Key Messages

- Decommissioning requires new environmental data collection techniques
- Chevron trialed / used 3 in Thailand:
  - Stereo ROV video (fish)
  - eDNA (biodiversity)
  - 3D Photogrammetry (marine growth)
- Lots of potential though validation & standardization of approaches needed
# Methods for Assessing Offshore Environmental Values

<table>
<thead>
<tr>
<th>Methods</th>
<th>Limitations</th>
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| **Seabed sampling (grabs, cores, trawls etc.)** | ▪ Distance from structures being assessed  
   ▪ Seabed not representative of water column / structure-related species  
   ▪ Limited numbers of point samples |
| **Diver surveys**                 | ▪ Safety risk  
   ▪ Diving skills and taxonomic expertise required  
   ▪ Depth limitations  
   ▪ Time consuming, expensive |
| **Maintenance ROV footage**       | ▪ Large volume of data available  
   ▪ Video often low resolution, identification difficult  
   ▪ Difficult to quantify size and area sampled  
   ▪ Large, work-class ROVs can affect fish behaviour |
| **Mini-ROV with single camera**   | ▪ High quality video  
   ▪ Limited effect on fish behaviour  
   ▪ Difficult to quantify size and area sampled |
New Fish Survey Method: Mini-ROV with Stereo-Video

- Stereo-video measures XYZ coordinates:
  - **Fish length** (+1% accuracy)
  - **Area/volume sampled**
- High-def video allows species identification
- Mini-ROV = Limited effects on fish behaviour
- Can be used as a consistent method for platforms, pipelines, natural habitats
- Can retrofit stereo-cameras to existing ROVs

*Collaboration between Chevron (Dr Michael Marnane) and Curtin University, Perth*
Example outputs of Stereo-Video Fish Survey: Standing biomass and value

Mean Economic Value (Thai Baht ± SE)

Mean Biomass (kg ± SE)

Average for jacket =
Rapid Biodiversity Assessments Methods: Environmental DNA (eDNA)

- eDNA detects organisms based on presence of DNA fragments in environment

- DNA detected in samples is then compared to a growing library of DNA sequences to determine taxa

- Whole-community eDNA assessments made possible due to recent advances in sequencing technology

*Collaboration between Chevron (Dr Michael Marnane) and Curtin University, Perth*
Example eDNA Survey Approach for Platform Jackets

Environmental DNA metabarcoding studies are critically affected by substrate selection

Adam Koziol, Michael Stat, Tiffany Simpson, Simon Jarman, Joseph DiBattista, Euan Harvey, Michael Marnane, Justin McDonald, Michael Bunce. Molecular Ecology Resources 2019

Water ▲  Sediment ●  Biofoul ★

0-5m
30m
50m
Bottom (60-70m) x 2 sides of Jacket
3D Photogrammetry: Marine Growth Volume, Roughness & Cover

• Uses multiple positions of video or still photos of same area to build up a 3D model
• Movement between images generates 3-D point clouds
• Reference photos stitched onto point cloud to provide 3-D photomosaic
• Can be used to provide:
  ➢ % cover
  ➢ Surface roughness (indicator of habitat quality)
  ➢ Volume
  ➢ Weight (if validated with scraping of biofoul)

Collaboration between Chevron (Peter Oliver) & Scottish Association of Marine Science & Tritonia Scientific Ltd.
3D Photogrammetry: jacket leg example
Summary: New Technologies Enhance Data Quality for NEBA and Comparative Assessment

- Faster, cheaper, improved resolution
- Quantitative instead of qualitative
- Foundation to move beyond ecological metrics into socioeconomic value (e.g. fisheries)

BUT
- Much research needed to validate results / standardize approaches