

Scottish Marine and Freshwater Science

Volume 5 Number 7

**EMEC Fall of Warness Tidal Test Site:
Wildlife Observations Project
Annual Report**

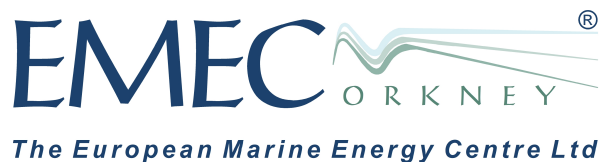
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EMEC Fall of Warness Tidal Test Site: Wildlife Observations Project

Annual Report



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This report presents the results of marine and freshwater scientific work carried out for Marine Scotland under external commission.

Copies of this report are available from the Marine Scotland website at www.scotland.gov.uk/marinescotland

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Revision History

Version	Date	Description	Originated by	Approved by
0.1	29/04/14	Initial draft report issued to the Scottish Govt.	CB	DC
1.0	10/06/2014	Final version incorporating Scottish Govt. revisions.	CB	DC

1. Executive Summary

A key concern expressed by policy makers, regulators and environmental stakeholders about deployment of marine energy devices in open waters relates to the possibility of negative impacts they may have on marine mammals and diving birds. The potential for direct collision with such devices, or harmful effects caused by their presence, including the potential for displacement of marine wildlife from habitual waters, are issues which need to be addressed. In order to get as accurate a picture as possible about the presence and behaviour of marine wildlife in the vicinity of operating devices, data needs to be collected both underwater and at the sea surface. The current wildlife observation programme underway at the European Marine Energy Centre (EMEC) in Orkney gathers surface-visible wildlife information across EMEC's grid-connected and nursery test sites, and the data gathered can be used to inform regulatory decision-making, as well as in guiding developers' device-specific wildlife monitoring programmes.

Activities of the wildlife observation programme underway at EMEC are overseen by the EMEC Monitoring Advisory Group (MAG), whose membership includes representatives from Marine Scotland Science, Marine Scotland Licencing Operations Team, Marine Scotland Compliance, Scottish Natural Heritage, Scottish Government, and the Sea Mammal Research Unit at the University of St Andrews.

The Fall of Warness wildlife observation project commenced in July 2005, with Scottish Government funding current contract. During the period 1 April 2013 to 31 March 2014 a total of 909 hours of observations were completed. Observations at the site for this reporting period have shown seasonal peaks at the site in grey and harbour seal abundances corresponding with pupping seasons, which is mirrored in the data collected to date at the site. The majority of cetacean sightings during this reporting period have been white-beaked dolphins, whereas typically the most sighted cetacean is harbour porpoise. A typically diverse range of marine birds has also been observed, although for several species numbers in April and May 2013 fell below the mean. This could be due to the enduring winter of 2012/2013 and resultant late spring experienced in Orkney as was the case for the rest of the UK.

Detailed analysis of the data collected is out-with the scope of this project; however a separate data analysis project, funded by Marine Scotland and Scottish Natural Heritage, has been established to carry out an in-depth analysis of the data.

2. Introduction

The potential displacement of key wildlife species (e.g. marine mammals and marine birds) from their normal range of habitats is a key factor which needs to be addressed by developers in order for the marine renewable energy industry to progress. It is recognised that assessing marine species' usage of particular areas of ocean is an extremely challenging task. The European Marine Energy Centre Ltd (EMEC) has received research funding from the Scottish Government to carry out land-based vantage point surface wildlife observations at its tidal test site at Fall of Warness, Eday, Orkney Islands in order to aid informing the solution to this industry-wide concern.

Activities of the wildlife observation programme underway at EMEC are overseen by the EMEC Monitoring Advisory Group (MAG), whose membership includes representatives from Marine Scotland Science (MSS), Marine Scotland Licencing Operations Team (MS-LOT), Marine Scotland Compliance, Scottish Natural Heritage (SNH), Scottish Government (SG), and the Sea Mammal Research Unit at St Andrews University (SMRU). The objectives of this group include: translation of policy requirements into practical monitoring effort; overseeing the production of relevant monitoring tools and best practice techniques at the EMEC test sites whilst ensuring monitoring effort and methods of data stewardship are compatible with relevant methodologies; and exchanging knowledge and information relating to similar initiatives so as to avoid duplication and establish links with other relevant research programmes at national and international level. The terms of reference for the EMEC MAG are provided as Annex A of this document.

Land-based wildlife observations using a bespoke methodology initially developed with input from SMRU have been carried out at the site since July 2005. These observations provide baseline data which can be used to look at the distribution and behaviour of marine mammals, diving birds and other wildlife across the test site area.

The main objective of this project is to provide site description species data which can later be used to establish whether the installation, presence and operation of marine energy converter devices causes displacement of surface-visible wildlife from habitual waters, and to identify any discernible changes to wildlife behaviour.

Detailed analysis of the data collected is out-with the scope of the project. A first-stage analysis of the data up until June 2010 has been carried out by SNH (Robbins, 2011) and a separate project funded by Marine Scotland, SNH and EMEC has been established to perform an in-depth analysis of the data. The EMEC Wildlife Data Analysis project commenced in August 2013, and will analyse all wildlife data collected at the EMEC grid-connected test sites from July 2005 to March 2015. Initial results are expected in summer 2015, with final results due to be reported in November 2015. EMEC has subcontracted the Centre for Research into Ecological and Environmental Modelling (CREEM) of the University of St Andrews to provide expert statistical input and training for this project.

Outputs from the project will be available to all relevant parties including marine energy technology developers and other marine renewables environmental projects. The data collected in this project will be publically available via the Marine Scotland Interactive website¹.

This report provides details of project progress for the period 1 April 2013 to 31 March 2014.

¹ <http://www.scotland.gov.uk/Topics/marine/science/MSInteractive/Themes/EMEC-Wildlife>

3. Methodology

In 2005, Highland and Islands Enterprise (HIE) commissioned local environmental consultants Aurora Environmental Ltd. to produce a survey methodology for marine wildlife observations. These consultants worked with SMRU to set up the wildlife observation project and train the wildlife observers, but no formal documentation was produced. The methodology involved recording numbers, location and behaviour of individual animals for 20 hours per week throughout the year. The observer's instructions were to undertake watches across a variety of wave and tidal states, times of day, and weather conditions, but a formal watch system was not specified. Full details of these variables were recorded along with the species sighting data.

In 2010, EMEC and SMRU Ltd produced documentation to accurately reflect the methodology used at the site to facilitate recording the presence, distribution and behaviour of marine mammals and marine birds. At this point a formal watch rota was introduced in order to ensure a full range of sampling across available watch times. This methodology is available to download from the Marine Scotland Interactive website². The formal methodology with defined scheduling of watches was implemented in April 2011; however the formal scheduling of watches proved to be unsuccessful in terms of watch attainment due to the conditions often experienced at the site. In May 2011 the formal watch rota was relaxed, and whilst the observers do work to a target watch rota, flexibility in the watch times allows for provision of good temporal and tidal coverage in the observations programme.

3.1 Observations

Fully trained observers stationed on Eday carry out the observations through regular scanning of the test site by telescope (Opticron GS 815, set at 20x magnification) for hour long periods from an elevated vantage point to the south of the island. Due to the size of the study area, which extends down and across the Fall of Warness, a vantage point at approximately 50m above sea level with sufficient height to give good visibility across the whole test site area was chosen. In order to aid accurate recording of sightings, the study area was subdivided into grid squares, by overlaying a matrix of squares of approximately 500m². Wildlife sightings are identified to species level, and their location on the grid recorded.

Figure 1 below shows the observation grid overlaid on the EMEC test berths and cables.

² <http://www.scotland.gov.uk/Topics/marine/science/MSInteractive/Themes/EMEC-Wildlife/Fall-of-Warness>

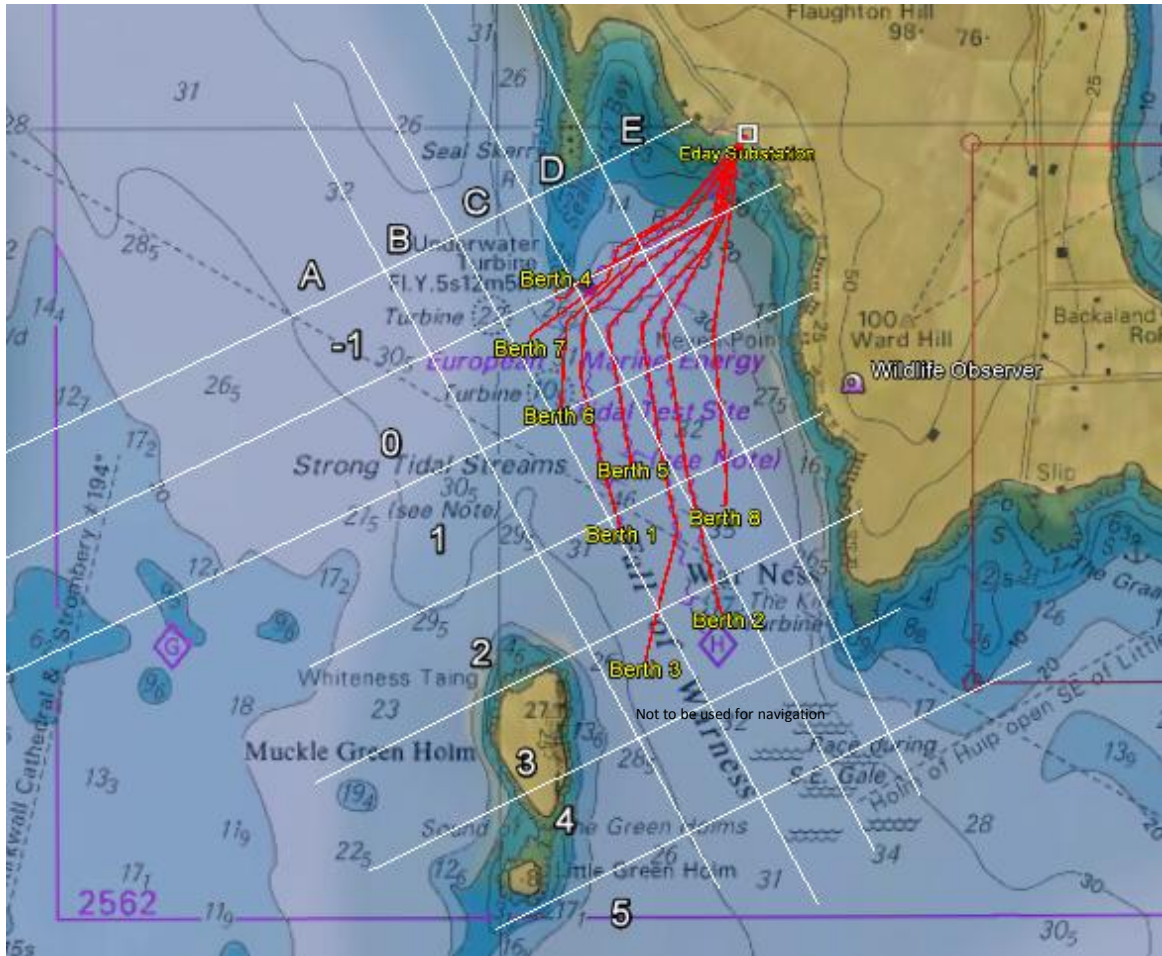


Figure 1: Observation grid for EMEC's Fall of Warness tidal test site

3.2 Survey Effort

Observations are routinely carried out for 4 hours at a time (a watch). One watch is routinely carried out per day, 5 days per week, resulting in 20 hours of observations per week. On some occasions, two watches may be performed on the same day in order to maintain a high attainment of watches in periods of bad weather. On rare occasions, a watch may be abandoned part-way through due to deterioration in weather conditions. A target watch schedule is created annually in advance, to ensure a spread of watches over times of day and states of tide. The watch schedule is adhered to as far as possible, however attainment of watches in good environmental conditions is a priority.

Watches are carried out throughout the year during daylight hours, covering the period from 04:00hrs to 20:00hrs during summertime, and 09:00hrs to 15:00hrs in winter. It takes approximately 1 hour to complete a single scan of the entire survey area. A total of 909 hours of observations were completed for the period 1 April 2013 to 31 March 2014.

3.3 Data Recording

The observer records wildlife sightings by making regular scans of the study area in a consistent manner and entering the details of any sightings made on paper field forms. This information is later transcribed into a standard Microsoft Excel template. In addition to sighting data, the observer also records effort (date, start/end time), environmental conditions (tide state, meteorological conditions), and details of any shipping observed in the area during the watch. Completed spreadsheets are submitted to EMEC each month.

Sightings are only recorded for any birds or marine mammals sighted in or on the surface of the sea. Details recorded include grid location, numbers, and behavioural details (eg feeding, diving, swimming, stationary). Birds are only recorded as sightings if they are on the water or hovering directly above the surface (within a few metres). Any birds flying higher than this or birds that are clearly transiting through the survey area are not recorded.

4. Project Summary

4.1 Site Activity

A number of developers have completed various stages of device installation at the test site during the period 1 April 2013 to 31 March 2014. Table 1 below summarises work in progress during this period.

EMEC Berth	Developer	Activity
1	Hammerfest Strom UK	Device testing
2	Tidal Generation Ltd.	Device testing
3	Kawasaki Heavy Industries	No activity
4	Open Hydro	Device testing
5	Bluewater	No activity
6	Atlantis	No activity
7	Voith Hydro	Device nacelle installed Sept. 2013
8	Scotrenewables	Device testing

Table 1: Developer site activity at the EMEC Fall of Warness test site 1st April 2013 to 31st March 2014

Installed devices may or may not be operational at any given time. Typical additional activity at the test site may include periodic complete removal/re-installation of devices for maintenance, maintenance visits by developers, deployment of Acoustic Doppler Current Profilers to measure tidal resource, and acoustic surveys.

4.2 Project Activity

Overall, this contract period has seen a very high completion rate of planned watches, with an average watch achievement rate of 95%.

The third quarter of the contract suffered a reduced rate of data collection due to the exceptionally heavy storms which were a persistent feature of the UK and Orkney weather pattern in winter 2013/14. The reduced daylight hours experienced in Orkney during the winter months afford less flexibility in the schedule. Nevertheless, watch achievement rates remained above 80% for all months, with the exception of May which was affected by observers' holidays (see Table 2 below).

Month	Percentage (%)	Actual/Potential Hours	Comments
April 2013	100	80/80	
May 2013	65	52/80	Annual holiday
June 2013	100	80/80	
July 2013	100	80/80	
August 2013	100	80/80	
September 2013	100	80/80	
October 2013	100	80/80	
November 2013	90	72/80	Bad weather
December 2013	88	70/80	Bad weather
January 2014	98	78/80	Bad weather
February 2014	96	77/80	Bad weather
March 2014	100	80/80	

Table 2: Achievement of watches expressed as a percentage and actual contractual hours per month.

A new observer joined the observation team in November 2013, to replace one who resigned. As with previous changes to the team, the lead wildlife observer trained the new observer in the methodology and characteristics of the observation area through a series of shadowed watches, culminating in a set of dual watches carried out on the 4th and 5th November 2013. There was a high level of correlation in the results of these dual watches as can be seen from Table 3 and Table 4 below. The apparent discrepancy in numbers recorded for shag and phalacrocorax species (Table 4) is due to the time taken for detailed identification, and the variance observed when the total number of these species is taken together with the number of cormorant is only 5.

	Number of Species Recorded	
	Lead	New
GANNET	19	17
PHALACROCORAX	98	106
EIDER	3	1
Total	120	124

Table 3: Analysis of results of dual watch carried out on 04/11/2013

	Number of Species Recorded	
	Lead	New
PHALACROCORAX	51	157
SHAG	108	8
CORMORANT	1	0
SEAL	11	17
RED THROATED DIVER	7	7
BLACK GUILLEMOT	34	22
EIDER	38	42
GREAT NORTHERN DIVER	1	1
RED BREA STED MERGANSER	5	7
GANNET	2	2
TOTAL	258	263

Table 4: Analysis of results of dual watch carried out 05/11/2013

In order to ensure consistency in the data collected, the lead wildlife observer continues to supervise and collate the results from all observers in the team.

4.3 Wildlife Observations Summary

Detailed analysis of the data collected is out-with the scope of this project. The entire set of raw wildlife observation data collected for the period 1 April 2013 to 31 March 2014 is available to download from the Marine Scotland Interactive website.

The monthly wildlife sighting counts are presented in Table 5 and Table 6 below. Note these sightings are total sightings per month, and have not been corrected for effort (number of hours observed per month). Seasonal graphs showing sighting counts per mean summer month and per mean winter month are also provided (Figures 2 to 4).

A high proportion of seals sighted are recorded as 'unidentified'. This is mainly due to a combination of environmental conditions (light, glare, sea state, etc) and distance from the observation point making it difficult to identify seals to species level. Also, it is very difficult to distinguish young grey seals (up to around 3 months old) from adult harbour seals when in the water.

Monthly wildlife sighting counts with respect to monthly means (calculated from the entire EMEC Wildlife Observations Programmes Fall of Warness dataset) are presented graphically as Annex B.

Species	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14
Arctic tern	0	373	4508	880	36	0	0	0	0	0	0	0
Auk	0	0	0	0	0	0	0	0	0	0	0	0
Black guillemot	3564	1542	2103	2077	1015	29	35	66	64	235	1343	1990
Black throated Diver	0	0	0	0	0	0	0	0	0	0	0	0
Common guillemot	82	69	319	114	1	8	16	0	3	33	128	57
Common scoter	0	0	0	0	0	0	0	0	0	0	0	0
Cormorant	11	16	46	11	42	8	28	24	24	32	13	45
Diver Sp.	4	0	3	0	0	0	0	15	22	6	26	11
Eider Duck	986	163	64	39	4	3	147	501	772	446	905	1012
Gannet	10	13	26	149	357	199	147	210	110	7	0	4
Goldeneye	0	0	0	0	0	0	0	0	0	0	0	0
Goosander	0	0	0	0	0	0	0	0	0	0	0	0
Great Northern Diver	0	0	27	0	0	0	1	7	12	8	13	8
Kittiwake	0	0	0	26	0	0	0	0	0	0	0	0
Little Auk	0	0	0	0	0	0	0	0	0	1	0	0
Long Tailed Duck	0	0	0	0	0	0	0	29	97	103	147	71
Phalacrocorax spp	914	241	279	339	474	1359	2285	4740	6124	1473	1526	926
Puffin	249	120	803	695	68	0	0	0	0	0	1	22
Razorbill	3	1	17	1	0	0	0	0	0	0	4	3
Red Breasted Merganser	37	0	0	6	0	6	51	52	40	29	34	25
Red Throated Diver	23	13	4	3	7	73	94	36	18	14	19	18
Sandwich Tern	1	0	0	0	0	0	0	0	0	0	0	0
Shag	73	67	71	78	59	40	109	292	159	135	102	181
Slavonian Grebe	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified Bird	60	33	235	743	87	5	3	1	1	0	3	7
TOTAL BIRDS	6017	2651	8505	5161	2150	1730	2916	5973	7446	2522	4264	4380

Table 5: Monthly sighting counts for bird species for period April 2013 to March 2014 at the EMEC Fall of Warness tidal test site.

Species	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14
Harbour seal	0	0	1	1	3	0	3	0	0	0	0	3
Grey seal	0	0	1	1	4	14	21	10	7	12	1	0
Unidentified seal	105	27	70	90	72	224	521	73	50	50	65	11
TOTAL SEALS	105	27	72	92	79	238	545	83	57	62	66	14
Harbour porpoise	5	0	0	0	2	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	1	0	0	0
White beaked dolphin	0	0	0	55	0	0	0	0	0	0	0	0
Risso's Dolphin	0	0	0	0	0	0	0	1	0	0	0	0
Orca	8	0	0	6	0	0	0	1	0	0	0	0
Unidentified cetacean	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CETACEANS	13	0	0	61	2	0	0	2	1	0	0	0
Basking shark	0	1	0	0	5	11	0	0	0	0	0	0
Otter (European)	6	1	2	0	1	1	1	1	2	1	0	0

Table 6: Monthly sighting counts for seals, cetaceans and other species for period April 2013 to March 2014 at the EMEC Fall of Warness tidal test site.

Figures 2 to 4 below summarise the species of birds, cetaceans and seals observed at the Fall of Warness tidal test site during summer (April to September) and winter (October to March) months. Values shown are mean summer month (red) and mean winter month (blue). Any inter-seasonal comparisons drawn from Figures 2 to 4 should be made with caution as the data represents only one year of observations.

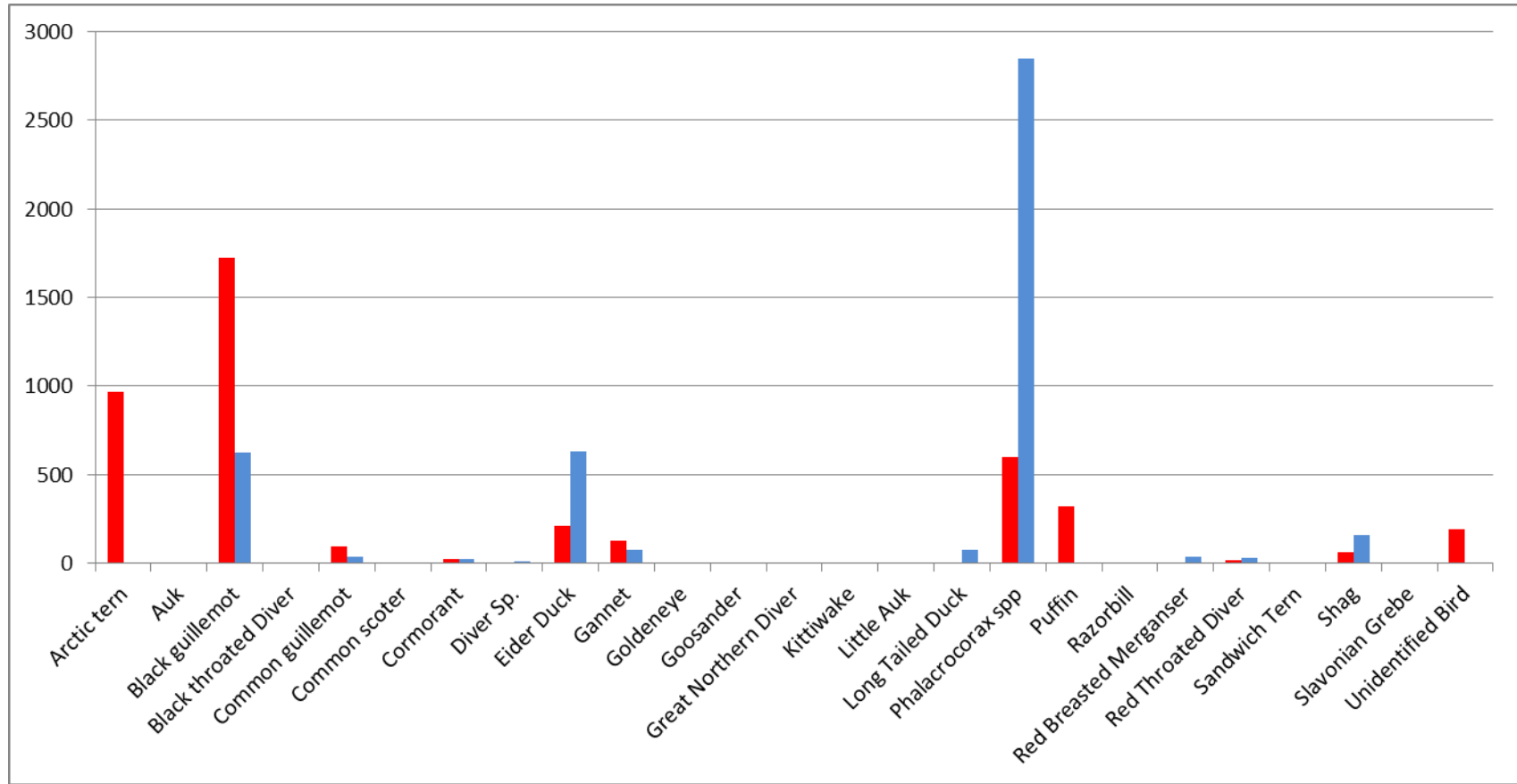


Figure 2: Mean summer month (red) and mean winter month (blue) bird species sightings at the Fall of Warness for period April 2013 to March 2014.

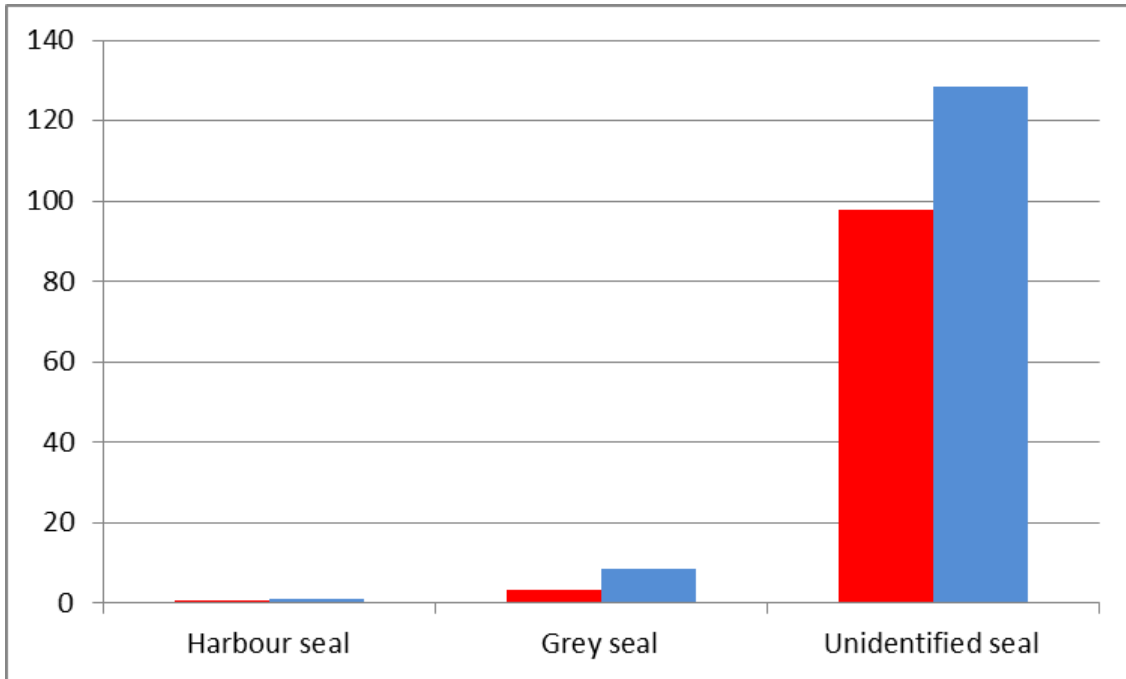


Figure 3: Mean summer month (red) and mean winter month (blue) seal species sightings at the Fall of Warness for period April 2013 to March 2014.

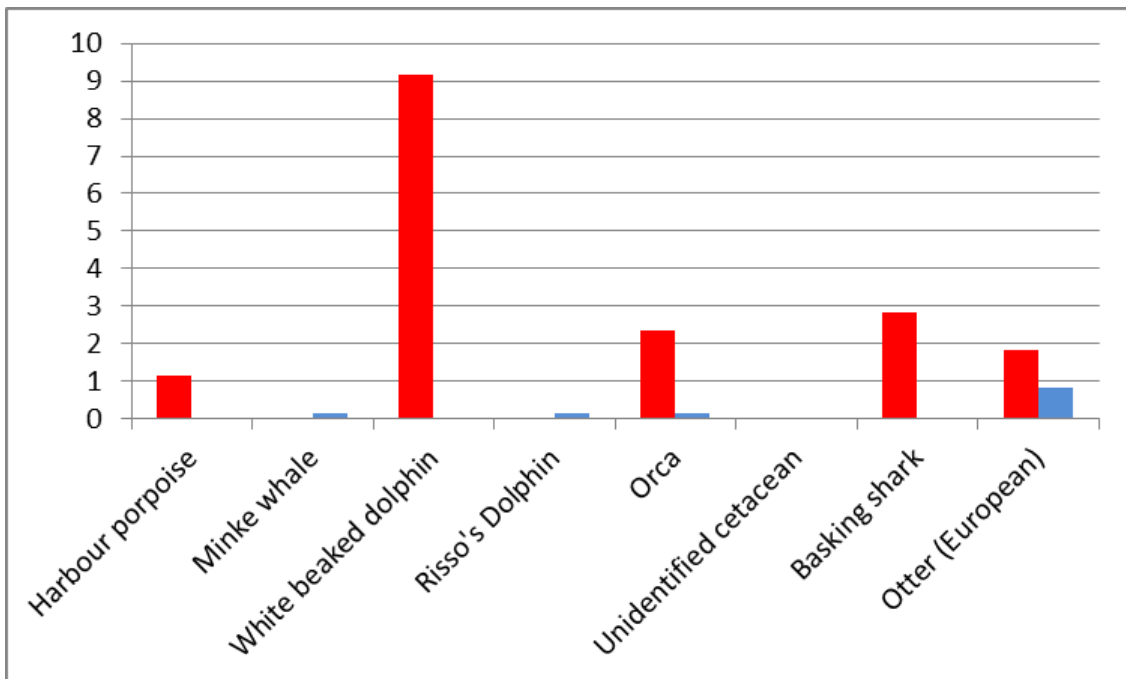


Figure 4: Mean summer month (red) and mean winter month (blue) cetacean, basking shark and otter species sightings at the Fall of Warness for period April 2013 to March 2014.

4.4 Issues & Concerns

Under a separate project funded by Marine Scotland and SNH, EMEC will undertake detailed analysis of the data gathered through this project. Within the data analysis

project, EMEC has sought expert input from the Centre for Research into Ecological and Environmental Modelling (CREEM) who have identified a limitation with the data in that there is insufficient data to construct 'detection functions' for the test sites.

To address this limitation, EMEC has developed a proposal for funding a boat-based calibration exercise to collect additional wildlife observation data at the test sites. This would provide information about the detectability rates for a range of distances from the observation points. The steering group for the data analysis project (which comprises Marine Scotland, SNH and EMEC) agree that the construction of site-specific detection functions, which will enable modelling of absolute changes in surface-visible wildlife presence, is an important output of the analysis project.

5. Recommendations

- 5.1 It is recommended that work should be undertaken to carry out calibration of the land-based wildlife observations. The objectives of this calibration exercise will be:
1. To evaluate how accurately the observers at the land-based vantage points are able to detect, identify and, particularly, locate wildlife species within and at the outermost limits of the observation area, and thus derive site-specific 'detection functions' that can be applied to the analysis of the wildlife data.
 2. To geo-reference the Fall of Warness observation area grid squares.

6. References

Robbins, A. 2012. Analysis of Bird and Marine Mammal Data for Fall of Warness Tidal Test Site, Orkney. *Scottish Natural Heritage Commissioned Report No. 614.*

Terms of Reference

EMEC has close links with a range of different developers and types of marine energy devices – both wave and tidal – as well as academic institutions and regulatory bodies, whilst maintaining independence from any one body. This gives EMEC a unique and crucial position within the regulatory and research frameworks.

The range of possible impacts of the wave and tidal energy industries is wide and offers the potential for a series of projects and research partnerships between EMEC, developers, academia and other expert bodies. This requires EMEC to work with appropriate experts and regulators to establish and encourage best practice monitoring methods to be associated with devices as they are deployed at the wave and tidal test sites.

Outputs of monitoring projects will initially serve developers who deploy at EMEC, but in the longer term they are expected to serve as an essential resource for both developers and regulators in the licensing of future installations as the industries develop into commercial stages.

In repeated communications between EMEC, key regulators and environmental stakeholder groups (especially Scottish Natural Heritage), the emphasis has been on the unrepeatable opportunity for early research and monitoring associated with these industries, coordinated through EMEC. If the responsibility for device monitoring were to lie with individual developers and/or their different consultants, then there is a high risk that a suite of inconsistent approaches would be adopted, which would not necessarily employ the best available methods, and would risk a piecemeal approach to monitoring becoming the norm.

The EMEC Monitoring Advisory Group EMEC is a vehicle to formally extend and coordinate the ongoing monitoring discussions it has had with regulators and their consultees. Advisors are asked to contribute on specific methods in relation to the devices deployed at EMEC, including both device-specific and generic issues, and taking full account of the scale of deployment at these test sites. The group also provides an ongoing feedback vehicle as monitoring processes are put in place.

The group plans to meet at least three times per year with the following objectives

1. Translate policy requirements into practical monitoring effort to ensure that the EMEC facility is optimised to meet existing and future monitoring and assessment needs for wave and tidal energy converters.
2. Oversee the production of relevant monitoring tools and best practice techniques at the EMEC test sites whilst ensuring monitoring effort and methods of data stewardship are compatible with relevant methodologies.
3. Exchange knowledge and information relating to similar initiatives so as to avoid duplication and establish links with other relevant research programmes at national and international level.

EMEC MONITORING ADVISORY GROUP

4. Maintain an overview of emerging research and technology and identify new requirements.
5. Identify sources of funding available for research and supporting studies.
6. Undertake an annual assessment of the strategy and goals for monitoring undertaken at the EMEC test sites.
7. Undertake systematic review and QA of project specific Impact Monitoring reports submitted by developers at EMEC to Marine Scotland, and assess the wider implications and relevance of the methods pursued and results obtained to the Marine Renewables sector in Scotland.

Core parties:

EMEC, Marine Scotland (Science), Marine Scotland (Licensing Operations Team), Marine Scotland (Compliance), Scottish Natural Heritage, Sea Mammal Research Unit, Scottish Government, and the Department for Energy and Climate Change.

Attendees shall be nominated by their respective organisations. No decisions taken at the meetings shall be regarded as binding upon the organisation; however attendees are encouraged to champion actions where possible.

Other key stakeholders (e.g. particular developers or specialist experts) will be invited to contribute on specific issues as and when required.

Chair: EMEC Research Director

Fall of Warness Wildlife Observations Project

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ANNEX B: Graphs of Monthly Wildlife Sighting Counts with Respect to Monthly Means

This annex presents graphs of the monthly wildlife sighting counts with respect to monthly means (calculated from the entire EMEC Wildlife Observations Programme Fall of Warness dataset). The vertical axes on each graph are logarithmic (base 10), and the diamond markers show the monthly mean per species.

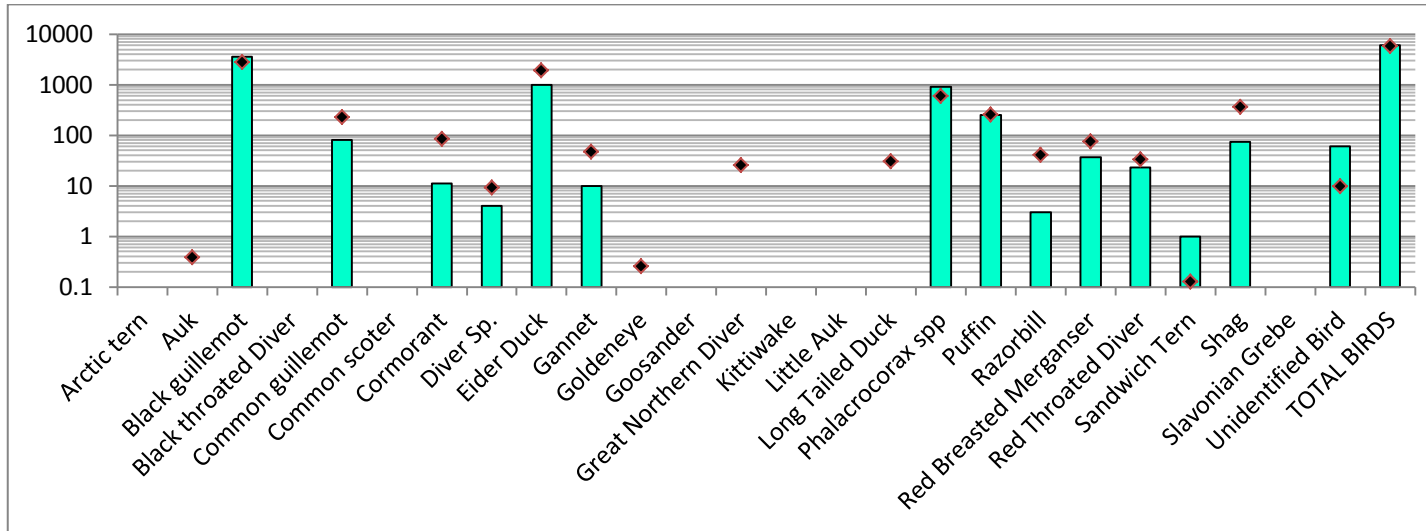


Figure 1: Bird species sighted at EMEC Fall of Warness test site April 2013

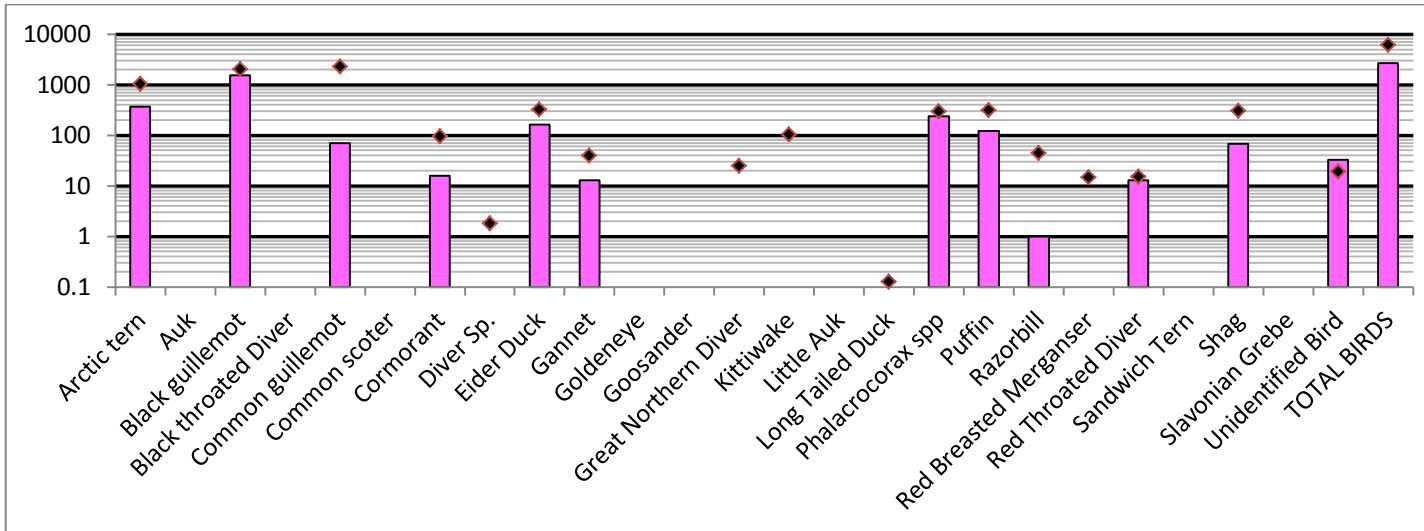


Figure 2: Bird species sighted at EMEC Fall of Warness test site May 2013

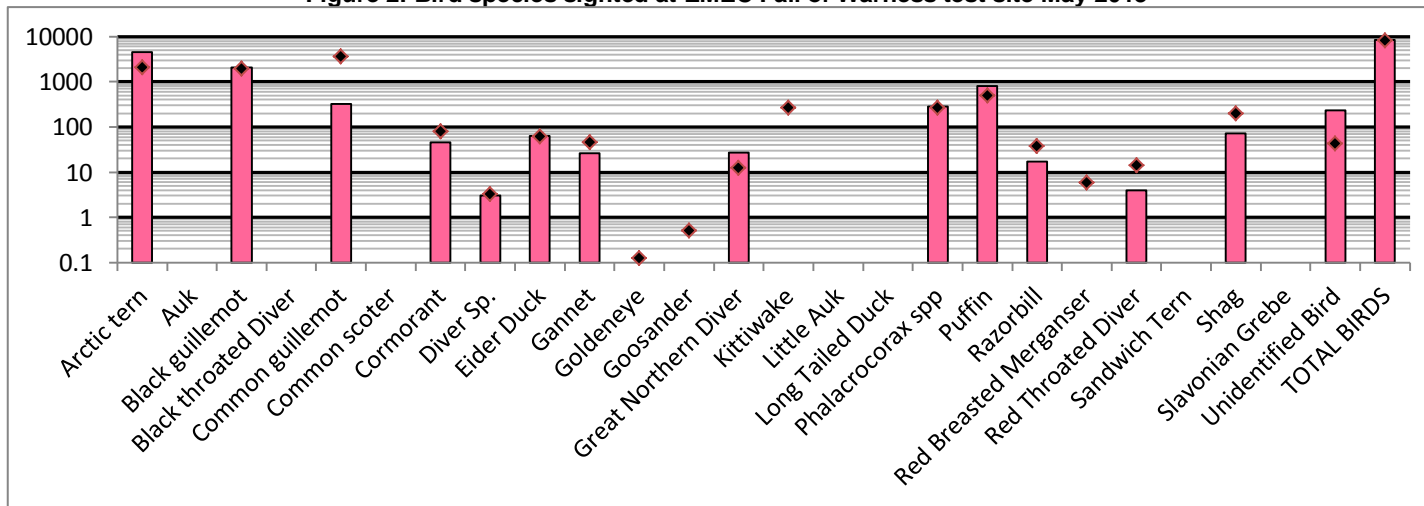


Figure 3: Bird species sighted at EMEC Fall of Warness test site June 2013

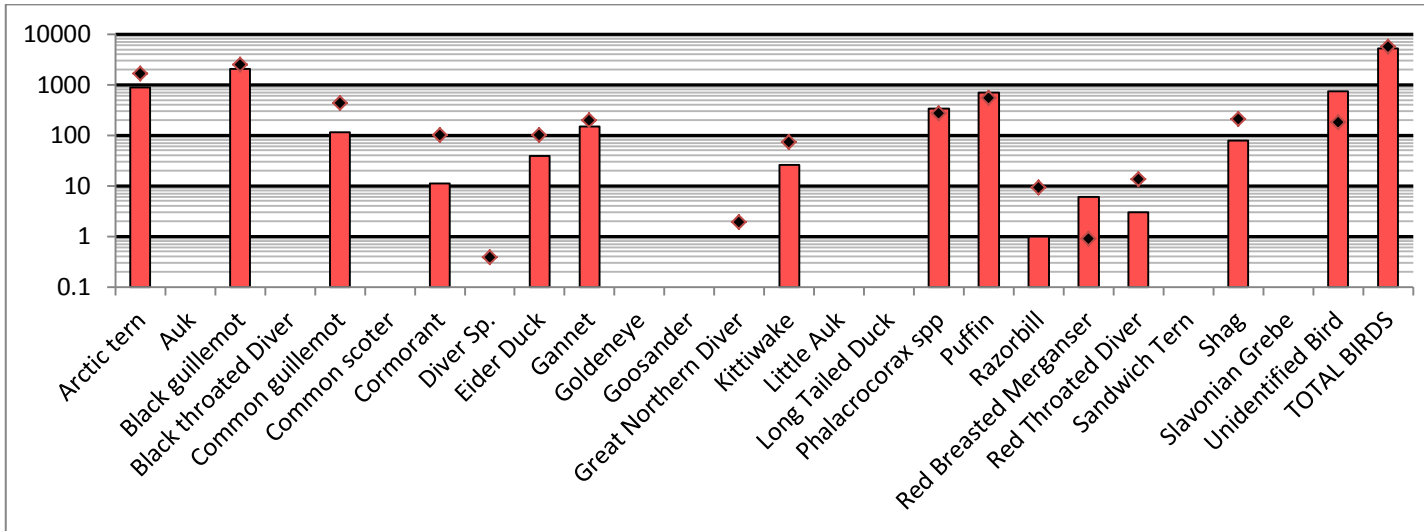


Figure 4: Bird species sighted at EMEC Fall of Warness test site July 2013

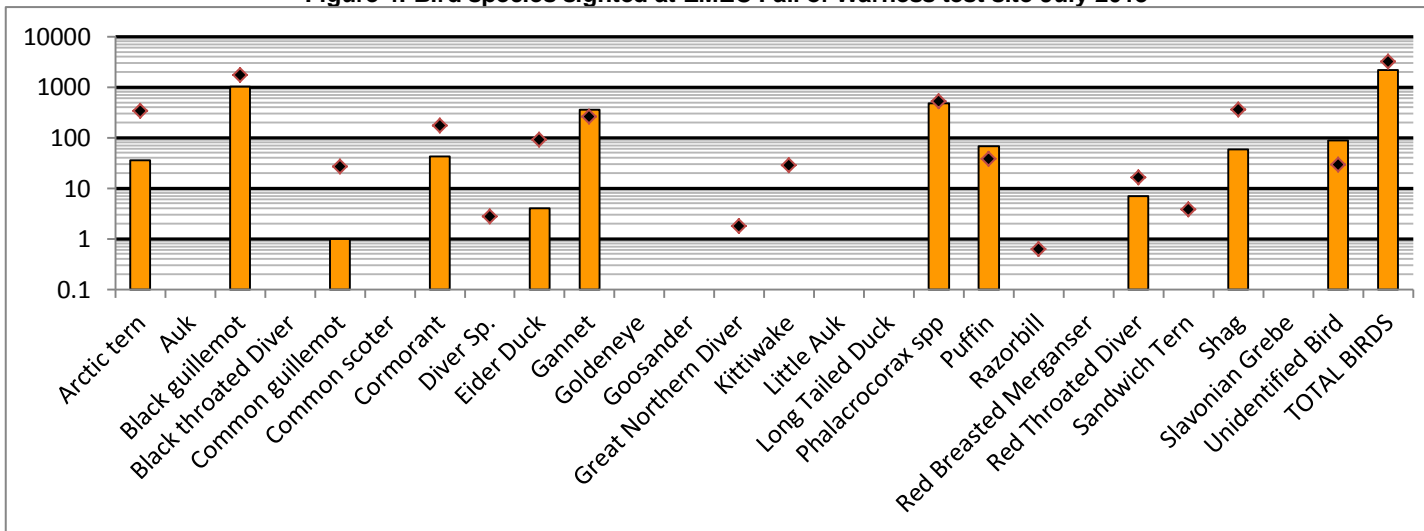


Figure 5: Bird species sighted at EMEC Fall of Warness test site August 2013

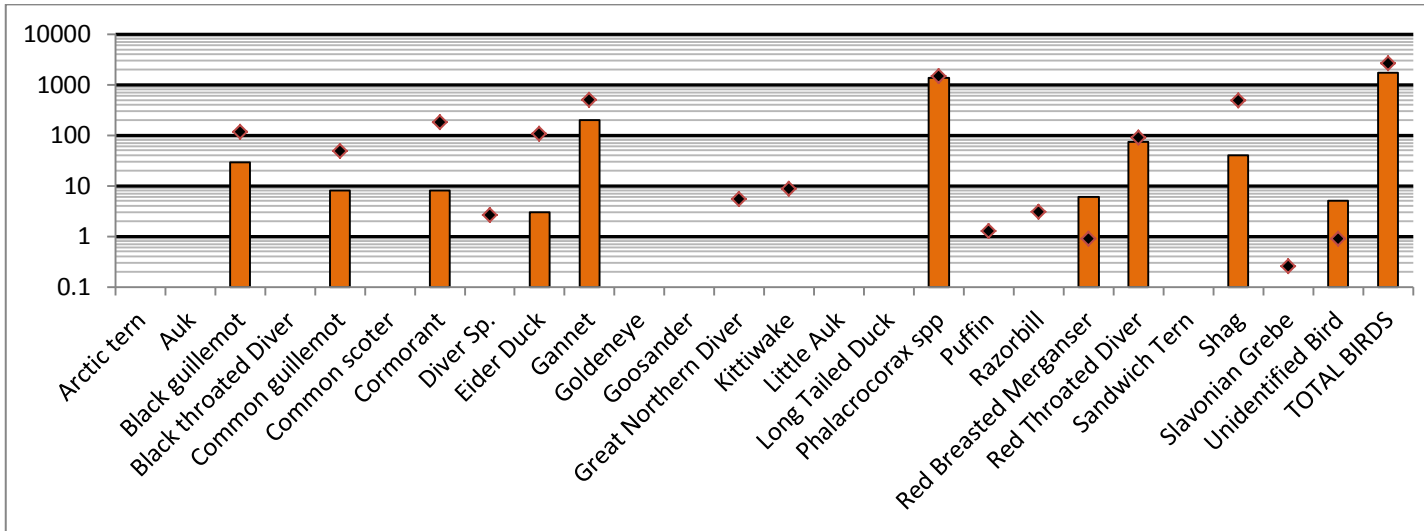


Figure 6: Bird species sighted at EMEC Fall of Warness test site September 2013

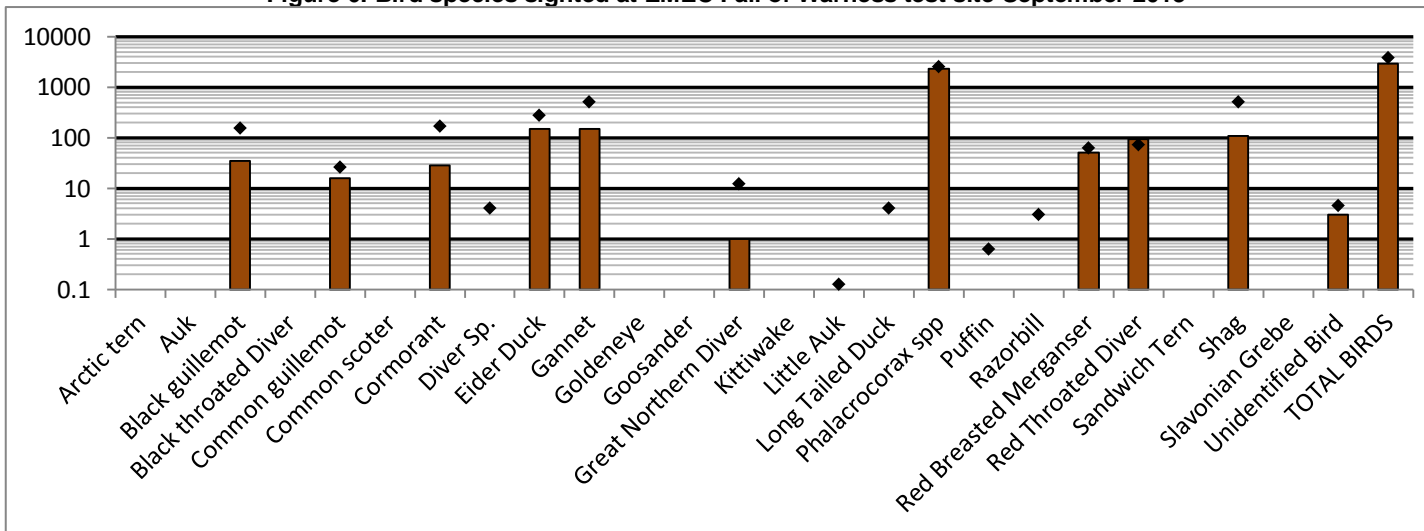


Figure 7: Bird species sighted at EMEC Fall of Warness test site October 2013

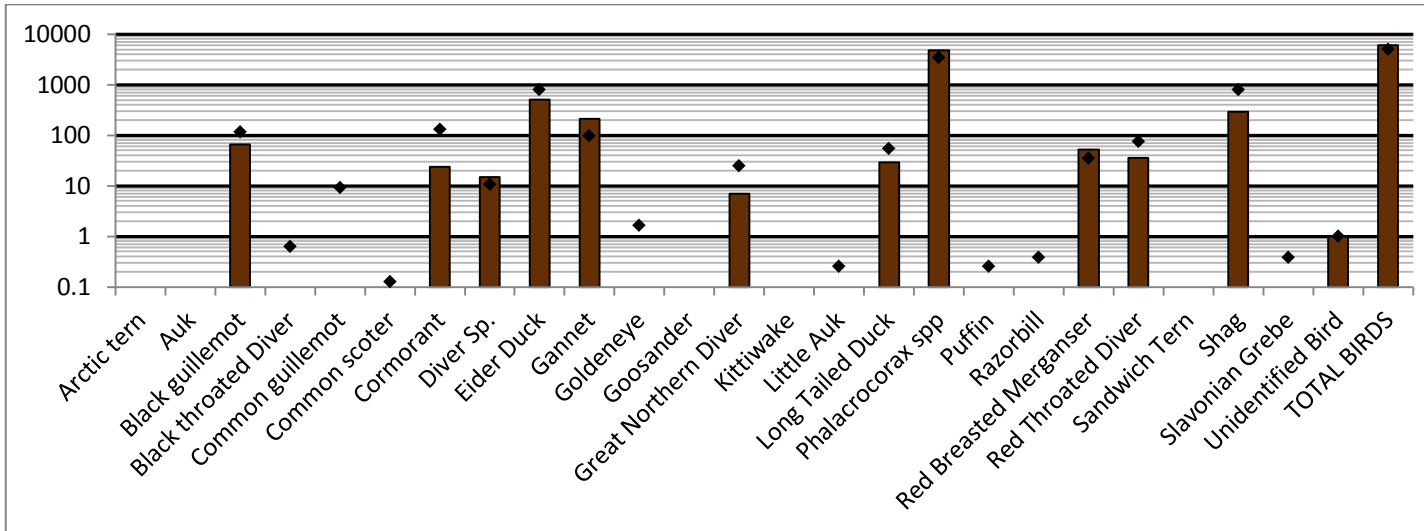


Figure 8: Bird species sighted at EMEC Fall of Warness test site November 2013

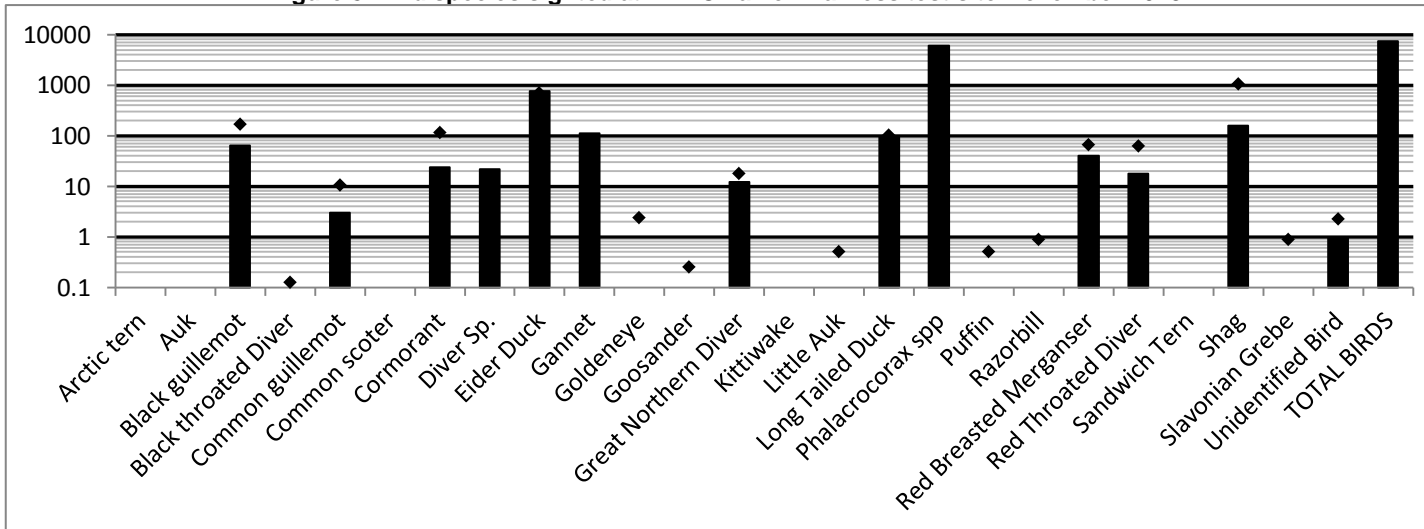


Figure 9: Bird species sighted at EMEC Fall of Warness test site December 2013

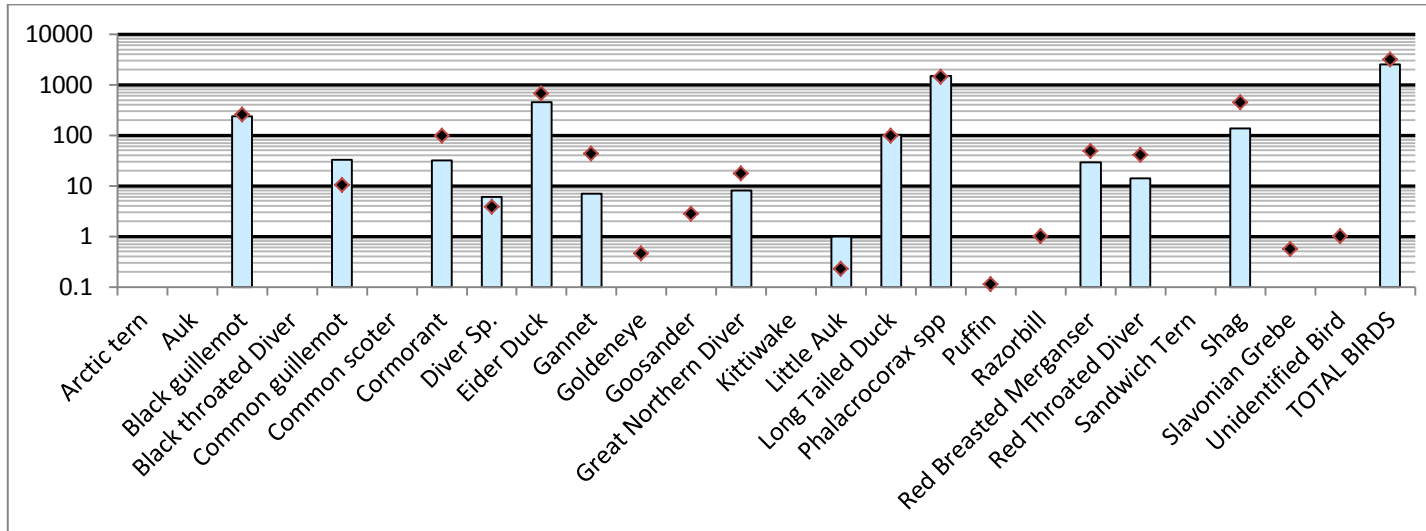


Figure 10: Bird species sighted at EMEC Fall of Warness test site January 2014

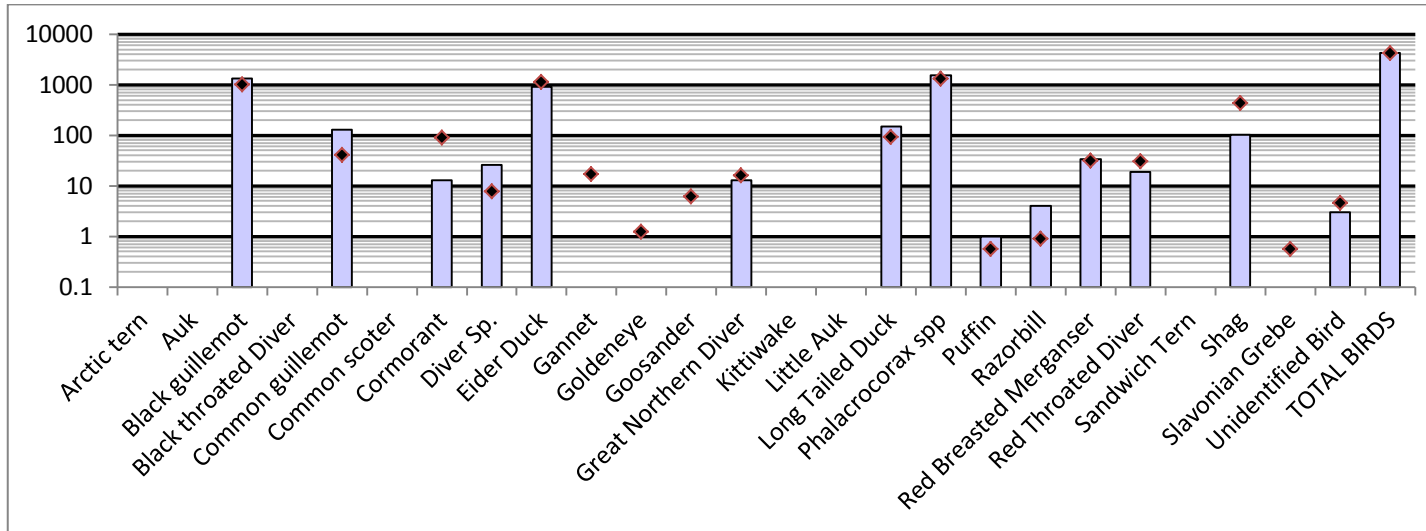


Figure 11: Bird species sighted at EMEC Fall of Warness test site February 2014

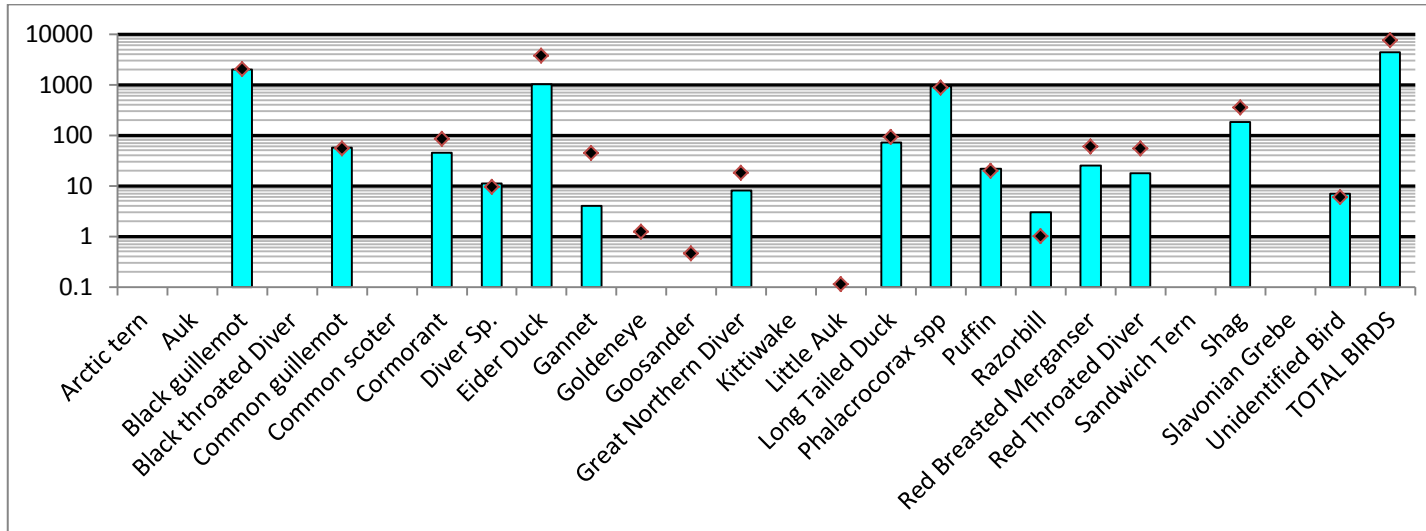


Figure 12: Bird species sighted at EMEC Fall of Warness test site March 2014

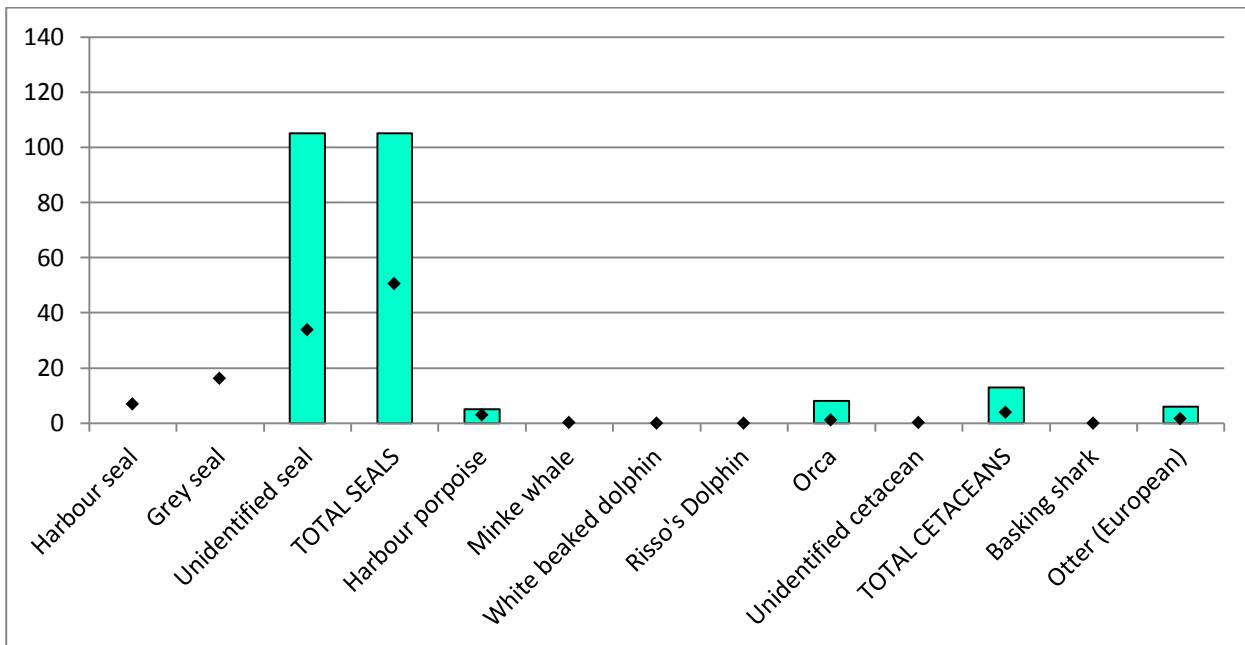


Figure 13: Cetacean, seal and other species sighted at EMEC Fall of Warness test site April 2013

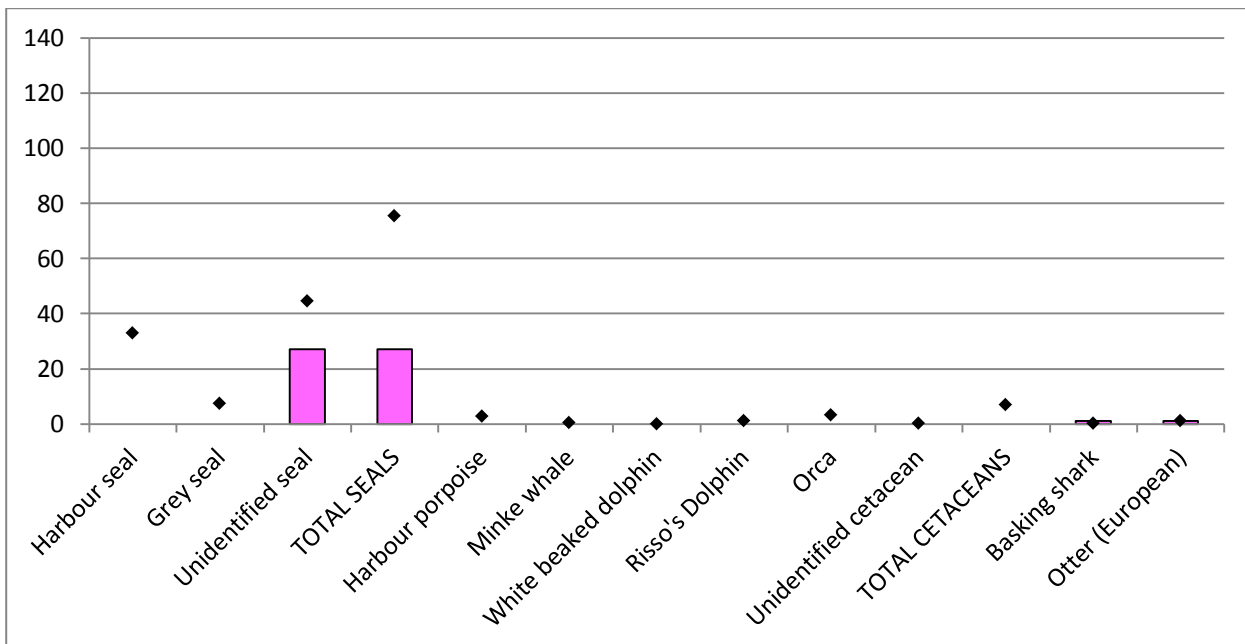


Figure 14: Cetacean, seal and other species sighted at EMEC Fall of Warness test site May 2013

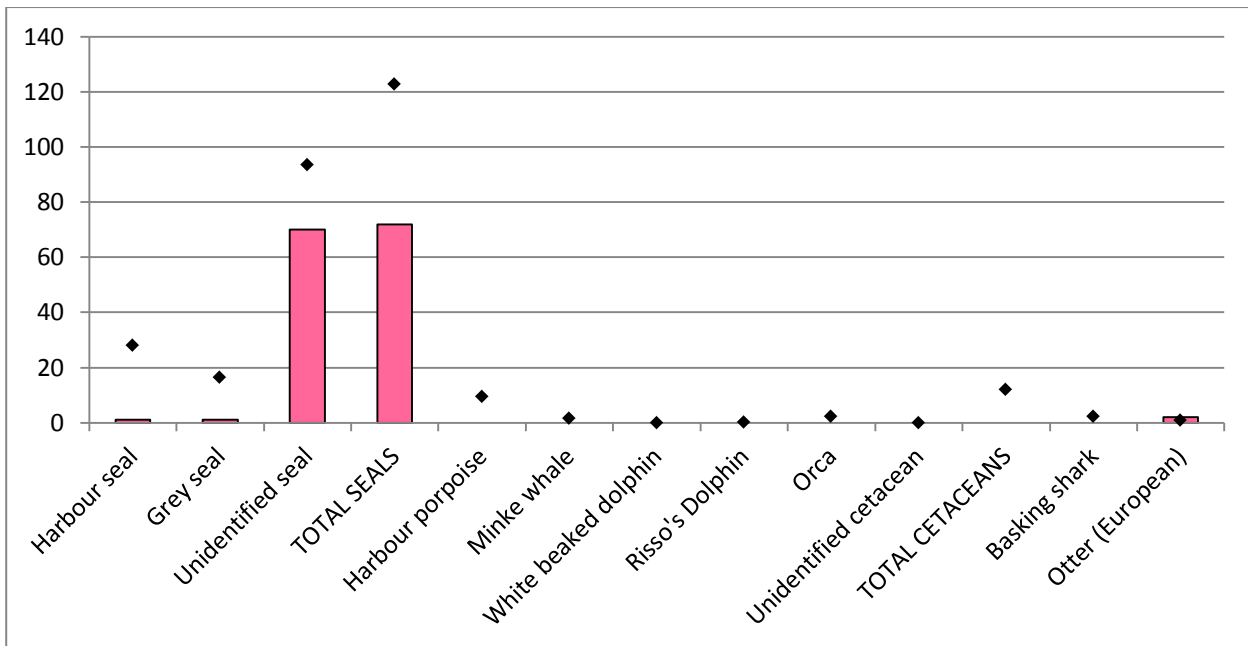


Figure 15: Cetacean, seal and other species sighted at EMEC Fall of Warness test site June 2013

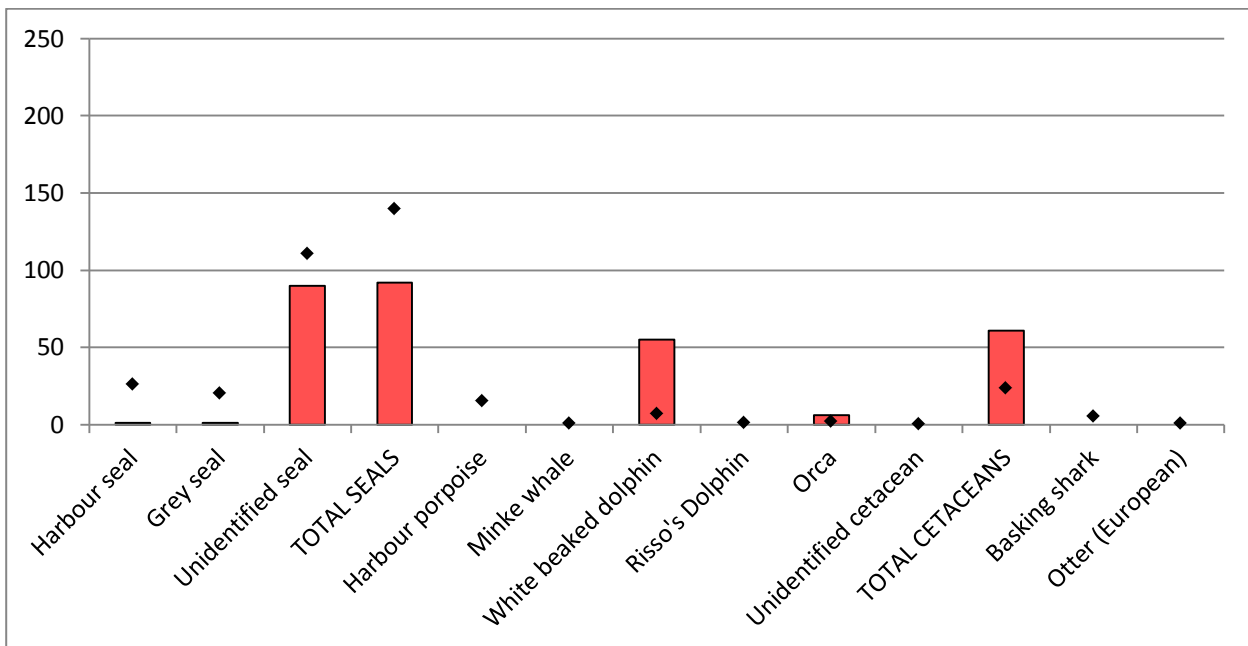


Figure 16: Cetacean, seal and other species sighted at EMEC Fall of Warness test site July 2013

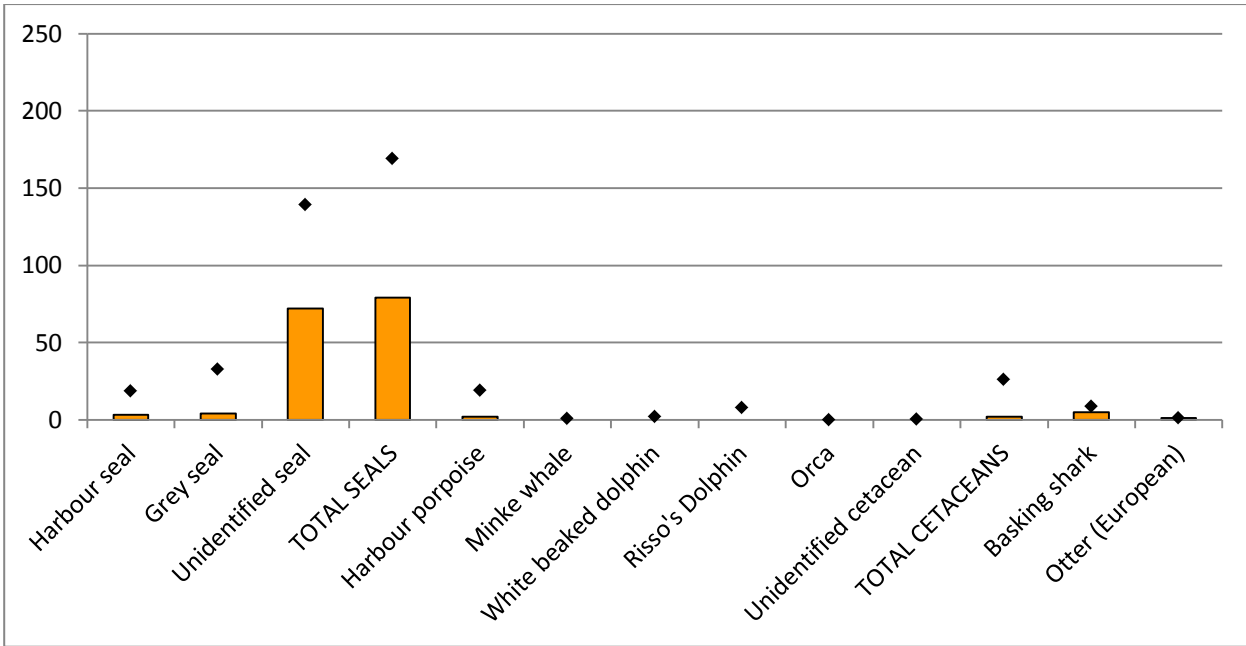


Figure 17: Cetacean, seal and other species sighted at EMEC Fall of Warness test site August 2013

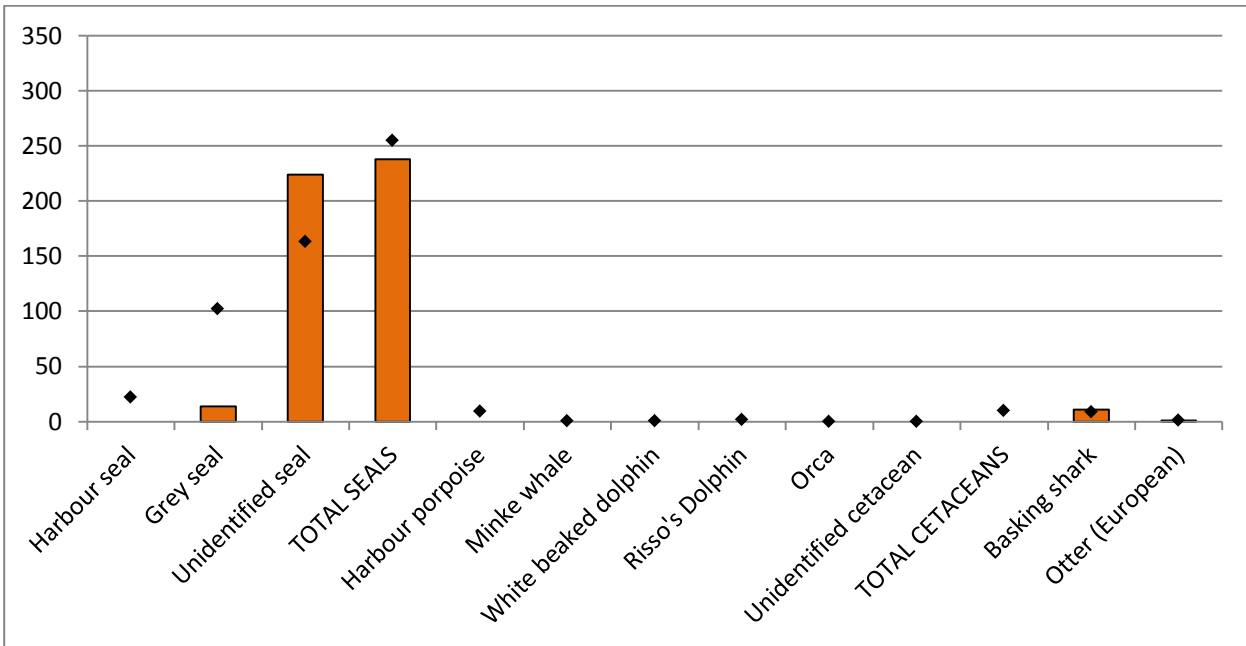


Figure 18: Cetacean, seal and other species sighted at EMEC Fall of Warness test site September 2013

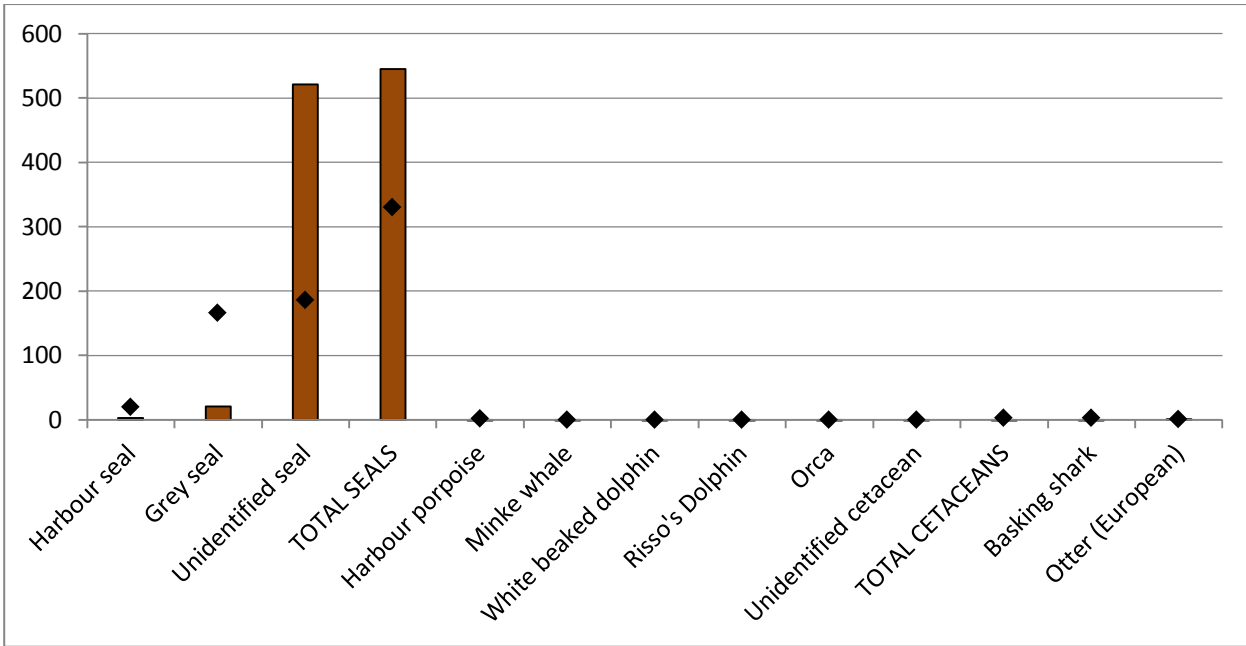


Figure 19: Cetacean, seal and other species sighted at EMEC Fall of Warness test site October 2013

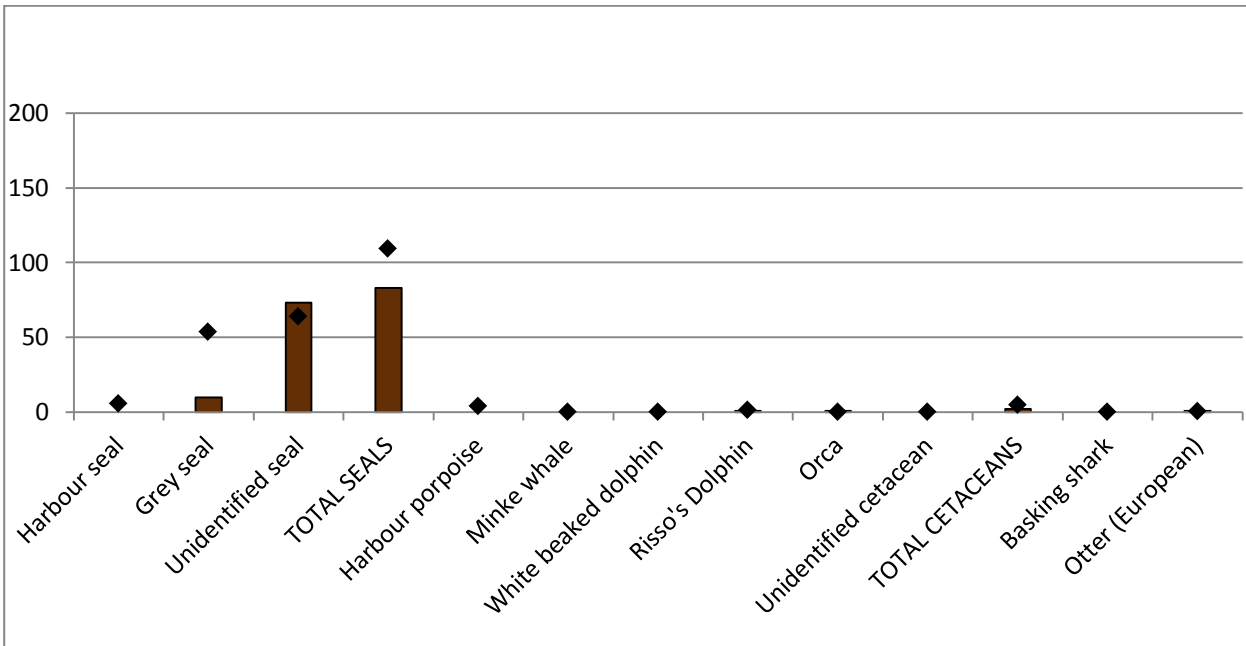


Figure 20: Cetacean, seal and other species sighted at EMEC Fall of Warness test site November 2013

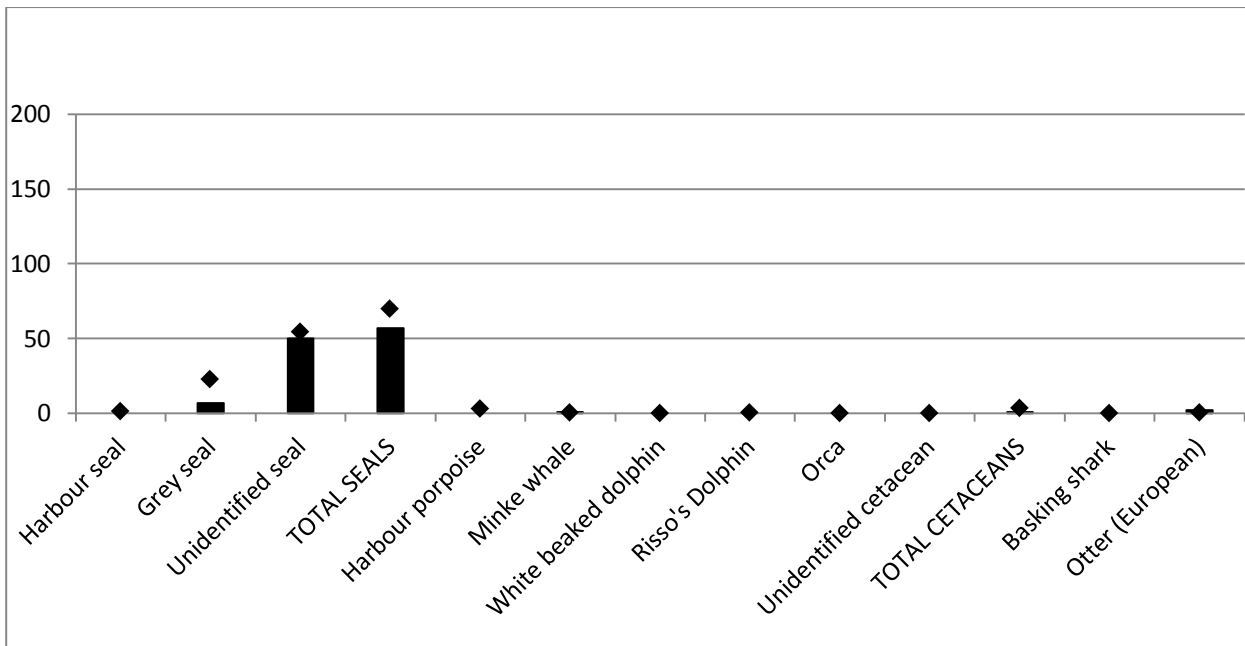


Figure 21: Cetacean, seal and other species sighted at EMEC Fall of Warness test site December 2013

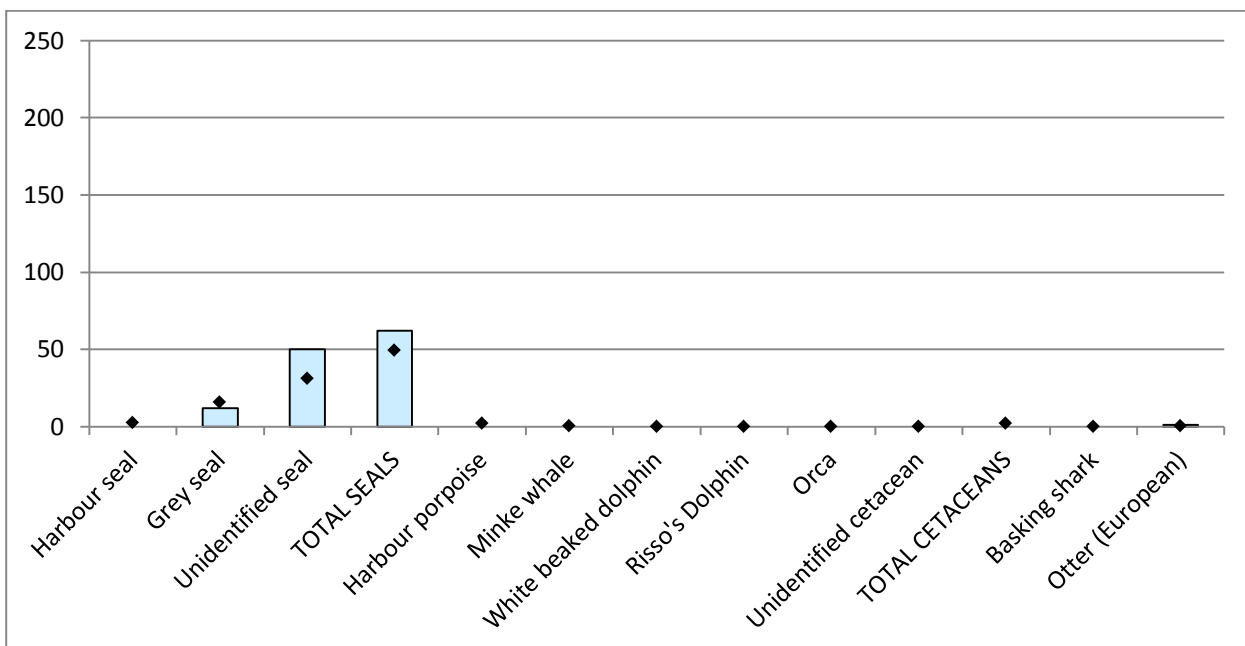


Figure 22: Cetacean, seal and other species sighted at EMEC Fall of Warness test site January 2014

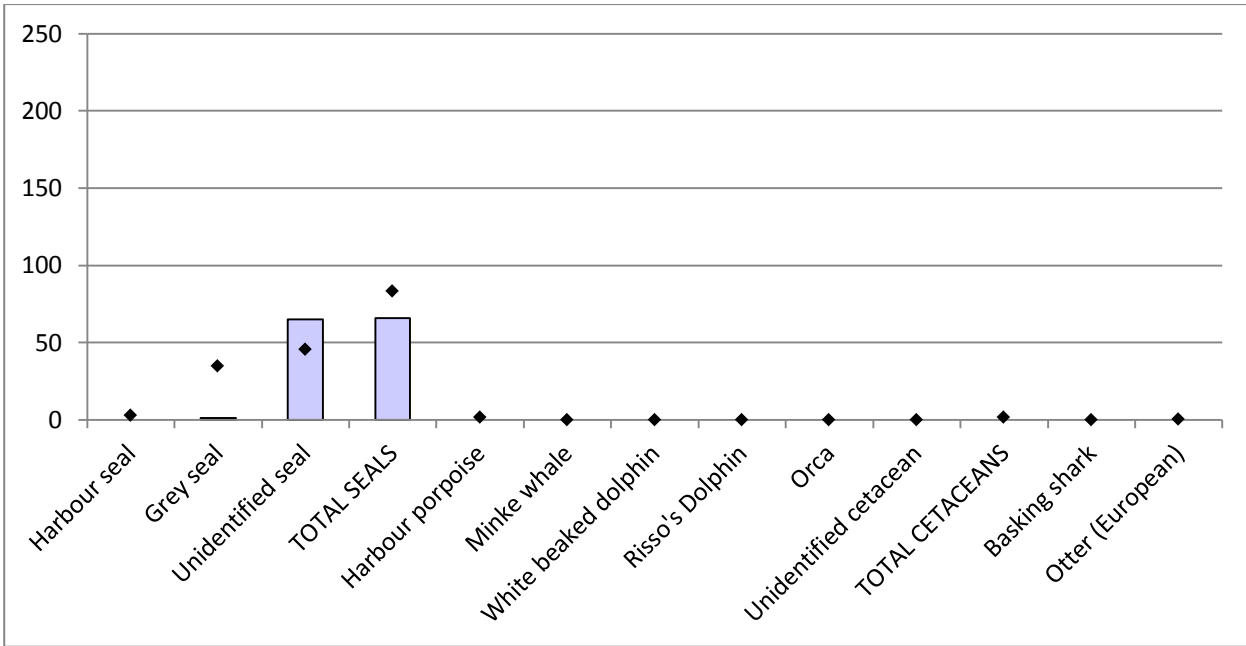


Figure 23: Cetacean, seal and other species sighted at EMEC Fall of Warness test site February 2014

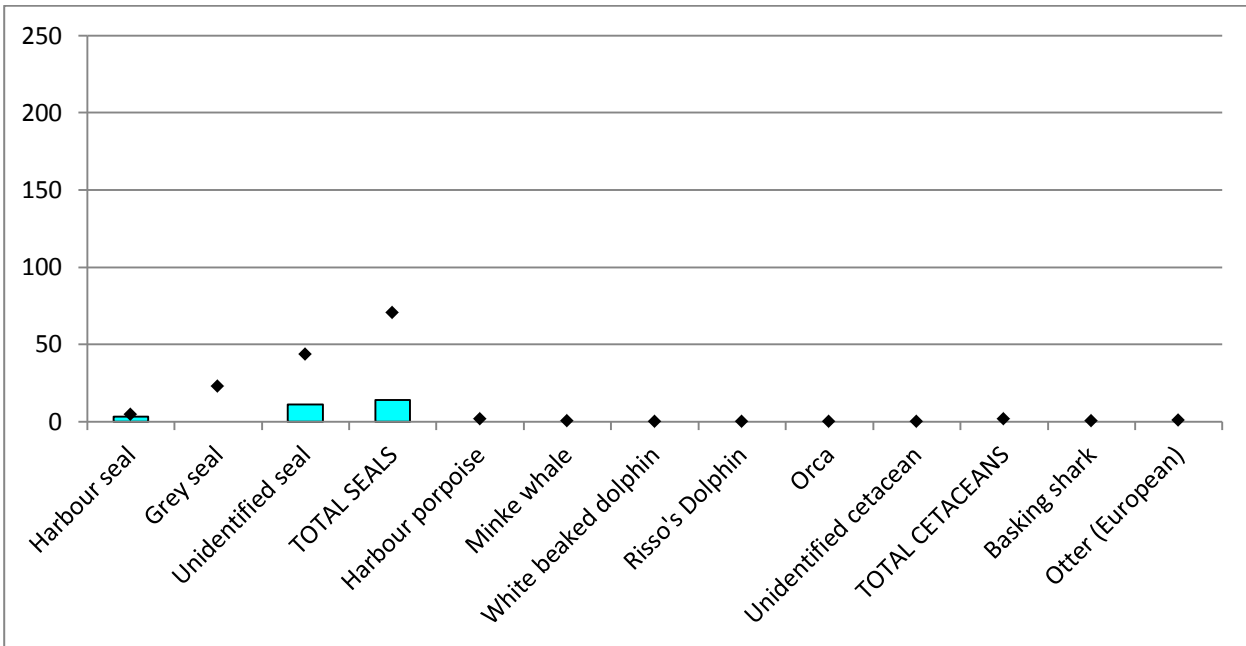


Figure 24: Cetacean, seal and other species sighted at EMEC Fall of Warness test site March 2014

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