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Monitoring the east coast bottlenose dolphin population: accounting for southward range expansion

Annual fieldwork progress report from 2020 photo-identification surveys and citizen science

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Contents

Figures

Tables

1 Introduction

This report summarises the fieldwork carried out by our group between June and September 2020 for the project "Monitoring the east coast bottlenose dolphin population: accounting for southward range expansion", funded by the Forth and Tay windfarm developers (Inch Cape Offshore Limited (ICOL), Neart na Gaoithe (NNGOWL) and Seagreen Wind Energy Limited (SWEL)). and NatureScot. The report also includes a summary of the processed photo-identification data and of the Citizen Fins project component. All photo-identification surveys were conducted under SNH licence number 98465 to PSH, in the Fife, Tayside area and in the Firth of Forth.

2 Survey Effort

In total, twenty-two boat-based photo-identification trips were carried out in Angus, Tayside, and Firth of Forth coastal waters between 24th June and 29th September 2020, with surveys occurring in all months (Table 1). Surveys were designed to maximise our chances of encountering bottlenose dolphins and obtaining high quality photographs. Surveys started from Newport-on-Tay or from Anstruther, depending on the tide and planned survey. Surveys in Tayside generally covered the area between Newport-on-Tay out to the entrance of the Firth of Tay, and from there to St Andrews and/or Arbroath. Eight of those surveys extended to Lunan Bay and the Montrose area, north of Arbroath, and three surveys extended onto the Firth of Forth. Another six surveys occurred within the Firth of Forth only (Figure 1).

Between June and September 2020, bottlenose dolphins were encountered on 15 trips, in 40 separate encounters, with each encounter lasting an average of 37 minutes. Overall, a total of just over 24 hours were spent with dolphins during the study period (Table 1). Most encounters occurred between Newport-on-Tay and the entrance to the Firth of Tay, between Arbroath and Montrose, and on the north side of the Firth of Forth, with fewer encounters in St Andrews Bay and on the south side of the Firth of Forth (Figure 1). Estimated group sizes during field observations ranged from 2 to 50 animals in the encountered groups, with an average group size of 13 animals. The exact locations and estimated group sizes are given in Appendix 1.

Surveys were always initiated in favourable weather conditions (sea conditions between Beaufort 0 and 3), but on four occasions the conditions reached Beaufort 4 during the survey. Harbour porpoises were encountered on sixteen separate occasions, minke whales were seen on three occasions and a basking shark was seen once during the surveys in 2020 (Figure 1).

Table 1 Summary of survey time and encounters with bottlenose dolphins in Fife and Tayside during 2020.

Trip	Month	Date	Area	Survey time (hours)	Number of encounters	Encounter time (hours)	Group size	% time with dolphins
1799	June	24/06/2020	Tayside	5.28	3	1.18	6-12	22.4
1801	July	02/07/2020	Tayside	5.68	1	0.67	6	11.7
1804	July	08/07/2020	Tayside & Forth	7.48	5	4.02	3-12	53.7
1807	July	15/07/2020	Tayside	7.00	5	3.33	4-15	47.6
1809	July	21/07/2020	Tayside	5.23	2	1.08	6-7	20.7
1810	July	24/07/2020	Tayside & Forth	8.12	2	0.72	5-8	8.8
1815	July	30/07/2020	Tayside & Montrose	6.90	2	1.73	10-15	25.1
1817	August	06/08/2020	Tayside / Southern Forth	7.52	1	0.48	3	6.4
1819	August	07/08/2020	Northern Forth / Tayside	8.30	3	1.08	5-17	13.0
1820	August	12/08/2020	Tayside & Montrose	5.32	1	0.73	8	13.8
1823	August	18/08/2020	Forth	5.52	0	0.00		
1824	August	19/08/2020	Tayside & Montrose	6.75	3	2.22	7-25	32.8
1826	August	27/08/2020	Tayside & Montrose	5.42	0	0.00		
1827	August	31/08/2020	Forth	8.02	2	1.15	12-14	14.3
1829	September	01/09/2020	Tayside & Montrose	5.92	0	0.00		
1832	September	06/09/2020	Tayside & Montrose	5.62	0	0.00		
1835	September	15/09/2020	Forth	10.48	6	2.98	8-50	28.5
1837	September	18/09/2020	Forth	5.77	0	0.00		

1842	September	23/09/2020	Forth	6.75	0	0.00		
1843	September	24/09/2020	Tayside & Montrose	5.85	3	2.78	2-45	47.6
1844	September	28/09/2020	Tayside & Montrose	5.93	0	0.00		
1845	September	29/09/2020	Forth	6.70	1	0.42	8	6.2
Total				**145.55**	**40**	**24.58**		**16.9**

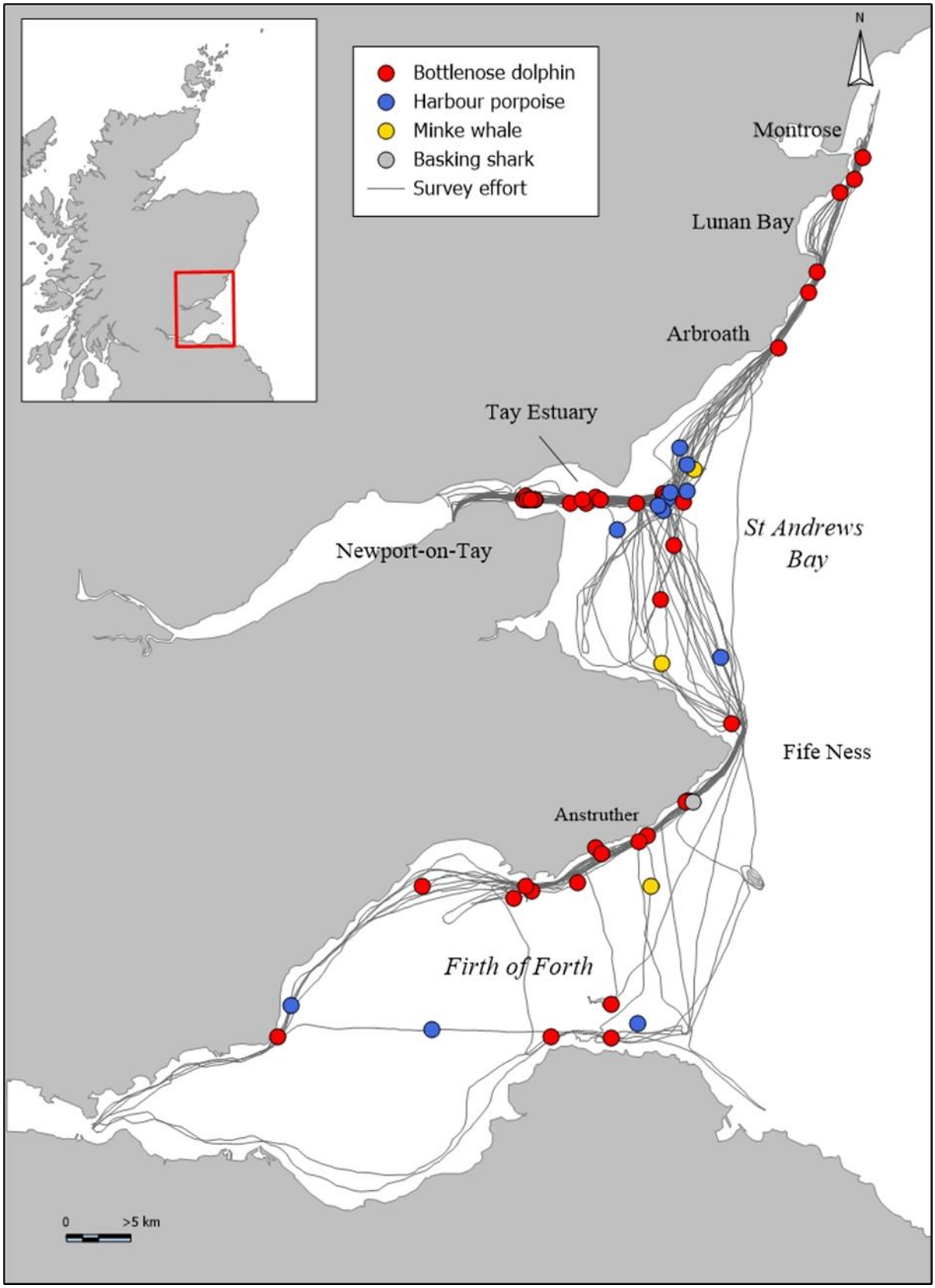

Figure 1 Survey effort in 2020 (grey lines) and bottlenose dolphin (red), harbour porpoise (blue), minke whale (yellow) and basking shark (grey) encounters.

3 Photo-identification Effort

Photo-identification data were collected using a Canon EOS 7D with a 70-200 mm f2.8 USM Canon lens. Standardised protocols taken from the long running east coast of Scotland bottlenose dolphin project (Cheney et al. 2013) coordinated by the Lighthouse Field Station, University of Aberdeen and the Sea Mammal Research Unit, University of St Andrews, were used at all times. This ensured all data were standardised with and incorporated into the long running dataset for Scottish bottlenose dolphins curated at the Lighthouse Field Station. Two different photographers were used, Emily Hague (EH) for nine trips and Claire Lacey (CL) for 13 trips. During each encounter, data on group size, behaviour, and the presence of new-born individuals and older calves were recorded, as well as environmental data on sea conditions and water depth.

In total, over 8,000 photographs were taken during the encounters with bottlenose dolphins, with photographs containing one or multiple individual dorsal fins. Each of the individual dorsal fins photographed was graded for its photographic quality following criteria adapted from Wilson et al. (1999) (Appendix 2) and individuals matched to the existing catalogue for this population.

Processing of the photo-ID data identified a total of 140 individual dolphins from 2,541 high quality photographs (Table 2). Of these, 111 were known individuals included in the catalogue of dolphins from the east coast of Scotland, nine were new-born calves associated with known females, and seven were older calves associated with known females, but not yet in the known catalogue. The remaining 12 animals were unidentified; they mostly included young and juvenile dolphins with no permanent marks on the dorsal fin. Additionally, three known dolphins, one new-born calf associated with a known mother, and six unidentified individuals (mostly young animals) were identified based on lower quality photographs only.

Photo quality grading and dolphin identification from 2020 will be confirmed by another two experienced researchers as part of the annual protocol applied to all photo-ID data that are part of the Aberdeen/St Andrews Scottish east coast bottlenose dolphin project. We expect only minor, if any, changes to the results once all the confirmations have been finalised. New individuals might be given new ID numbers and incorporated into the catalogue if they have enough good quality photographs.

3.1 Photo-identified individuals by area

Of the 2,541 high quality photographs, 1,586 were taken in the Tayside area (from Montrose to Fife Ness, covering the Tay Estuary and adjacent waters south into St Andrews Bay and north to Montrose), and 995 photographs were taken in the Firth of Forth area. Some individuals were identified in both the Tayside and Firth of Forth areas (n=56), while others were identified in the Tayside area only (n=41) or in the Firth of Forth area only (n=43) (Table 2).

Table 2 Number of individual dolphins identified from high quality photographs in each area of interest during 2020 surveys.

	Total number of dolphins	Tayside area only	Firth of Forth area only	Both areas
Known dolphins from catalogue	111	36	27	48
New-born calves associated with known mothers	10	1	5	4
Unknown older calves associated with known mothers	7	3	2	2
Unidentified dolphins	12	1	9	2
Total	**140**	**41**	**43**	**56**

4 Citizen Fins Project

The Citizen Fins project started in September 2020 (after the peak summer months) and during the ongoing coronavirus pandemic. After a fairly slow start, a recent increase in the number of photographs submitted to the project has been noted. It is expected that the relaxation of COVID restrictions and the start of the spring/summer period will lead to comparatively more photographs being submitted as 2021 progresses.

As of April 2021, a total of 175 photographs have been submitted to the project (by 15 different people) (**Error! Reference source not found.**). Of these 175 photographs, 164 were accepted for data processing (the remaining photos did not meet the minimum criteria for quality, such as showing the dorsal fin). As expected, the quality of these photographs was generally not as good as the quality of photographs taken during photo-ID surveys as part of the long running project. However, the images were good enough to allow the preliminary identification of 23 unique known dolphins from the east coast of Scotland photo catalogue (Figure 3). Of these 23 individuals, 13 were also identified in the SMRU 2020 photo-ID surveys.

Quality grading and dolphin identification for the Citizen Fins project photographs will also be confirmed by another two experienced researchers, following the same protocol as the long running project. One dolphin has already been confirmed as an unknown animal (i.e. with no match found in the catalogue). Several additional dolphins also appear to match to currently unknown animals seen during the SMRU surveys, or identified from photographs taken by the public from the north east coast of England in 2019 and 2020 and submitted to the University of Aberdeen.

Data from some of the more recently submitted Citizen Fins photographs are still being processed and a number of good quality photos from earlier submissions need further examination to identify individuals from them.

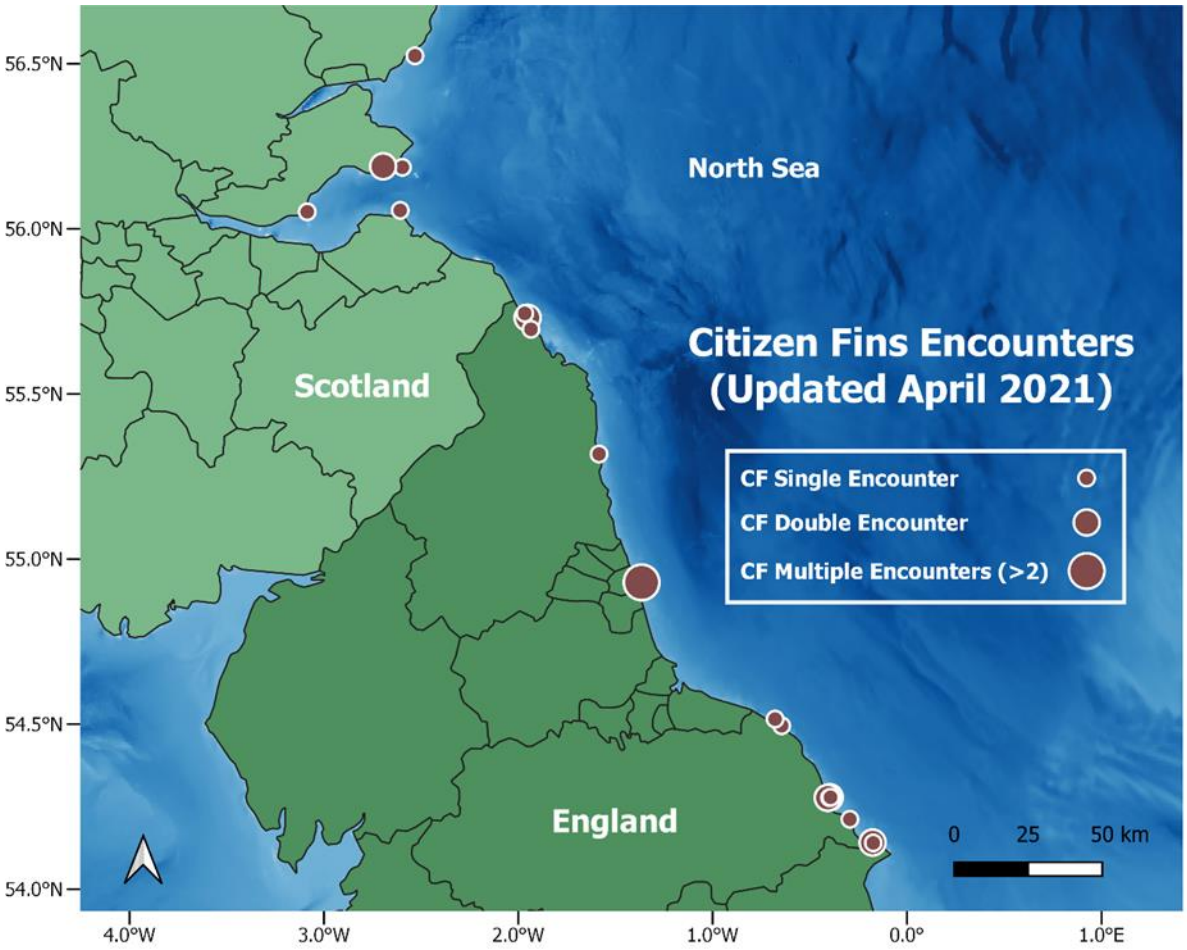

Figure 2 Map of locations of Citizen Fin photograph submissions as of April 2021. One encounter from the Aberdeen region is not shown.

Figure 3 Examples of photographs submitted to the Citizen Fins project in which known individuals from the east coast of Scotland catalogue could be identified. Top photograph shows dolphin 1121 (courtesy of Sheila Ivison) and bottom photograph shows dolphin 1150 (courtesy of Stuart Baines).

Several public outreach activities have been conducted as part of the Citizen Fins project, including a live question and answer webinar as part of Explorathon 2020. Monica Arso Civil (MAC) has also given multiple presentations on the project in the Levenmouth Whale Project talk series, the Scottish Marine Animal Stranding Scheme/Whale and Dolphin Conservation 2021 Marine Forum, and The Royal Society for the Protection of Birds 2021 'DolphinFest' programme.

An information leaflet has been put together (Appendix 3) and will be distributed to dolphin and wildlife boat trip businesses to increase awareness of the Citizen Fins project and encourage submission of photographs.

5 References

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Wilson, B., P. S. Hammond, and P. M. Thompson. 1999. Estimating size and assessing trends in a coastal bottlenose dolphin population. Ecological Applications **9**:288-300.

6 Appendix 1

Table 3 Location, date, and observed number of bottlenose dolphin individuals encountered per group in summer 2020.

Latitude	Longitude	Trip	Date	Encounter	Estimated group size
56.4524	-2.77529	1799	24/06/2020	5225	12
56.45627	-2.76274	1799	24/06/2020	5226	6
56.24068	-2.64039	1799	24/06/2020	5227	6
56.45388	-2.84084	1801	02/07/2020	5233	6
56.45228	-2.7099	1804	08/07/2020	5245	10
56.29642	-2.58515	1804	08/07/2020	5246	12
56.21604	-2.69229	1804	08/07/2020	5247	3
56.38433	-2.67721	1804	08/07/2020	5248	12
56.4543	-2.75659	1804	08/07/2020	5249	10
56.45441	-2.8562	1807	15/07/2020	5258	4
56.45675	-2.85189	1807	15/07/2020	5259	14
56.68402	-2.43241	1807	15/07/2020	5260	5
56.69958	-2.42145	1807	15/07/2020	5261	15
56.60366	-2.49014	1807	15/07/2020	5262	15
56.45392	-2.8494	1809	21/07/2020	5268	6
56.45188	-2.7953	1809	21/07/2020	5269	7
56.1778	-2.97866	1810	24/07/2020	5270	5
56.45384	-2.84157	1810	24/07/2020	5271	8
56.45413	-2.85157	1815	30/07/2020	5279	10
56.6181	-2.47991	1815	30/07/2020	5280	15
56.07163	-2.81142	1817	06/08/2020	5286	3

Latitude	Longitude	Trip	Date	Encounter	Estimated group size
56.20645	-2.75803	1819	07/08/2020	5290	5
56.20299	-2.74954	1819	07/08/2020	5291	17
56.45455	-2.77973	1819	07/08/2020	5292	15
56.45936	-2.67647	1820	12/08/2020	5293	8
56.67475	-2.45096	1824	19/08/2020	5300	7
56.45767	-2.67313	1824	19/08/2020	5301	25
56.45393	-2.84565	1824	19/08/2020	5302	20
56.07176	-2.73587	1827	31/08/2020	5306	14
56.06919	-3.16026	1827	31/08/2020	5307	12
56.21104	-2.70292	1835	15/09/2020	5319	35
56.18165	-2.78107	1835	15/09/2020	5320	8
56.17563	-2.83786	1835	15/09/2020	5321	25
56.17058	-2.86106	1835	15/09/2020	5322	15
56.17872	-2.84648	1835	15/09/2020	5323	50
56.09579	-2.73535	1835	15/09/2020	5324	30
56.56368	-2.52838	1843	24/09/2020	5331	45
56.45366	-2.65025	1843	24/09/2020	5332	2
56.42286	-2.66167	1843	24/09/2020	5333	15
56.23968	-2.64283	1845	29/09/2020	5344	8

7 Appendix 2

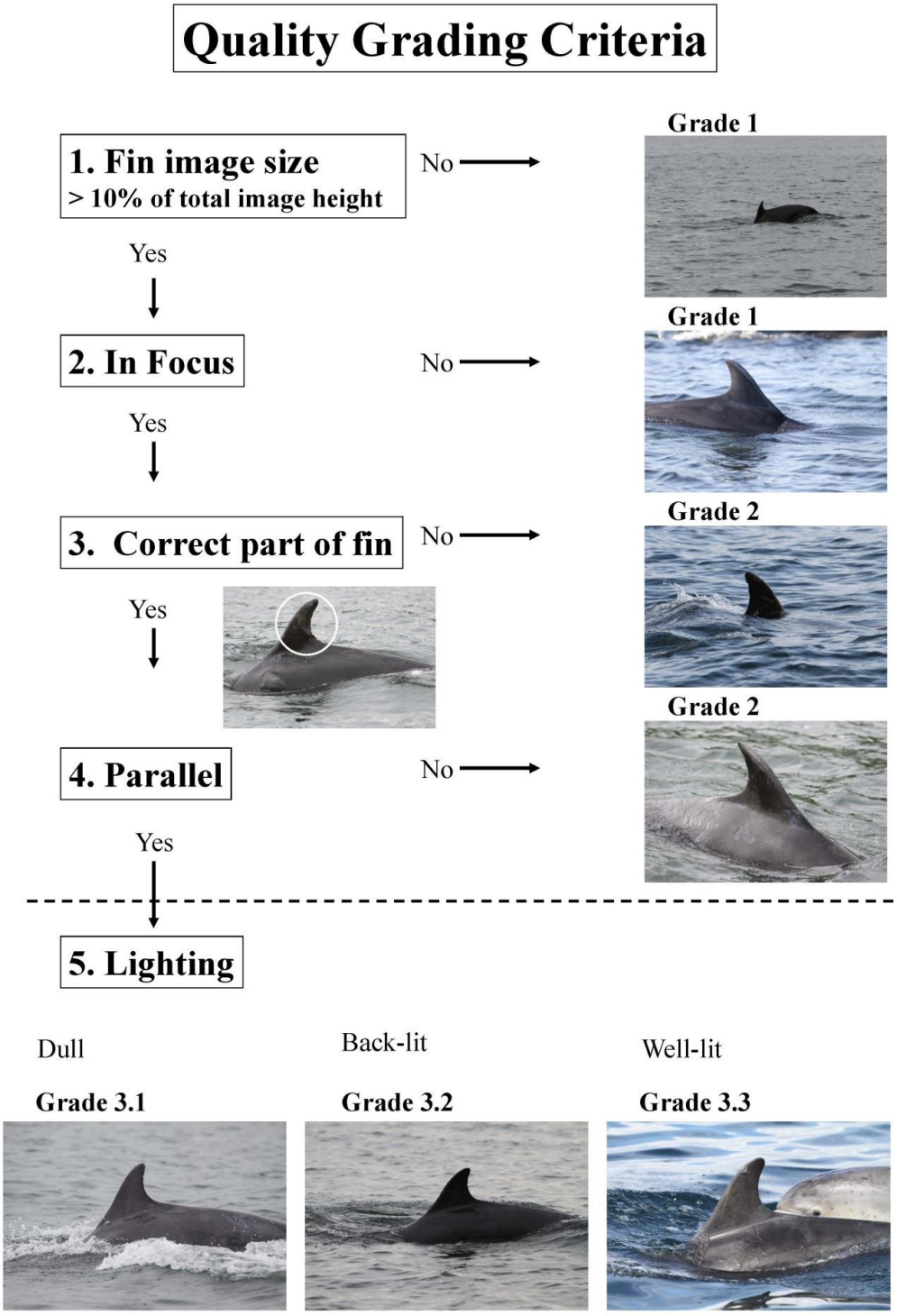
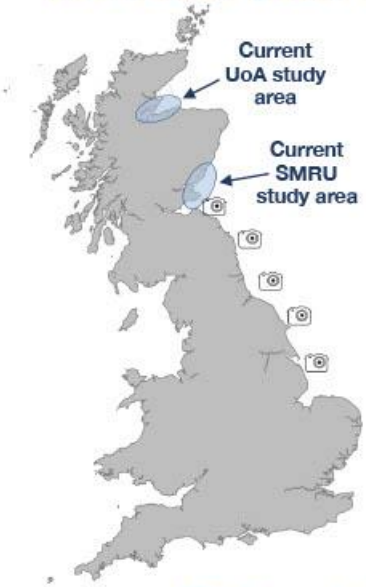


Figure 4 Criteria for grading pictures based on photographic quality, adapted from Wilson et al. (1999)

8 Appendix 3

We need your bottlenose dolphin photographs!



The Sea Mammal Research Unit (SMRU), with our collaborators at the University of Aberdeen (UoA), have been studying the bottlenose dolphins off the east coast of Scotland for many years. Recently, the population has expanded its distributional range into English waters. Can you help us monitor them?

We are looking for photos of the dorsal fins of bottlenose dolphins taken off SE Scotland and along the NE coast of England. These photographs will allow us to identify which animals in the population are spending time in these areas and get a better understanding of their movements between the Scottish and English coasts.

- Dorsal fin is not too far away ✓
- Side of dorsal fin is facing the camera ✓
- Dorsal fin is in focus ✓

Please visit our website for full guidelines and to submit your photos (taken in any year). You can also have a go at matching your dolphins to individuals in our east coast photo catalogue!

Keep in touch!
Citizen Fins Website: https://synergy.st-andrews.ac.uk/citizenfins
citizenfins@st-andrews.ac.uk
@_SMRU_ (Sea Mammal Research Unit)

Citizen Fins is funded by: NatureScot, Sea green, NnG Offshore Wind, Inch Cape

Figure 5 Citizen Fins leaflet.