

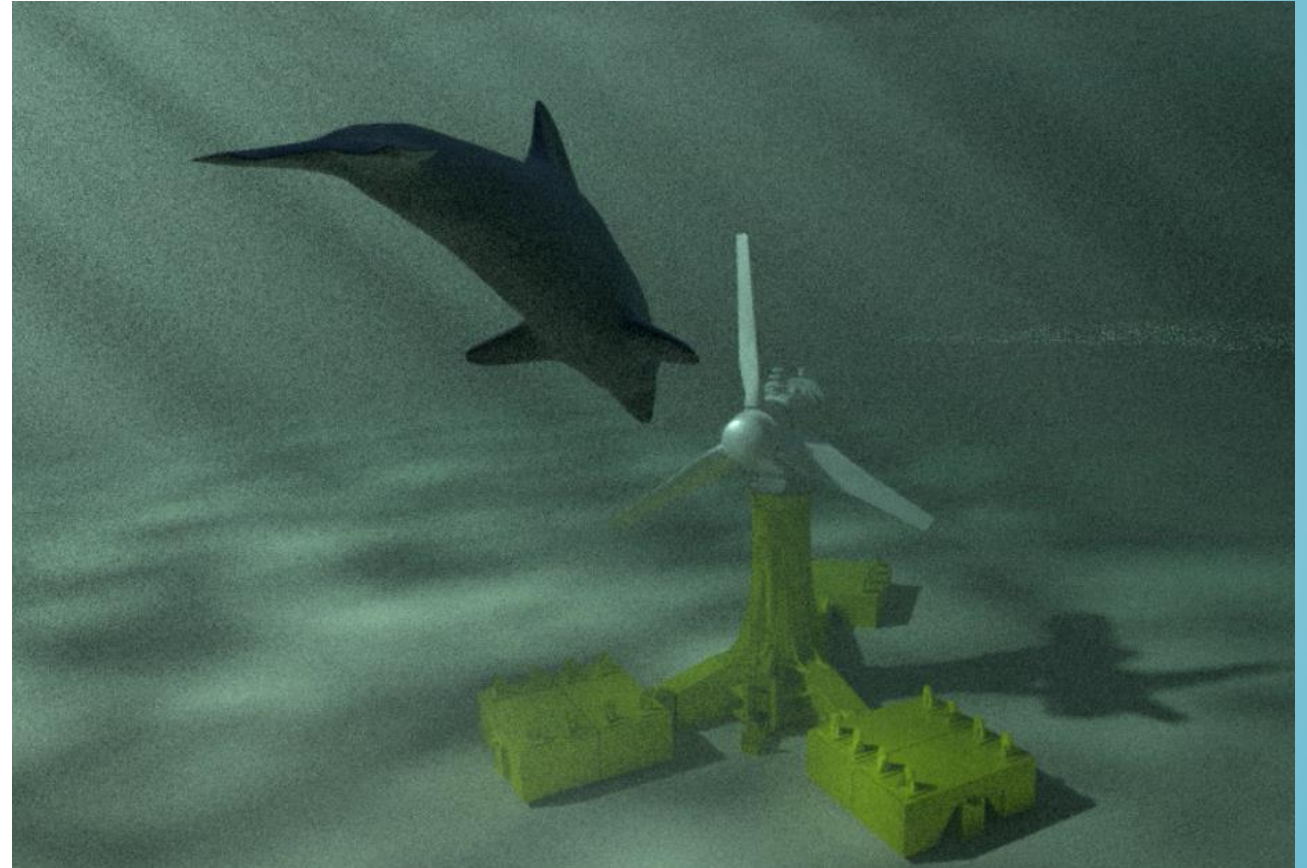


# Tidal Energy and Marine Mammals

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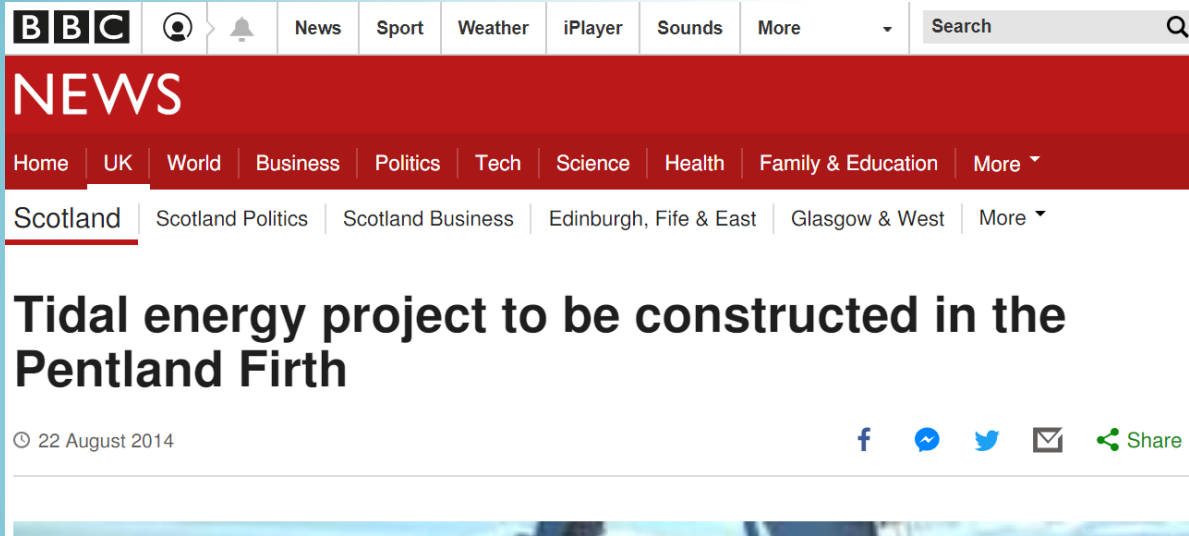


# Tidal energy projects and marine mammals

- Overview of main issues
- Summary of previous research
- Knowledge gaps
- Future priorities



# Tidal energy projects and marine mammals – conservation concerns



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### Tidal energy project to be constructed in the Pentland Firth

22 August 2014

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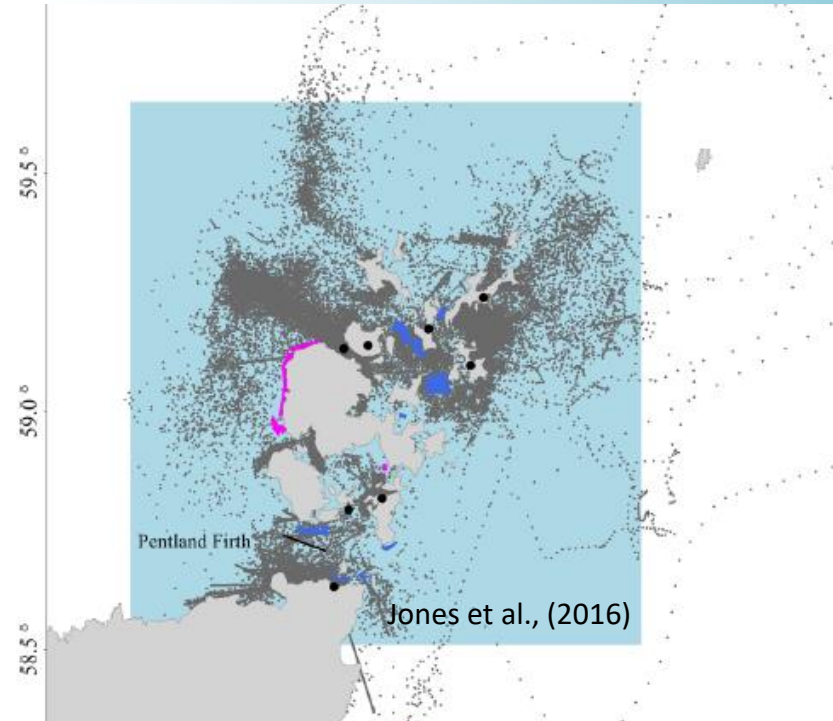
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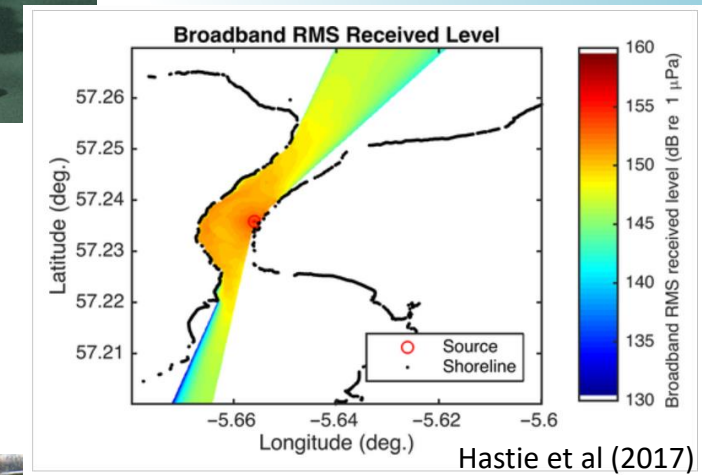
### Whale and dolphin turbine injury risk to be studied

By Steven McKenzie  
BBC Scotland Highlands and Islands reporter



# Tidal energy projects and marine mammals – conservation concerns

- Collision
- Disturbance
- Displacement
- Barrier effects
- Indirect effects on prey



# Summary of progress

- Monitoring around single devices, test centres and small arrays, e.g.
  - SeaGen
  - DeltaStream
  - EMEC
  - MeyGen
  - Nova Bluemull Sound
  - Minesto Holyhead Deep
  - FORCE

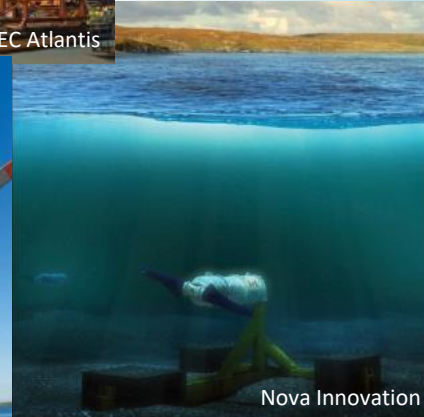


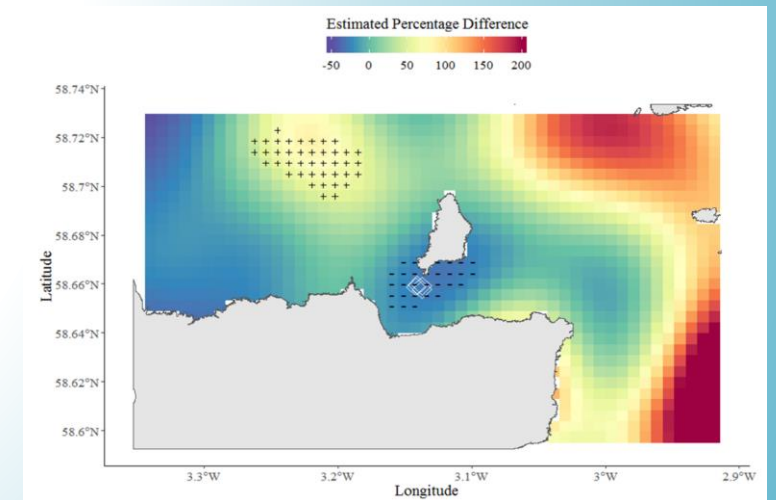
Figure 3.5. Minesto's Deep Green 0.5 MW tidal kite being deployed at Holyhead Deep, in Anglesey, Wales. (Photo courtesy of Minesto)



# Summary of progress

- Monitoring around single devices, test centres and small arrays
  - SeaGen
  - DeltaStream
  - EMEC
  - MeyGen
  - Nova Bluemull Sound
  - Minesto Holyhead Deep
  - FORCE
  - Sabella

- Technologies for monitoring
  - Seal tagging

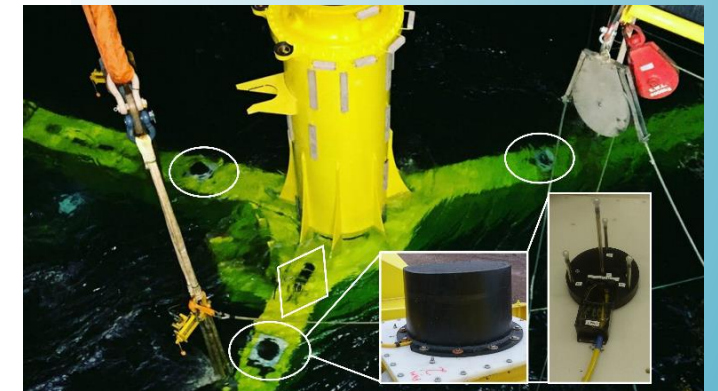
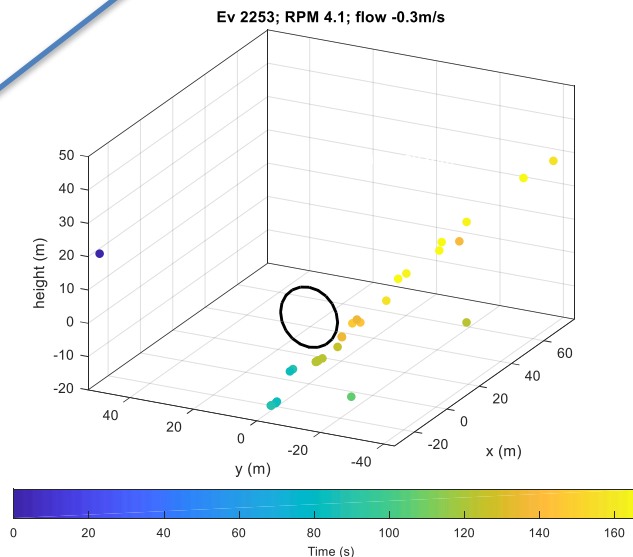


# Summary of progress

- Monitoring around single devices, test centres and small arrays

- SeaGen
- DeltaStream
- EMEC
- MeyGen
- Nova Bluemull Sound
- Minesto Holyhead Deep
- FORCE

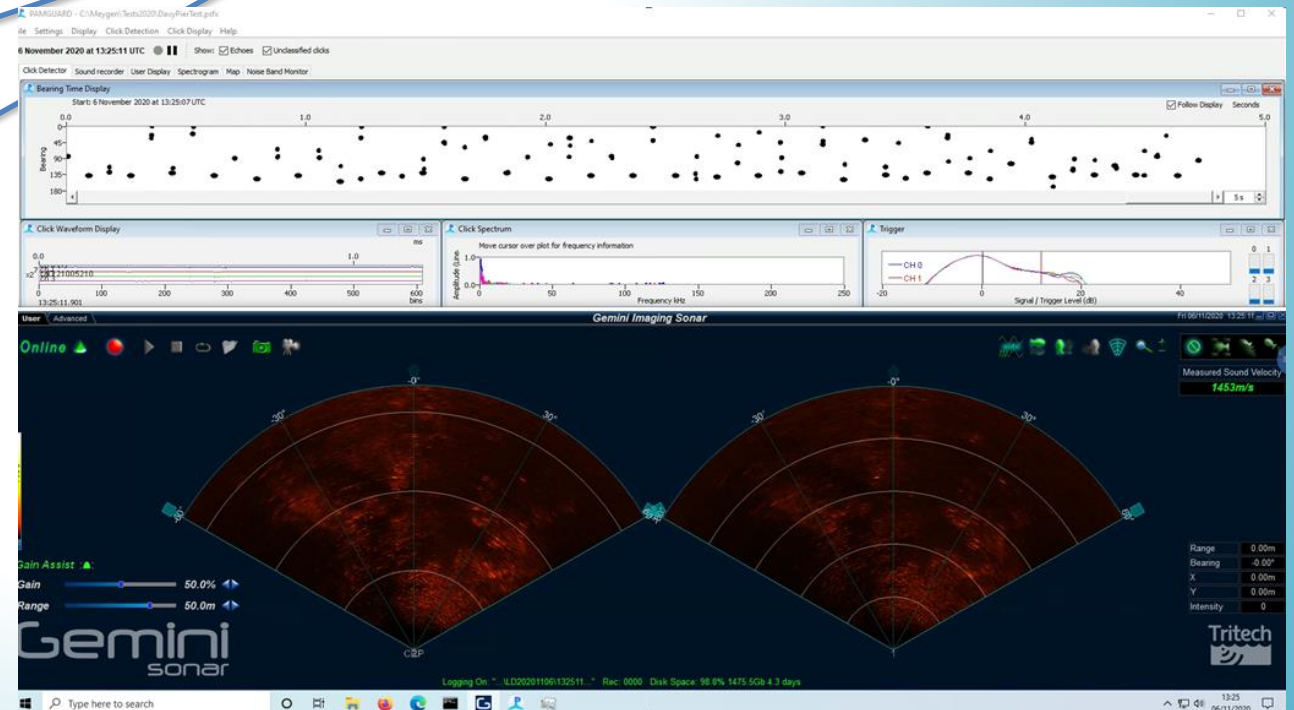
- Technologies for monitoring
  - Passive Acoustic Monitoring



# Summary of progress

- Monitoring around single devices, test centres and small arrays
  - SeaGen
  - DeltaStream
  - EMEC
  - MeyGen
  - Nova Bluemull Sound
  - Minesto Holyhead Deep
  - FORCE

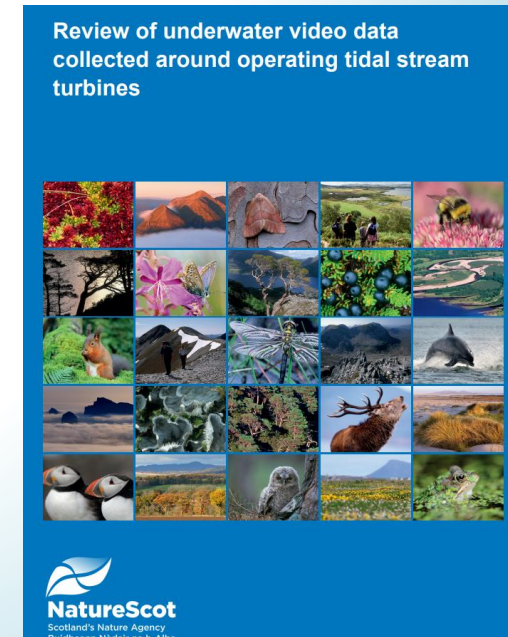
- Technologies for monitoring
  - Multibeam sonar





# Summary of progress

- Monitoring around single devices, test centres and small arrays
  - SeaGen
  - DeltaStream
  - EMEC
  - MeyGen
  - Nova Bluemull Sound
  - Minesto Holyhead Deep
  - FORCE
  - Sabella
  - SME PLAT-I
- Technologies for monitoring
  - Underwater video



# Summary of research to date - outcomes

- Evidence of reduction in abundance around turbines
  - Harbour seals:
    - 68% reduction within 200m of SeaGen (*Joy et al. 2018*)
    - 27% reduction within 500m during turbine noise playback trials (*Hastie et al. 2017*)
    - 28% reduction within 2 km of MeyGen array during operation (*Onoufriou et al. in review*)
  - Harbour porpoise:
    - 33-78% reduction within 140m of MeyGen turbine during operation (*Palmer et al. in review*)
    - Reduction at 200-230m from Cape Sharp Tidal turbine at FORCE (*Tollit et al. 2019*)
- Close range interactions:
  - 3D PAM tracking of porpoise at MeyGen – no transits through rotor swept area when turbine operating and evidence of close range avoidance (*Gillespie et al. in review*)
  - All harbour seal detections on video at Nova Innovation Shetland array were below turbine cut-in speed (20% subset of complete dataset; Nova Innovation, 2020).



# Remaining knowledge gaps

- Lacking data for some species – e.g. grey seals, bottlenose dolphins
- Fine scale 3D behaviour, do collisions actually occur?
- Displacement – consequences for individuals and populations
- How impacts will scale up to commercial arrays



# Future Priorities

- Filling data gaps for key species
- Discussion around (and agreement on) how emerging data are implemented into future assessment frameworks
- Understanding displacement and developing approaches for cost-effective monitoring at array scale
- Data management and processing – automated detection, species ID and classification

