Digital Aerial Surveys (DAS)

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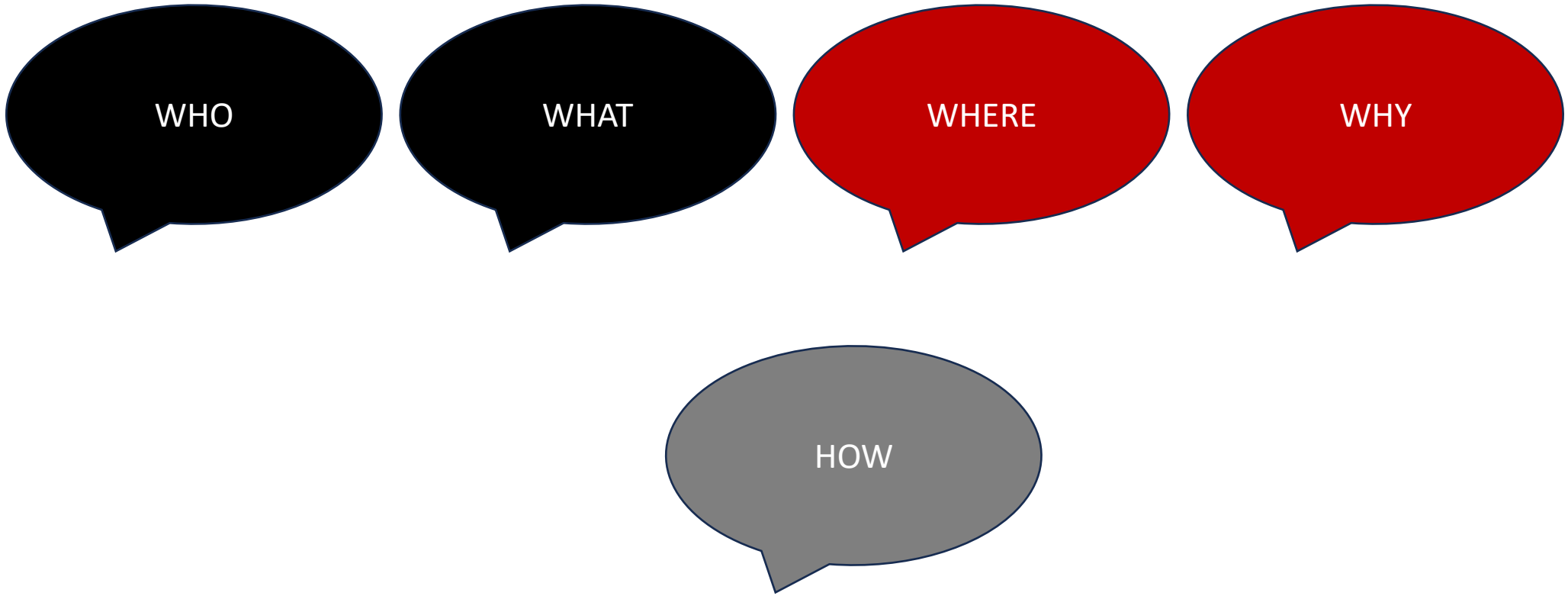
IATTC - 2nd Workshop on methods for monitoring the status of eastern tropical pacific ocean dolphin populations, 9-10 May 2024


WHO
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WHY
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- EXPERT ADVICE
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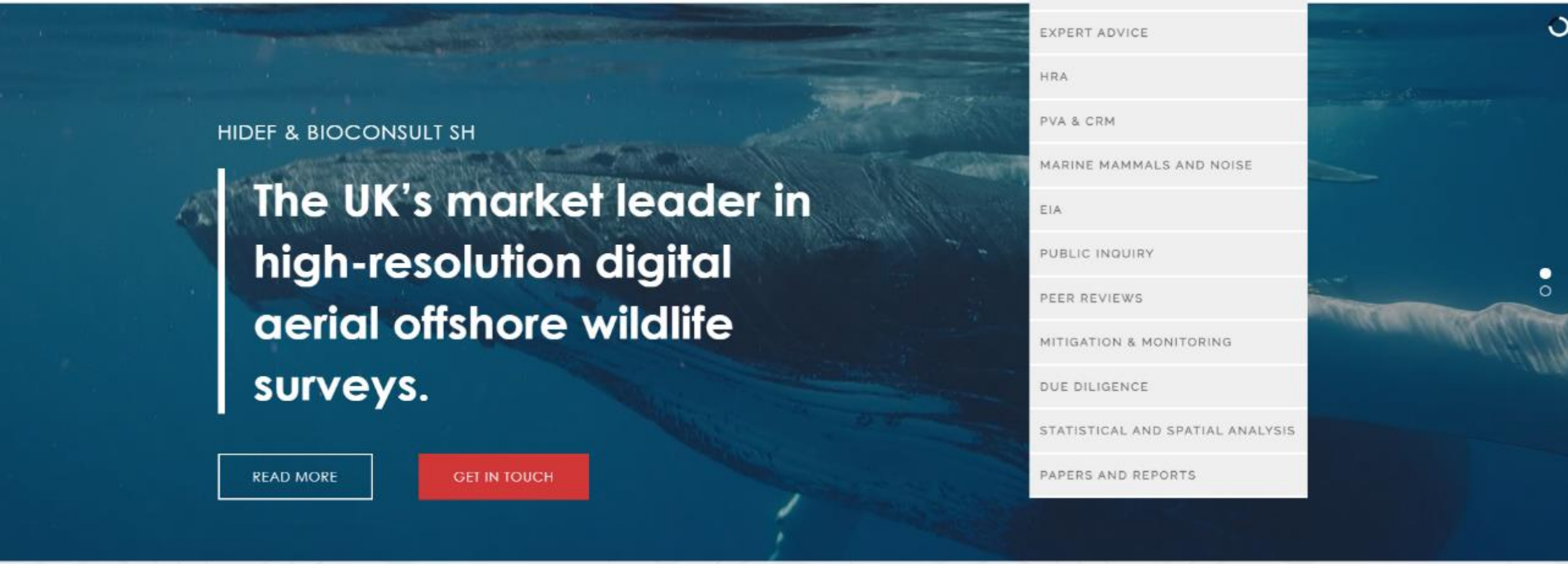
- PVA & CRM
- MARINE MAMMALS AND NOISE
- EIA
- PUBLIC INQUIRY
- PEER REVIEWS
- MITIGATION & MONITORING
- DUE DILIGENCE
- STATISTICAL AND SPATIAL ANALYSIS
- PAPERS AND REPORTS



biotope
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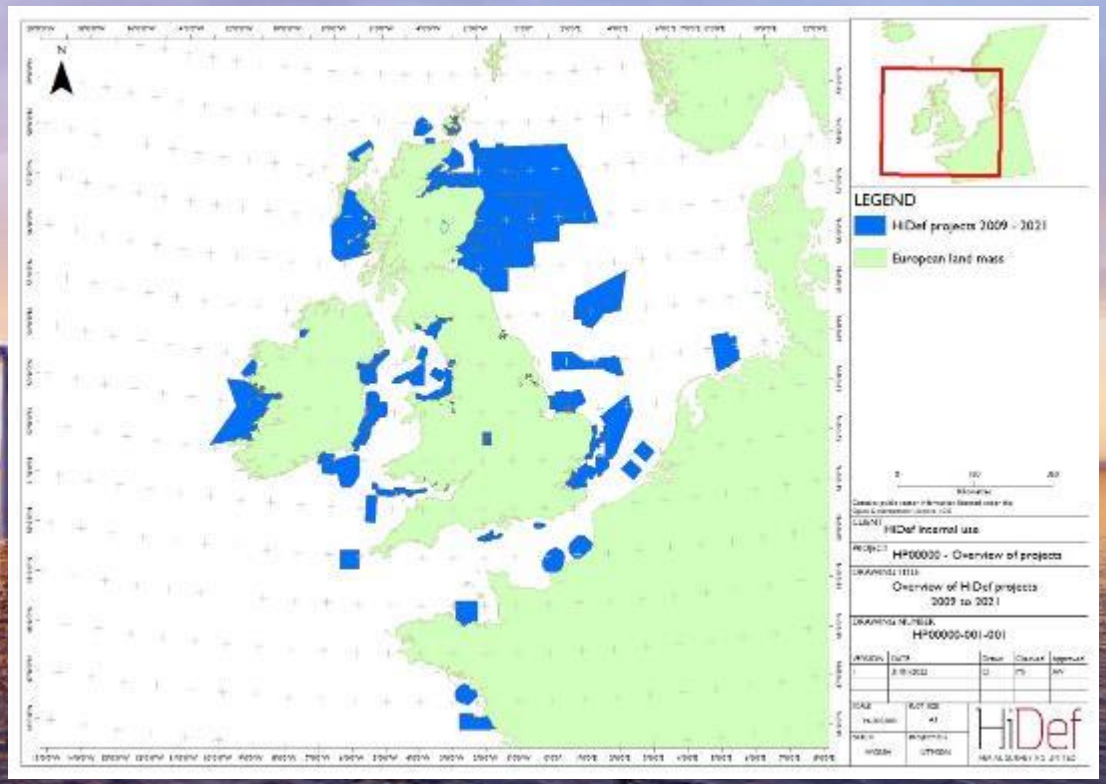
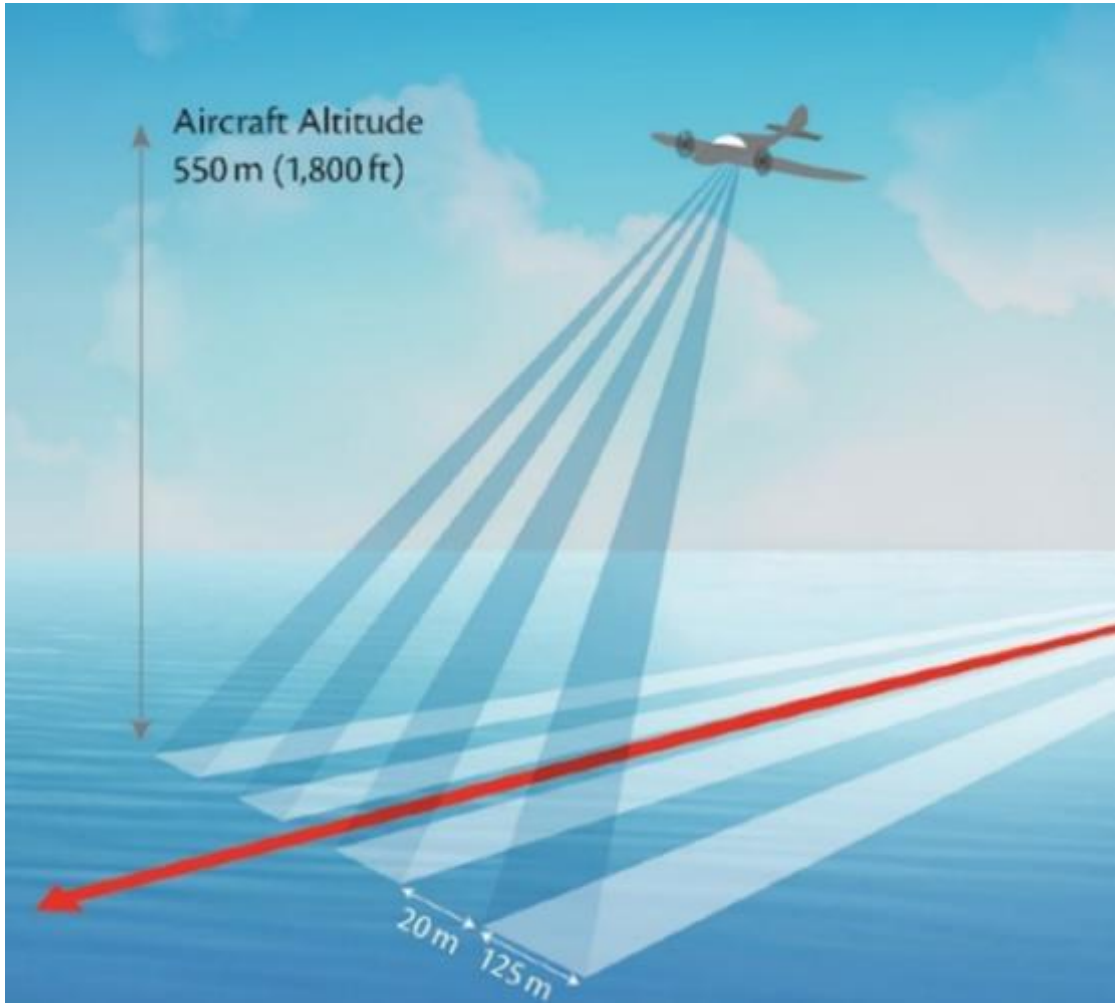
- Offshore renewables growth
- Replacement of visual aerial surveys
  - Health & safety concerns
  - Increasing turbine heights
- Active in10 countries



- Bespoke multi-digital video camera system
- Very high resolution ~ 1.7 - 2 cm Ground Sample Distance
- Rotating cameras and angled cameras (30° forwards/backwards) – minimize glare
- Angled cameras - maximise species identification

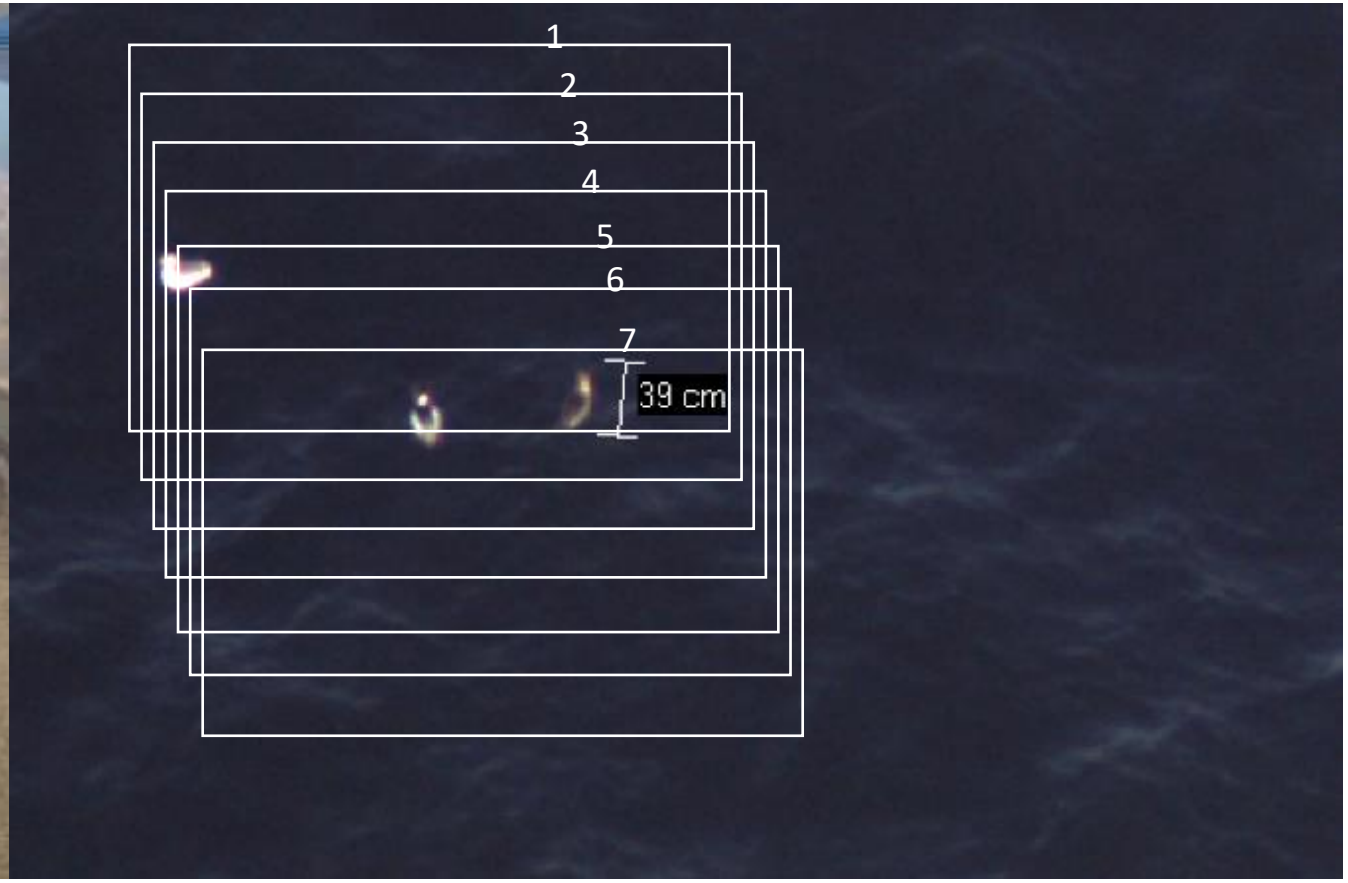
Survey method



- Each camera covers strip, 125 m wide
- ~ 500 m strip
- ~ 210 km/hr
- ~ 1,800 ft altitude
- Strip transects

Survey method

- Recording rate 7 frames/sec
- Each object captured at least 5 times



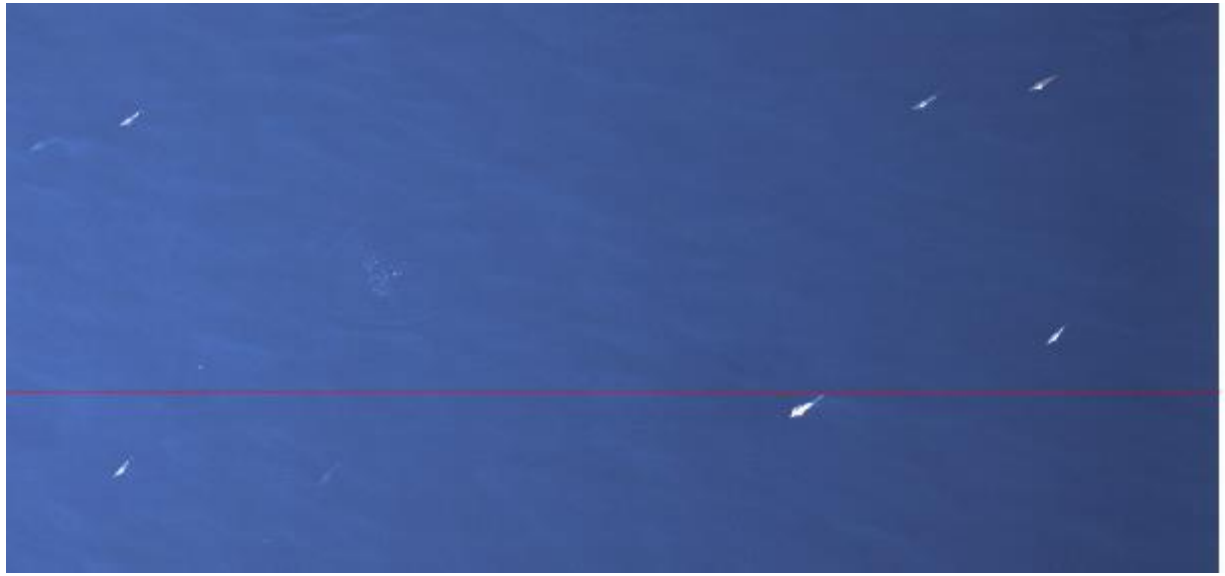
HiDef Surveys – Workflow

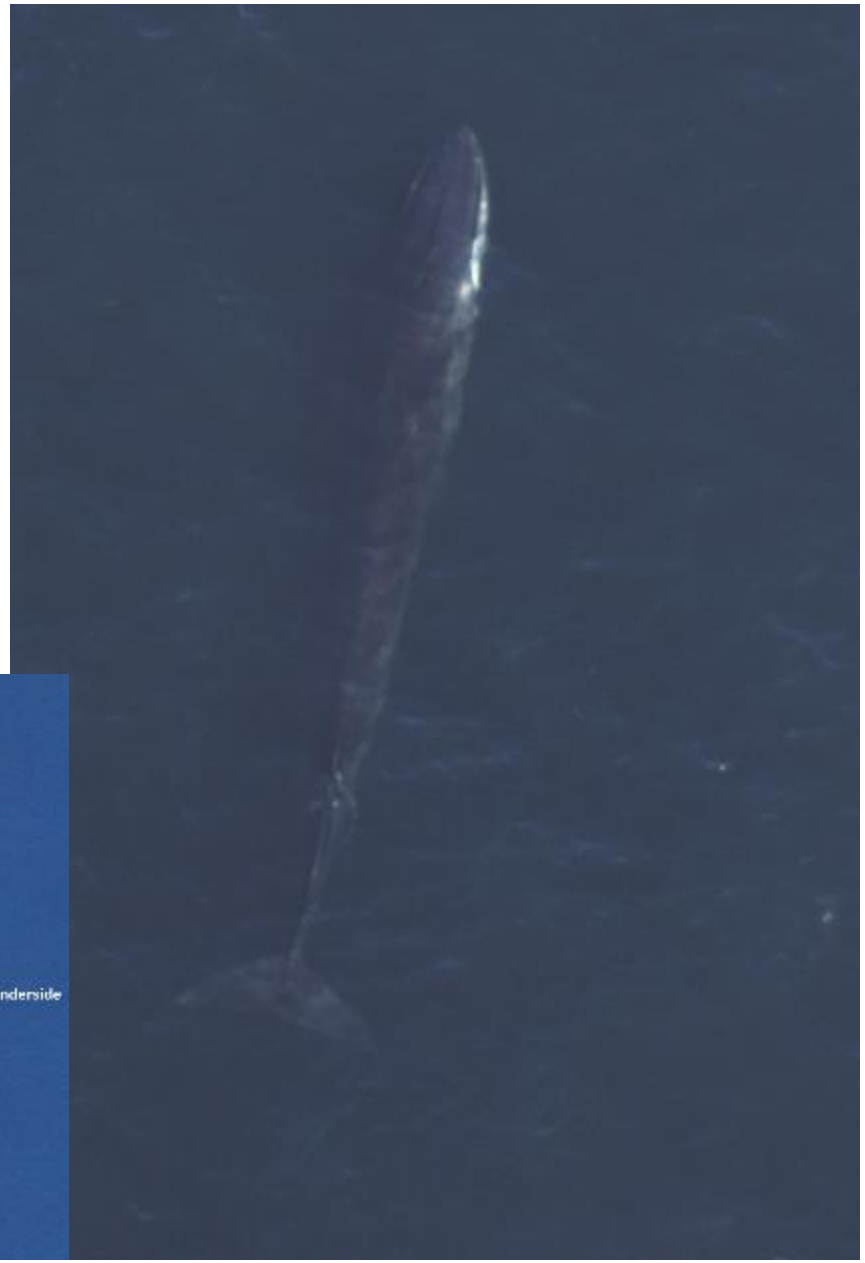
1. Flight planning (weather, Military), flight announcement
2. Survey flight, data transfer
3. Data check, preparation of data for analysis
4. Review QA (20%)
5. Identification (ID) QA (20%)
6. Compilation of the final dataset and QA


Harbour porpoise - adult
Size
Small dorsal fin
No contrast
Minimal beak


White-beaked dolphin
Size: up to 3.2m
Strong contrast of black and white/pale grey
White beak, saddle, cheeks, flanks and underside
Broad and pointed dorsal fin
Robust body
Found offshore on shelf edges and slopes


10 Short-beaked Common Dolphins
Outer Bristol Channel
Approx 2.2m long
'Hourglass' pattern on flanks
Pale pectoral fins
Splash from breaching






Minke whale
Size: up to 10m
White 'armbands' on pectoral fins
Dark body colouration with paler underside
Sickle shaped dorsal fin
Pointed rostrum


256 cm

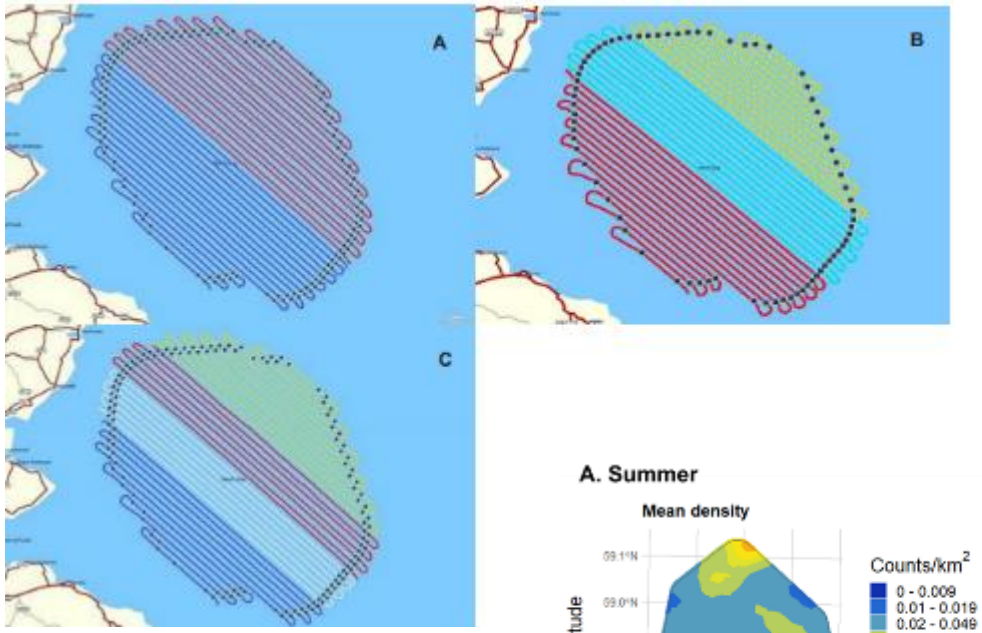

0 cm

Strengths and weaknesses

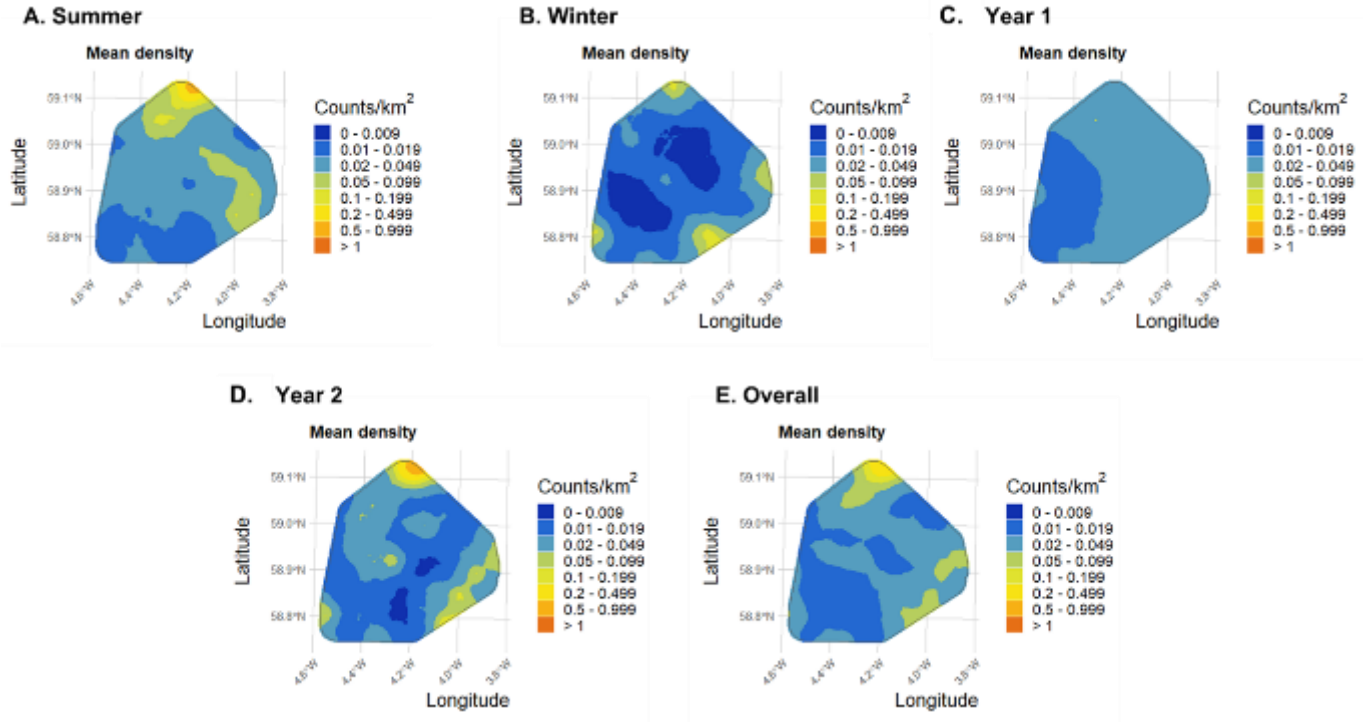
- Strengths
  - Cheaper than ship
  - Rapid mobilization
  - Survey in higher Beaufort
  - Survey year-round
  - High altitude; no disturbance /responsive movement
  - Group size estimation
  - Adult / calf associations
  - Photogrammetry
  - Video audit of survey
  - Relative abundance – trend

- Field constraints
  - Endurance of aircraft
  - Day length
  - Weather
  - Military activity
  - Technical camera failure
- Analytical constraints
  - Absolute abundance estimation
  - Perception bias – cameras and review
  - Availability bias – submerged

DAS use for cetacean surveys

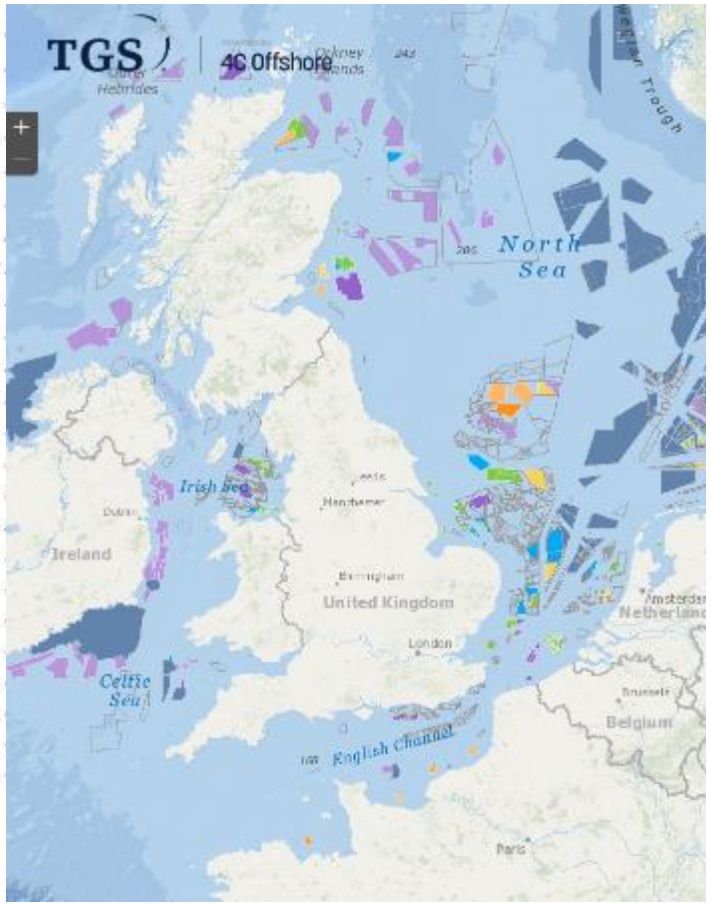


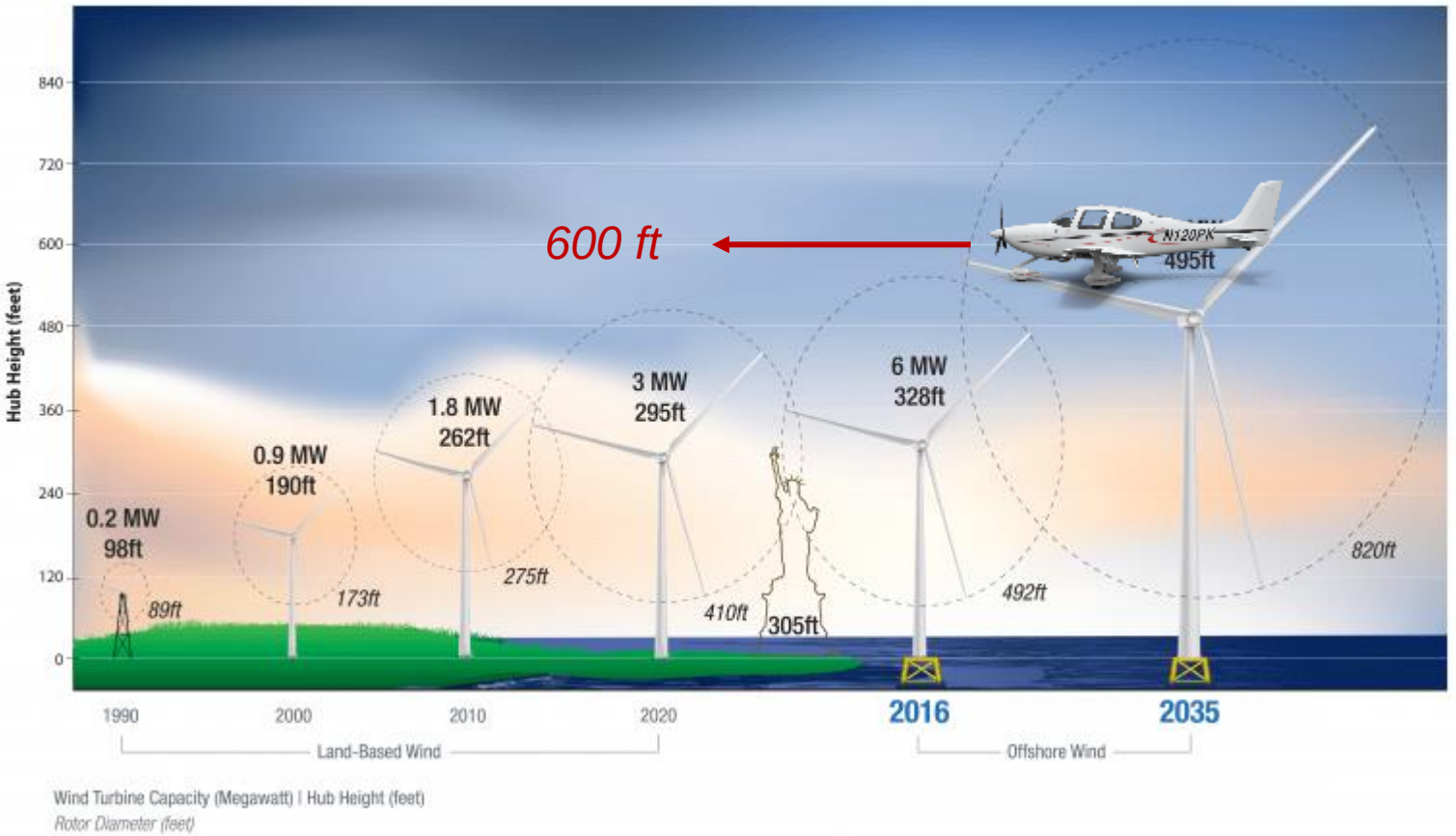
- Offshore wind sites – designed for ornithology, but cetacean data used
  - Design-based line transects – multiple planes
  - One day per month; 2 years
  - Relative abundance
  - Absolute abundance – “correction factors”
  - Design and model-based methods



DAS use for cetacean surveys

- Survey area - 1,467,358 km^2
- Primary effort 71,651.9 km
- “Gold standard”
- 600 ft altitude *1800 ft*





DAS use for cetacean surveys

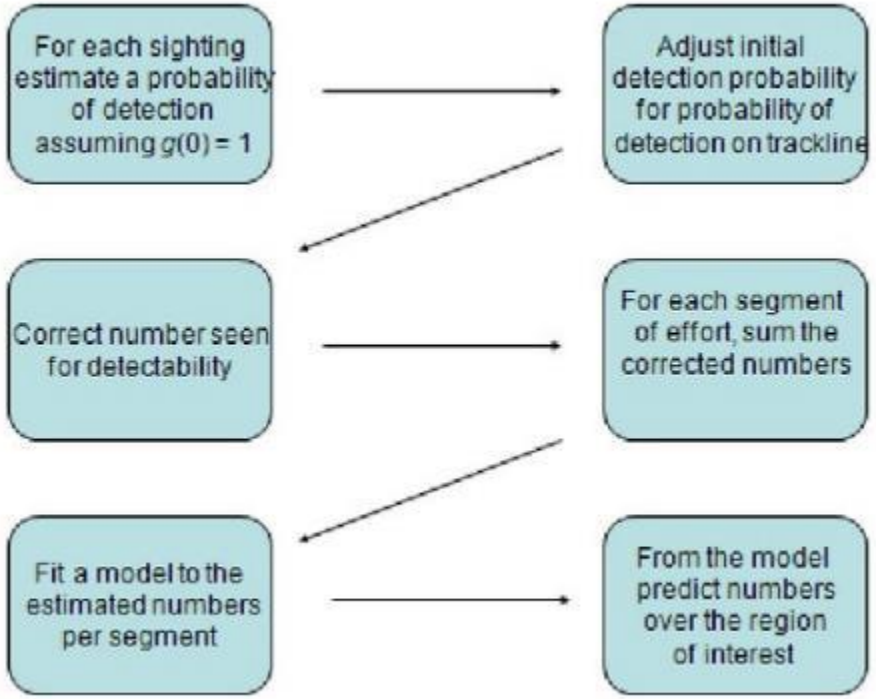
- Perception bias
  1) Cameras assumed eliminated
  2) Human review
  3) Moving to AI solution

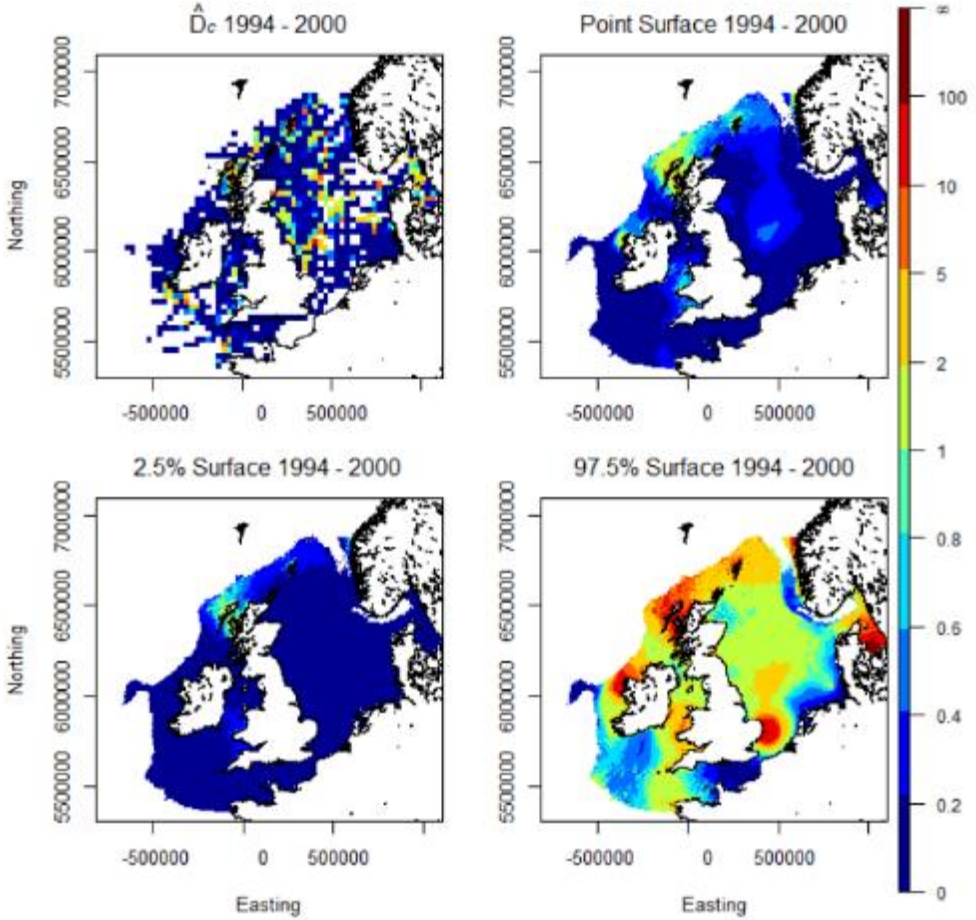
- Availability bias
  1) Double platform surveys (2010 trial, narrow swathe, mark-recapture approach – unsuccessful)
  2) Stevenson et al 2019. Cluster capture-recapture to account for identification uncertainty on aerial surveys of animal populations. *Biometrics 75: 326 – 336*
  3) Completed tandem aircraft survey July 2022 coinciding with SCANS-IV

     Macleod et al. *in prep.*
- Single aircraft? Fixed wing drones?

Integration of DAS

- SCANS – all ship to predominately aircraft. Integrate for NASS
- Joint Cetacean Protocol - Paxton et al. 2016[1]
- Joint Cetacean Data Protocol (JCDP)

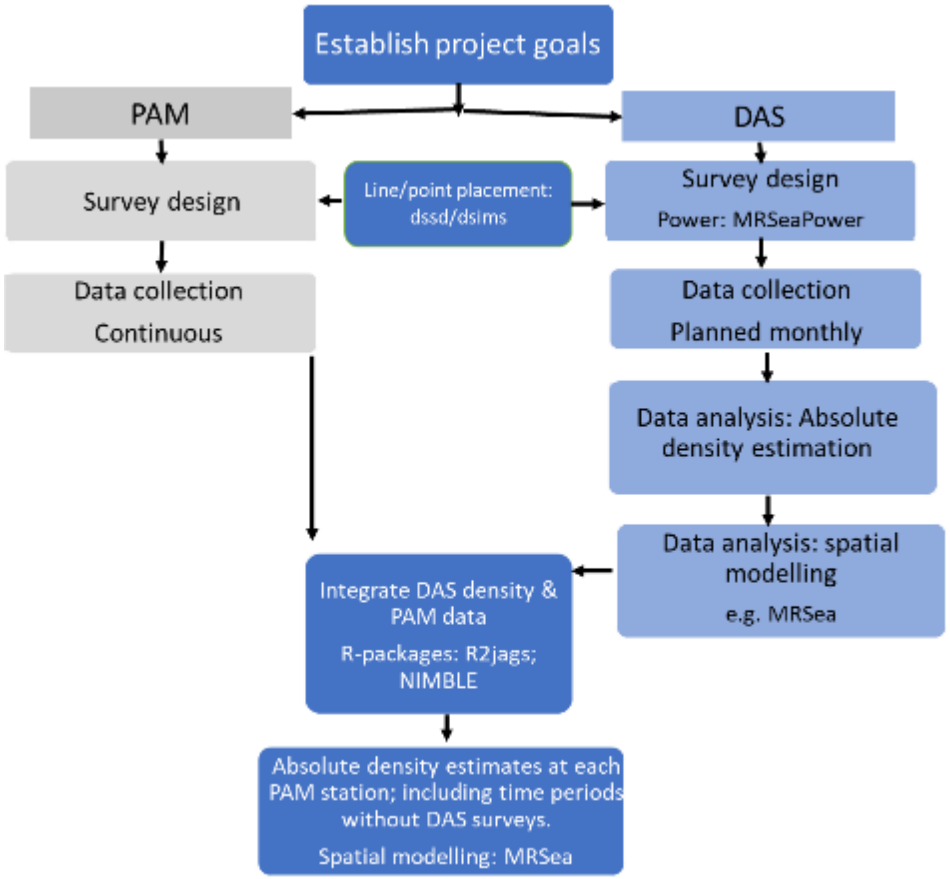


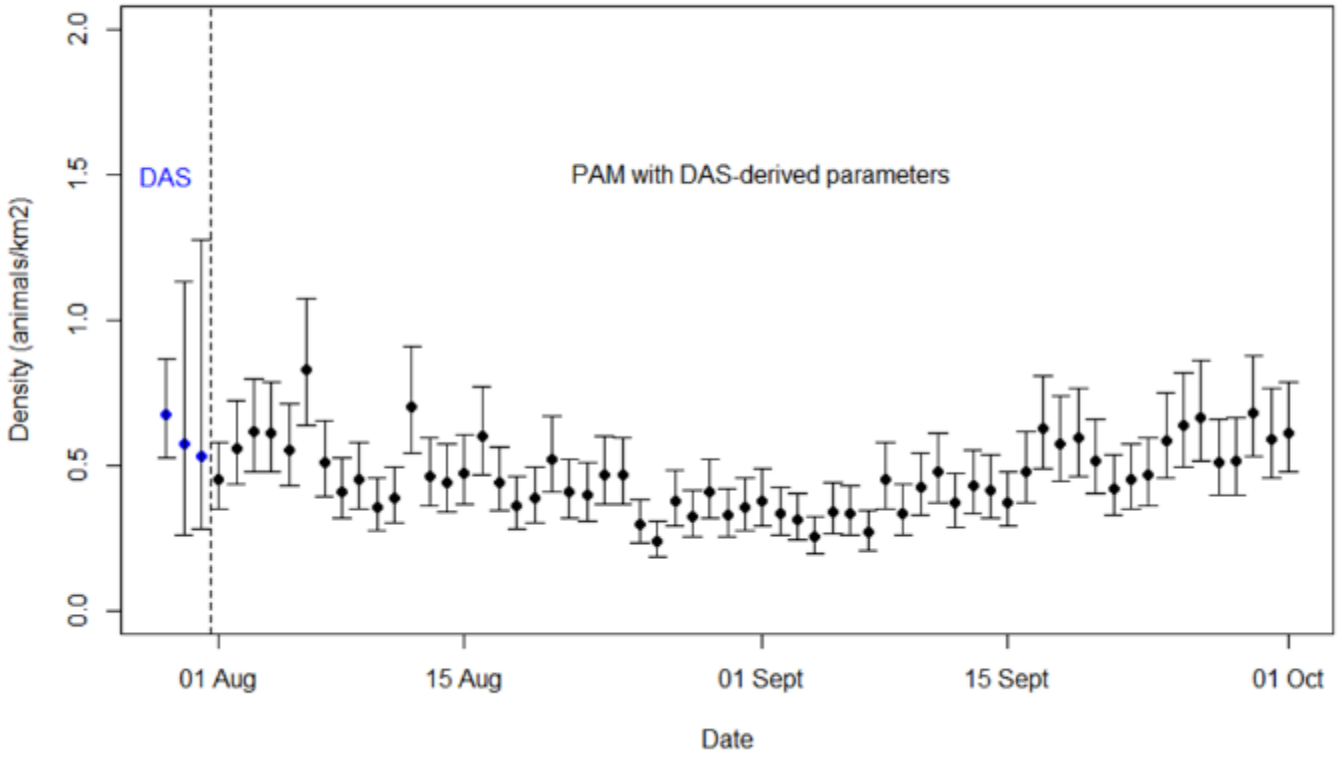


[1]Paxton, C.G.M., Scott-Hayward, L., Mackenzie, M., Rexstad, E. & Thomas, L. (2016) Revised Phase III Data Analysis of Joint Cetacean Protocol Data Resource, JNCC Report No. 517, JNCC, Peterborough, ISSN 0963-8091.

Integration of DAS

- Modelling framework to integrate PAM and DAS data - Harris et al. 2024[1]. Based on Jacobson et al. 2017[2]





[1]Harris, D. et al. (2024) Final report for project Methodology for combining digital aerial survey data and passive acoustic baseline data.
[2] Jacobson, E, Forney, K and Barlow, J. (2017). Using visual survey data to estimate passive acoustic detection parameters for harbor porpoise abundance estimates. The Journal of the Acoustical Society of America. 141. 219-230. 10.1121/1.4973415.

Implementation of DAS

- Considerations most affecting timing
  - Permissions
  - Weather
  - Military exercise
- Considerations most affecting cost
  - Suitable aircraft / modifications
  - Positioning
  - Number aircraft
  - Expected density of “objects”
- Key cost categories
  - Aircraft charter
  - Review / ID
  - Reporting

- Future work: long-range fixed wing drone

Thanks!

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