SEA TRUST CIC
(Community Interest Company)

People's Porpoise Project 2018-19
Photo ID Methods

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Contents

Abstract

Sea Trust is a non-profit community interest company established in 2003, working to better understand and help protect local marine wildlife, and to raise awareness in the local community. We aim to inspire people to care about their local marine wildlife by opening their eyes to the stunning diversity of wildlife around the Welsh coast and engaging them in its protection. Sea Trust focuses much of its research on marine mammals, conducting land, ferry and small boat surveys. Much of this work has taken place at Strumble Head, Pembrokeshire, where it has become clear that this is a site of high harbour porpoise abundance.

The following report describes the scientific methods used by Sea Trust to undertake the porpoise photo ID element of the People's Porpoise Project funded by the National Lottery, Heritage Lottery Fund. The report describes the initial need for the project and its methods with the aim that it can be used in the future by researchers and citizen scientists studying harbour porpoises. It is hoped that this method can be used nationwide increasing the current knowledge and understanding of the harbour porpoise at both species and population level.

Background

The harbour porpoise (*Phocoena phocoena*) is the UK's most abundant cetacean with sightings all around the coast (Evans *et al*., 2003). However their large abundance, their high mobility and their large distribution range, throughout the temperate and subpolar regions of the Northern Hemisphere (Hammond, 2008) seems to have hindered attempts to gather knowledge of the species as a whole. Previous research reveals that the harbour porpoise is not a deep diving species (Westgate *et al*., 1995) and they have to feed frequently to manage their energy expenditure (Kastelein and van Battum, 1990; Brodie, 1995). This limits their movements to shallow waters and to places where prey is regularly available (Brodie, 1995). This is often in high energy areas, where hydrodynamic features form, for example around headlands and through narrow channels. This knowledge in addition to distribution studies suggest that harbour porpoises populate coastal waters (Johnston *et al*., 2005; Pierpoint, 2008; de Boer *et al*., 2014; Jones *et al*., 2014; Benjamins *et al*., 2016). Despite what would seem an ideal location to study this species, there is a lack of research into harbour porpoise population dynamics. There is little understanding in abundance and survival, population status, life history information, group structure and local ranges and movements. Much of this information for cetacean populations is often obtained with long-term studies of local populations either through tagging and tracking individuals or more commonly through photo identification (Hammond *et al.,* 1990).

Longitudinal photo-ID studies of cetaceans have been conducted since the 1970's with large, regularly sighted animals such as killer whales (*Orcinus orca*) (Bigg, 1982), humpback whales (*Megaptera novaeangliae*) (Katona & Whitehead, 1981) and bottlenose dolphins (*Tursiops truncatus*) (Würsig & Würsig, 1977). Photo-ID involves photographing specific body parts, depending on the species, that have particular physical characteristics unique to the individual. Individuals are often identified by permanent and semi-permanent marks for example nicks and notches on dorsal fins, scarring and pigmentation patterns. Images collected over time can be matched using the same identifiable marks. Catalogues of individuals are created for each species and/or geographical area. Photo-ID is one of the least invasive methods of monitoring individuals due to the lack of physical contact, especially with land-based studies as this also avoids boat disturbance (Hammond *et al*., 1990).

Despite the success of photo-ID studies in other species it has only recently been used to study harbour porpoise populations (Elliser & MacIver, 2017; Podt, 2019). Studies of this kind are limited, potentially due to several challenges regarding photographing porpoises. Firstly, their small size (Reid *et al*.,2003) , cryptic colouration and subtle movements make them much harder to spot, let alone photograph (Elliser & MacIver, 2017). Secondly individual markings are often much more subtle compared to larger cetaceans such as bottlenose dolphins, although porpoises are often identified with fin marks this is a very small section of the population, however it has been noted that porpoises have unique pigmentation patterns on their side flank which can be used to identify individuals. It is also possible to identify individuals with scarring patterns (Koopman & Gaskin, 1994; Keener *et al*., 2011; Elliser & MacIver, 2017; Podt, 2019). Finally porpoises are often boat shy making traditional method of photo-ID from boats difficult as

the porpoises swim out of sight (Oakley *et al*., 2006). Luckily photo-ID has now become much more available due to advances in technology. It is now at a point where land-based photography of cetaceans can capture individuals in more detail than ever before. Parts of the Pembrokeshire coast provide ideal sites to conduct porpoise photo-ID surveys. There are several areas where porpoises are high in abundance and sighted regularly (Pierpoint, 2001) and where they can be photographed from land.

In 2017, after noticing several identifiable porpoises in photos from surveys at Strumble Head, Pembrokeshire, Sea Trust began piloting a porpoise photo-ID study. During the pilot year, survey sites were established and methods were tested and adapted for a land-based project at each site. In April 2018, Sea Trust launched the People's Porpoise Project funded by the National Lottery Heritage Lottery Fund. This project would put the developments from the pilot year into practice for a full 12 months, allowing the construction of a catalogue for the North Pembrokeshire coast. This was both a project to learn and understand more about the porpoise population in Pembrokeshire and a project to engage the community in their natural heritage by using volunteers to conduct surveys. The project raises awareness, knowledge and excitement of the porpoises in their area. An increased understanding of the porpoises and their population will aid in future conservation of the species. Specifically with the designation of protected areas or areas of marine development for example marine renewables (Wilson *et al*., 2007; Onoufriou and Thompson, 2015).

The following describes the photo-ID method used by Sea Trust at four sites in North Pembrokeshire.

Method

Study sites

Land-based surveys were conducted from 6 different vantage points across 4 sites around the North Pembrokeshire coast. The Pembrokeshire coastline is rugged and complex consisting of many headlands, bays and channels varying in size. This coastal topography interacts with the strong currents of the Irish Sea creating several areas of high tidal energy from broad to fine-scale as well as many areas of calm sheltered waters. This provides a large number of potential sites of high harbour porpoise abundance around the coast to survey. Sites and positions were chosen on the basis of previous research performed by Sea Trust and other organisations in previous years (Pierpoint, 2001, 2008; Barradell, 2009), the success of several visits to a number of sites during the pilot year of the project, as well as local knowledge of where porpoises were sighted regularly. Sites include the North Breakwater in Fishguard Bay, Strumble Head, Pen Anglas and Ramsey Sound (see fig. 1).

Fig.1 Map of North Pembrokeshire showing the four survey sites for the project.

The North Breakwater is a man-made structure bordering Fishguard harbour (52.013117, -4.9708106). Surveys take place from either end of the breakwater, with a vantage point of 1-2m above sea level. From Sea Trust's previous work at this site, it is recognised that harbour porpoises can be photographed particularly well from this site due to the observers close proximity to sea level. Strumble Head surveys were conducted from the old war lookout to the right of the lighthouse headland (52.030291, -5.0689137) from a vantage point of 20m above sea level. Despite the high vantage point, Sea Trust have had much success photographing harbour porpoises here due to the larger field of view allowing the observer to track the individual animal movements.

Both Pen Anglas and Ramsey Sound sites include two positions. Pen Anglas surveys take place from the Fog Horn (52.024534, -4.9901835) and Crin Coed headland (52.022972, -4.9872022) both with a vantage point of approximately 6m above sea level. Ramsey Sound surveys are performed from the old coppermine ruins (1-2m above sea level) overlooking a rock formation known as 'The Bitches' (51.863984, -5.3198625) and a headland at the south of the Sound overlooking Shoe Rock (51.861417, -5.3186944)(6m above sea level). Ramsey sound is commonly known as a site of high porpoise abundance from previous research (Pierpoint, 2001, 2008; Barradell, 2009) as well as it's strong, fast currents that run through the sound (Pierpoint, 2008).

Data Collection

Data were collected over a two year period between April 2017 and April 2019. Surveys were conducted on each day of the week throughout the year. On average 13 surveys a month were completed within the pilot year of the project and 26.3 a month within the second year. Surveys lasted a minimum of 30 minutes and a maximum of 2 hours. A maximum limit was set to avoid observer fatigue. Surveys were divided into 15 minute intervals, therefore once 30 minutes had passed, surveys would continue on a 15 minute basis until terminated for several reasons or until maximum time was reached. Multiple surveys could be completed in one day. Surveys were terminated or cancelled on bad weather days as this compromised the quality of photos. This included dull lighting, heavy rain or strong winds. Surveys were not necessarily cancelled due to high sea states as it was often noticed that with a large swell porpoises would often 'surf' or jump through the waves making them easy to track and allowing observers to capture a photo of the entire animal.

Surveys were performed with at least one observer, this would include a project officer/coordinator and at least one volunteer. Observations were made using Opticron 7x50 Marine 2 Binoculars and photographs were taken using a Canon 7d Mk2 camera fitted with a Tamron 150-600mm zoom lens (see fig. 2). There were few occasions when data was collected opportunistically with several other cameras. Scans of the survey area occurred every 15 minutes. Scan intervals standardise the surveys, allow more flexibility with survey duration, allow time for sightings to become independent from each other and also allow for effort and environmental data to be recorded throughout the survey. Scan procedures and survey area varied across sites. The range of the survey area was determined by the range in which the camera could reach whilst still producing high quality photos in good lighting conditions. For all sites this was approximately 1km from the coastline, a distance measured using the reticles within the binoculars. A restricted survey area aids in the reduction of variations in detectability and allows for an increased confidence in identification of species and activity (Elliser and MacIver, 2017; Waggitt *et al*., 2014).

Fig. 2 Opticron 7x50 Marine 2 Binoculars (Left), Canon 7d Mk2 Camera (Right).

For each 15 minute scan; sea state, wind direction, visability, cloud cover and precipitation were recorded. When porpoises were sighted the minimum number of animals seen was recorded as well as the behaviours observed and the location of the porpoises (based on the compass bearings built in the binoculars). Classification of sightings was based on observer judgement. Presence of boats, calves and other species sighted were also noted. For each sighting attempts were made to photograph as much of the animal as possible on both sides as many features could be used for identification. Photos were taken of as many individuals as possible in order to identify the number of marked or unmarked animals as well as to confirm group numbers. Photos were taken until the animals left the survey area.

Data Analysis

After each survey photographs were subjected to an initial screening process. This first involved deleting all photos that did not contain a porpoise. Those that did were subjected to grading on quality. A grading system adapted from recommendations made by Urian *et al*., 2015 was used on every photo. The system scores photos on 3 criteria: focus/clarity, angle/position and contrast/lighting. In some cases lighting issues could be corrected with simple editing performed in PhotoScape X. Photos were given a score of 1-3 based on this criteria and photos with a score of 3 were used for further analysis. Photos graded 2 were only considered for very distinctively marked porpoises.

Once graded each individual was visually assessed for identifying marks and given a distinctiveness score from 1-3 where 1 = not marked, 2 = subtle marks and 3 = well marked. Only individuals with a score of 2 and 3 were processed further. Identifying marks were grouped into 3 categories: fin, scars and pigmentation. Individuals that could be identified using more than one feature or those that had a very distinct single feature reduced chances of misidentification. The 3 categories were split further into several sub-categories which included more detailed information about the mark (see fig. 3). This information was placed into a matrix created in excel.

Once new individuals were identified by their marks they were then subjected to a matching process. The matrix filtered out potential matches by eliminated individuals that lack similar marks. The new individual was then matched visually to selected catalogue individuals. Several photos of each individual were used during this process to ensure 100% certainty with matching. The matching process for all photos taken throughout the project have been initially matched by the same observer to ensure consistency with matching. Potential matches were then confirmed or rejected by 2 more observers. If no consensus was met amongst observers the match was rejected. If an individual could not be matched it was classed as a new individual and added to the catalogue and matrix.

Preliminary Catalogue Results

As a result of the following project the Sea Trust Porpoise photo ID catalogue contains 101 individuals, 68 individuals have been sighted and identified as a result of this method. New individuals per month range from 0- 9, with an average of 2.8 newly identified individuals per month. Sightings of individual animals range from 1-18, with an average number of sightings of 2.1 per individual. 30 individuals have been sighted on more than one occasion. The catalogue documents each sighting of an individual porpoise, sighting locations, a description of the identifying mark and lists other porpoises in the catalogue with similar markings.

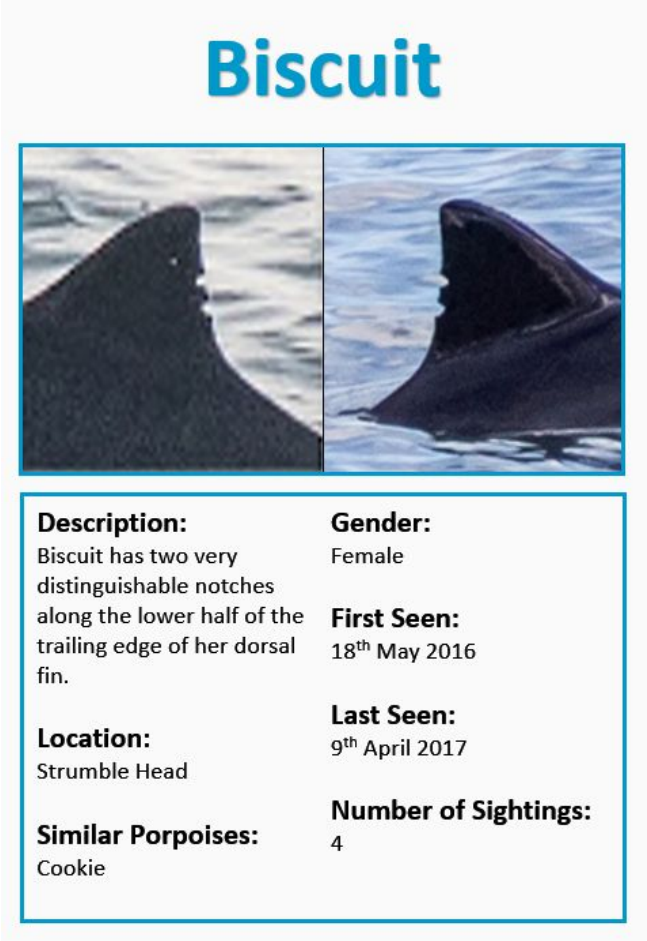

Fig. 3 Example catalogue page detailing identification features and information on previous sightings.

Conclusion

The method presented here has been used successfully for over 12 months, resulting in a catalogue with 101 porpoises. This along with other successful studies/catalogues in other areas prove it is possible to conduct photo ID studies on harbour porpoises and from land which is the least invasive way to study these animals. By collecting long-term photographic and observational data on this species we can increase our knowledge of the porpoise and answer several questions at both species and population level. By using this method at four different sites around the North Pembrokeshire coast shows it is easily adaptable and can work elsewhere at sites with regular porpoise sightings. There is also potential for the method to be rolled out nationwide providing a collective understanding of local porpoise populations, links between them and the UK population. This will lead to greater protection and conservation of the species and their environment.

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