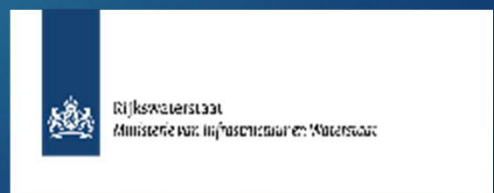
JOMOPANS

JOINT MONITORING PROGRAMME FOR AMBIENT NOISE IN THE NORTH SEA

Dr Ewan Edwards

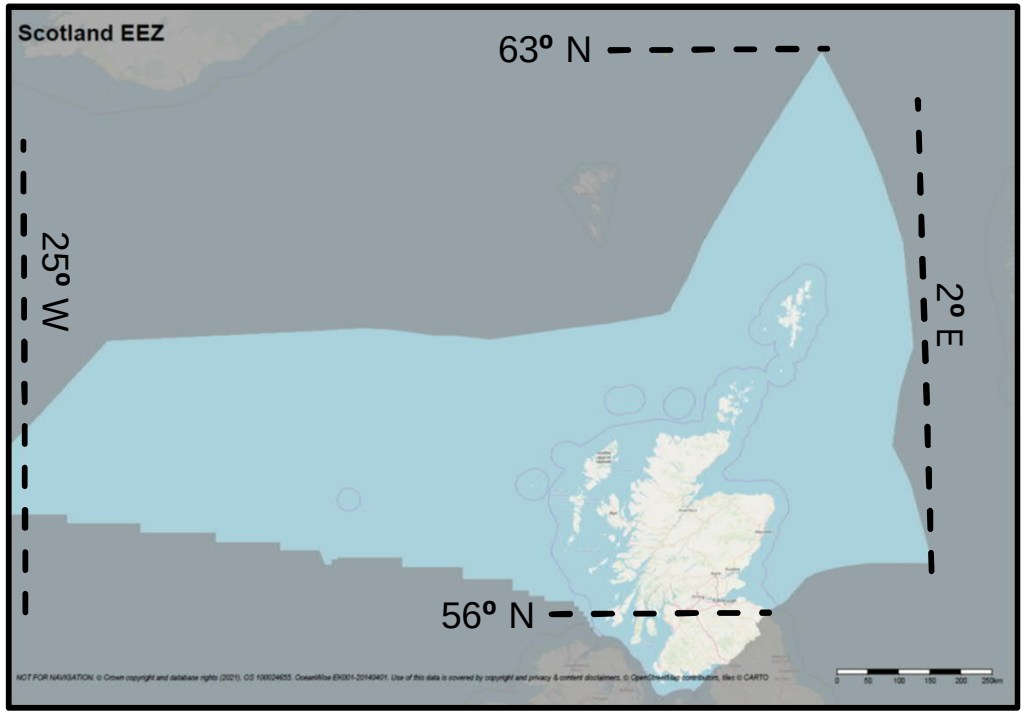
Marine Scotland Science



A little bit of context

Scotland: a small country with a huge maritime area

- North Sea marine “borders” with Faroes, Norway, England
- 5.45 million inhabitants
- Oil and gas production since 1975
- Ca. 5000 people employed in commercial fishing



marinescotland are the primary marine management organisation

- Policy
- science
- Compliance

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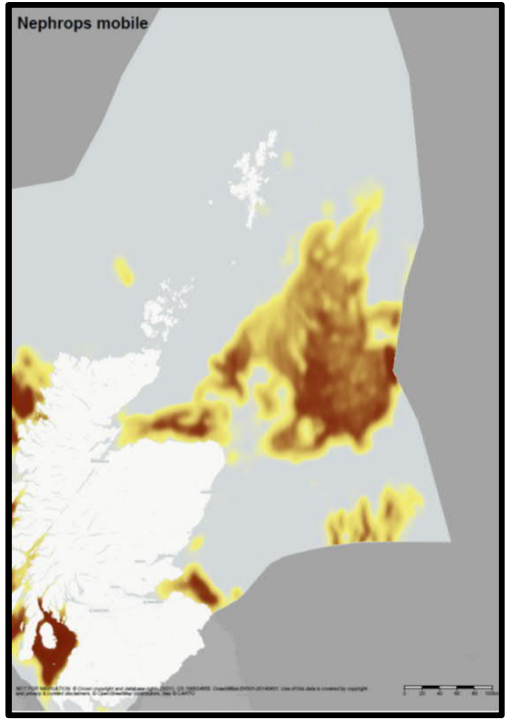
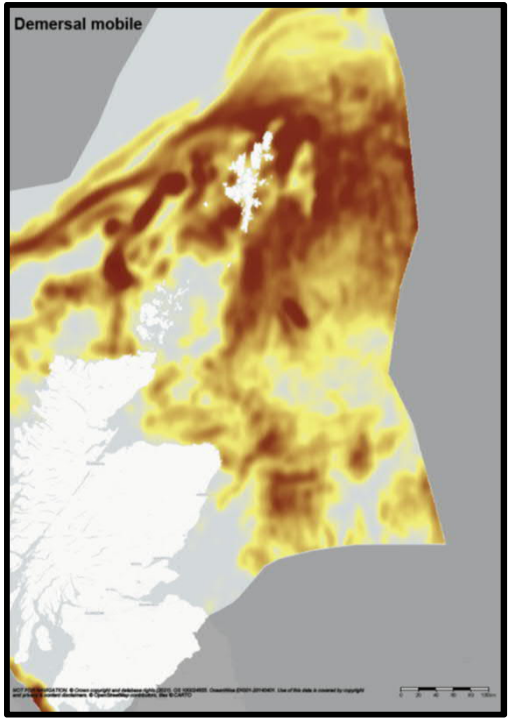
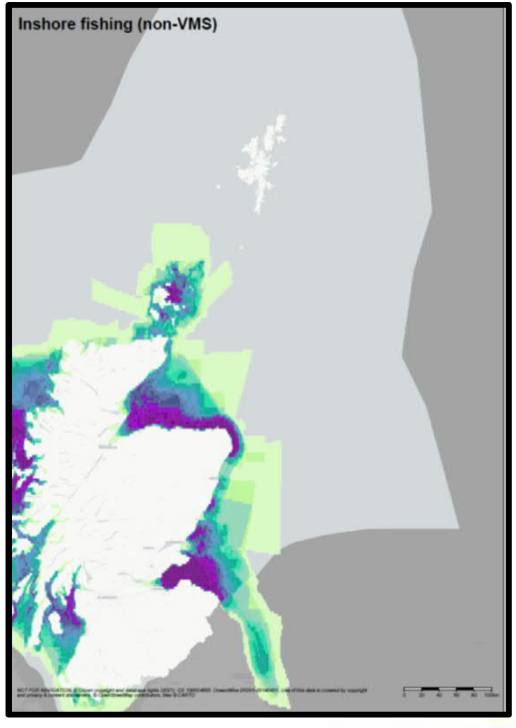
Fishing







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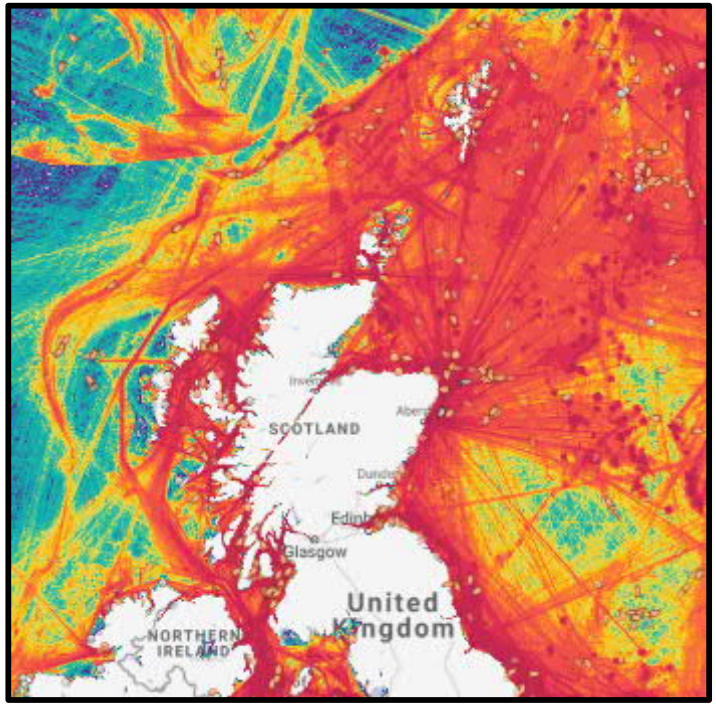
Shipping, oil & gas exploration and production



- High density of shipping activity around North Sea coast
  - Edinburgh, Dundee, Montrose, Aberdeen, Peterhead, Fraserburgh, Cromarty Firth
- Much of this traffic associated with North Sea oil and gas production (and exploration)
- Increasing traffic associated with offshore wind farm construction, operation/maintenance
- Some fishing vessels transmit AIS but they can turn them off; access to VMS data is highly restricted

(Image is a screen-grab from MarineTraffic; 2019 vessel density)

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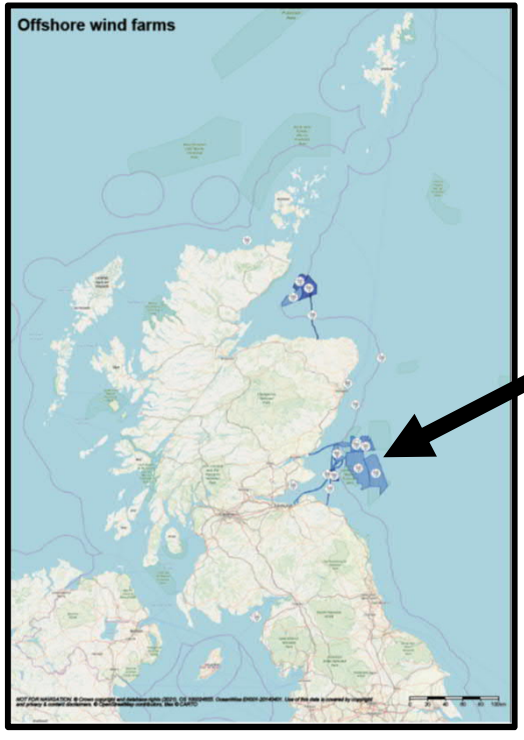
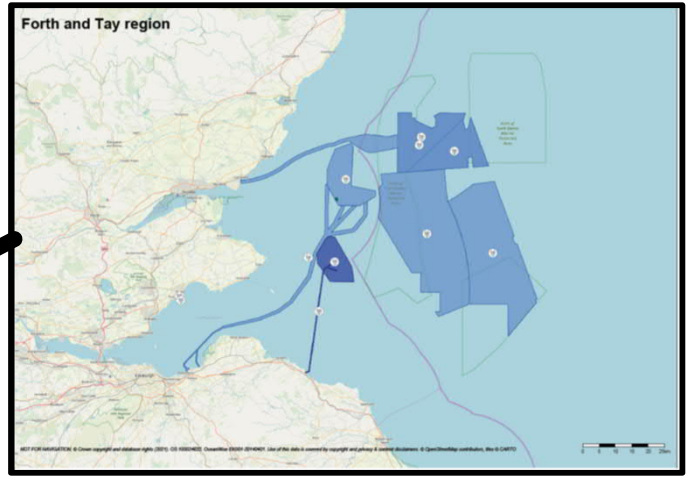
Marine renewable energy





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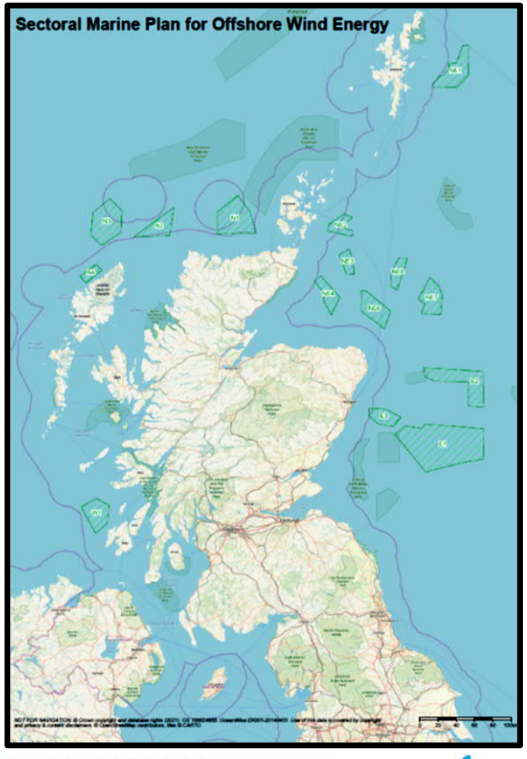
Marine renewable energy



Sectoral Marine Plan for Offshore Wind Energy

- Plan published in early 2021
- 15 option areas
  - including 10 in North Sea
- 10 gigawatts capacity
  - ca. 1000 new turbines
  - fixed foundation & floating technologies
  - environmental uncertainties

- Also plans for oil & gas electrification, hydrogen production, carbon capture & storage

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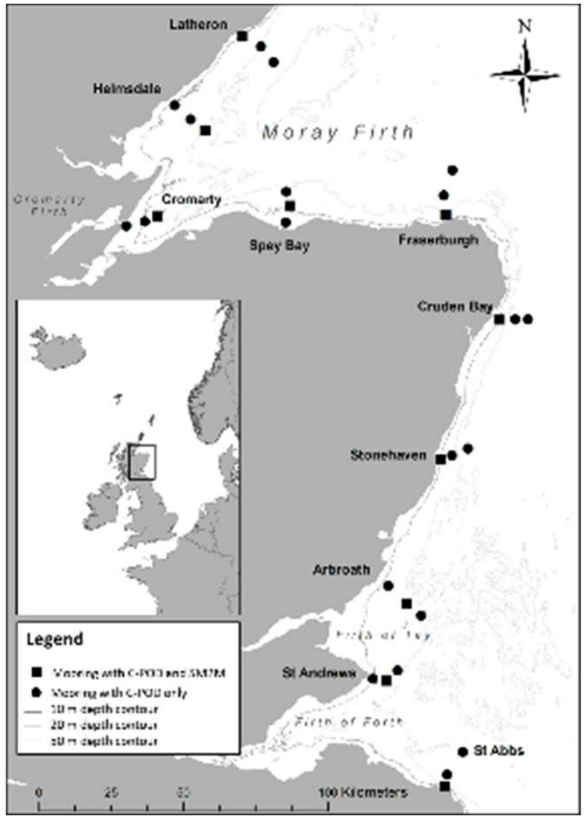
Underwater noise research

- In 2012, early wind farm applications started appearing
- East Coast Marine Mammal Acoustic Study commenced in 2013
  - Led by Dr Kate Brookes, MSS
- *ECOMMAS* continues to this day
  - Scottish Government funded
  - 30 CPOD monitoring sites
  - 10 broadband sound recorders
- We also manage west coast monitoring, in particular through the EU INTERREG VA projects *COMPASS* and *MarPAMM*



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Underwater noise research

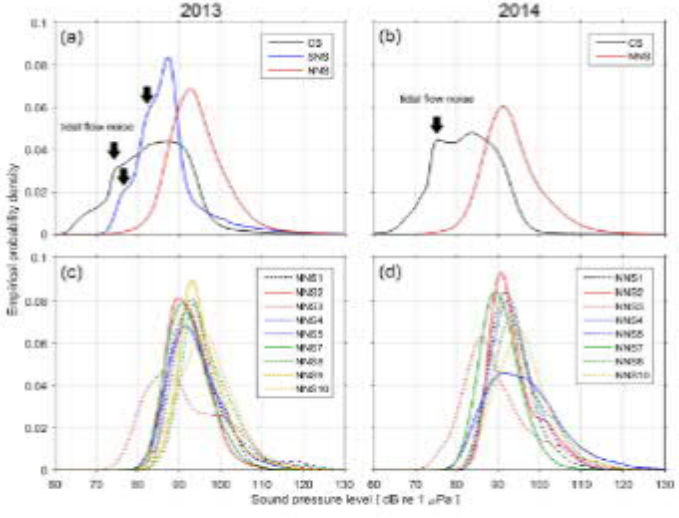

Figure 3. Empirical probability densities of noise levels in the 125 Hz band. Levels in the three monitoring regions during (a) 2013 (b) 2014.; Levels at individual northern North Sea monitoring sites during (c) 2013 (d) 2014. Abbreviations refer to monitoring regions: Celtic Sea (CS), northern North Sea (NNS), and southern North Sea (SNS). NNS data in (a,b) are mean probability densities computed over individual sites shown in (c,d).

Merchant *et al.* (2016) *Scientific Reports*

www.nature.com/scientificreports

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Underwater noise levels in UK waters

Nathan D. Merchant[1], Kate L. Brookes[2], Rebecca C. Faulkner[1], Anthony W. J. Bicknell[3,4], Brendan J. Godley[3,4] & Matthew J. Witt[3]

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Underwater noise from human activities appears to be rising, with ramifications for acoustically sensitive marine organisms and the functioning of marine ecosystems. Policymakers are beginning to address the risk of ecological impact, but are constrained by a lack of data on current and historic noise levels. Here, we present the first nationally coordinated effort to quantify underwater noise levels, in support of UK policy objectives under the EU Marine Strategy Framework Directive (MSFD). Field measurements were made during 2013–2014 at twelve sites around the UK. Median noise levels ranged from 81.5–95.5 dB re 1 µPa for one-third octave bands from 63–500 Hz. Noise exposure varied considerably, with little anthropogenic influence at the Celtic Sea site, to several North Sea sites with persistent vessel noise. Comparison of acoustic metrics found that the RMS level (conventionally used to represent the mean) was highly skewed by outliers, exceeding the 97th percentile at some frequencies. We conclude that environmental indicators of anthropogenic noise should instead use percentiles, to ensure statistical robustness. Power analysis indicated that at least three decades of continuous monitoring would be required to detect trends of similar magnitude to historic rises in noise levels observed in the Northeast Pacific.

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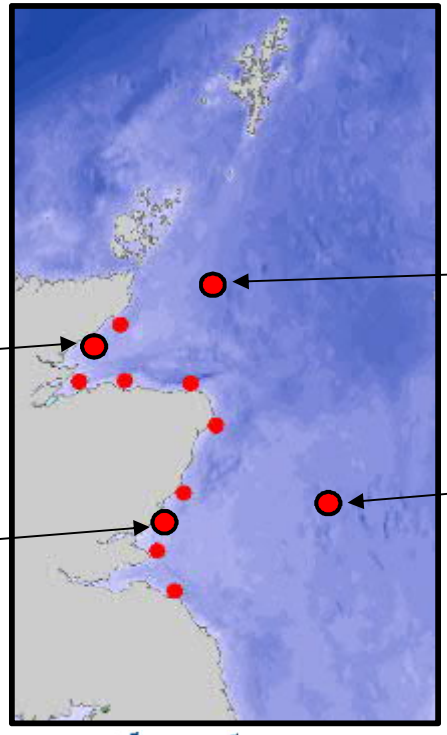
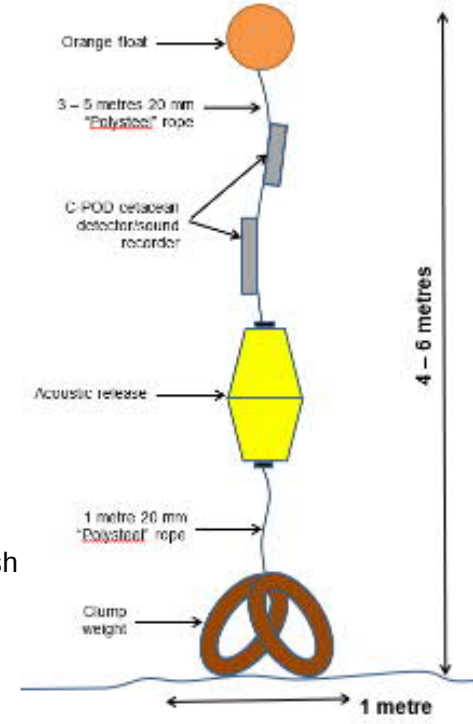
MSS in JOMOPANS

- MSS involvement in JOMOPANS uses some of these data from ECOMMAS coastal sites
- Supplemented by offshore monitoring at two sites selected for JOMOPANS





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- CPOD cetacean click detector
- Loggerhead DSG-ST sound recorder
  - other devices are available!

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MRV *Alba na Mara*

- Marine Scotland's inshore vessel (26 metres)
- Home port Fraserburgh

MRV *Scotia*

- Marine Scotland's offshore vessel (68 metres)
- Home port Aberdeen

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Rob Main, Ewan Edwards, Paul Stainer, Rob Watret

Bottlenose dolphins resident in Scottish coastal North Sea waters

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MSS in JOMOPANS

- We were already good at putting recorders on the seabed
- We were less good at getting them back again!
- We were very inexperienced in what to actually *do* with the ambient sound data

So what have we learned?

- A lot about underwater acoustics
  - Calibration
  - Measurement standards
  - Data analysis
  - Experiences of other countries
  - Great companionship and collaboration with JOMOPANS partners


Ross Culloch


Charlotte Altass


Hannah Millar


Ewan Edwards


Pablo Chevallard


Kate Brookes

Still lots to learn – but in a good place for any potential future projects in the North Sea region

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MSS in JOMOPANS: 2021 and beyond

Central North Sea mooring

- Deployed from *Scotia* 19 May 2021
- Planned recovery Jan 2022

ECOMMAS monitoring

- Deployed from *Alba* March 2021
- Underway for duration of 2021/22…

Questions?

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