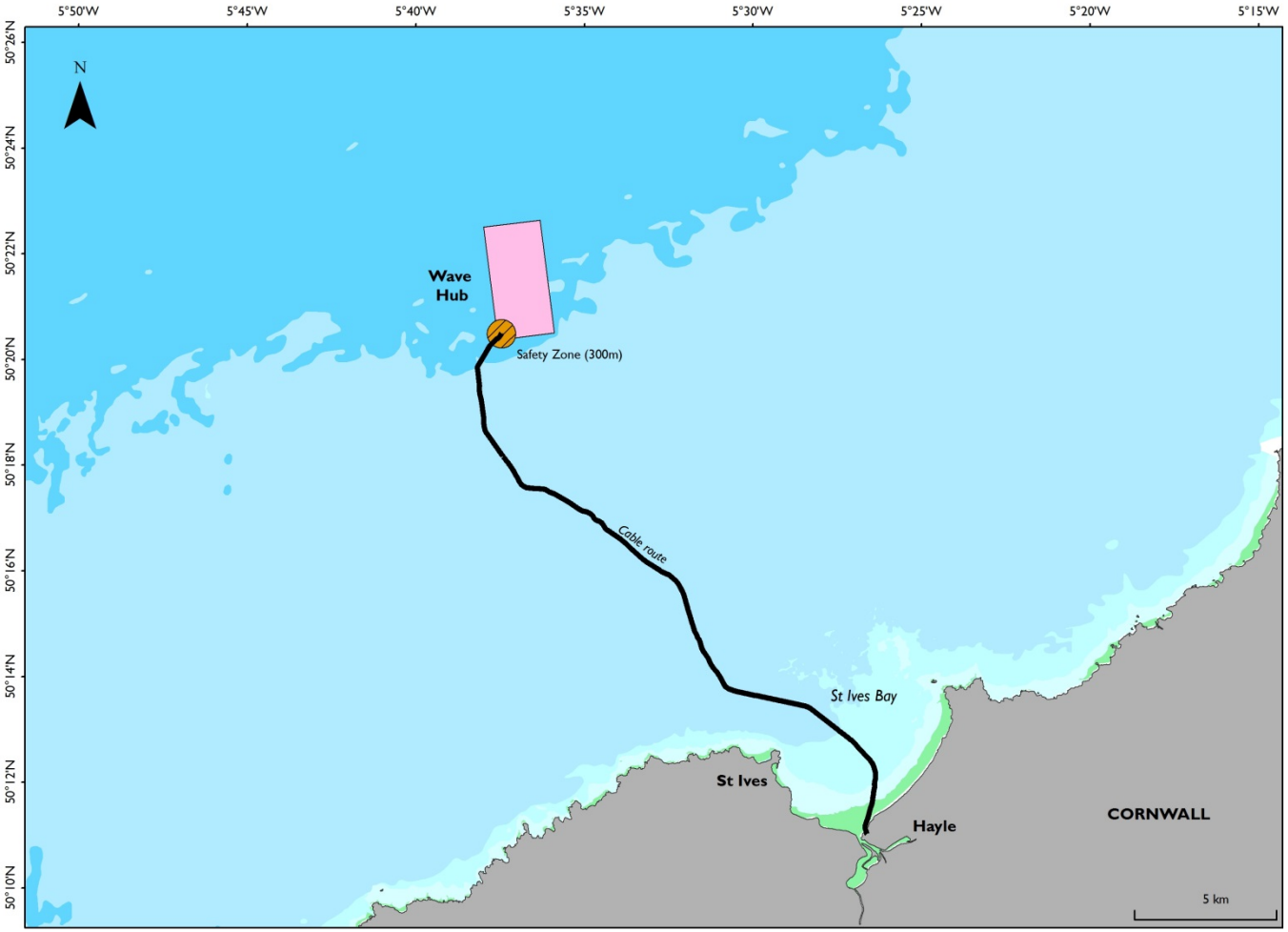
Monitoring biodiversity at marine energy farms: baited video and experimental potting

Matthew Witt, Anthony Bicknell
and Brendan Godley

University of Exeter, Cornwall Campus
College of Life and Environmental Sciences

Wave Hub Development Site



South West UK. Deployed in 2010. Developed for arrays of energy converters. 18~km offshore. 8 km^2 development zone. 18km of cable (approx. ~75% rock armoured, 25% buried). Exeter has worked at the site since 2008/9.

QBEX@Exeter

- **Over-arching aim(s):**
  - Increase knowledge on marine aquatic resources and potential for overspill around a wave energy farm
  - Increase understanding of natural environmental variation to improve context / interpretation on observed effects prior to upscaling
- **Focus of interest:**
  - Wave Hub development site (offshore)
  - Cable route (nearshore to offshore)

- **Why focus on these areas?**

  - Wave Hub provides a *de facto* MPA, there are potential benefits e.g. relief of seabed from fishing, improved catches at periphery, integration of RE sites to existing MPA network

    Can we observe aquatic resource overspill?

    Is the site a good surrogate for an MPA?

  - Rock armouring of cable route provides novel habitat, which may have +/- effects

    How are crustaceans responding?

    Is it more complex than just 'are there more/less crustaceans'?

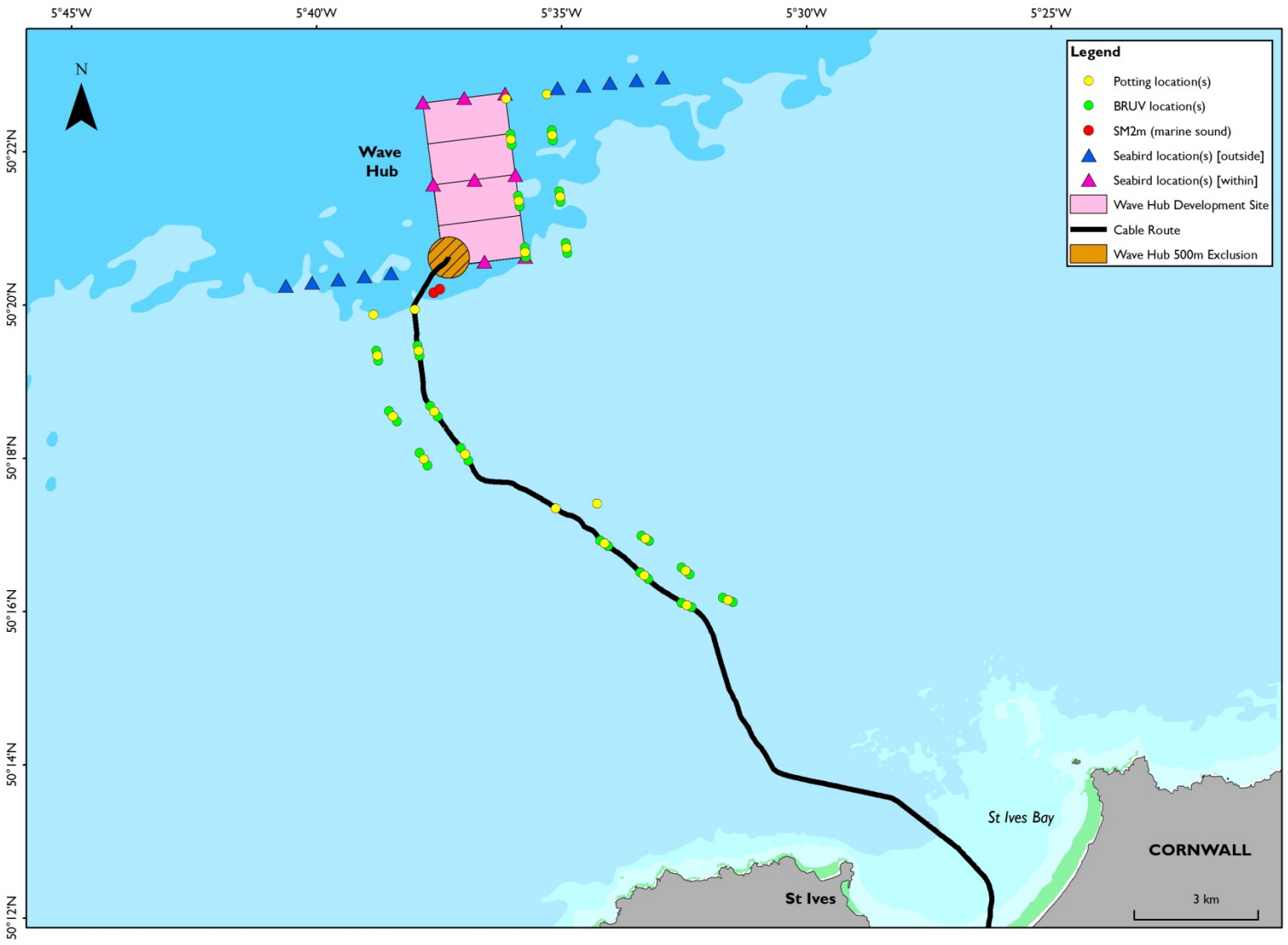
    What can we learn for future developments?

Two techniques for Exeter(QBEX)@Wave Hub

Baited Remote Underwater Video systems (BRUVs)

Crustacean potting using experimental protocols

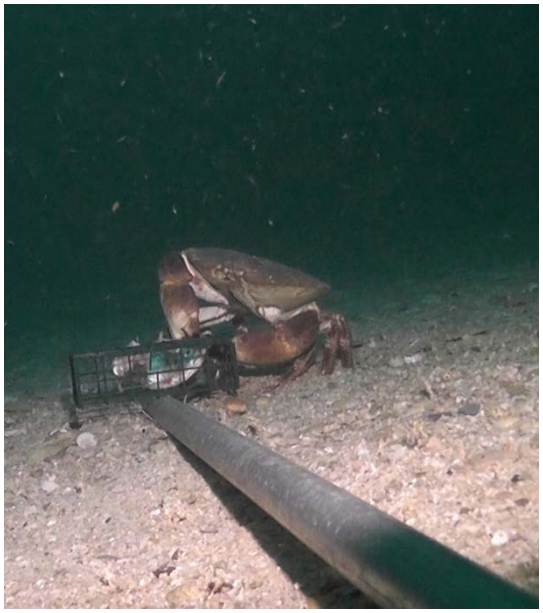
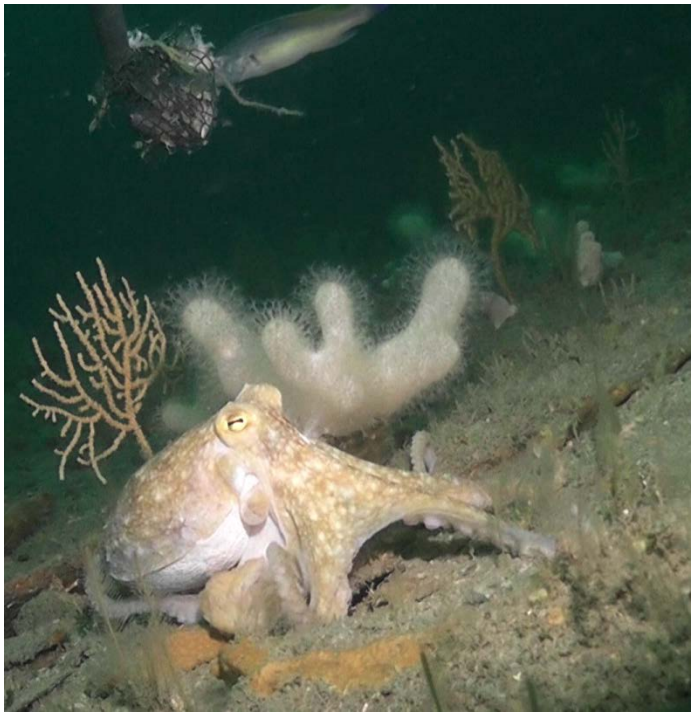
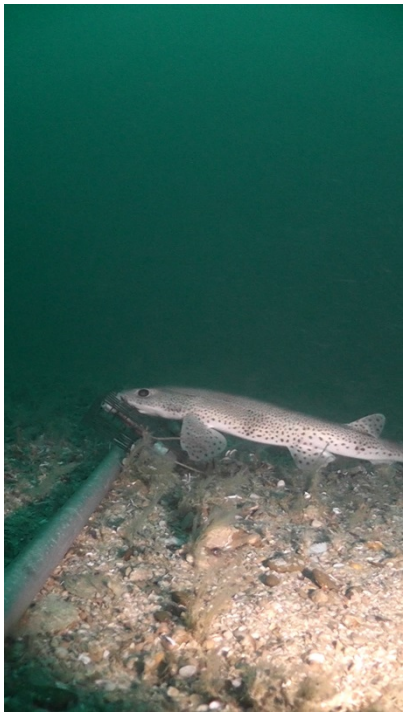
Exeter (QBEX) offshore activities



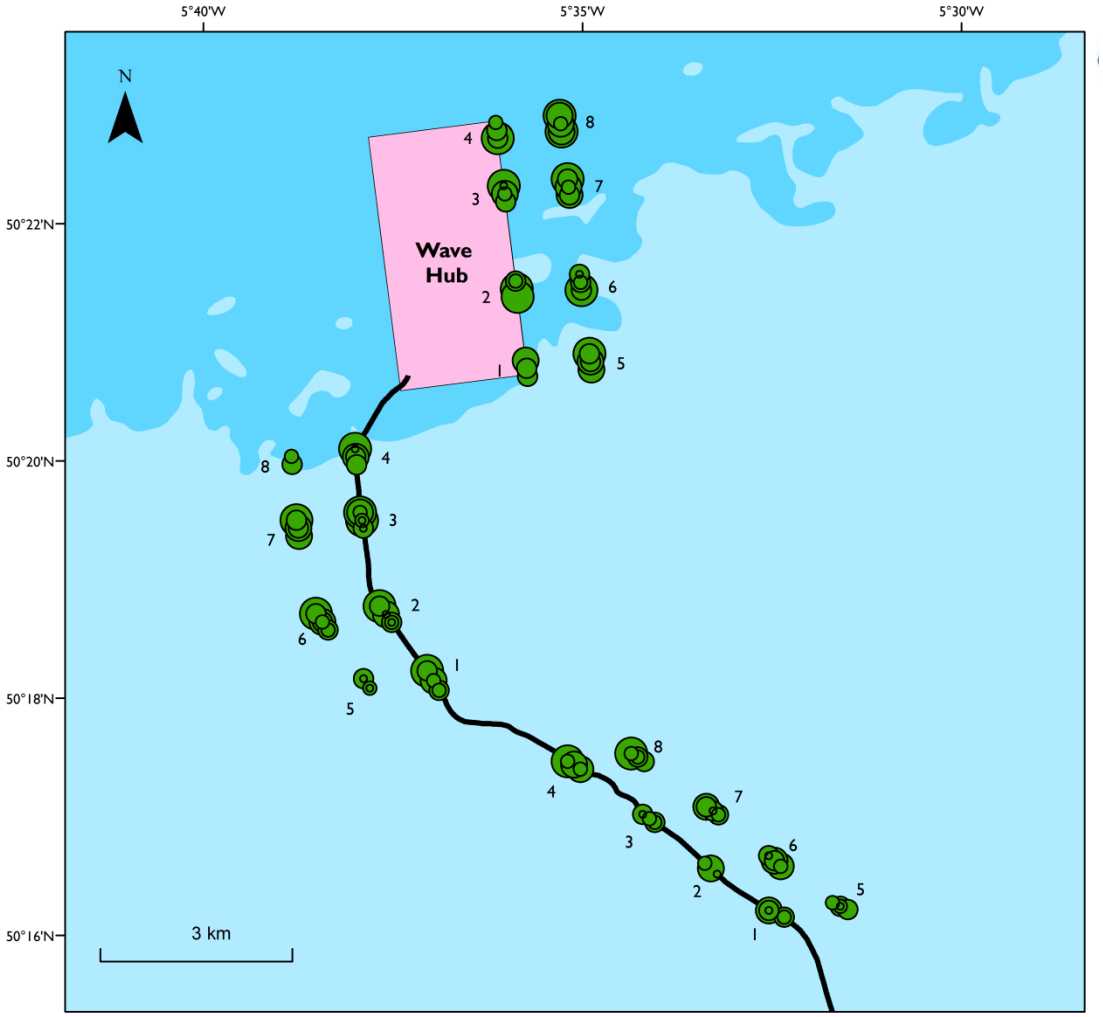
BRUVS

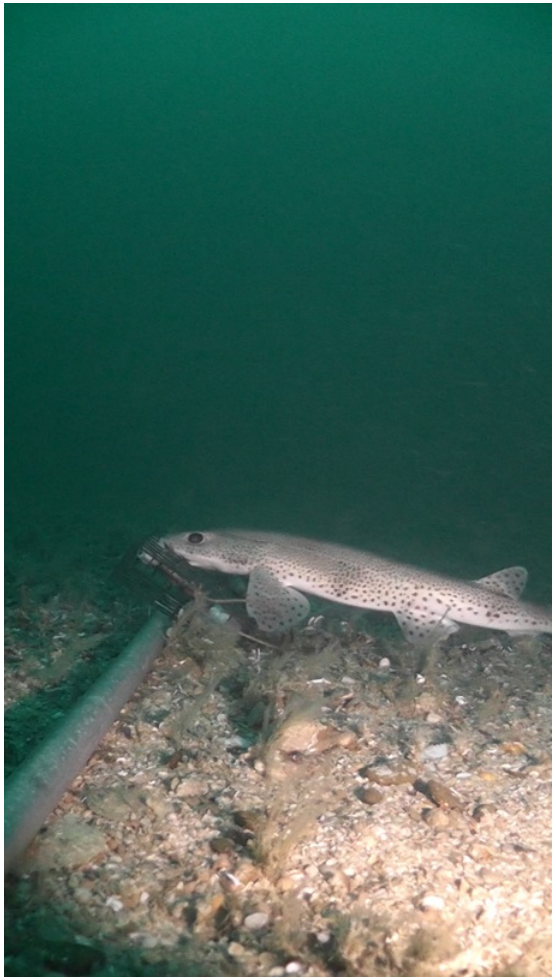
- Assessing macro–mobile fauna
- Each year since 2010
- 54 x 1-hr camera deployments
- Remote video work ON cable route and AT Wave Hub [TREATMENT SITES]
- Remote video work OFF cable route and AWAY from Wave Hub [REFERENCE SITES]

- Investigating changes in:
  - **Community composition**
  - **Species abundance**
  - **Species richness (diversity)**
  - **Behaviour**

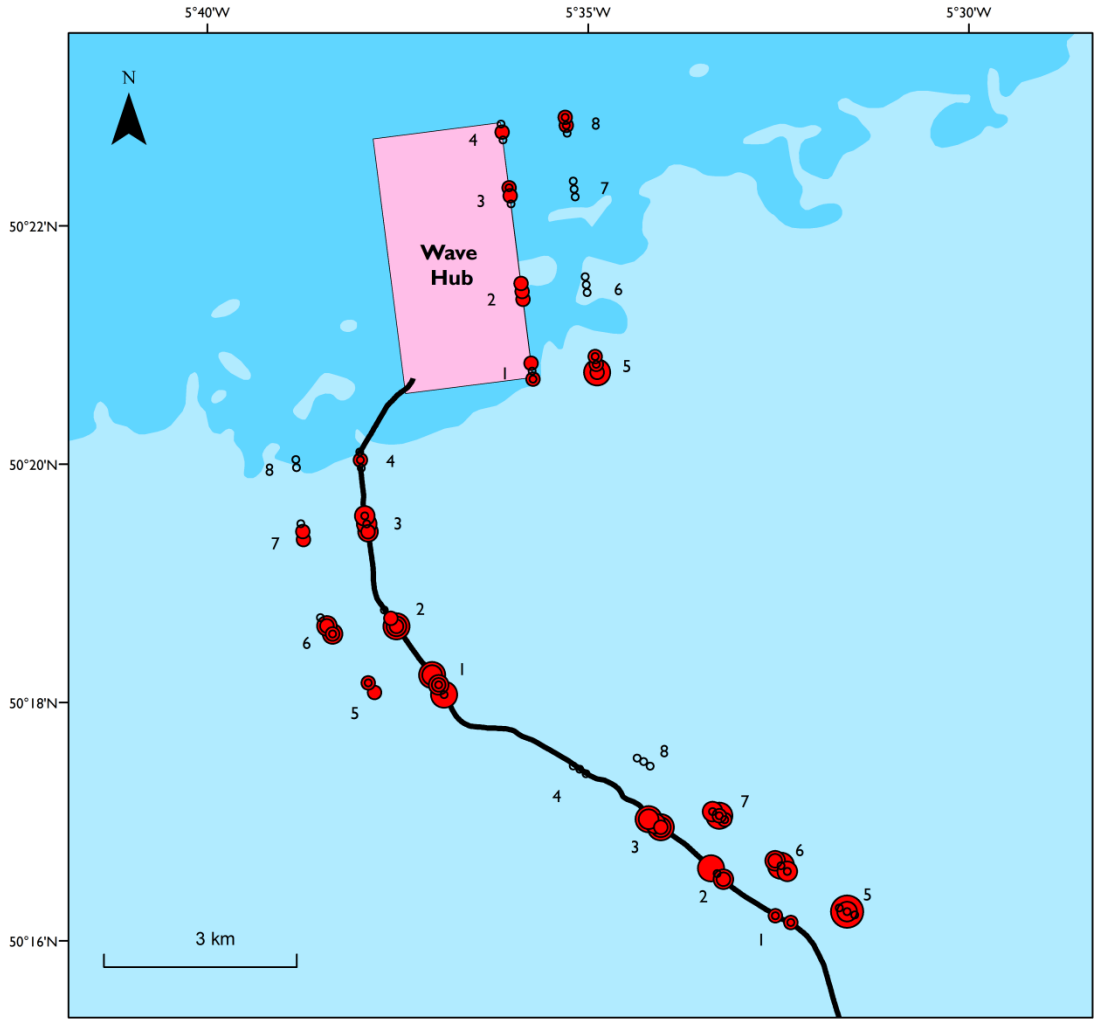





Abundance/distribution of small (lesser) spotted cat shark (dog fish). All surveys





Abundance/distribution of <u>edible (brown) crab.</u> All surveys



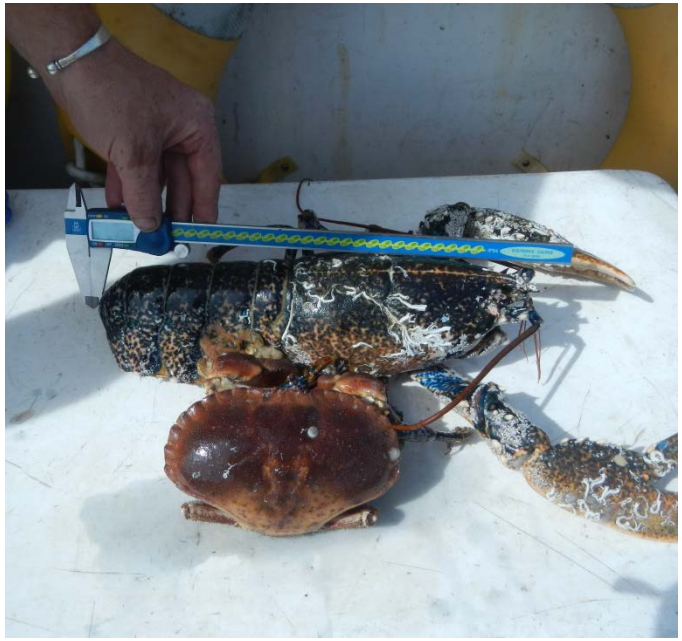
POTTING

- Assessing edible crab, spider crab and European lobster
- Annually (Spring) since 2011
- Potting ON cable route and AT Wave Hub [TREATMENT SITES]
- Potting OFF cable route and AWAY from Wave Hub [REFERENCE SITES]

- Crustaceans caught, identified, sexed and measured
- Initial time-lapse camera work to establish optimal sampling

- Investigating changes in:

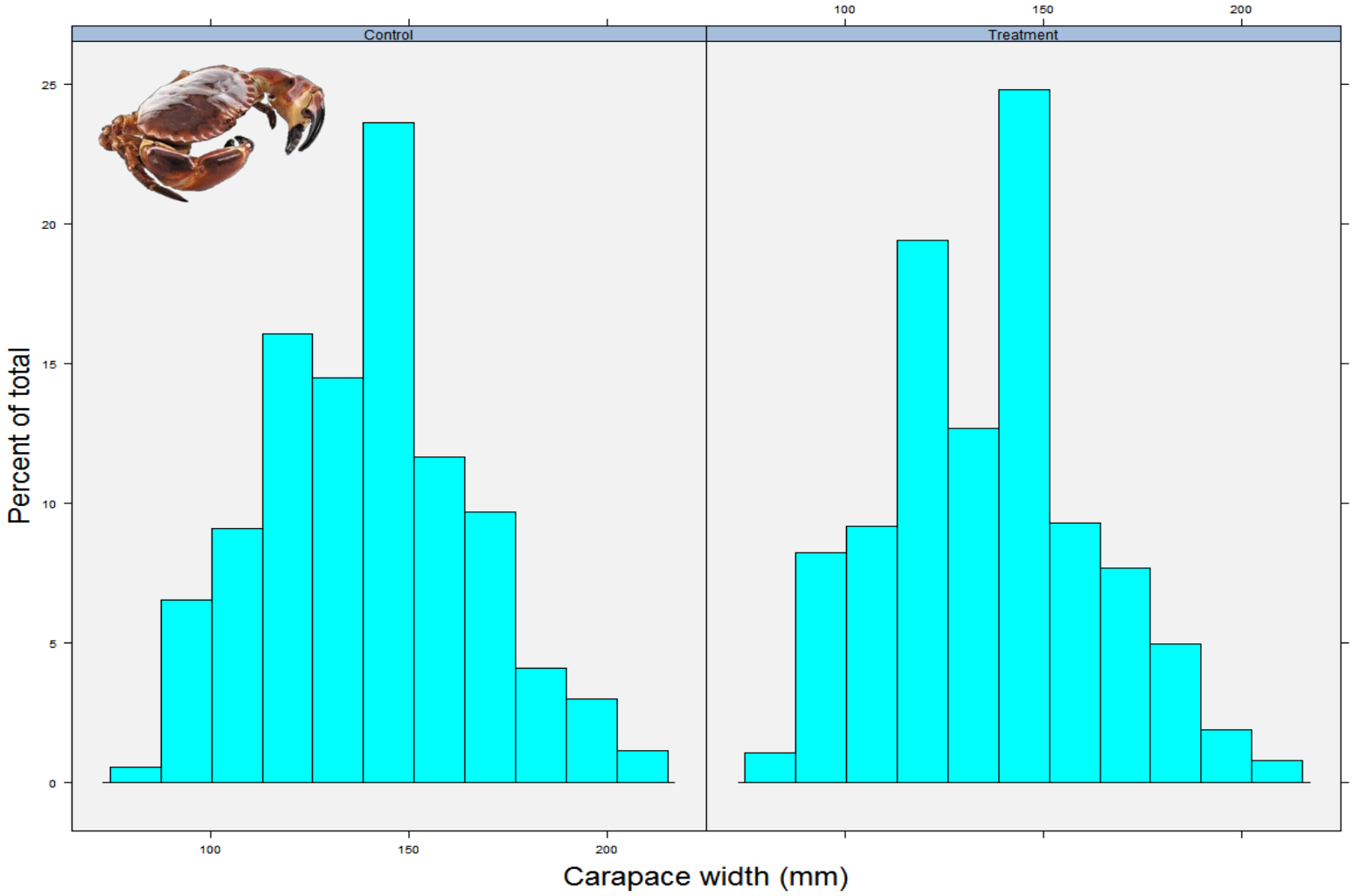
  Species abundance
  Body size
  Sex ratio



Edible crab size distribution

Off cable route

On cable route



Discussion

- We (hope to/aim) to measure the EFFECT of developments on host ecosystems. Measuring IMPACT is far more difficult / expensive.
- Do not underestimate the level of sampling and replication you need to make robust statistical conclusions.
- High levels of inter-annual variation may mask or interact with device-induced effects (+/-).
- Acknowledge the limitations of the technologies. EIA volume of surveying is likely insufficient for effect-level science.

Discussion

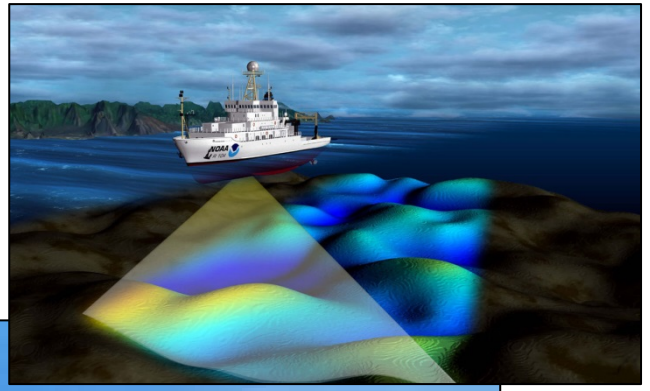
- Still analysing, can not conclude as yet, but now have multi-year pre-construction baseline.
- And for cable route we have a treatment versus no treatment study.
- Science is policy relevant
  - Do RE sites create resource overspill for fisheries and/or ecosystem restoration?
  - Are RE sites appropriate to integrate into extant MPA networks?
  - Is there a net BENEFIT or LOSS to ecosystem function within host environments?
- Funding for impact level research.

Exeter@Wave Hub datasets

- Monthly bird surveys
  (43 surveys; 2009 onwards)
- Marine ambient sound dataset
  (3+ years; 24/7 recording ~85% complete)
- Small cetacean detection array
  (~6 years; multiple sites and depths)
- Fisheries SIMRAD EK60 survey
  (with Cefas) and now EK80 & M3




SIMRAD EK60 survey for mid-water pelagic fish (with and without swim bladders)



Data discovery tool (NERC-IAA funding)

https://expl.ore.exeter.ac.uk/explore/1