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Connectivity of Bottlenose dolphins in Wales: North Wales Photo-Monitoring Interim Report 2008

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Executive Summary

Increasingly, sightings of bottlenose dolphins have been reported in waters off North Wales, and they can comprise large groups of over 40 individuals. Whether these dolphins come from Cardigan Bay or are part of an offshore population is not known, and shedding light on this matter is the scope of this project.

Sightings collected from land sites, mainly by Marine Awareness North Wales, as well as from boat trips conducted following the reporting of the presence of dolphins in the area by a network of observers, have been analysed, and pictures of individual dolphins compared with existing catalogues to look for any possible matches. A total of eight boat surveys were carried out during the study period (August 2007 – March 2008). Seven sightings of bottlenose dolphins were collected during these trips, while pictures from a further two sightings were provided by other people working in the area. A total of 75 dolphins were found to be a match with the Cardigan Bay catalogue, while another nine dolphins were entirely new to the catalogue, indicating that the population of Cardigan Bay has a home range wider than previously known, and that movements in and out the Bay are normal.

A total of 72 sightings were recorded from land sites in the period from November 2001 to December 2007, with sightings frequencies being highest during the winter months of November, December and January (the opposite trend to that in Cardigan Bay where there are strong summer peaks). Mean group size is 18 individuals, three times larger than summer sightings in Cardigan Bay. This suggests that the dolphins for the most part leave the Bay during the winter months and move into North Welsh waters (and maybe beyond), where they aggregate in relatively large groups, possibly reflecting a change in prey type, availability and dispersion.

These findings have important implications on management. First, it is clear that consideration needs to be given to areas well beyond the two Special Areas of Conservation within Cardigan Bay. The full extent of the ranging movements of individual bottlenose dolphins remains unknown, but the indications are that a large part of this population spends the winter in waters off North Wales, and possibly beyond, whilst some bottlenose dolphins can be seen in the area in most months of the year. Sightings of large groups close to Liverpool Bay (where industry is concentrated) help explain the unusually high levels of pollutants that have been recorded in Welsh bottlenose dolphins in the past. Besides chemical pollutants, these waters experience much higher recreational activity and more shipping than anywhere in Cardigan Bay. Any conservation management of the Welsh bottlenose dolphin population needs to take these new findings into consideration.

Crynodeb Gweithredol

Soniwyd yn aml fod dolffiniaid trwyn potel i'w gweld yn y moroedd yng Ngogledd Cymru, ac yn casglu mewn grwpiau mawr o dros 40. Nid oes sicrwydd os yw'r dolffiniaid hyn yn dod o Fae Ceredigion, neu a ydynt yn rhan o boblogaeth o ddolffiniaid sydd allan yn y môr. Mae'r prosiect hwn yn rhoi cyfle i daflu goleuni ar y mater.

Gwelwyd y dolffiniaid o'r tir, yn bennaf gan Ymwybyddiaeth Forol Gogledd Cymru, yn ogystal â gan rai yn cynnal tripiau cychod, yn dilyn y sôn gan rwydwaith o wylwyr fod yna ddolffiniaid yn y moroedd cyfagos. Ymchwiliwyd i hyn, a chymharwyd darluniau o wahanol ddolffiniaid â mathau sydd eisoes yn bodoli, er mwyn chwilio am rai tebyg. Cynhaliwyd wyth arolwg mewn cwch yn ystod y cyfnod hwn o'u hastudio (Awst 2007 - Mawrth 2008). Gwelwyd y dolffiniaid trwyn potel saith gwaith yn ystod y tripiau hyn, ac yn ychwanegol at hyn fe dynnwyd eu lluniau ddwywaith gan bobl eraill a oedd yn gweithio yn yr ardal. Darganfuwyd fod 75 o'r dolffiniaid yn debyg i'r math o ddolffiniaid ym Mae Ceredigion, tra roedd naw arall yn fath hollol newydd, sy'n dangos fod mwy o ddolffiniaid cynhenid ym Mae Ceredigion nag a wyddai neb, a bod y symudiadau i mewn ac allan o'r Bae yn normal.

Cofnodwyd fod y dolffiniaid wedi cael eu gweld 72 o weithiau o'r tir yn y cyfnod rhwng Tachwedd 2001 a Rhagfyr 2007, a'u bod i'w gweld y rhan amlaf yn ystod misoedd y gaeaf, sef Tachwedd, Rhagfyr ac Ionawr (yn groes i'r drefn ym Mae Ceredigion pryd maent i'w gweld y rhan amlaf yn ystod yr haf). Y nifer yn y grŵp yw 18 dolffin, teirgwaith mwy ohonynt nac a welir yn ystod yr haf ym Mae Ceredigion. Awgryma hyn fod y dolffiniaid y rhan amlaf yn gadael Bae Ceredigion yn ystod misoedd y gaeaf ac yn symud i foroedd Gogledd Cymru (ac efallai ymhellach), lle maent yn ymgynnull mewn grwpiau cymharol fawr. Efallai fod hyn yn dangos newid yn y math o ysglyfaeth, argaeledd a gwasgariad. Mae gan y darganfyddiadau hyn oblygiadau pwysig ar reolaeth. Yn gyntaf, mae'n glir y dylid rhoi ystyriaeth i ardaloedd ymhell y tu hwnt i'r ddwy Ardal o Gadwraeth Arbennig o fewn Bae Ceredigion. Mae gwir ehangder symudiadau'r dolffiniaid trwyn potel yn parhau'n anhysbys, ond mae'r arwyddion yn dangos fod y mwyafrif ohonynt yn treulio'r gaeaf ym moroedd Gogledd Cymru, ac efallai ymhellach, tra gwelir rhai o ddolffiniaid trwyn potel yn yr ardal yn ystod y mwyafrif o fisoedd y flwyddyn. Mae'r ffaith fod y dolffiniaid i'w gweld mewn grwpiau mawr yn agos i Fae Lerpwl (man canolog i ddiwydiant) yn egluro lefel anghyffredin o uchel o lygryddion sydd wedi eu darganfod mewn dolffiniaid trwyn potel yng Nghymru yn y gorffennol. Heblaw am lygryddion cemegol, mae llawer mwy o weithgareddau hamdden yn digwydd yn y moroedd hyn, a mwy o longau nac mewn unrhyw le arall ym Mae Ceredigion. Dylai unrhyw reolaeth gadwraethol o boblogaeth dolffiniaid trwyn potel Cymru gymryd y darganfyddiadau newydd hyn i ystyriaeth.

Introduction

The bottlenose dolphin (*Tursiops truncatus*) is a protected species under the 1992 EU Habitats and Species Directive (92/43/EEC). Two Special Areas of Conservation (SACs) have been formally declared in Welsh waters in 2004 to protect them, the Cardigan Bay and the Pen Llyn a'r Sarnau SACs. Although it was previously thought that the population of Cardigan Bay was composed of animals with strong site fidelity and small home ranges (Bristow & Rees, 2001) and therefore that the dolphins might not leave the Bay during their lifetimes, there is now clear evidence that at least part of the population is much more mobile and moves in and out of the Bay, including part if not all of the Irish Sea in their home ranges. Sightings of bottlenose dolphins in Welsh waters outside Cardigan Bay are not a rarity, although they are infrequent. In the waters off North Wales, sightings have become more frequent in recent years (although this could reflect greater awareness and observer effort), and these can consist of large groups numbering over 40 individuals. Whether these individuals come from Cardigan Bay or are part of an offshore population was not known, and shedding light on this matter formed the basis of this project.

Information on bottlenose dolphin distribution and ranging movements is required in order to deal with casework enquiries and strategic environmental assessments (SEAs) at a time when there is great pressure for development in the region, particularly of renewable energy. Any photographic matches with individuals from the Cardigan Bay SACs would inform conservation management measures for this population, whilst understanding linkage between sites is an important backdrop to assessing condition of dolphins on those sites.

The project aims also to assist in reporting on the status and condition of bottlenose dolphins in Welsh waters by developing an understanding of the relatedness and connectivity between the SACs (an important consideration within NATURA 2000), and for assessing whether to treat the Welsh dolphin population as a single entity or several sub groups. Without this project, the possibilities to adequately report on CSM attributes are limited.

Methods

A network of cetacean watchers was involved in the project, including people watching from land and fishermen working at sea. Once a bottlenose dolphin group was spotted in the area, the observers would give the alert and, weather permitting, a local boat was chartered with the aim of finding the dolphins and collecting information on their position, group size, composition, behaviour and, most importantly, to perform photo-identification. Central to responding to reports were the regular watches made by Dave Powell and the telephone contacts established by Jon Shaw. All information collected was validated and then stored on a database, and the pictures were compared with existing catalogues from Cardigan Bay and other areas of Wales (within the Euroflukes project) to look for any possible matches.

1. Study area

The boat surveys were conducted out of the harbours of Amlwch or Menai Bridge on Anglesey (mainly the former port), and generally aimed at finding dolphin groups that had been recently reported by local observers. Thus vessel movements were limited. Nevertheless, some trips covered a wider area around the island of Anglesey, mainly the north and east coast from Cemlyn across to the mainland coast around Great Orme Head and Llandudno.

Sightings reported from land were largely collected by Dave Powell, Nia Haf Jones and others from Marine Awareness North Wales, using observation points around Penmon, Red Wharf Bay, Moelfre, Fresh Water Bay, Llan Carw, Amlwch, Bull Bay, Cemlyn, Carmel Head, Lligwy, The Range at South Stack, and Rhoscolyn Head (see Fig. 1).

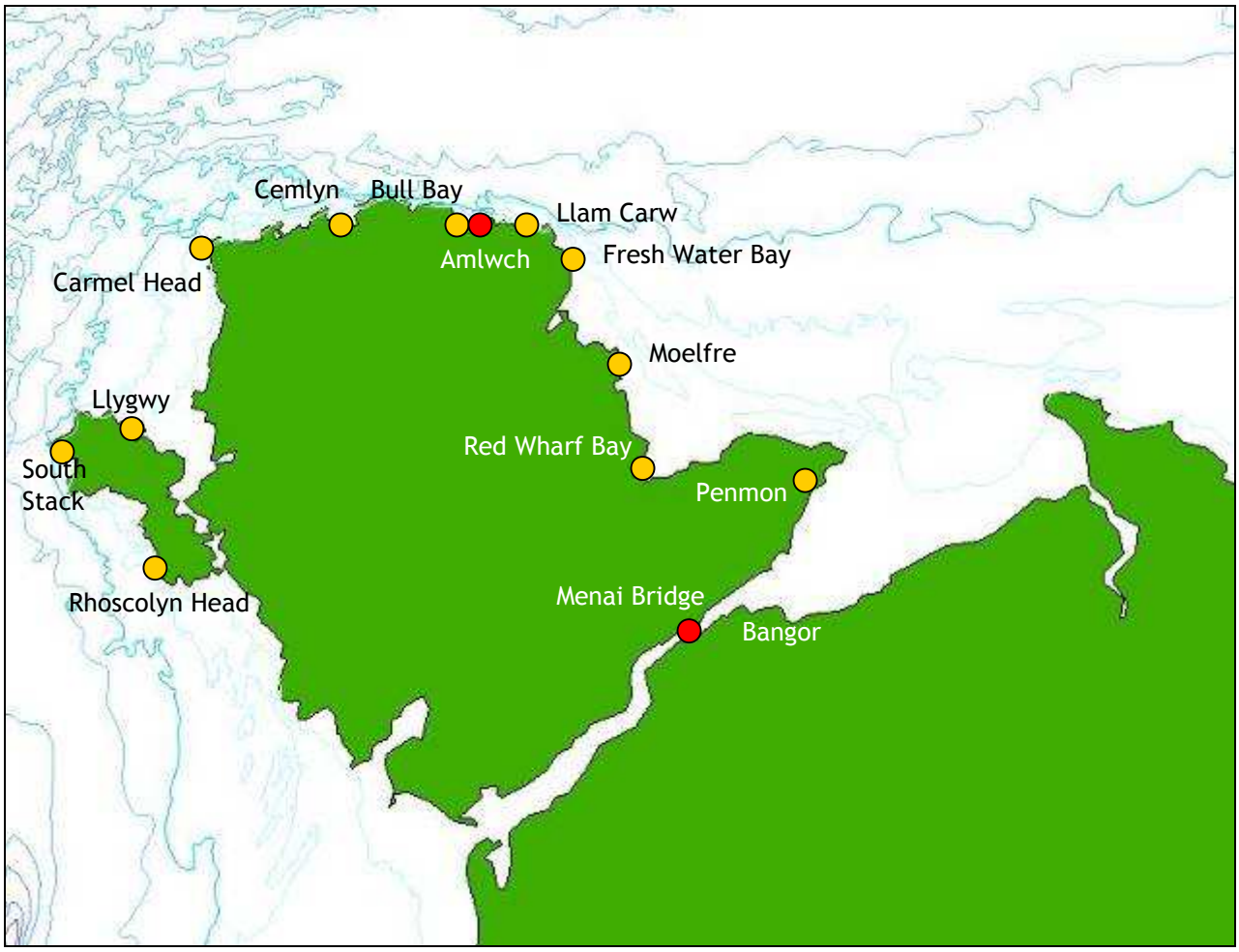


Figure 1. The study area showing home ports (in red) and land observation points (in yellow)

2. Photo-identification

Dolphin groups were approached to a distance of 20-50 metres following the guidelines outlined in the photo-identification licence granted to the Sea Watch Foundation by the Countryside Council for Wales (www.ccw.gov.uk; www.cardiganbaysac.org.uk). Photo-identification sessions lasted until all the dolphins in the group were identified or either moved away or showed sings of disturbance. The photo-identification protocol followed Würsig and Jefferson (1990), and the equipment used were primarily Canon EOS digital cameras with 17-85mm or 75-300mm zoom

lenses. All those dolphins that moved in the same direction or were engaged in the same activity within a spatial proximity of 100 metres or less, were classified as forming a group (Wells *et al.*, 1987). Four age categories were used, based on the size of the animal relative to an adult, the swimming pattern, skin coloration, presence of foetal folds and the proximity of the mother. These were: adult, juvenile, calf and newborn (Bearzi *et al.*, 1997). Group size was determined in the field, but if the photo-identification estimate resulted in a larger group size value, this latter estimate was used in the analysis. Matching was performed using Adobe Photoshop 7.0 and/or ACDSee Pro, and followed the techniques described by Defran and colleagues (1990) and Würsig & Jefferson (1990). In order to avoid false positives or false negatives, only high quality pictures were used to confirm the identity of a dolphin, and matches were confirmed by a second person (see Hammond, 1986; Scott *et al.*, 1990; Stevick *et al.*, 2001).

Results and Discussion

1. Boat based surveys

A total of eight boat surveys were carried out during the study period, with details given in Table 1.

Table 1. Surveys carried out during the study period, with information on the boat used, the number of km traveled and the total number of bottlenose dolphins (BND), harbour porpoises (HP), grey seals (GS) and Risso's dolphins (RD) sightings recorded during each trip.

Date	*Boat*	*Km travelled*	*BND sightings*	*HP sightings*	*GS sightings*	*RD sightings*
10/08/2007	Seekat 2	52.90	1	5	0	0
12/09/2007	Seekat 2	100.48	0	6	2	1
21/09/2007	Seekat 2	28.18	0	1	0	0
07/10/2007	Endeavour	63.71	1	1	0	0
11/12/2007	Seekat 2	28.91	3	2	0	0
12/02/2008	Seekat 2	58.97	1	6	0	0
17/02/2008	Seekat 2	134.13	0	4	2	0
28/02/2008	Seekat 2	15.53	1	2	0	0

The effort lines followed during each trip, and the location of the sightings are reported in Figure 2.

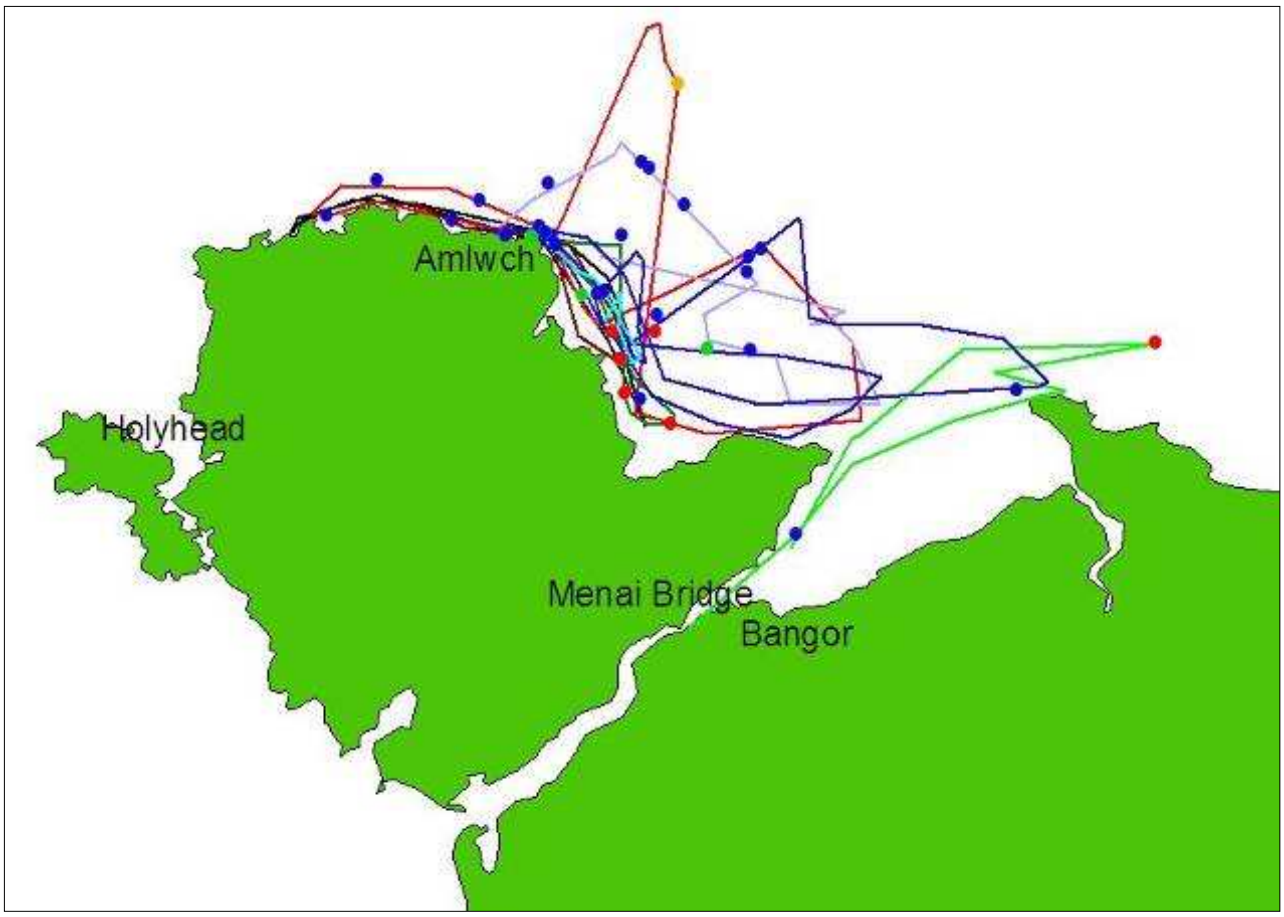


Figure 2. Effort lines and sightings locations (red dots for bottlenose dolphins, blue for harbour porpoises, green for grey seals and yellow for Risso's dolphins) for the 8 surveys carried out during the study period.

Details of each bottlenose dolphin sighting are given below.

<u>26/11/2006</u>

This sighting was recorded by Marine Awareness North Wales/The Wildlife Trusts, during one of their research trips. Information on the sighting, along with photo-identification pictures of the dolphins, was kindly provided to this project in order to build up our database. Information on the route followed during this trip was not available.

18 individuals were sighted around 53º 24.525N 004º 14.510W, at 13:58 hrs. The group comprised 15 adults and 3 juveniles, and the dolphins displayed some bow riding and feeding activities.

A total of 17 dolphins were photographically identified during this encounter, but some were recognizable only from right or left, so the estimate for the sightings is of 13 animals. Eight of these (47%) were found to be a match with the Cardigan Bay catalogue; their ID numbers are 024-05S, 062-06S, 082-01W, 110-01W, 113-03W, 115-02W, 128-02S and 152-05W. The others were dolphins that either had bad quality pictures, or no marks on the fin, so it was not possible to establish whether they were new dolphins or not.

<u>25/01/2007</u>

This sighting was recorded by Jon Shaw during a fishing trip and not during a dedicated cetacean survey, and so information on the route followed during this trip is not available.

About 30-40 individuals were sighted around 14.00 hrs at 53^{o} 25.817'N, 04^{o} 17.572'W. Contact was lost at 14:20 hrs at 53^{o} 25 841'N, 04^{o} 22.009'W.

A total of 13 dolphins were photographically identified during this encounter, but taking account of the fact that some were recognizable only from right or left, the estimate for the sightings is of 11 animals. Five of these (38%) were found to be a match with the Cardigan Bay catalogue; their ID numbers are 015-01W, 046-03L, 070-06W, 110-01W and 118-02W. The others were dolphins that either had bad quality pictures, or no marks on the fin, so it was not possible to establish whether or not they were new dolphins.

10/8/2007

15-20 individuals were sighted between Point Lynas and Cemaes Head, on the north-east coast of Anglesey, between 15:04 and 16:58 hrs. The group contained 1-2 juveniles and 1-2 calves. The dolphins were travelling initially northwards, then west along the coast.

A total of 11 dolphins were photographically identified during this encounter. Only one (9%) of them was found to be a match with the Cardigan Bay catalogue; this individual matched with ID number 191-07W. Six of the others were newly identified dolphins, and were therefore given new ID names; the other four had no nicks or major markings, and so were very difficult to match; it is possible that some of them are present among the "right" or "left" categories of the Cardigan Bay catalogue.

7/10/2007

30-40 individuals were sighted north-east of Llandudno between 11:08 and 12:14 hrs. The group contained 10 juveniles and 5 calves. The dolphins performed a wide range of behaviours, from normal swimming to feeding, bow-riding, socializing and leaping.

A total of 26 dolphins were photographically identified during this encounter. 14 (54%) of these were found to be a match with the Cardigan Bay catalogue; their ID numbers are 003-01W, 011-01S, 013-01S, 025-01W, 040-03W, 049-89S, 050-01S, 052-02W, 056-01W, 059-03S, 104-05S, 107-03S, 115-01W and 129-03W. None of the other dolphins had nicks or major markings, so they were very difficult to match and it is possible that some of them are present among the "right" or "left" categories of the Cardigan Bay catalogue.

11/12/2007 – sighting 1

Ten individuals were sighted one mile east of Moelfre between 12:45 and 13:08 hrs while they were feeding. The group was composed of 8 adults and 2 calves.

A total of seven dolphins were photographically identified during this encounter. Three (43%) of these were found to be a match with the Cardigan Bay catalogue; their ID numbers are 052-03L, 102-07R and 199-07S. One of the others had nicks, but the pictures of it were not good enough for an identification; the other three had no nicks or major markings (one being a calf) so they were very difficult to match, and some of them may have been present among the "right" or "left" categories of the Cardigan Bay catalogue.

11/12/2007 – sighting 2

12 individuals were sighted one mile south-east of Treat Bychan at 13:15 hrs while they were feeding. The group comprised 10 adults and 2 calves.

A total of 13 dolphins were photographically identified during this encounter. Five (38%) of them were found to be a match with the Cardigan Bay catalogue; their ID numbers are 017-03W, 032-90S, 065-06S, 103-06S and 113-02W. The other eight had no nicks or major markings, so they were very difficult to match and it is possible that some of them are present among the "right" or "left" categories of the Cardigan Bay catalogue.

11/12/2007 – sighting 3

12 individuals were sighted in Red Wharf Bay between 14:05 and 14:45 hrs while they were feeding. The group comprised 12 adults and 2 calves.

A total of 16 dolphins were photographically identified during this encounter. Eight (50%) of them were found to be a match with the Cardigan Bay catalogue; their ID numbers are 017-03W, 032-90S, 065-06S, 103-06S, 113-02W, 181-06W, 188-07W and 194-07W. One of the others was a new dolphin, and was given a new ID name; the other seven had no nicks or major markings, so they were very difficult to match and some of these are present among the "right" or "left" categories of the Cardigan Bay catalogue.

12/2/2008

Forty to sixty individuals were sighted in separate sub-groups three miles north-east of Moelfre between 11:08 and 12:14 hrs. The groups contained at least 10 juveniles and 1 calf. The dolphins were mainly travelling, both slowly and fast, in a generally east-north-easterly direction, but also exhibited some aerial behaviours such as breaches, along with some bow-riding.

A total of 73 dolphins were photographically identified during this encounter, but with some recognizable only from right or left sides, the estimate for the sightings is of 55 animals. 41 (56%) of the identified ones were found to be a match with the Cardigan Bay catalogue; their ID numbers are 004-90W, 013-01S, 016-01W, 017-03W, 019-02S, 023-02W, 027-06S, 028-05W, 032-03R, 036-06W, 039-07L, 042-07L, 058-04W, 060-03L, 061-06S, 062-06S, 070-06W, 074-03S, 078-06W, 085-03W, 092-05R, 096-06L, 098-06W, 101-05W, 103-06S, 104-06L, 158-05W, 159-05W, 161-06W, 163-05S, 165-06S, 166-05S, 167-06S, 169-06S, 171-06S, 174-05W, 181-06W, 182-06S, 189-07S, 192-07S and 200-07S. Five of the others were new dolphins, and were given new ID names; the other 27 had no nicks or major markings (some being calves), so they were difficult to match and some of them may have been present among the "right" or "left" categories of the Cardigan Bay catalogue.

28/2/2008

Around ten dolphins were sighted in separate sub-groups in Dulas Bay between 14:07 and 15:30 hrs. The group contained only adult individuals. At the beginning of the sighting, the dolphins were travelling at a normal speed, but then became more active, performing some leaps. Towards the end of the sighting a rare event was recorded: four dolphins (all thought to be male) converged on a small area and were seen to toss a porpoise into the air, and then literally jump on it repeatedly. This forced it to stay underwater for an extended period, as well as to cause multiple rib fractures particularly to the right wall as well as extensive haemorrhaging, as revealed from the subsequent post mortem (report no. XT/191/08) conducted by the Institute of Zoology.

A total of eight dolphins were photographically identified during this encounter. All of them were found to be a match with the Cardigan Bay catalogue; their ID numbers are 016-01W, 029-02W, 070-06W, 085-03W, 101-05W, 105-03W, 142-01W and 200-07W. All the dolphins belonged to the

category “well-marked”, and the dolphin most involved in the killing of the harbour porpoise was 085-03W.

2. Land based surveys

A total number of 72 sightings of bottlenose dolphins were recorded from November 2001 to December 2007 from the land sites, with the details given in Table 2.

Table 2. Sightings of bottlenose dolphins from land. Details given are date, name of the site, start time of the sighting, group size, group composition (number of adults, juvenile and calves) and behaviours displayed (from D. Powell)

Date	*Site*	*Time*	*Group size*	*Adult #*	*Juvenile #*	*Calves #*	*Behaviour*
26/11/2001	Fresh Water Bay	---	14	14	0	0	traveling
29/12/2001	Fresh Water Bay	---	2	2	0	0	traveling
27/01/2002	Fresh Water Bay	---	6	6	0	0	feeding
19/04/2002	Fresh Water Bay	17:05	4	4	0	0	traveling
07/07/2002	Fresh Water Bay	15:35	8	7	1	0	traveling
27/10/2002	Fresh Water Bay	08:45	12	12	0	0	traveling
09/11/2002	Fresh Water Bay	08:15	15	15	0	0	traveling
25/11/2002	Fresh Water Bay	15:40	17	17	0	0	feeding
04/12/2002	Fresh Water Bay	15:15	11	11	0	0	bowriding
18/12/2002	Fresh Water Bay	09:00	38	34	0	4	traveling
12/01/2003	Fresh Water Bay	08:15	34	33	0	1	traveling
13/01/2003	Fresh Water Bay	08:30	26	26	0	0	traveling
16/01/2003	Fresh Water Bay	09:00	50	45	0	5	traveling
14/03/2003	Fresh Water Bay	08:15	58	58	0	0	traveling
02/11/2003	Fresh Water Bay	15:45	10	7	3	0	feeding
01/12/2003	Fresh Water Bay	08:15	7	5	0	2	feeding
14/12/2003	Fresh Water Bay	07:50	12	8	0	4	traveling
25/01/2004	Fresh Water Bay	09:00	36	36	0	0	traveling
02/02/2004	Fresh Water Bay	09:00	12	12	0	0	traveling
07/02/2004	Fresh Water Bay	08:00	1	1	0	0	traveling
08/04/2004	Fresh Water Bay	07:50	18	14	0	4	traveling
01/08/2004	Fresh Water Bay	17:00	1	1	0	0	traveling
25/10/2004	Fresh Water Bay	16:30	5	5	0	0	traveling
26/10/2004	Fresh Water Bay	16:30	8	7	0	1	feeding
03/11/2004	Fresh Water Bay	07:40	24	21	0	3	traveling
20/11/2004	Fresh Water Bay	10:00	23	21	0	2	traveling
22/11/2004	Fresh Water Bay	07:30	17	15	0	2	---
26/01/2005	Fresh Water Bay	14:10	31	29	0	2	---
29/01/2005	Fresh Water Bay	08:00	21	19	0	2	feeding
31/01/2005	Fresh Water Bay	09:00	27	25	0	2	traveling
13/04/2005	Fresh Water Bay	09:30	1	1	0	0	milling
16/04/2005	South Stack	07:00	34	34	0	0	traveling
21/04/2005	Rhoscolyn Head	10:30	10	10	0	0	traveling
04/06/2005	Fresh Water Bay	07:30	2	2	0	0	traveling
05/07/2005	Fresh Water Bay	14:45	1	1	0	0	traveling
08/07/2005	Carmel Head	18:15	2	2	0	0	traveling
16/07/2005	Fresh Water Bay	06:45	11	9	0	2	traveling
26/07/2005	Fresh Water Bay	07:30	2	2	0	0	traveling
23/09/2005	Fresh Water Bay	06:45	3	3	0	0	traveling
18/11/2005	Penmon	07:30	6	5	0	1	milling
19/11/2005	Penmon	07:45	6	5	0	1	milling
20/11/2005	Penmon	09:00	6	5	0	1	milling
23/11/2005	Fresh Water Bay	09:00	14	12	0	2	traveling

30/11/2005	Llan Carw	09:30	5	4	0	1	traveling
18/12/2005	Fresh Water Bay	09:30	64	64	>7	0	traveling
20/12/2005	Fresh Water Bay	09:30	50	50	>5	0	traveling
24/12/2005	Fresh Water Bay	09:00	62	58	4	0	traveling
21/01/2006	Fresh Water Bay	08:30	5	5	0	0	---
18/02/2006	Lligwy	09:30	2	2	0	0	traveling
27/02/2006	The Range, at South Stack	08:00	18	18	0	0	traveling
29/04/2006	Llam Carw	17:00	15	12	1	2	feeding
05/08/2006	Carmel Head	08:45	6	6	0	0	traveling
12/08/2006	Bull Bay	16:00	5	5	0	0	traveling
04/10/2006	Fresh Water Bay	06:45	2	2	0	0	traveling
12/11/2006	Carmel Head	07:30	30	30	0	0	traveling
23/11/2006	Moelfre	08:00	22	20	0	2	traveling
26/11/2006	Fresh Water Bay	12:30	15	14	0	1	feeding
08/12/2006	Fresh Water Bay	08:00	32	32	0	0	traveling
09/12/2006	Fresh Water Bay	08:00	2	2	0	0	traveling
12/01/2007	Bull Bay	08:30	7	6	0	1	traveling
20/02/2007	Bull Bay	16:30	8	8	0	0	traveling
01/03/2007	Cemlyn	16:30	7	5	0	2	traveling
08/04/2007	Fresh Water Bay	11:00	25	21	1	3	bowriding
13/04/2007	Fresh Water Bay	07:15	60	60	?	?	traveling
19/07/2007	Fresh Water Bay	07:00	7	5	1	1	traveling
05/08/2007	Moelfre	11:30	12	12	0	0	milling
10/08/2007	Amlwch + Cemlyn	13:00	18	15	3	0	feeding
21/09/2007	Fresh Water Bay	16:00	12	12	0	0	traveling
12/11/2007	Red Wharf Bay	14:15	86	73	13	0	feeding
13/11/2007	Fresh Water Bay	07:45	10	10	0	0	traveling
18/11/2007	Fresh Water Bay	08:45	3	3	0	0	feeding
01/12/2007	Fresh Water Bay	09:00	60	51	9	0	feeding

Sightings were more frequent in the area during the winter months of November, December and January (Figure 3), which is exactly the opposite trend to that recorded in Cardigan Bay, where sightings frequencies are higher from April to October (Ugarte & Evans, 2006). However, these data have not yet been corrected for effort, and so at this stage trends should be considered as preliminary.

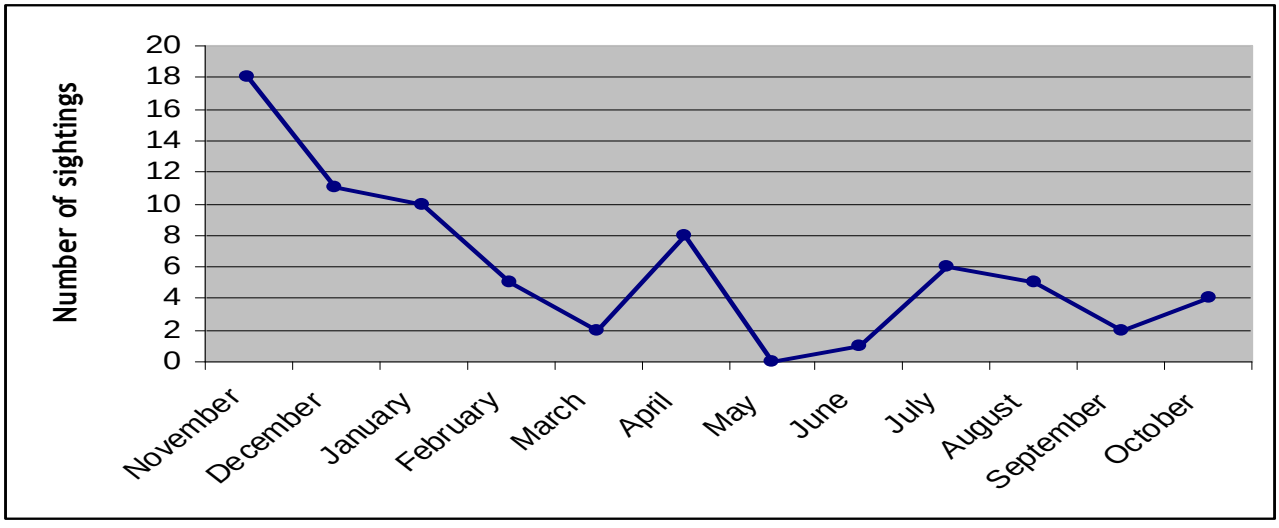


Figure 3. Number of sightings from the land sites for each month of the study period

The mean group size was 18.0 individuals (range 1-86, SD=18.46), three times larger than the mean of 5.85 individuals (1-42, SD=5.85) reported for Cardigan Bay (Lott, 2004). There was also a seasonal trend, with larger groups seen particularly in December and March (Fig. 4).

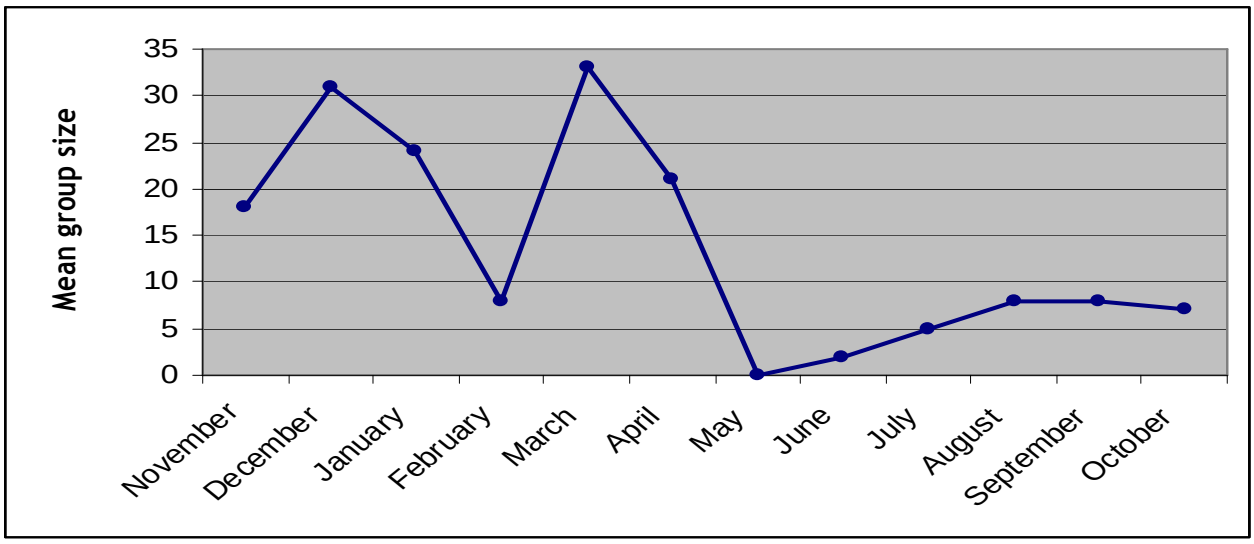


Figure 4. Mean group size for each month of the study period.

3. Individual dolphins

A total of 64 marked and 11 non-marked dolphins (4 photographed from the right side, and 7 from the left one) identified during the study period were found to be a match with the Cardigan Bay catalogue; a further 9 dolphins were new ones and were therefore given new identification names and included in the catalogue, so that we can check whether these dolphins will be seen in Cardigan Bay in the future. To differentiate them from the Cardigan Bay dolphins, the letter A (= Anglesey) was added to the standard Cardigan Bay identification name.

Details for all the marked dolphins identified are given in the following pages; for each dolphin. there are four possible categories: adult, juvenile, calf and newborn.

MARKING CATEGORY. Eg: ***well-marked***

The SWF catalogue divides the dolphins into marked (those that have nicks or marks on their dorsal fin and can be identified from both sides) and non-marked ones. The marked dolphins are then divided into well-marked (those with big nicks or marks that can be identified even from distant or out of focus pictures) and slightly-marked (with small nicks). Finally, the non-marked dolphins are divided into right or left dolphins, depending on which side the pictures were taken from.

SWF CATALOGUE NAME. Eg: ***003-01W***

This is the identification name of the Sea Watch Foundation (SWF) catalogue from Cardigan Bay.

NICKNAME. Eg: ***Checkmate***

The nickname of the dolphins in the SWF catalogue. Not all dolphins have a nickname.

AGE CATEGORY. Eg: ***adult***

The age category of the dolphins determined from its length, coloration and behaviour. Four are the possible categories: adult, juvenile, calf and newborn.

GENDER. Eg: ***female***
The gender of the dolphin, if known. Only rarely, are the dolphins sexed from pictures of the genital area; most of the females are recognized because they are seen closely associated with calves, whilst some males are inferred from the level of scarring of the dorsal fin.

RELATIONSHIPS. Eg: ***mother of 015-01W***
This field reports any relationship known between the dolphin and any other in the catalogue.

FIRST TIME SEEN. Eg: ***23/08/2001***
The date (day, month, year) when the animal was sighted for the first time.

NUMBER OF TIMES SEEN: ***27***
The number of times that the dolphins was confirmed seen between 2001 and 2008, which is the time frame of the Cardigan Bay SWF catalogue.


SWF CATALOGUE NAME: ***003-01W*** NICKNAME: ***Checkmate***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***female*** RELATIONSHIPS: ***mother of unidentified***
FIRST TIME SEEN: ***23/08/2001*** NUMBER OF TIMES SEEN: ***27***


SWF CATALOGUE NAME: ***004-90W*** NICKNAME: ***Chris***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***female*** RELATIONSHIPS: ***mother of unidentified***
FIRST TIME SEEN: ***26/08/1990*** NUMBER OF TIMES SEEN: ***25***


SWF CATALOGUE NAME: ***011-01S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: unknown RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***22/06/2001*** NUMBER OF TIMES SEEN: ***26***


SWF CATALOGUE NAME: ***013-01S*** NICKNAME: ***Colin***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: unknown RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***23/09/2001*** NUMBER OF TIMES SEEN: ***32***


SWF CATALOGUE NAME: ***015-01W*** NICKNAME: ***Whisper***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***12/06/2001*** NUMBER OF TIMES SEEN: ***26***


SWF CATALOGUE NAME: ***016-01W*** NICKNAME: ***Myfanwy***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***female*** RELATIONSHIPS: ***mother of unidentified***
FIRST TIME SEEN: ***21/09/2001*** NUMBER OF TIMES SEEN: ***28***


SWF CATALOGUE NAME: ***017-03W*** NICKNAME: ***Smoothy***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***female*** RELATIONSHIPS: ***mother of 014-03R***
FIRST TIME SEEN: ***30/05/2003*** NUMBER OF TIMES SEEN: ***48***


SWF CATALOGUE NAME: ***019-02S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***female*** RELATIONSHIPS: ***mother of 103-06L+094-06R***
FIRST TIME SEEN: ***01/09/2002*** NUMBER OF TIMES SEEN: ***16***


SWF CATALOGUE NAME: ***023-02W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: 0***1/09/2002*** NUMBER OF TIMES SEEN: ***7***


SWF CATALOGUE NAME: ***024-05S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***18/10/2005*** NUMBER OF TIMES SEEN: ***10***


SWF CATALOGUE NAME: ***025-01W*** NICKNAME: ***Haf***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***female*** RELATIONSHIPS: ***mother of 056-03R=058-03L***
FIRST TIME SEEN: ***2001*** NUMBER OF TIMES SEEN: ***26***


SWF CATALOGUE NAME: ***026A-07S*** NICKNAME: none
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***10/08/2007*** NUMBER OF TIMES SEEN: ***1***


SWF CATALOGUE NAME: ***027-06S*** NICKNAME: none
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: 0***5/06/2006*** NUMBER OF TIMES SEEN: ***6***


SWF CATALOGUE NAME: ***028-05W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***21/04/2005*** NUMBER OF TIMES SEEN: ***6***


SWF CATALOGUE NAME: ***029-02W*** NICKNAME: ***Strata***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***male*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***24/08/2002*** NUMBER OF TIMES SEEN: ***14***


SWF CATALOGUE NAME: ***032-90S*** NICKNAME: ***White-tip***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***female*** RELATIONSHIPS: ***mother of unidentified***
FIRST TIME SEEN: ***1990*** NUMBER OF TIMES SEEN: ***6***


SWF CATALOGUE NAME: ***036-06W*** NICKNAME: ***Comb***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: 0***8/06/2006*** NUMBER OF TIMES SEEN: ***4***


SWF CATALOGUE NAME: ***040-03W*** NICKNAME: ***Gyzmo***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***male*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***15/06/2003*** NUMBER OF TIMES SEEN: ***16***


SWF CATALOGUE NAME: ***049-89S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***1989*** NUMBER OF TIMES SEEN: ***21***


SWF CATALOGUE NAME: ***050-01S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***29/08/2001*** NUMBER OF TIMES SEEN: ***3***


SWF CATALOGUE NAME: ***052-02W*** NICKNAME: ***Cog***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***female*** RELATIONSHIPS: ***mother of 019-03L***
FIRST TIME SEEN: ***21/08/2002*** NUMBER OF TIMES SEEN: ***16***

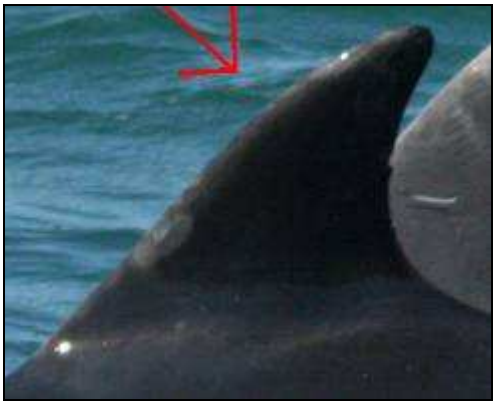

SWF CATALOGUE NAME: ***056-01W*** NICKNAME: ***Mitsos***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***male*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***15/08/2001*** NUMBER OF TIMES SEEN: ***13***


SWF CATALOGUE NAME: ***058-04W*** NICKNAME: ***Titania***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***11/10/2004*** NUMBER OF TIMES SEEN: ***3***


SWF CATALOGUE NAME: ***059-03S*** NICKNAME: ***Grill***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***male*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***14/05/2003*** NUMBER OF TIMES SEEN: ***26***


SWF CATALOGUE NAME: ***061-06S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***10/09/2006*** NUMBER OF TIMES SEEN: ***3***


SWF CATALOGUE NAME: ***062-06S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***16/06/2006*** NUMBER OF TIMES SEEN: ***8***




SWF CATALOGUE NAME: ***065-06S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***16/09/2006*** NUMBER OF TIMES SEEN: ***5***


SWF CATALOGUE NAME: ***070-06W*** NICKNAME: ***Ghost***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***25/09/2006*** NUMBER OF TIMES SEEN: ***12***


SWF CATALOGUE NAME: ***074-03S*** NICKNAME: ***Bond***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***male*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***09/06/2003*** NUMBER OF TIMES SEEN: ***27***


SWF CATALOGUE NAME: ***078-06W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***26/09/2006*** NUMBER OF TIMES SEEN: ***6***


SWF CATALOGUE NAME: ***082-01W*** NICKNAME: ***Fish hook***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: possible fe***male*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***25/08/2001*** NUMBER OF TIMES SEEN: ***21***


SWF CATALOGUE NAME: ***085-03W*** NICKNAME: ***Dusky***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***male*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***15/07/2003*** NUMBER OF TIMES SEEN: ***12***


SWF CATALOGUE NAME: ***098-06W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***20/05/2006*** NUMBER OF TIMES SEEN: ***4***


SWF CATALOGUE NAME: ***101-05W*** NICKNAME: ***Dalmatian***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***05/05/2005*** NUMBER OF TIMES SEEN: ***12***

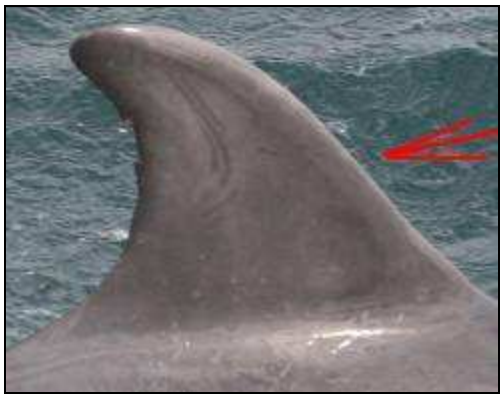

SWF CATALOGUE NAME: ***103-06S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***29/10/2006*** NUMBER OF TIMES SEEN: ***5***


SWF CATALOGUE NAME: ***104-05S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***08/08/2005*** NUMBER OF TIMES SEEN: ***6***


SWF CATALOGUE NAME: ***105-03W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***20/10/2003*** NUMBER OF TIMES SEEN: ***4***


SWF CATALOGUE NAME: ***107-03S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***12/07/2003*** NUMBER OF TIMES SEEN: ***12***


SWF CATALOGUE NAME: ***110-01W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***16/07/2001*** NUMBER OF TIMES SEEN: ***14***

SWF CATALOGUE NAME: ***113-02W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***possible female*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***24/08/2002*** NUMBER OF TIMES SEEN: ***17***


SWF CATALOGUE NAME: ***115-01W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***possible male*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***23/09/2001*** NUMBER OF TIMES SEEN: ***22***


SWF CATALOGUE NAME: ***118-02W*** NICKNAME: ***Snowflake***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***18/09/2002*** NUMBER OF TIMES SEEN: ***8***


SWF CATALOGUE NAME: ***125A-07W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***10/08/2007*** NUMBER OF TIMES SEEN: ***1***


SWF CATALOGUE NAME: ***128-02S*** NICKNAME: ***Nose***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***26/08/2002*** NUMBER OF TIMES SEEN: ***16***


SWF CATALOGUE NAME: ***129-03W*** NICKNAME: ***Noughts and crosses***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***possible female*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***02/09/2003*** NUMBER OF TIMES SEEN: ***14***


SWF CATALOGUE NAME: ***142-01W*** NICKNAME: ***Spike***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***09/07/2001*** NUMBER OF TIMES SEEN: ***16***


SWF CATALOGUE NAME: ***150A-07S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***10/08/2007*** NUMBER OF TIMES SEEN: ***1***


SWF CATALOGUE NAME: ***152-05W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***08/08/2005*** NUMBER OF TIMES SEEN: ***8***


SWF CATALOGUE NAME: ***158-05W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***31/07/2005*** NUMBER OF TIMES SEEN: ***4***


SWF CATALOGUE NAME: ***159-05W*** NICKNAME: ***Ticklefish***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***22/07/2005*** NUMBER OF TIMES SEEN: ***9***


SWF CATALOGUE NAME: ***161-06W*** NICKNAME: ***Ratchet***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***possible female*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***14/04/2006*** NUMBER OF TIMES SEEN: ***5***


SWF CATALOGUE NAME: ***163-05S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***21/04/2005*** NUMBER OF TIMES SEEN: ***4***


SWF CATALOGUE NAME: ***165-06S*** NICKNAME: ***Fourknocks***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***21/04/2006*** NUMBER OF TIMES SEEN: ***7***


SWF CATALOGUE NAME: ***166-05S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***05/05/2006*** NUMBER OF TIMES SEEN: ***6***


SWF CATALOGUE NAME: ***167-06S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***21/04/2006*** NUMBER OF TIMES SEEN: ***4***


SWF CATALOGUE NAME: ***169-06S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***07/05/2006*** NUMBER OF TIMES SEEN: ***2***


SWF CATALOGUE NAME: ***171-06S*** NICKNAME: ***none***
AGE CATEGORY: ***juvenile*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***01/06/2006*** NUMBER OF TIMES SEEN: ***6***


SWF CATALOGUE NAME: ***174-05W*** NICKNAME: ***Bites***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***05/05/2005*** NUMBER OF TIMES SEEN: ***6***

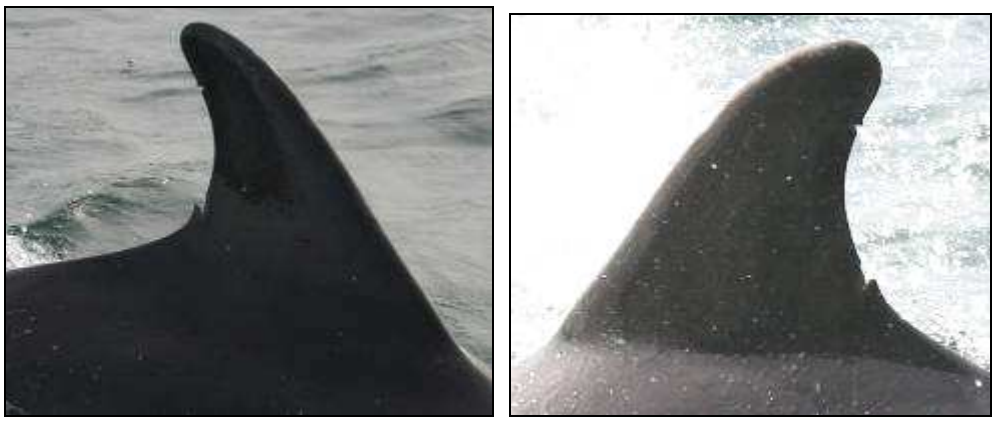

SWF CATALOGUE NAME: ***181-06W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***05/06/2006*** NUMBER OF TIMES SEEN: ***11***


SWF CATALOGUE NAME: ***182-06S*** NICKNAME: ***none***
AGE CATEGORY: ***juvenile*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***05/06/2006*** NUMBER OF TIMES SEEN: ***6***

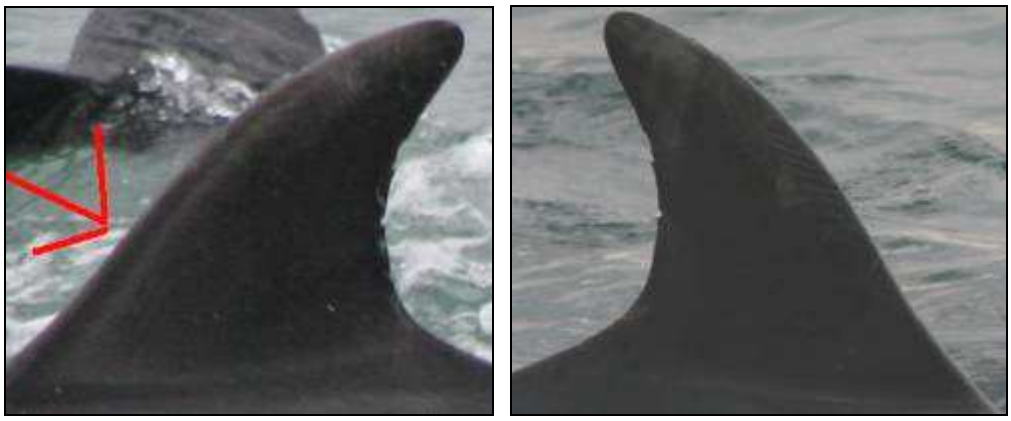

SWF CATALOGUE NAME: ***187A-07S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***10/08/2007*** NUMBER OF TIMES SEEN: ***1***


SWF CATALOGUE NAME: ***188-07W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***19/04/2007*** NUMBER OF TIMES SEEN: ***6***

SWF CATALOGUE NAME: ***189-07S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***01/08/2007*** NUMBER OF TIMES SEEN: ***2***



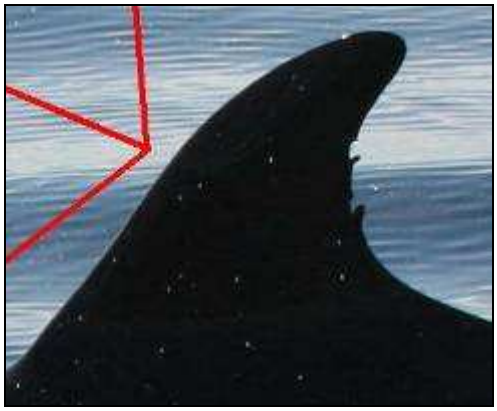
SWF CATALOGUE NAME: ***191-07W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***possible female*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***23/05/2007*** NUMBER OF TIMES SEEN: ***3***



SWF CATALOGUE NAME: ***192-07S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***01/06/2007*** NUMBER OF TIMES SEEN: ***5***


SWF CATALOGUE NAME: ***194-07W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***10/06/2007*** NUMBER OF TIMES SEEN: ***4***


SWF CATALOGUE NAME: ***199-07S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***05/09/2007*** NUMBER OF TIMES SEEN: ***2***




SWF CATALOGUE NAME: ***200-07W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***06/09/2007*** NUMBER OF TIMES SEEN: ***3***


SWF CATALOGUE NAME: ***201A-07W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***10/08/2007*** NUMBER OF TIMES SEEN: ***1***


SWF CATALOGUE NAME: ***202A-07S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***10/08/2007*** NUMBER OF TIMES SEEN: ***1***


SWF CATALOGUE NAME: ***203A-07S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***12/11/2007*** NUMBER OF TIMES SEEN: ***1***

SWF CATALOGUE NAME: ***204A-08S*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***slightly-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***12/02/2008*** NUMBER OF TIMES SEEN: ***1***

SWF CATALOGUE NAME: ***205A-08W*** NICKNAME: ***none***
AGE CATEGORY: ***adult*** MARKING CATEGORY: ***well-marked***
GENDER: ***unknown*** RELATIONSHIPS: ***none known***
FIRST TIME SEEN: ***12/02/2008*** NUMBER OF TIMES SEEN: ***1***

Conclusions and Recommendations

A relatively small number of opportunistic surveys between August 2007 and March 2008 has yielded 64 marked (i.e. well-marked, and identifiable from either side due to nicks in their fin) and 11 non-marked (i.e. poorly marked with pigmentation patches or scars on one side or the other) dolphins (4 photographed from the right side, and 7 from the left one) that were found to be a match with animals identified within the Cardigan Bay catalogue. A further nine marked dolphins were new ones identified for the first time.

This high proportion (91%) of dolphins identified as occurring in Cardigan Bay, mostly photographed during the winter months of November to March, clearly shows that the bottlenose dolphin population that we know inhabits the two Special Areas of Conservation in Cardigan Bay, particularly in summer, ranges far outside these protected areas, particularly in winter. Their presence in waters east of Anglesey towards Liverpool Bay has very important conservation management implications. Along the coasts of North-east Wales there is intensive recreational activity - water sports of various kinds. Pile driving activities have been conducted in the construction of neighbouring North Hoyle Wind Farm, and whereas in the past it was thought that harbour porpoises were likely to be the only cetacean species potentially impacted to any great extent, this conclusion clearly now needs revision. And, finally, Liverpool Bay has long been the most heavily polluted inshore sea area in the UK, due to the heavy chemical based industry in the area. Many marine organisms have been shown to have elevated levels of persistent hydrocarbons such as PCBs as well as heavy metals such as mercury, all of which are known to have a detrimental effect on marine mammals (Morris *et al*., 1989; Law *et al*., 1991, 1995). These recent findings help to explain the unusually high levels of contaminants obtained from bottlenose dolphins in Cardigan Bay. Indeed, a dead baby bottlenose dolphin from Aberaeron in Cardigan Bay, found in 1988, had one of the highest levels of PCBs (290 ppm), dieldrin (74 ppm) and DDT (150 ppm) ever recorded in the blubber of a small cetacean (Morris *et al.*, 1989). A four year old was tested in 1989 and a 23 year old in 1991, both of which carried similar high loads of PCBs and DDT (Law *et al.*, 1995).

Our photo-ID studies in Cardigan Bay indicate that although a significant portion of the population occurs every summer in the area, there is also substantial turnover with new individuals entering the population each year, and others leaving it. At present, we remain unclear of the full extent of the local bottlenose dolphin population, how much their movements are seasonal, and how far individual animals may range. In order to better answer these questions, it is important that opportunistic photo-ID surveys are conducted not just in winter but at other times of the year, and that they cover as wide an area as possible. It may well be that individuals from the Cardigan Bay population spend part of their lives in the northern Irish Sea. In order to ascertain this, surveys should take place in those areas.

The bottlenose dolphin is placed within Annex 2 of the EU's Species & Habitats Directive (1992), giving it special protection through the establishment of a network of protected areas referred to as Natura 2000. If such protection is to be at all effective, it is necessary to determine home ranges for individual dolphins, the population structure and the extent of movements between areas.

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This project would not have been possible also without the network of fishermen and other observers who reported sightings of bottlenose dolphins in the study area. We are therefore extremely grateful to all of them, and in particular to Jon Shaw for his range of contacts and for skippering the boat that was chartered for these surveys. We also thank Scott Waterman and Dylan Evans for one of the boat charters.

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