



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

Annual fieldwork progress report on 2022 photo-identification surveys and citizen science

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Report to Forth and Tay windfarm developers and NatureScot

April 2023

Introduction

This report summarises the fieldwork carried out between May and September 2022 for the project “Monitoring the east coast bottlenose dolphin population: accounting for southward range expansion”, funded by the Forth and Tay windfarm developers Seagreen, Neart na Gaoithe and Inch Cape, and NatureScot. The report also includes a summary of the processed photo-identification data and of the Citizen Fins project. All photo-identification surveys were conducted under NatureScot licence number 98465 to PSH, in the Fife and Tayside area, and in the Firth of Forth.

Survey effort

In total, 28 boat-based photo-identification trips were carried out in Angus, Tayside, and Firth of Forth coastal waters between 17th May and 29th September 2022, with surveys occurring in all months (Table 1). Surveys were designed to maximise our chances of encountering bottlenose dolphins and obtaining high quality photographs. All surveys started from Newport-on-Tay. 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. Thirteen

of those surveys extended to Lunan Bay and the Montrose area, north of Arbroath, and ten surveys extended into the Firth of Forth (Figure 1).

Between May and September 2022, bottlenose dolphins were encountered on 22 trips, in 75 separate encounters, with encounters lasting an average of 34 minutes. Overall, a total of 42 hours were spent with dolphins during the study period (Table 1). Most encounters (n=41) occurred between Newport-on-Tay and the entrance to the Firth of Tay (Figure 1). Another thirteen encounters occurred between Arbroath and Montrose, nine encounters occurred in St Andrews Bay and the remaining (n=12) were in the Firth of Forth (all on the north side) (Figure 1). Estimated group sizes during field observations ranged from 1 to 50 animals in the encountered groups, with an average group size of 12 animals. The exact locations and best estimates of group sizes are given in Appendix 1.

Surveys were always initiated in favourable weather conditions (sea conditions between Beaufort 0 and 3). On some trips, weather conditions worsened to Beaufort 4 or 5 and survey effort stopped until conditions improved. Harbour porpoises were encountered on thirteen separate occasions, and minke whales were seen on nine occasions (Figure 1).

Table 1. Summary of survey time and encounters with bottlenose dolphins in Tayside and adjacent waters during 2022.

Trip	Month	Date	Area	Survey Time (hrs)	No. Enc.	Time on Enc. (hrs)	Group size	% time with dolphins
1906	May	17/05/2022	Tayside	2.43	0	0.00		
1910	June	07/06/2022	Tayside to Lunan Bay	6.63	3	0.70	1 to 3	11%
1911	June	14/06/2022	Tayside to Lunan Bay	4.35	0	0.00		
1913	June	16/06/2022	Forth	7.23	0	0.00		
1914	June	21/06/2022	Tayside to Montrose	7.93	7	4.03	2 to 17	51%
1915	June	24/06/2022	Forth	6.82	3	1.80	1 to 13	26%
1916	July	01/07/2022	Tayside to Montrose & St Andrews Bay	7.33	4	1.33	2 to 8	11%
1918	July	05/07/2022	Tayside to Montrose	8.38	3	1.92	3 to 18	14%
1919	July	07/07/2022	Tayside to St Andrews Bay	6.65	3	1.47	3 to 10	13%
1920	July	11/07/2022	Forth	7.30	5	2.18	4 to 12	18%

Trip	Month	Date	Area	Survey Time (hrs)	No. Enc.	Time on Enc. (hrs)	Group size	% time with dolphins
1921	July	14/07/2022	Tayside to Lunan Bay & St Andrews Bay	6.77	2	1.47	2 to 50	13%
1922	July	18/07/2022	Forth	8.52	6	2.70	9 to 45	19%
1925	July	21/07/2022	Tayside to Montrose & St Andrews Bay	7.28	7	2.55	2 to 20	21%
1926	July	26/07/2022	Tayside to Forth	5.60	1	1.63	42	18%
1927	July	27/07/2022	Forth	7.95	2	0.85	5 to 12	6%
1931	August	09/08/2022	Tayside to Montrose	7.53	6	3.05	1 to 35	40%
1932	August	12/08/2022	Forth	9.22	5	3.38	5 to 45	37%
1934	August	17/08/2022	Tayside to St Andrews Bay	7.08	2	2.40	5 to 45	34%
1939	August	25/08/2022	Tayside to Montrose	7.72	2	2.32	6 to 35	30%
1940	August	26/08/2022	Forth	9.45	4	0.88	2 to 6	9%
1941	August	29/08/2022	Tayside to Montrose	6.42	3	1.97	4 to 30	31%
1943	September	01/09/2022	Forth	7.05	0	0.00		
1945	September	13/09/2022	Forth	7.77	2	2.42	14 to 30	31%
1946	September	14/09/2022	Tayside to Lunan Bay	5.97	3	1.10	10 to 14	18%
1948	September	20/09/2022	Tayside to Montrose & St Andrews Bay	7.35	1	1.20	20	16%
1950	September	23/09/2022	Forth	7.15	0	0.00		
1951	September	28/09/2022	Tayside to Lunan Bay	5.13	1	1.00	20	19%
1953	September	29/09/2022	Tayside	1.65	0	0.00		
Total				190.67	75	42.35	1 to 50	22%

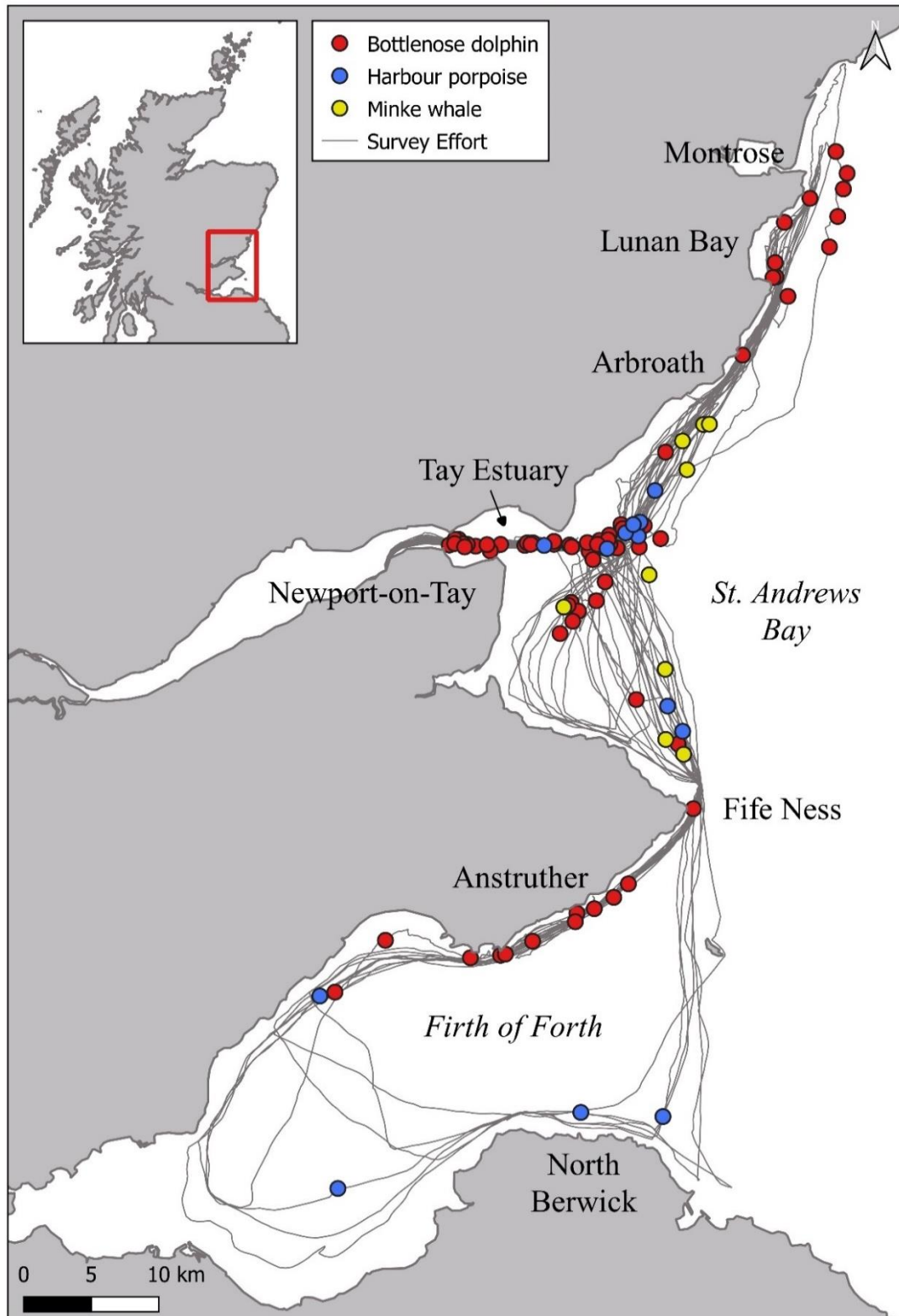


Figure 1. Survey effort in 2022 (in grey) and bottlenose dolphin (red), harbour porpoise (blue), and minke whale (yellow) encounters.

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 consistent with and incorporated into the long running dataset for Scottish bottlenose dolphins curated at the Lighthouse Field Station. One photographer (GE) was used for all 28 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, 11,882 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) (see Appendix 2), and individuals matched to the existing catalogue for this population.

Processing of the photo-ID data identified a total of 200 individual dolphins from 5,535 high quality photographs (Table 2). Of these, 138 were known individuals included in the catalogue of dolphins from the east coast of Scotland, 11 were new-born calves associated with known females, and 12 were older calves associated with known females, but not yet identified individually in the catalogue. There were another 39 animals unidentified; these included mostly young and juvenile dolphins with no permanent marks on the dorsal fin. Some of these individuals have been also identified through Citizen Fins based on photographs from NE England. We suspect there was a particular trip in which animals that have been occurring primarily in NE England waters were encountered in the Firth of Forth area. This should provide interesting information on individuals not well known until now.

Photo quality grading and dolphin identification from the 2022 season 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. It is likely that some of the unknown individuals will be matched to the catalogue. However,

we expect only minor changes to these preliminary 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.

Photo-identified individuals by area

Of the 5,535 high quality photographs, 4,401 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 1,134 were taken in the Firth of Forth area. Some individuals were identified in both the Tayside and Firth of Forth areas (n=89), while others were identified in the Tayside area only (n=93) or in the Firth of Forth area only (n=18) (Table 2).

Table 2. *Number of individual dolphins identified in the Tayside and/or Firth of Forth areas in 2022*

	Total number of dolphins	Tayside area only	Firth of Forth area only	Both areas
Known dolphins from catalogue	138	59	6	73
New-born calves associated with known mothers	11	9	0	2
Unknown older calves associated with known mothers	12	4	0	8
Unidentified dolphins	39	21	12	6
Total	200	93	18	89

Citizen Fins project

The Citizen Fins project, which was launched in September 2020, aims to increase our knowledge of bottlenose dolphins outside the surveyed areas, particularly to the south, by encouraging members of the public to submit photographs that are of sufficient quality to identify individual dolphins. An information leaflet was circulated at the start of the project to dolphin and wildlife boat trip businesses to increase awareness of the Citizen Fins project and encourage submission of photographs (see Appendix 3). Additionally, contact was made

with several social media groups on Facebook that are dedicated to reporting and sharing sightings and photographs of bottlenose dolphins along the coasts of SE Scotland and NE England. Moderators of those groups have been encouraging photographers to submit photographs to Citizen Fins, and direct contact has also been made with some photographers.

The project had a slow start in terms of number of submissions, partially because the peak of the summer sightings had passed but also because of the restrictions imposed during the coronavirus pandemic. However, the number of submissions started to increase in spring and summer 2021 as restrictions eased. There is a small number of members of the public that submit photographs regularly, with others submitting more sporadically. As of end of March 2023, 1,986 photographs have been submitted to the project by 59 different people in 234 submissions. These contained photographs taken between 2017 and 2023 (see Table 3), along the coast from the Moray Firth to Flamborough Head (see Figure 2).

Table 3. Number of photographs submitted to Citizen Fins by year taken

Year	2017	2019	2020	2021	2022	2023*	Total
No. photos	2	42	148	853	755	184	1986

*2023 only covers the period January to March

As expected, the quality of the submitted photographs was generally poor, compared to photographs taken during dedicated photo-ID surveys. However, a proportion of the images were good enough (even if not of top quality) to allow the identification of 98 individual dolphins from the east coast of Scotland photo-ID catalogue, 53 of which were photographed in NE England (Figures 3 and 4). Another 42 individuals have been identified as being distinct, but a match has not been found yet. Because the quality of the photographs limits the ability to identify animals that do not contain many permanent marks, some of these unknown animals might have a match in the catalogue that we cannot identify. A portion of these animals might also not have been seen in the regularly surveyed areas (Moray Firth, Tayside, Firth of Forth) and thus have not had an opportunity to be “captured” and included in the catalogue.

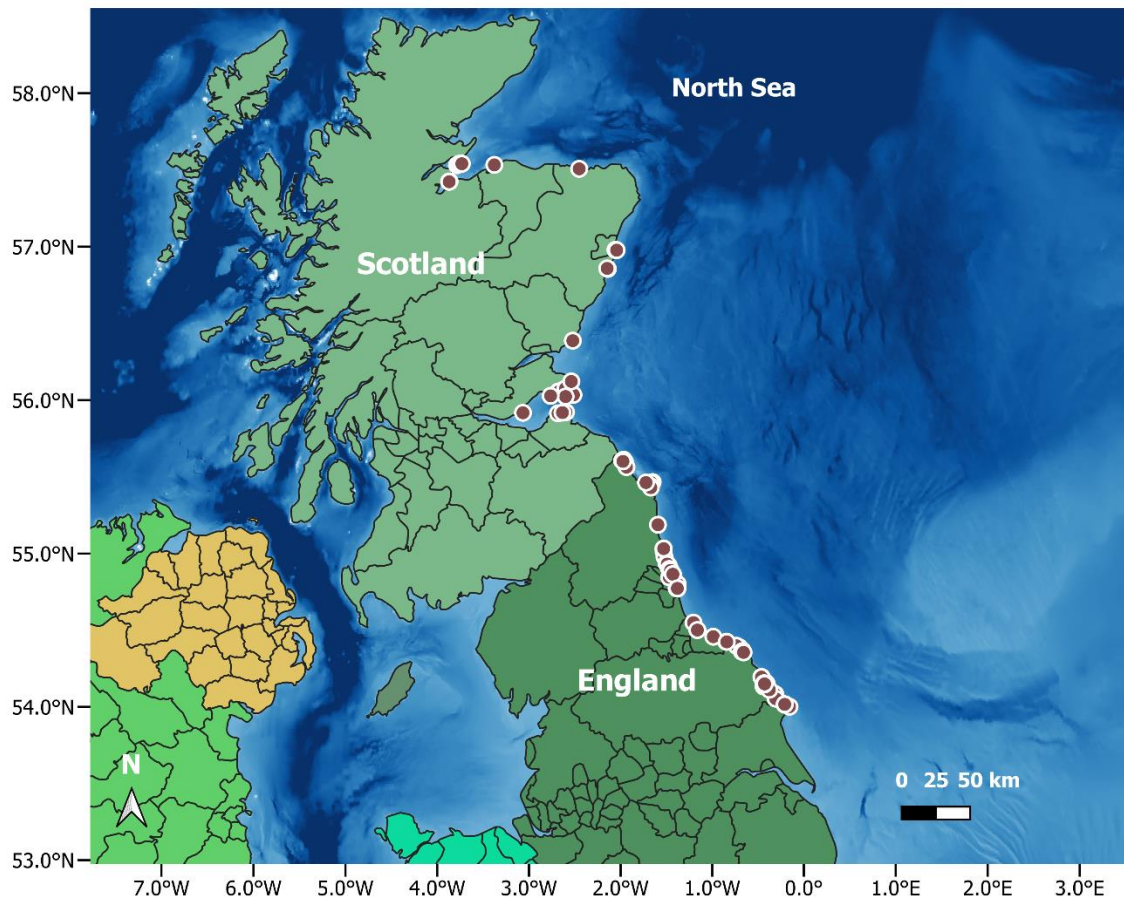


Figure 2. Map of locations of Citizen Fins photograph submissions as of March 2023.

Photo quality grading and dolphin identification of Citizen Fins project photographs will also be confirmed by another two experienced researchers, following the same protocol as the long running project. Data from some of the more recently submitted Citizen Fins photographs are still being processed and a number of photographs from earlier submissions need further examination to identify individuals from them.



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: dolphin #1121 (courtesy of Sheila Ivison). Middle: dolphin #1150 (courtesy of Stuart Baines). Bottom: dolphin #1 (courtesy of Stuart Baines).



Figure 4. Examples of qualities of photographs submitted for individuals #1050 and #1048, from better quality (top) to lower quality (bottom). Lower photographic qualities than shown in these examples will only allow for the identification of animals that are really well marked.

Literature cited

- Cheney, B., P. M. Thompson, S. N. Ingram, P. S. Hammond, P. T. Stevick, J. W. Durban, ..., and B. Wilson. 2013. Integrating multiple data sources to assess the distribution and abundance of bottlenose dolphins *Tursiops truncatus* in Scottish waters. *Mammal Review* 43: 71-88.
- 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.

Appendices

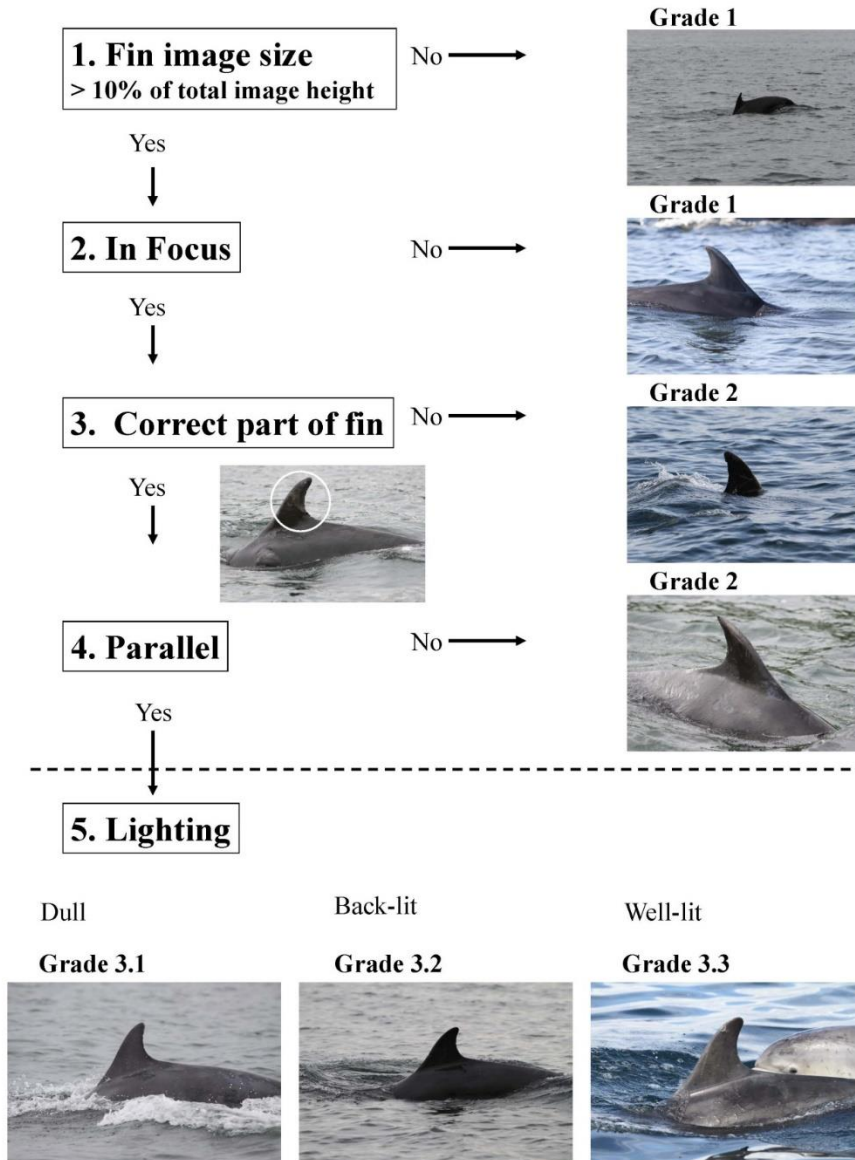
1. Location, date, and best estimate of observed number of bottlenose dolphin individuals encountered per group in summer 2022.

Latitude	Longitude	Trip	Date	Encounter	Estimated group size
56.66831	-2.46345	1910	07/06/2022	5474	3
56.45683	-2.67745	1910	07/06/2022	5475	5
56.45501	-2.68283	1910	07/06/2022	5476	1
56.45848	-2.61523	1914	21/06/2022	5480	17
56.63199	-2.47406	1914	21/06/2022	5481	12
56.71515	-2.40054	1914	21/06/2022	5482	6
56.70057	-2.38718	1914	21/06/2022	5483	4
56.69016	-2.39183	1914	21/06/2022	5484	3
56.67191	-2.39896	1914	21/06/2022	5485	5
56.65171	-2.4093	1914	21/06/2022	5486	2
56.45478	-2.86924	1915	24/06/2022	5487	13
56.45211	-2.82034	1915	24/06/2022	5488	1
56.18177	-2.80899	1915	24/06/2022	5489	5
56.45439	-2.77845	1916	01/07/2022	5490	8
56.4545	-2.72472	1916	01/07/2022	5491	2
56.45026	-2.70127	1916	01/07/2022	5492	3
56.45506	-2.7435	1916	01/07/2022	5493	6
56.46725	-2.63477	1918	05/07/2022	5502	3
56.46628	-2.6435	1918	05/07/2022	5503	16
56.45233	-2.6675	1918	05/07/2022	5504	18
56.45606	-2.76889	1919	07/07/2022	5505	3
56.45508	-2.80756	1919	07/07/2022	5506	10
56.45075	-2.82004	1919	07/07/2022	5507	2
56.45848	-2.85789	1920	11/07/2022	5508	12
56.20956	-2.71766	1920	11/07/2022	5509	12
56.18014	-2.84495	1920	11/07/2022	5510	4
56.18252	-2.80322	1920	11/07/2022	5511	8
56.45496	-2.67623	1920	11/07/2022	5512	5
56.45279	-2.68503	1921	14/07/2022	5513	2
56.61908	-2.45992	1921	14/07/2022	5514	50
56.22892	-2.65604	1922	18/07/2022	5515	9
56.22	-2.67358	1922	18/07/2022	5516	45
56.19104	-2.7707	1922	18/07/2022	5517	12
56.27868	-2.57787	1922	18/07/2022	5518	11
56.32177	-2.59571	1922	18/07/2022	5519	14
56.45395	-2.83756	1922	18/07/2022	5520	18
56.44475	-2.69668	1925	21/07/2022	5532	9
56.41635	-2.72317	1925	21/07/2022	5533	2



Latitude	Longitude	Trip	Date	Encounter	Estimated group size
56.41053	-2.71437	1925	21/07/2022	5534	16
56.39568	-2.73656	1925	21/07/2022	5535	20
56.45553	-2.68716	1925	21/07/2022	5536	10
56.45696	-2.7434	1925	21/07/2022	5537	3
56.45603	-2.77551	1925	21/07/2022	5538	8
56.45846	-2.86231	1926	26/07/2022	5539	42
56.45513	-2.84751	1927	27/07/2022	5540	5
56.45546	-2.85286	1927	27/07/2022	5541	12
56.45572	-2.86276	1931	09/08/2022	5551	14
56.45347	-2.8508	1931	09/08/2022	5552	35
56.63162	-2.47784	1931	09/08/2022	5553	10
56.46098	-2.67684	1931	09/08/2022	5554	3
56.45748	-2.68873	1931	09/08/2022	5555	1
56.45606	-2.70333	1931	09/08/2022	5556	3
56.15739	-3.00658	1932	12/08/2022	5557	16
56.19186	-2.94637	1932	12/08/2022	5558	45
56.21251	-2.69692	1932	12/08/2022	5559	5
56.45325	-2.72208	1932	12/08/2022	5560	7
56.45492	-2.82393	1932	12/08/2022	5561	25
56.45511	-2.77134	1934	17/08/2022	5563	45
56.45291	-2.64098	1934	17/08/2022	5564	5
56.5802	-2.51518	1939	25/08/2022	5571	6
56.68415	-2.43232	1939	25/08/2022	5572	35
56.42996	-2.68212	1940	26/08/2022	5573	2
56.41733	-2.69279	1940	26/08/2022	5574	3
56.41441	-2.72661	1940	26/08/2022	5575	6
56.40381	-2.72128	1940	26/08/2022	5576	3
56.45384	-2.68371	1941	29/08/2022	5577	30
56.46712	-2.64786	1941	29/08/2022	5578	7
56.46794	-2.66279	1941	29/08/2022	5579	4
56.20392	-2.7196	1945	13/09/2022	5589	14
56.35151	-2.64548	1945	13/09/2022	5590	30
56.64165	-2.47502	1946	14/09/2022	5591	14
56.46529	-2.66061	1946	14/09/2022	5592	10
56.45789	-2.67843	1946	14/09/2022	5593	13
56.4549	-2.69118	1948	20/09/2022	5594	20
56.51605	-2.60865	1951	28/09/2022	5598	20


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

Quality Grading Criteria




3. Citizen Fins leaflet

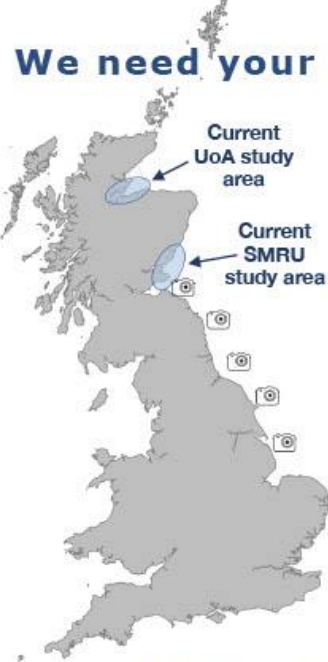


Sea Mammal Research Unit








University of St Andrews


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_](https://twitter.com/_SMRU_) (Sea Mammal Research Unit)

Citizen Fins is funded by:

