

NEODAAS application

Office use

App no.	Grade	UID	Received	Reviewed	Returned	Replied	Started	Finished
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Principal investigator

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Department/address		

Collaborators

Name	Telephone	Email
Mrs Laura Williamson		
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Reference number	Degree level	Course end date
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Course title

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Dr Beth Scott		
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Project details

Project title	Project duration
Environmental factors driving the distribution of harbour porpoise	2.5 years
NERC science theme(s)	Funding
Sustainable use of natural resources	MASTS

Background rationale for project

Harbour porpoise (*Phocoena phocoena*), are abundant with a widespread distribution throughout UK waters (Hammond et al. 2013). They are expected to be present in most offshore development sites (e.g. wind farms); therefore this research aims to identify the fine-scale dynamic variables that influence their distribution and activity. This increased understanding of how harbour porpoise make use of specific environmental variables will be used for the informed development of Special Areas of Conservations (SACs) for harbour porpoise and the marine spatial management of fishing and renewables. There is currently a requirement to develop SACs for harbour porpoise in UK waters; however there is often a lack of appropriate data to determine the locations of these SACs. This work forms parts of a MASTS PhD studentship, supervised by the University of Aberdeen (UoA) and Marine Scotland Science (MSS), to assess the distribution of harbour porpoise using an extensive dataset of acoustic and digital video detections collected over the past five years. In addition to informing the development of SACs, this project also aims to identify the predicted impacts from the development of offshore wind farms on the distribution and foraging of harbour porpoise. Pile driving, and other impulsive noises can disrupt cetacean behaviour at distances ranging from 20 km to 70 km (Madsen et al. 2006; Tougaard et al. 2009; Bailey et al. 2010; Brandt et al. 2011). Porpoise show behavioural responses to loud noises from pile driving and seismic surveys (Bailey et al. 2010; Brandt et al. 2011; Pirotta et al. 2014). However, responses to disturbance at a fine scale are poorly understood. Understanding these fine-scale responses is crucial for the informed development of construction time plans and exploring different mitigation strategies for use during the construction and operation phases of wind farms, and could result in extensive economic savings for the companies involved.

Description of project research/activity

Acoustic detections of harbour porpoise have already been collected at over 100 sites in the Moray Firth between 2009 and 2012 by UoA and at an additional 30 sites along the entire East Coast of Scotland between 2013-present by MSS. These data will be used to identify porpoise presence/absence and also foraging behaviour. In addition to these acoustic data, digital video surveys were performed along the east coast and in the Moray Firth in 2014 by MSS and 2010 by UoA respectively. The satellite SST, chlorophyll and front data will be combined with hydrodynamic model data of tide speed, direction, upwelling, etc. to model the fine-scale drivers of harbour porpoise distribution and activity.

Use of satellite data to support research

The satellite SST, chlorophyll and front data will be among f the key inputs incorporated into species distribution models to identify the environmental variables that influence harbour porpoise distribution and the key features that they take advantage of for feeding. NOTE: We have permission from Peter Miller to use data (SST, Chl-a and Front from 2002-2012) from a previous project involving David Lusseau and Enrico Pirotta. We have used these data and found that SST and front Density are significantly correlated with harbour porpoise distribution in 2009-2011 and would therefore like to use these same variables for the analysis of more recent data.

Expected results

Results obtained using these data will be incorporated into Laura Williamson’s PhD thesis, and into two or more peer-reviewed research papers and conference presentations. There is also the potential that results obtained using these satellite data will be used to influence the location of harbour porpoise SACs in Scotland.

Related references

Bailey, H., Senior, B., Simmons, D., Rusin, J., Picken, G. & Thompson, P.M. (2010). Assessing underwater noise levels during pile-driving at an offshore windfarm and its potential effects on marine mammals. *Marine pollution bulletin*, 60, 888-897. Brandt, M.J., Diederichs, A., Betke, K. & Nehls, G. (2011). Responses of harbour porpoises to pile driving at the Horns Rev II offshore wind farm in the Danish North Sea. *Marine Ecology Progress Series*, 421, 205-216. Hammond, P.S., Macleod, K., Berggren, P., Borchers, D.L., Burt, L., Cañadas, A., Desportes, G., Donovan, G.P., Gilles, A. & Gillespie, D. (2013). Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management. *Biological Conservation*, 164, 107-122. Madsen, P.T., Wahlberg, M., Tougaard, J., Lucke, K. & Tyack, P.L. (2006). Wind turbine underwater noise and marine mammals: implications of current knowledge and data needs. *Marine Ecology Progress Series*, 309, 279-295. Pirotta, E., Brookes, K.L., Graham, I.M. & Thompson, P.M. (2014). Variation in harbour porpoise activity in response to seismic survey noise. *Biology Letters*, 10, 20131090. Tougaard, J., Carstensen, J., Teilmann, J., Skov, H. & Rasmussen, P. (2009). Pile driving zone of responsiveness extends beyond 20 km for harbor porpoises (*Phocoena phocoena* (L.)). *The Journal of the Acoustical Society of America*, 126, 11-14.

Data requirements

Request

Chlorophyll (standard) in weekly at 300m between N 55 - 59 & E -4.5 - 0 in GeoTIFF

Request

Sea surface temperature in weekly at 1km between N 55 - 59 & E -4.5 - 0 in GeoTIFF

Request

Thermal fronts in weekly at 1km between N 55 - 59 & E -4.5 - 0 in GeoTIFF

Time range (s) of requested data

1 April 2012 - 31 November 2015