

# MAC-MIGS Project Proposals

## Laura Williamson, Victoria Todd



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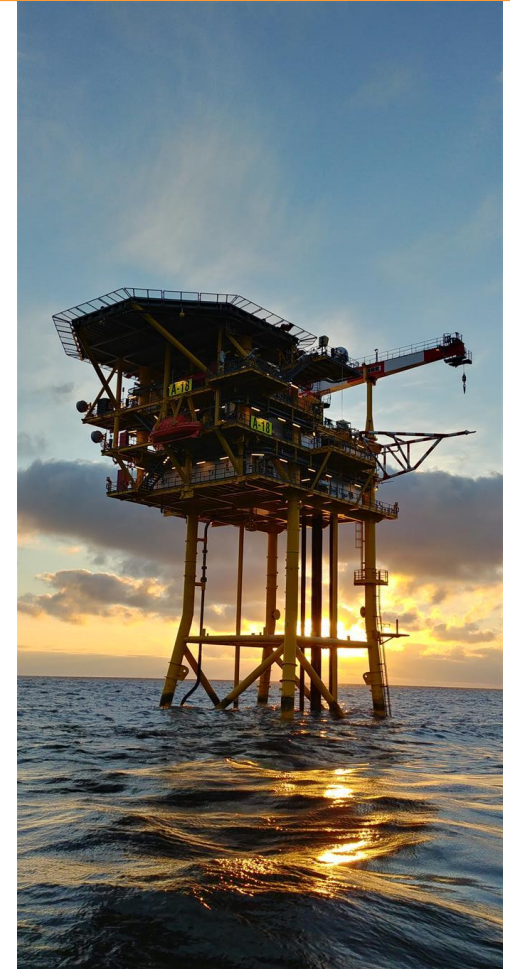
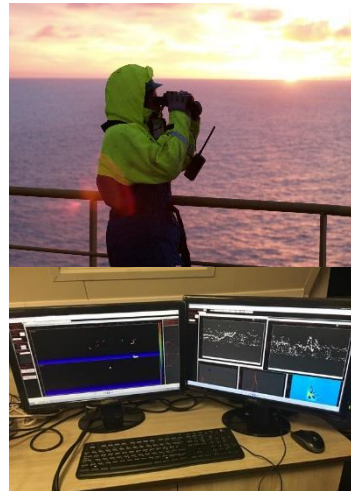
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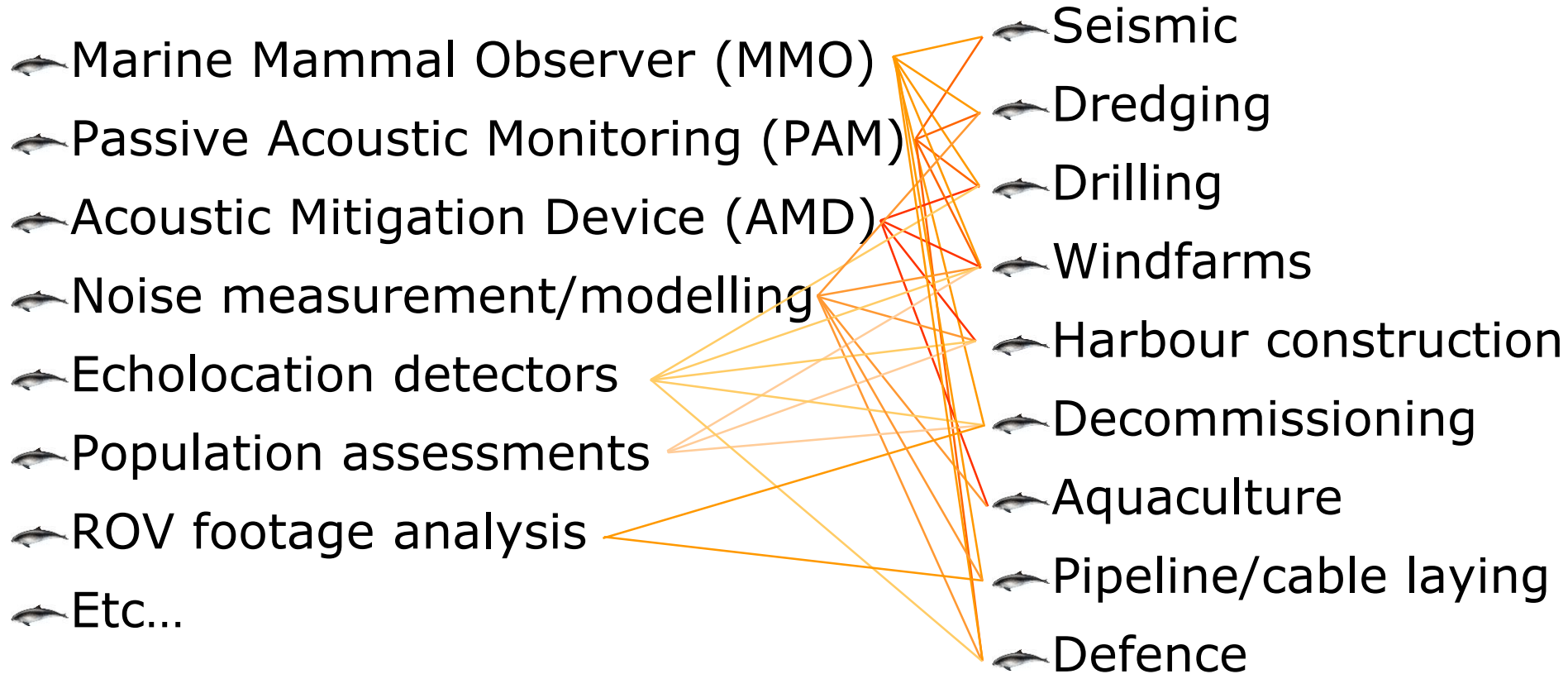
Edinburgh, November 2019

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- Marine Mammal Observer (MMO)
- Passive Acoustic Monitoring (PAM)
- Acoustic Mitigation Device (AMD)
- Noise measurement/modelling
- Echolocation detectors
- Population assessments
- ROV footage analysis
- Etc...







 **OSC science team**

**James  
Jiang**



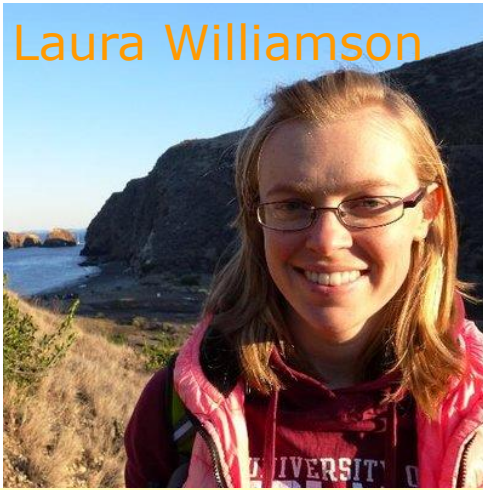
**Max  
Ruffert**



**Sophie Cox**



**Laura Williamson**



**Laura Lazar**



**Ian & Victoria Todd**





**Marine mammals  
(harbour porpoise)**



Acoustic detections  
(echolocation)

Noise measurement  
& modelling

Prey species  
(ROV imagery)

Use of offshore  
structures

Inform decommissioning  
options (rigs-to-reefs)



**Most places don't  
look like this**





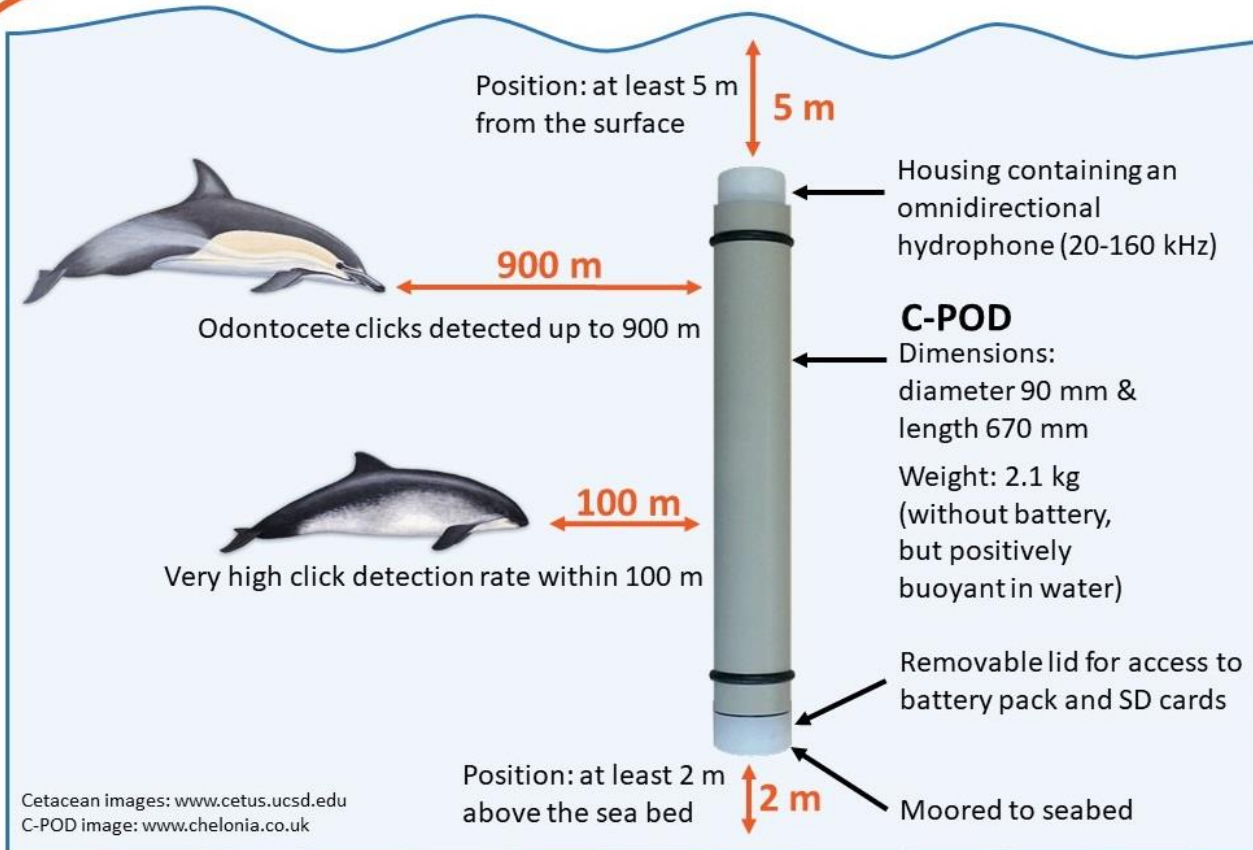
**Usually its more  
like this...**

**... so many species rely on  
sound instead of vision**



- Navigation, communication, foraging, predator avoidance
- Clicks – foraging
- Whistles – social communication
- Songs – finding a mate
- Vocalisations are often species-specific
- Sometimes even individual-specific
- Collect data using C-PODs or PAM



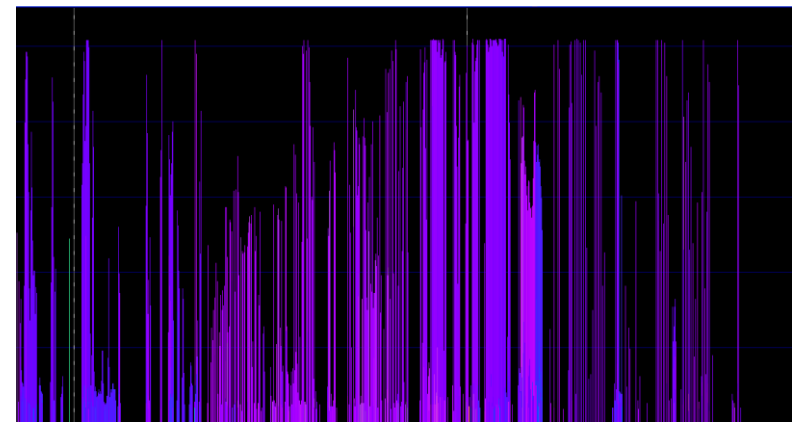
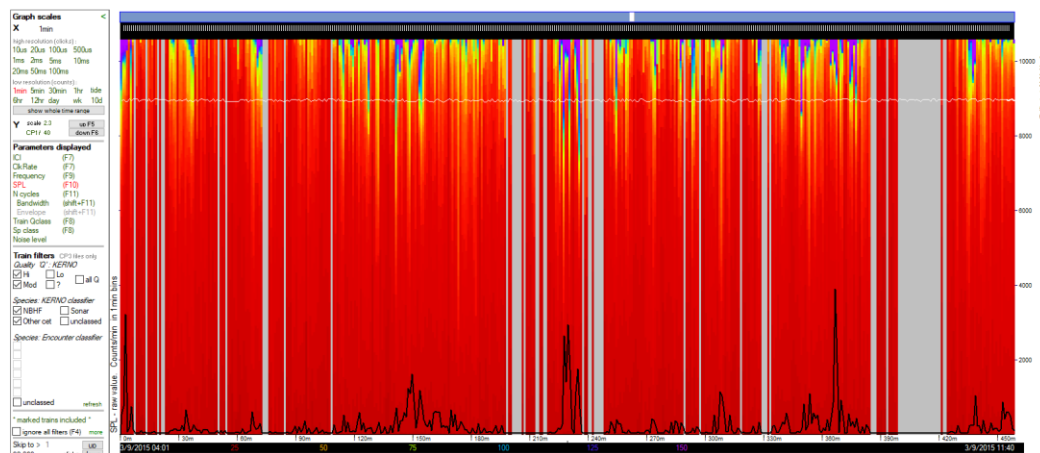


## The C-POD:

- Automated, i.e. power, processing, detection and classification software
- 2 to >6 months operation
- Detects most odontocetes
- Distinguishes between dolphins and porpoises
- Provides information on presence and behaviour
- Low false positive rates
- Low-cost data collection
- Extremely robust
- Highly sensitive with precise calibration



- 🐟 Detection Positive Minutes/Hours (DPM/DPH)
- 🐟 Click details & inter-click-interval (proxy for foraging)
- 🐟 Environmental details & noise (approximate)
- 🐟 Boat sonar



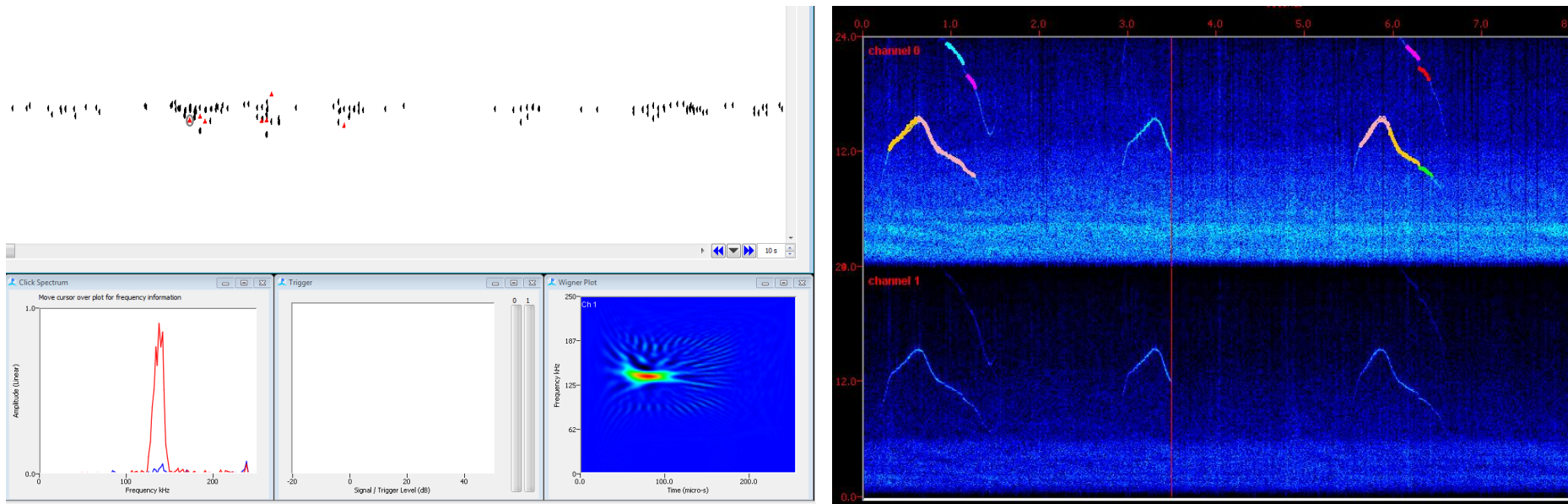


- Record noise
- Piling, vessel, dredging, seismic, AMD, etc...





- 🐬 Echolocation clicks – porpoises & dolphins
- 🐬 Whistles, moans, songs – dolphins & whales

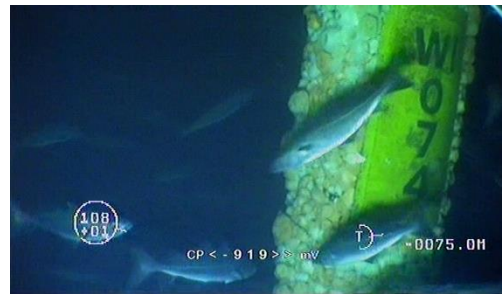




- Weather data (SWH, SW, windspeed, etc.)
- Empirical temperature at seabed (from C-PODs)
- Empirical CTD casts
- Satellite SST & Chl-a
- Modelled SST, BT, Chl-a, Current speed & direction
- **Modelling detections & environment using GAMs**
- Determine impacts of abiotic environment
- Before addressing anthropogenic impacts



- Decommissioning of O&G platforms
- OSPAR
- Rigs-to-reefs
- Alternatives...





- ROV data currently analysed manually
- Takes 8 hrs to analyse 1 hr of footage
- Takes 20-30 minutes to analyse a single still



- Machine learning
- Neural network
- Database engineering
- Data mining
- Signal/image processing
- Pattern recognition

RESEARCH ARTICLE

MAIA—A machine learning assisted image annotation method for environmental monitoring and exploration

Martin Zurowietz<sup>1\*</sup>, Daniel Langenkämper<sup>1</sup>, Brett Hosking<sup>2</sup>, Henry A. Ruhl<sup>2,3</sup>, Tim W. Nattkemper<sup>1</sup>

Vol. 615: 15–30, 2010  
<https://doi.org/10.3354/meps12925>

MARINE ECOLOGY PROGRESS SERIES  
 Mar Ecol Prog Ser

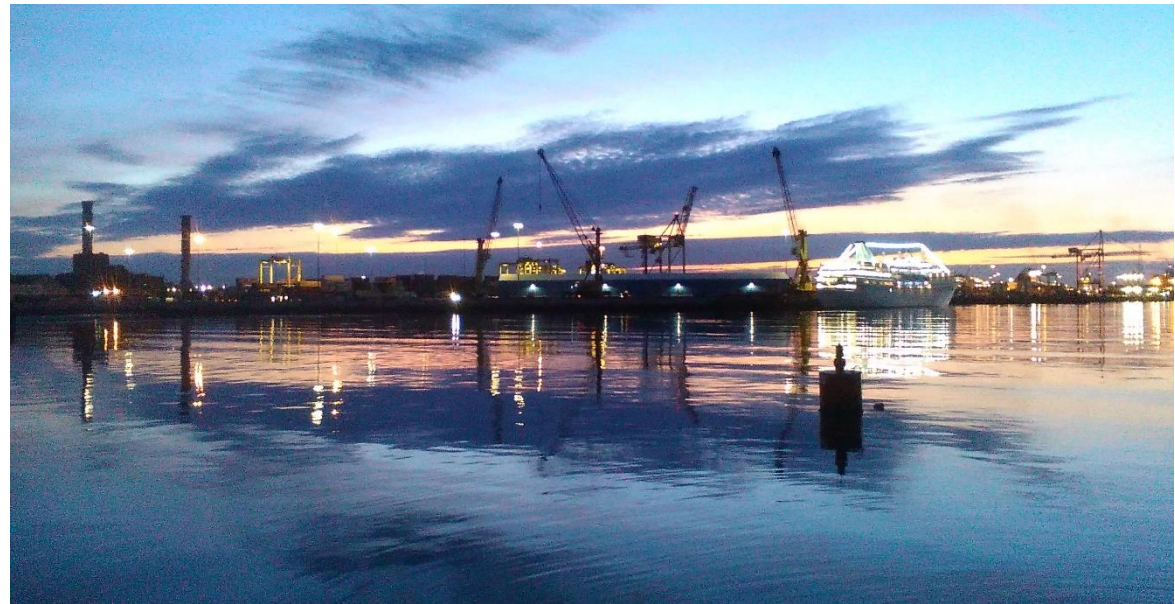
Published April 18

**Automated identification of benthic epifauna with computer vision**

Nils Piechaud<sup>1,\*</sup>, Christopher Hunt<sup>2</sup>, Phil F. Culverhouse<sup>3</sup>, Nicola L. Foster<sup>1</sup>, Kerry L. Howell<sup>1</sup>



- Repurposing industrial ROV imagery for ecology
- Differentiating dolphin species using C-PODs
- Testing PorCC click classifier
- PAM analysis
- Noise modelling







ICES Journal of Marine Science



ICES Journal of Marine Science (2019), doi:10.1093/icesjms/fsz077

RESEARCH ARTICLE

Characterizing the first wave of fish and invertebrate colonization on a new offshore petroleum platform Meals on Wheels? A Decade of Megafaunal Visual and Acoustic Observations from Offshore Oil & Gas Rigs and Platforms in the North and Irish Seas

Victoria L. G. Todd<sup>1,2,\*</sup>, Laura D. Williamson<sup>1</sup>, Sophie E. Cox<sup>1</sup>, Ian B. Todd<sup>1</sup>, Peter I. Macreadie<sup>3</sup>

Victoria Louise Georgia Todd<sup>1,2,\*</sup>, Jane Clare Warley<sup>1</sup>, Ian Boyer Todd<sup>1</sup>

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journal homepage: www.elsevier.com/locate/marenv

ICES Journal of Marine Science

ICES Journal of Marine Science (2015), 72(2), 328–340. doi:10.1093/icesjms/fsu187

Review

A review of impacts of marine dredging activities on marine mammals

Victoria L. G. Todd<sup>1,2,\*</sup>, Ian B. Todd<sup>1,2</sup>, Jane C. Gardiner<sup>1</sup>, Erica C. N. Morrin<sup>1</sup>, Nicola A. MacPherson<sup>1</sup>, Nancy A. DiMarzio<sup>1</sup>, and Frank Thomsen<sup>3</sup>