquiers; LE = Les Ecréhous; P = Paternosters.

Jersey Blue Carbon Assessment report published on 6 October 2022

Available on the Government of Jersey website:

www.gov.je/government/pages/statesreports.aspx?reportid=5605

The Jersey Marine Spatial Plan – data and evidence



The scoping process began with 5 stakeholder workshops inf Feb 2023.

- 406 stakeholder response opinions were gathered
- generating 430 key focus opinions over 51 topics.

An evidence base in the form of an integrated computer model containing over 170 separate datasets was built.

- The evidence covers everything from carbon storage, to dog walking, to shipping and infrastructure.

A series of supporting / background reports are published in draft form alongside the consultation including but not limited to:

- Legislative review
- Ecosystems Services report
- Sensitive Species and associated habitats report
- Maritime Activities Assessment

Stakeholder consultation

Infrastructure and Environment

Climate Emergency JSY

Jersey Marine Spatial Plan Public Consultation Response Summary

July 2024

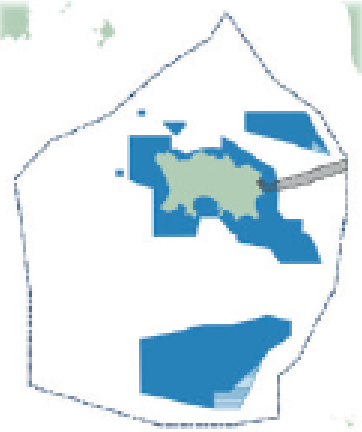
Marine Resources Department

- Charts were used as the basis of the consultation
- The goal was to understand what is valued where and any spatial conflicts
- The responses helped to shape the JMSP

Stage 9:

Post consultation

Proposed MPA taking into account comments and submissions made on the Public Consultation Draft, and including the Jersey-France submarine cable mandatory exclusion corridor. The MPA map is shown at a larger size in Fig. 8a, along with the areas for further survey for future MPA designation. Please see Chapter 9 for seasonally-restricted mobile fishing areas.



Marine Protected Area criteria

- Existing MPAs and Ramsar sites
- OSPAR habitat and reef systems
- Intertidal and nearshore
- Blue carbon, biodiversity and nature benefits

Stage 1:

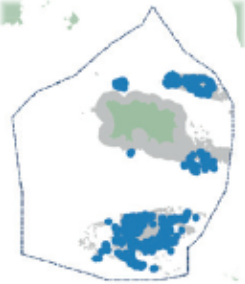
Existing MPAs and NTZ (shown in blue)

JMSP principle that there will be no loss of protection from existing levels.

Stage 5:

Drying rocks and islets (shown in blue)

Rich habitats associated with reefs, shoals and channel complexes, and supporting nursery habitats for fish as well as diverse fauna.



Stage 2:

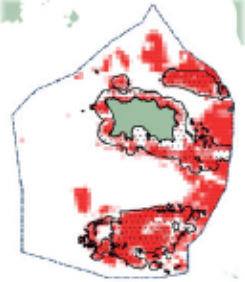
Ramsar Sites (shown in blue)

Designated and managed as wetlands of international importance, but currently without statutory protection.

Stage 6:

Blue Carbon

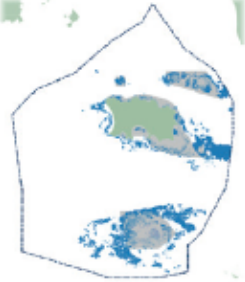
Areas of greatest potential to produce and store blue carbon. (The darker the colour, the greater the blue carbon potential).



Stage 3:

Potential OSPAR habitats (shown in blue)

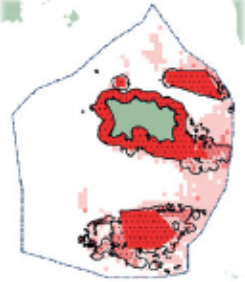
Areas of seagrass, maerl and kelp (containing areas of kelp forest) which are internationally recognised for their importance to biodiversity



Stage 7:

Scores for secondary features

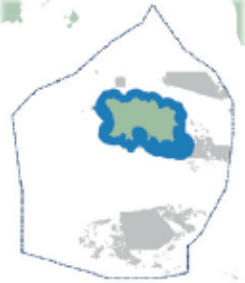
Combined results of scoring process for benefits from nature, marine biodiversity and seabed depth (The darker the colour, the higher the score).



Stage 4:

Intertidal and nearshore zone (shown in blue)

Areas of diverse habitat which require close management due to the range of activities being undertaken in the area.



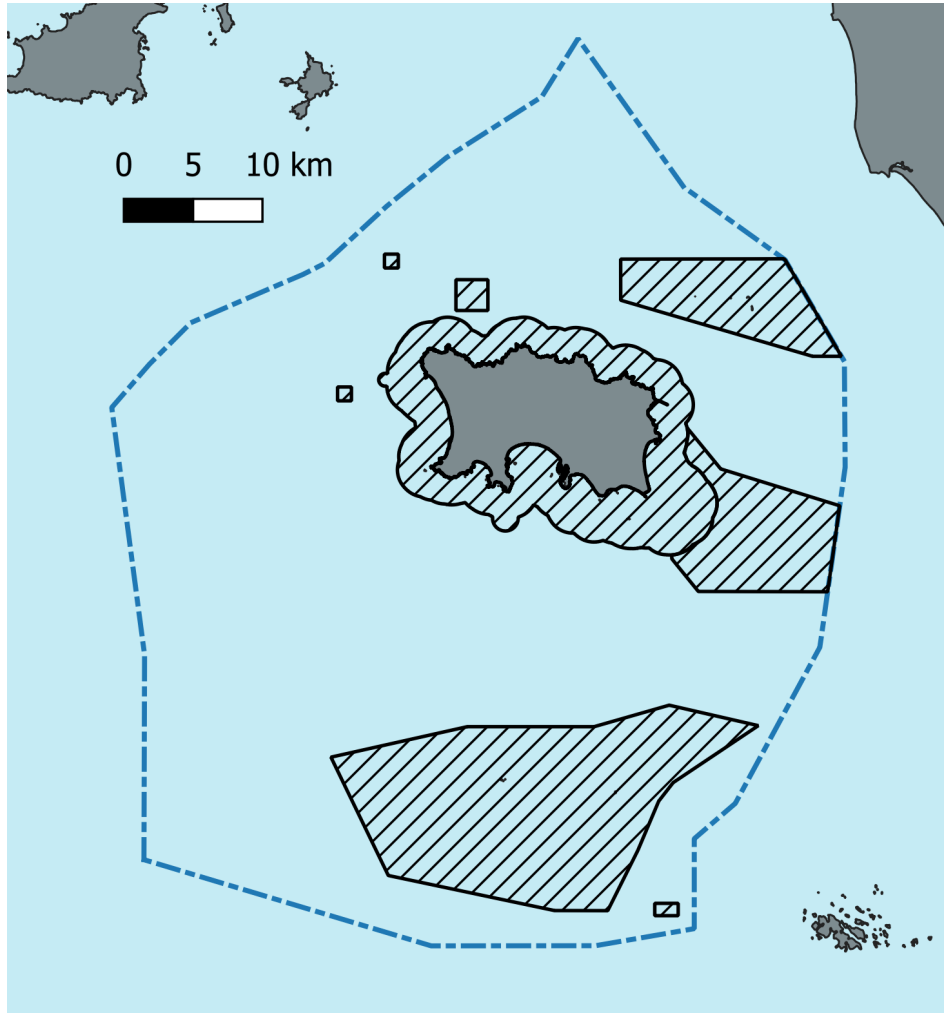
Stage 8:

Proposed MPA network from Public Consultation Draft (shown in blue)

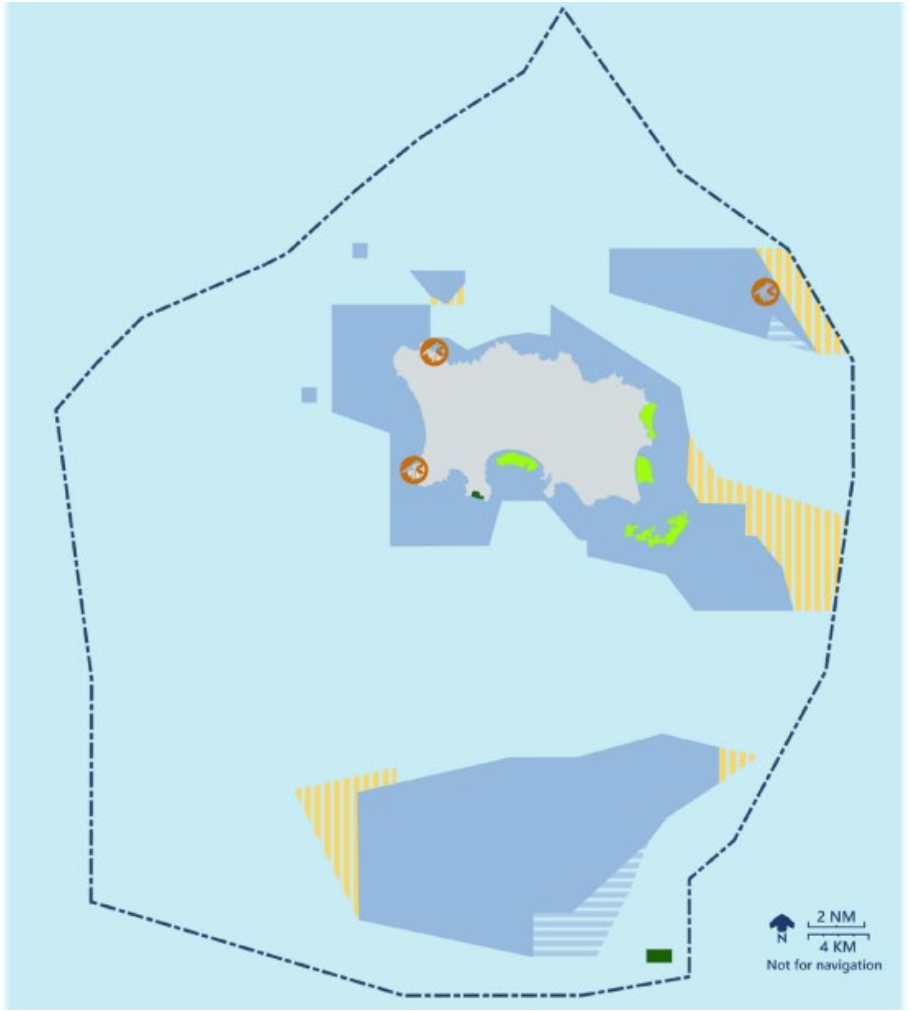
The map in Appendix D shows how these MPA boundaries were subsequently changed to reflect comments and submissions received through the public consultation process.

Marine Spatial Plan proposed MPA network

Pre consultation MPA proposal



Post consultation MPA proposal



MPA Coverage

Existing MPA = 6.5%
JSY-FR Cable = 1%

Pre consultation
MPA proposal = 27%

Post consultation
MPA proposal = 22.3%

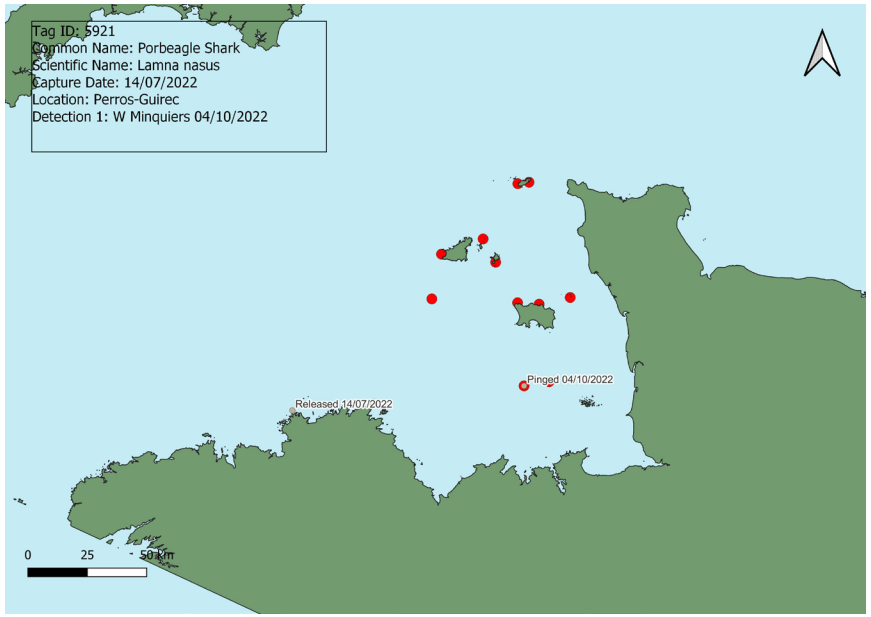
Area to be lost to mobile fishing:

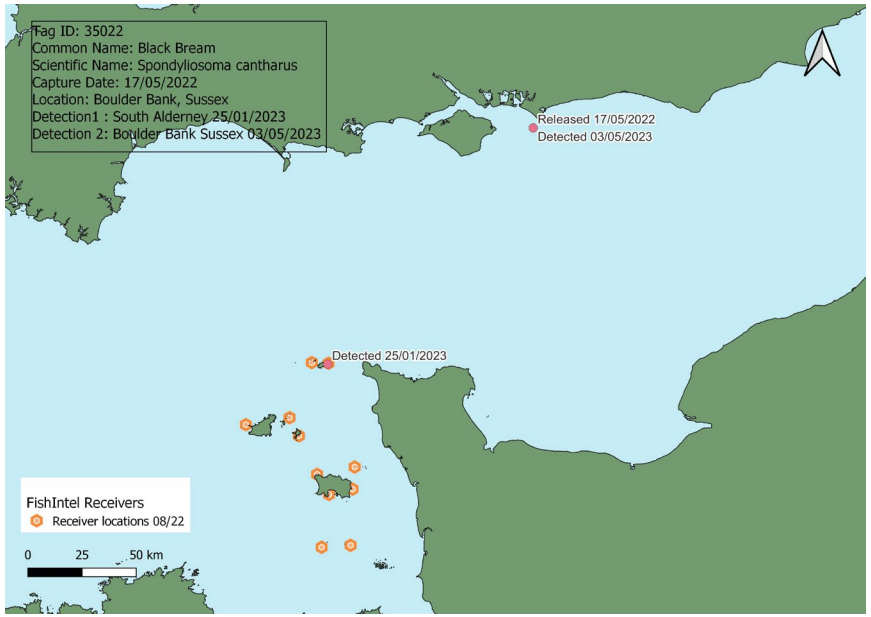
3-12NM area
NTZ area = 0.1%
MPA area = 17.5%
Phased area = 1.6%
Total = 19%

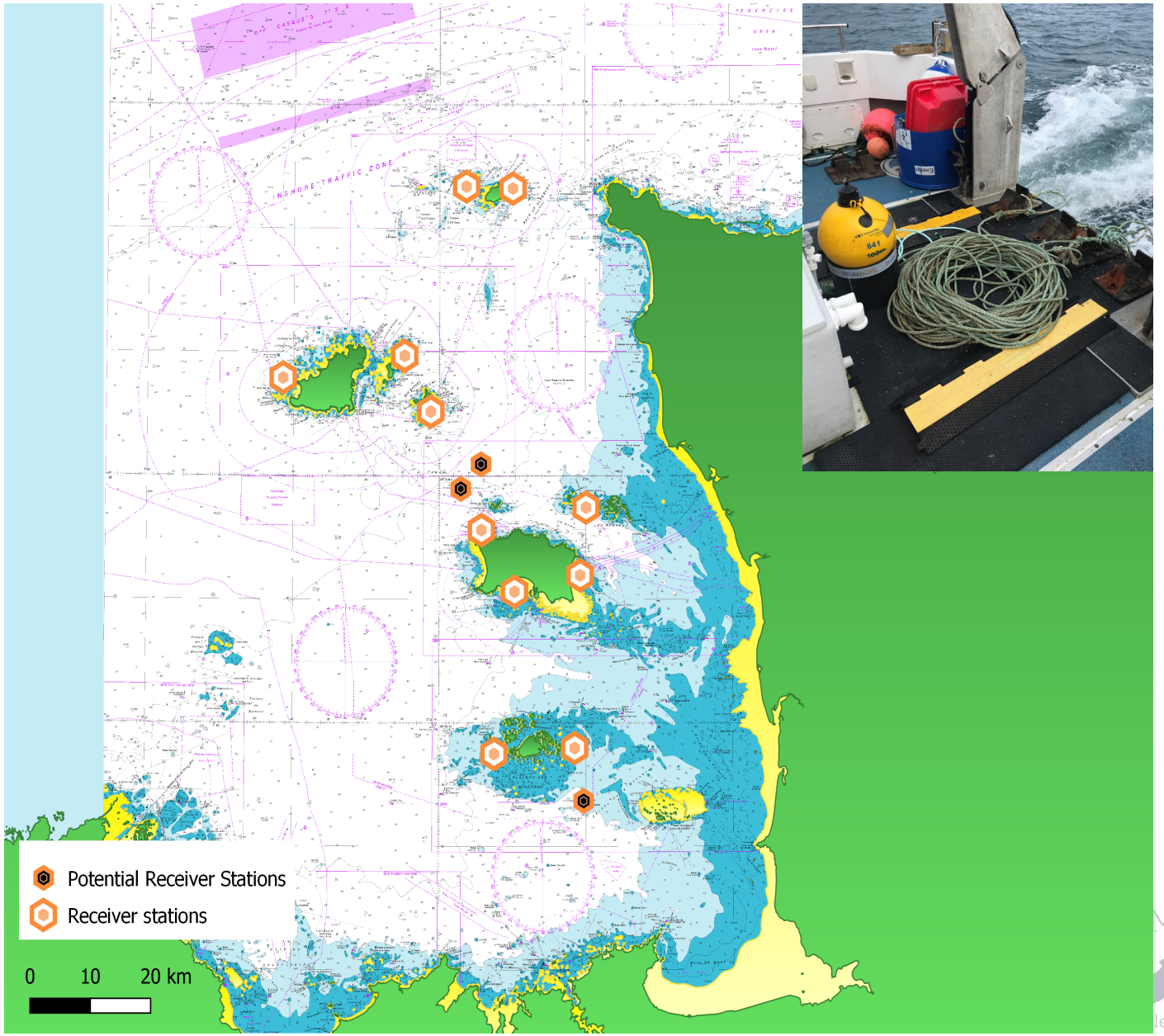
Survey area = 4.4%

0-3NM area
MPA area = 26%

Hydrophone and receiver array



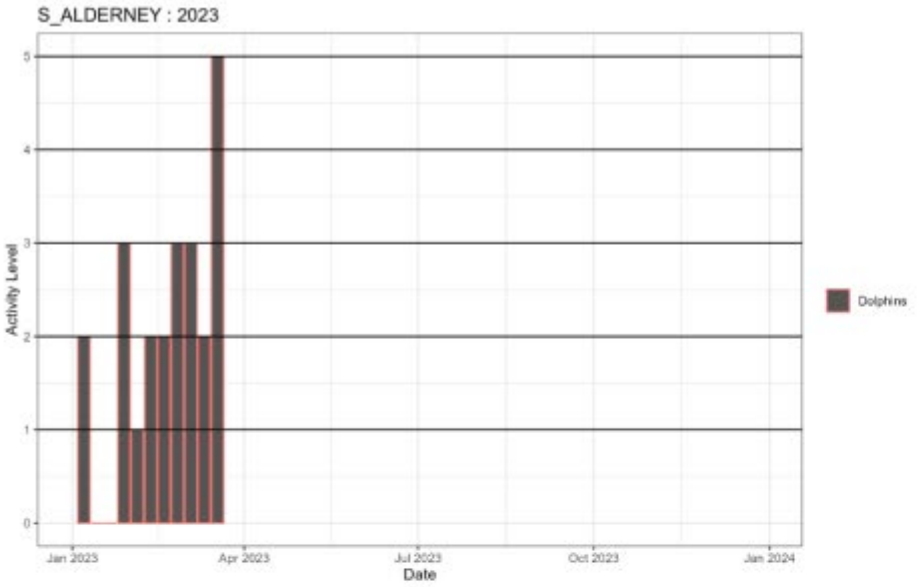


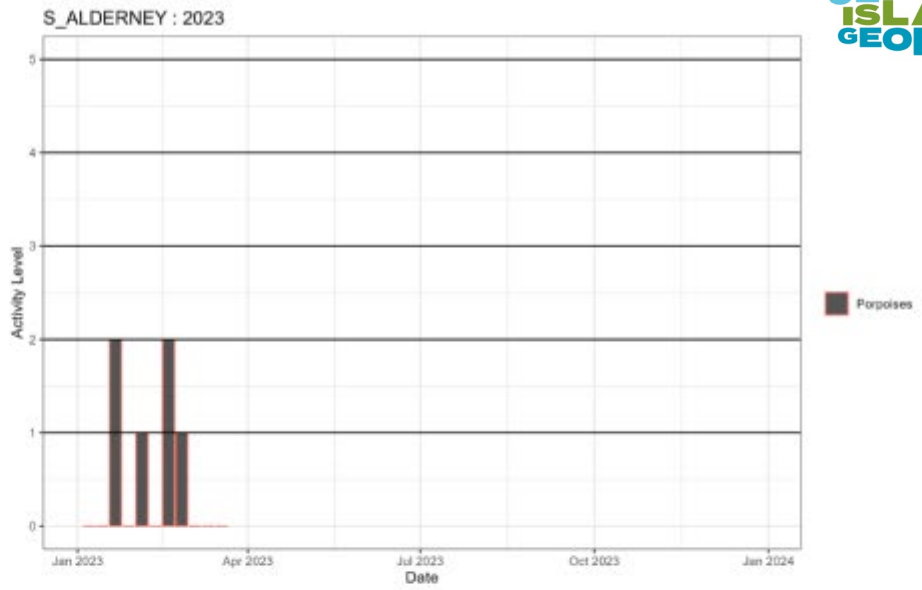


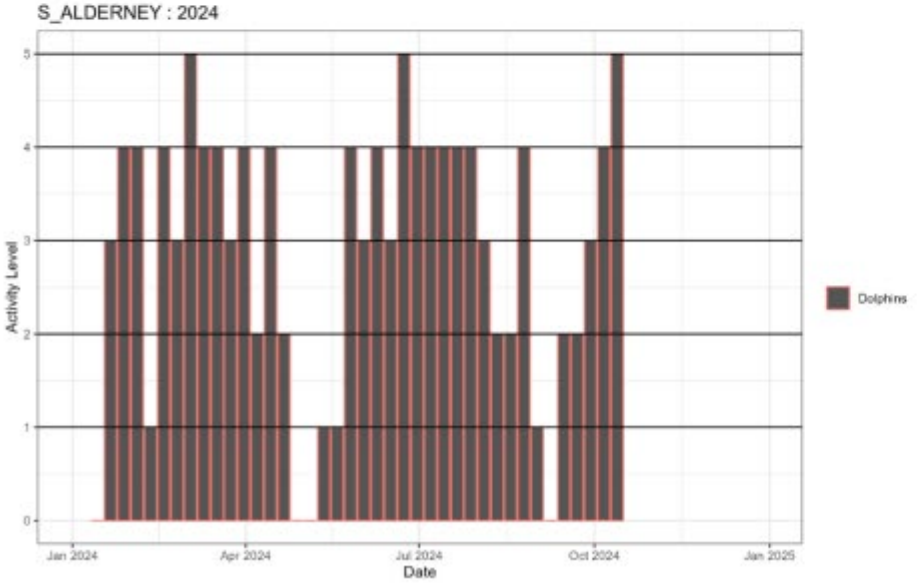
Dolphin and porpoise activity

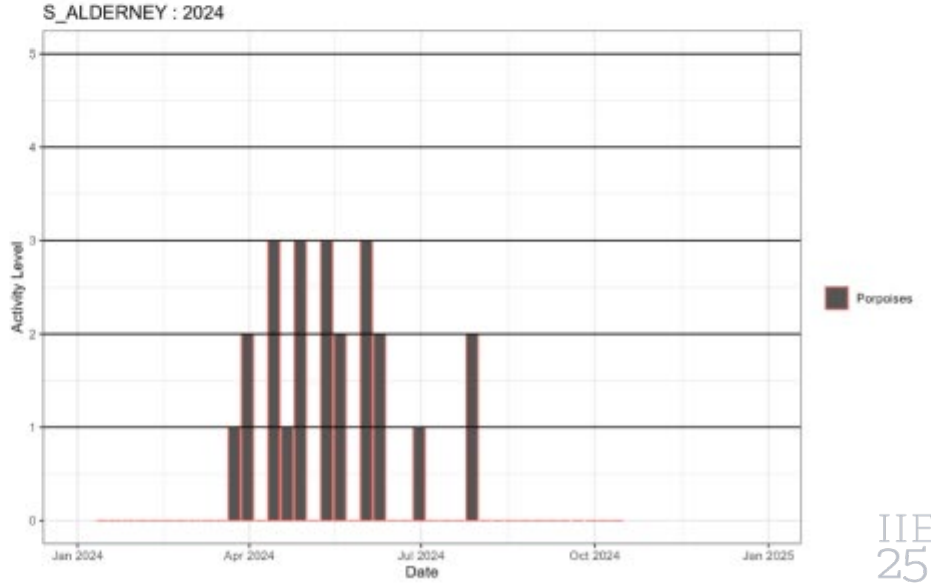
Analysis examples from Paul Chambers (Jersey aspiring Geopark).

Further work needed to understand detection rate difference between CPODs and FPODs.



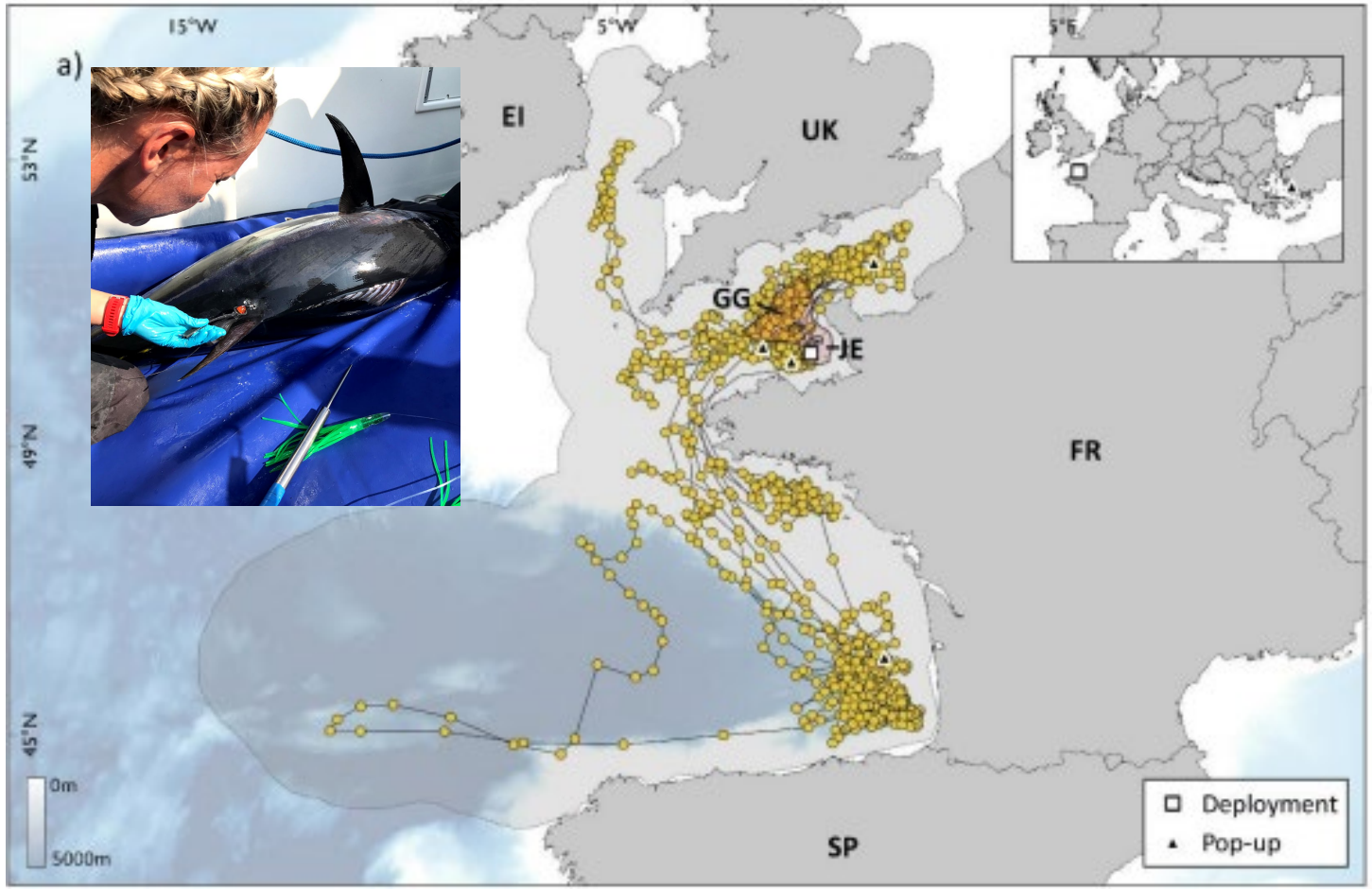






Bluefin Tuna Tagging

- Noticeably smaller fish sighted in Jersey compared to Falmouth and around the British Isles.
- Nearly all ABT were immature
- 140cm FL (smallest tagged in Thunnus Programme)
- Mean: 173cm (163lb)
- 15 ABT in total 2021-2024
- ICCAT Ratification complete July 2025

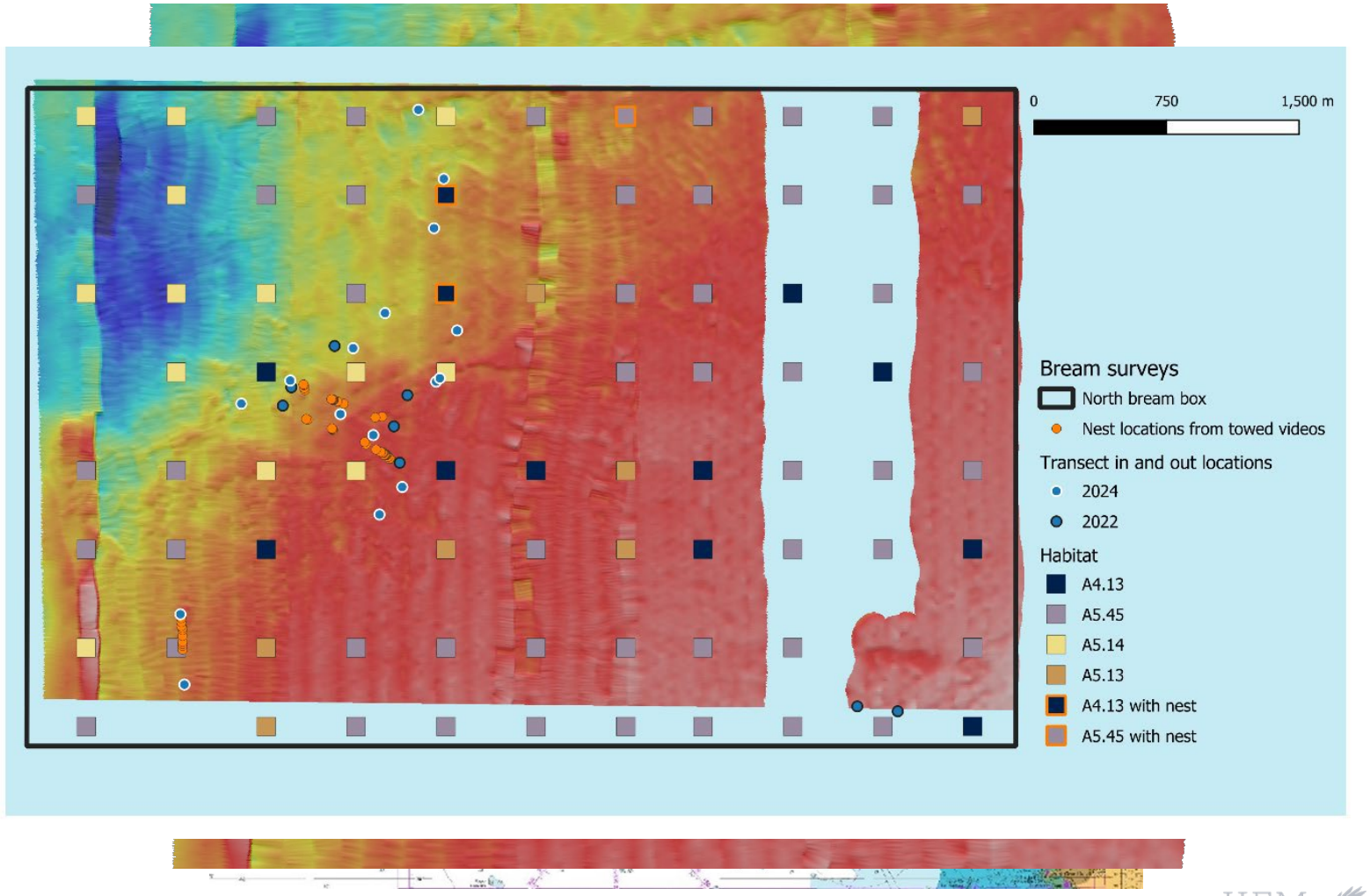


Shark and ray tagging

- The primary aims of this PhD are to investigate whether the tope shark and ray (Blonde, Undulate, Small-eyed) populations in Jersey waters are genetically distinct and isolated from neighbouring populations, and to assess the extent of genetic isolation and connectivity between local and regional populations.

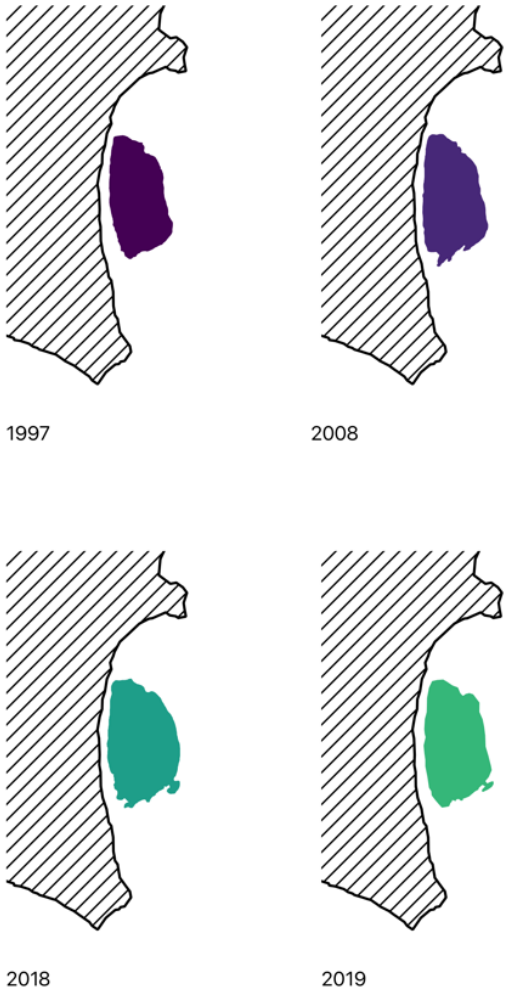
Bream nests

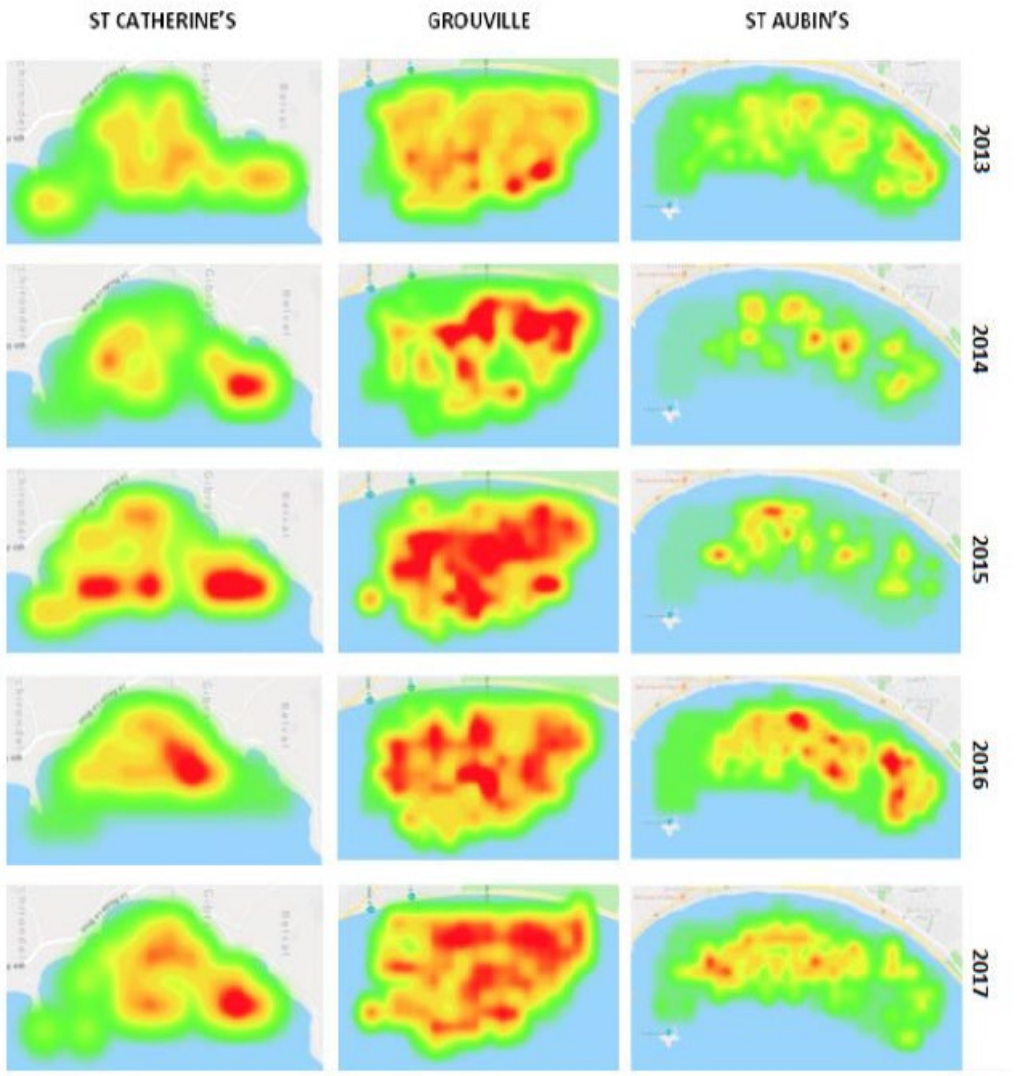
- Data layering
- Fishing activity, topography, habitat type (drop cameras), visual nest information (towed videos).



Seagrass monitoring

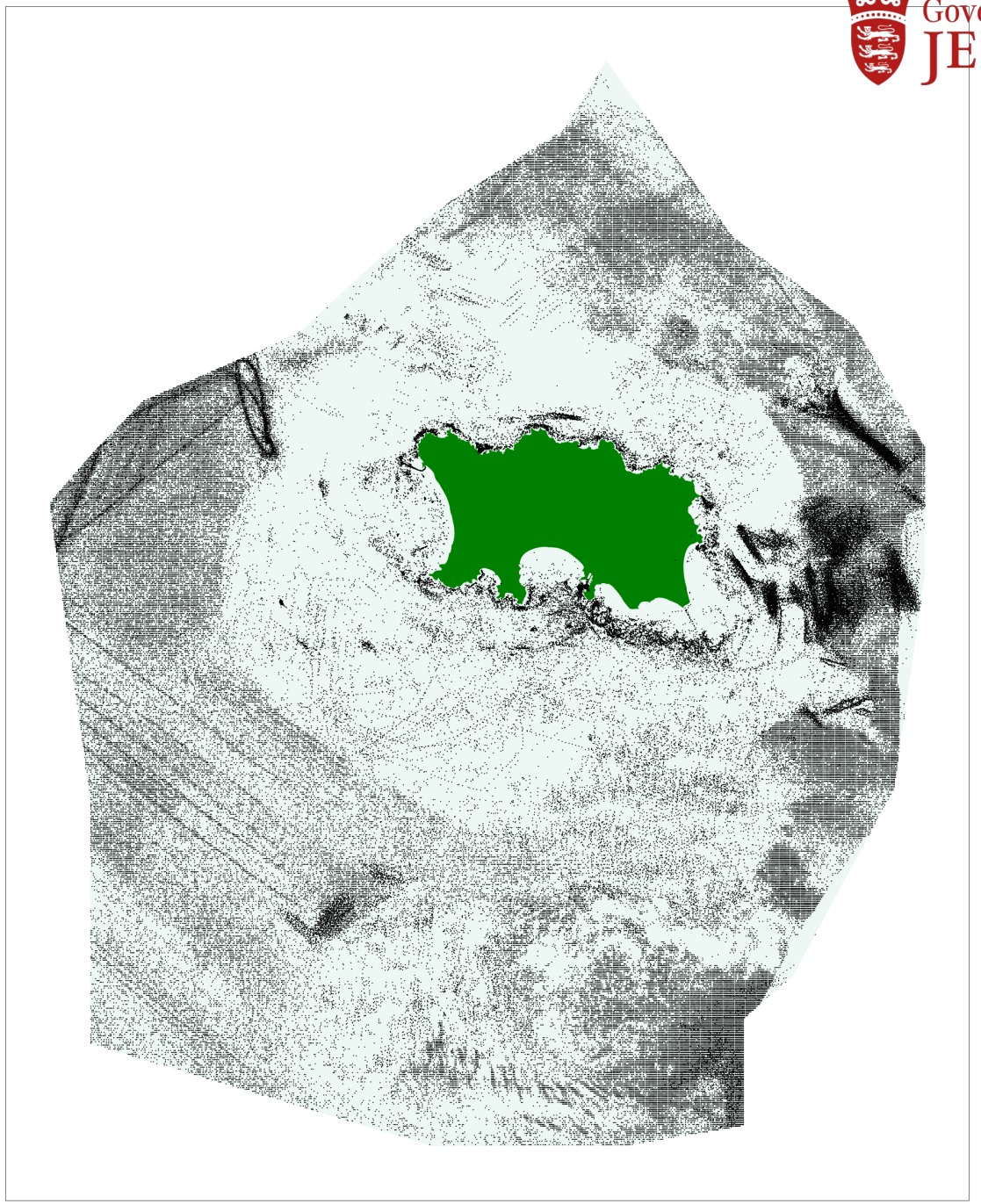
- Aerial imagery and annual point sampling





iVMS

- Jersey commercial vessel 2025 data
- Shows hotspots of fishing activity
- Certain fishing activities can be identified by the patterns
- Combined with catch data this can tell us a lot about fishing grounds and fish stocks

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