Population Structure, Mobility and Conservation of Bottlenose Dolphins in South West England from Photo-identification studies 2007 - 2013

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Project details

This report was commissioned by Natural England to get a better understanding of the inshore common bottlenose dolphins *Tursiops truncatus* in the southwest of England. The work was undertaken under Natural England contract by Marinelife and facilitated analysis of a photo-identification database, previously collated by Marinelife through a partnership project to better understand movements, population structure and abundance of common bottlenose dolphin *Tursiops truncatus* in south west England and surrounding waters, in order to inform conservation efforts of this Priority Species. The photos were chiefly collated from dedicated Marinelife surveys, and eco-tourist operators in the southwest but also from the public, where images were suitable to be included in the catalogue.

The outputs of the study are considered by Natural England to represent the most up to date understanding of the distribution of common bottlenose dolphins off the south west of England. However it remains clear there are still significant gaps in our evidence and understanding of the patterns in behaviour of this species, particularly around differences in movement between offshore and inshore populations.

Acknowledgements

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Summary

A catalogue of 485 photographic sightings of 113 individuals was compiled from ~150 common bottlenose dolphin encounters made on 87 dates between March 2007 and January 2014. From these and other data, three likely sub-populations were identified in the western English Channel, demarcated by bathymetry and distance to land: (1) south west England - inshore Cornwall to Devon, (2) offshore English/French waters and (3) inshore France from Brittany to Normandy. Maximum abundance estimates for south-west England coastal waters, using two methods, ranged between 83 and 113 (range 87-142 95% CL) over the period 2008-2013, likely qualifying the region as nationally important over the period, whilst the yearly maximum was 58 in 2013. The abundance estimates were far higher than those described in published studies from the 1990s and mid-2000s, indicating that either past studies have underestimated abundance or the population has increased. The population was centred on Cornwall, where, 19 well-marked animals were considered to be probably resident. There were no resident well marked individuals found to be restricted to either Devon or Dorset, with animals moving freely between different groups within coastal areas across the three counties, including over short time scales (within a week). Movements were also detected within offshore English waters and French waters (from other studies) of the western English Channel, but no interchange has as yet been detected between the three regions, highlighting the likely separation of the populations. Given the likely separation of populations, animals in the south west England waters, should be considered for a separate management unit.

Keywords: photo-identification, bottlenose dolphin, *Tursiops truncatus*, priority species, conservation, mobile species

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1 Introduction

Bottlenose dolphins are protected under UK and EU law, principally under Schedule 5 of the Wildlife and Countryside Act 1981, and the 1992 EU Habitats and Species Directive (92/43/EEC).There is a requirement under the EU Habitats Directive, to monitor favourable conservation status at a UK scale at six yearly intervals, and to designate Special Areas of Conservation (SACs) that will make a significant contribution to conserving the species where the EU criteria to identify SACs are met. In England, common bottlenose dolphin *Tursiops truncatus* is identified as a priority species for conservation action under Section 41 (S41) of the 2006 Natural Environment and Rural Communities (NERC) Act and in the UK Post-2010 Biodiversity Framework (DEFRA 2011)[1]. In England, a medium priority research action is to conduct research to better understand current status, recent and historic decline, current trends, abundance, movements/migration patterns, and causes of change and to identify means of population recovery.

In order to assess progress in conserving common bottlenose dolphins, there is a need for up to date information on distribution and abundance. The abundance of common bottlenose dolphin in UK waters has been estimated at 12,758 (CV=0.26) animals from the SCANS-II (Hammond et al. 2013) and CODA (H. P. Hammond et al. 2009) surveys in July 2005 and 2007 (Figure 1). The majority of the population is considered to have an offshore distribution, with coastal populations much smaller in size and centred on two areas, comprising ~300 animals in the Irish Sea (Evans 2012) and 200-300 animals in Scottish coastal waters (Cheney et al 2013). The coastal population estimates have been derived from detailed photo-identification studies. There are not considered to be any consistent regions of high density in the coastal waters of England (JNCC 2013) whilst the last published photo-identification catalogue covering English waters stems back to the early-mid 1990s and is somewhat out of date (Liret et al 1998).

Common bottlenose dolphins are regularly recorded off south west England, but the population is considered to have declined in recent decades, with a reported group of 30-40 animals present in the early 1990s (Wood 1998) considered to have dwindled to fewer than a dozen or so by the late 2000s (Jepson et al 2008). Similarly, Pikesley et al. (2011), detected a decline in sightings rates and mean groups sizes based on an analysis of Cornish casual sightings data, with a reduction of pod numbers to between 5 and 10 since 1996. However there has not been regular survey effort over the period.

The majority of data used in the assessment of common bottlenose dolphin regional status was collected from casual sightings made on land, raising concerns over data representativity. Since the mid-2000s, there has been a large increase in cetacean sightings data from at-sea sources, including from (1) effort-related surveys on commercial ferries and smaller boats by Marinelife and other groups (2) a growing ecotourism industry and (3) increasing efforts to collate casual sightings from skippers by Marinelife and other groups (Brereton et al 2012) (McClellan, et al. 2014). Over this period, there has also been an increase in the capture of photo-identification images of dolphins in the region from dedicated studies made by Marinelife, Marine Discovery, AK Wildlife Cruises and Elemental Tours, whilst the availability of good quality digital images from members of the public, which can be used to contribute to a photo ID catalogue of animals sighted offshore, has also increased.

This study brings together available photo-identification images and data on common bottlenose dolphins since the mid-2000s from these data sources for three main aims:

(1) To describe the population structure and mobility of common bottlenose dolphins off south west England and surrounding waters;
(2) To assess abundance in south west England waters;
(3) To highlight preliminary conservation and management implications of the results.

[1] http://www.defra.gov.uk/publications/2011/08/19/pb13583-biodiversity-strategy-2020/

2 Materials and Methods

2.1 Data sources

Four main photo-identification sources were collated:

I. Photos taken on Marinelife effort-related small boat surveys in the western English Channel 2009-2012 (Brereton et al 2012) (n=41 photo-id sightings)
II. Photos collated from a variety of observers at sea, through Marinelife's casual sightings scheme in south west waters 2007-2014 (Brereton, et al. 2009)(n=87 photo-id sightings)
III. Photos taken on Marine Discovery dolphin watching trips from Penzance, 2007-2013t (n=309 photo-id sightings)
IV. Photos taken on AK Wildlife Cruises dolphin watching trips from Falmouth, 2013-2014 (n=48 photo-id sightings)

2.2 Cataloguing images

Each image was linked to a database containing the survey date, photographer, time and position of the sighting, and group size. Images were graded with a quality rating based on the focus, angle, and size of the fin within the image (Wursig et al 1990). Recognisable individuals were identified according to whether they exhibited permanent (e.g., nicks, notches, damaged fins, or diagnostic fin shape) or temporary (e.g. depigmentation, skin lesions, scars, scratches, tooth rakes) features on their dorsal fins and bodies.

Three categories of markings were identified (following Ingram (2000) and Berrow (2012) :

Severity Grade 1: Marks consisting of significant fin damage or deep scarring that were considered permanent.
Severity Grade 2: Marks consisting of deep tooth rakes and lesions with only minor cuts present.
Severity Grade 3: Marks consisting of superficial rakes and lesions.

Best right and left side Images of individual were compiled into a catalogue that included notes on mark type and similar animals, table of the months and regional locations of photographic captures, map of captures, number of sightings and associations with other animals.

2.3 Mobility and site fidelity

The mobility and site fidelity patterns of individually identified dolphins were determined based on their re-sighting rate and presence across seasons (after (Moller et al . 2002), both within and between regions of the western English Channel. The regions included five English counties out to the 12 nm limit: Cornwall, Devon, Dorset, Hampshire and Sussex; and offshore UK waters (beyond 12nm); the Channel Islands and France. A composite for south west England was also identified (Cornwall, Devon and Dorset combined).

Sighting rates of individual dolphins were allocated into three categories according to re-sighting rate. Dolphins were defined as either:

i. Probable resident if they were sighted >5 times and were present in multiple seasons;
ii. Occasional visitors if dolphins were sighted 2-4 times and were present in multiple seasons;
iii. Transient if dolphins were only observed on one occasion.

2.4 Mapping sightings

Captures events of individual dolphins (sightings and re-sightings) were plotted in a geographic information system (GIS) created in ARC Map 9.3.1.

2.5 Abundance

Two methods were used to estimate abundance. A basic estimate of the minimum number of animals present (method 1) was made based on the assumption from studies elsewhere, that the number of well-marked (Grade 1) animals represents ~60% of the total number of animals present (respectively Peter Evans, Seawatch Foundation; Simon Berrow, Irish Whale and Dolphin Group; and Kevin Richardson, Cetacean Research & Rescue Unit pers. comm.). Thus, the total minimum number of animals occurring in each region was estimated based on a scaling factor of 1.67 for all Grade 1 animals recorded.

For south west England, there was sufficient re-sightings data to estimate absolute abundance (method 2) using the Chapman modification of the Lincoln-Petersen mark-recapture model (Chapman 1951), as has been used in numerous cetacean population studies approach (e.g. by (Currey R.J.C. 2007) (Balmer et al. 2008)). In the model (method 2) the number of animals that are captured (photographed), marked, and released is represented by $\mathbf{n_1}$. On a second capture event, the total number of animals captured is given by $\mathbf{n}_2$, and the number of previously-marked animals is represented by $\mathbf{m_2}$.

$$N_c = \left[\frac{(n_1 + 1)(n_2 + 1)}{(m_2 + 1)} \right] - 1$$

(Where **Nc** is really "**Nc-hat**", the estimated population size versus the true size)

The variance of the Chapman-modified estimate of population size is:

$$\text{var}(\mathbf{N_c}) = \frac{(n_1 + 1)(n_2 + 1)(n_1 - m_2)(n_2 - m_2)}{(m_2 + 1)^2 (m_2 + 2)}$$

The variance can be used to approximate a 95% confidence interval for the population estimate using the following equation:

$$\mathbf{N_c} \pm 1.965 \sqrt{\text{var}(\mathbf{N_c})}$$

Given the high degree of variability in the type and intensity of sampling effort between years and regions, data was pooled across years to construct two time periods and to derive an estimate of abundance for all years combined. These were 2008-2010 (n=34 individuals sighted) and 2011-2013 (n=61). We considered survey work conducted 2008-2010 as the first three-year capture period, and the survey work 2011-2013 as the second three-year capture period.

The abundance estimate and confidence intervals were corrected by the mark rate (averaged across all groups encountered). Note that the model makes a number of assumptions:

1) The population is sampled only twice; once initially to mark a subset and again later to count the number of recaptures.
2) The population must be closed during the sampling period.
3) Each individual in the population has an equal probability of being captured.

4) The mark used to identify the individual does not harm the animal or reduce the likelihood of its being captured again in the second session.

2.6 Matches with other catalogues

Photo-identification catalogues were obtained from:

- Normandy and Brittany,
- France (n= 600 individuals captured between 2004-2011 per Marie Louise, GECC),
- Ireland (n=208 individuals captured between 2007-2012 per Irish Whale and Dolphin Group - IWDG),
- Aberdeenshire, Scotland (n=128 individuals captured 2000-2008 per Caroline Weir)
- Cardigan Bay, Wales (n=412 individuals captured 2005-2011 per Cardigan Bay Marine Wildlife Centre).

2.7 Data representativity

The extent to which the bottlenose dolphin photo-identification sightings data were representative, was evaluated in comparison to more wide ranging surveys and data collation activities (chiefly) off south west England undertaken by Marinelife. This comprised (1) 75 effort related common bottlenose dolphin sightings of 538 animals obtained from the English Channel during 681 dedicated small boat and ferry surveys between 1995 and 2011, totalling 128,000 km of track line and extending over ~80% of the western English Channel at 10km^2 resolution and (2) collation of 213 casual sightings totalling 2536 animals, submitted by skippers and other members of the public from 2004-2012 (Brereton et al 2012).

3 Results

3.1 Sightings and re-sightings rates

Photo-identification images were obtained on 87 dates between March 2007 and January 2014, from ~150 common bottlenose dolphin groups totalling ~1100 individual animals. On average photo-identification images were obtained for 50% of individuals within photographed groups observed/collated by Marinelife covering all waters off south west England and 74% of individuals within photographed by Marine Discovery in Mounts Bay, west Cornwall. From Marinelife data, 71% of individuals photographed were identifiable from photos, where mean group size was 14. On Marine Discovery surveys, 98% of individuals photographed were identifiable from photos; though mean group size was less than five animals in this dataset. Comparable data are not available for AK Wildlife Cruises.

There were 485 photographic sightings of 113 individuals, with 26% of animals (n=32) being re-sighted on one or more occasions (Figure 1). In the waters of south west England, the proportion of animals re-sighted was higher at 37%. Two individuals were recorded on 40 or more occasions.

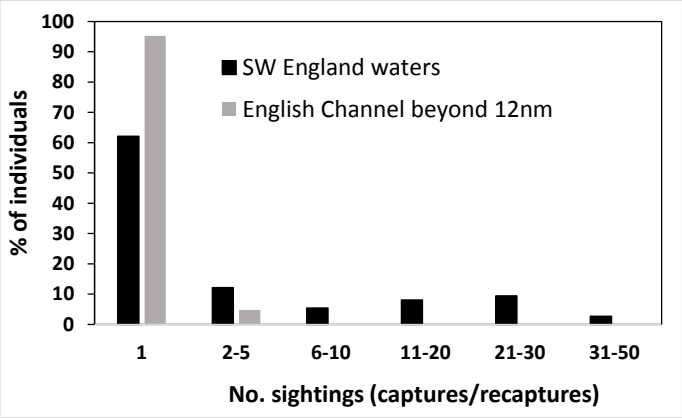

Figure 1: Bar chart showing the range of capture recaptures with > 70% of individuals encountered only once between 2007 and 2014.

New individuals were regularly encountered in south west England waters from 2007 to 2013, with a more rapid increase in 2013, primarily due to a large, new group being recorded off east Cornwall (Figure 2).

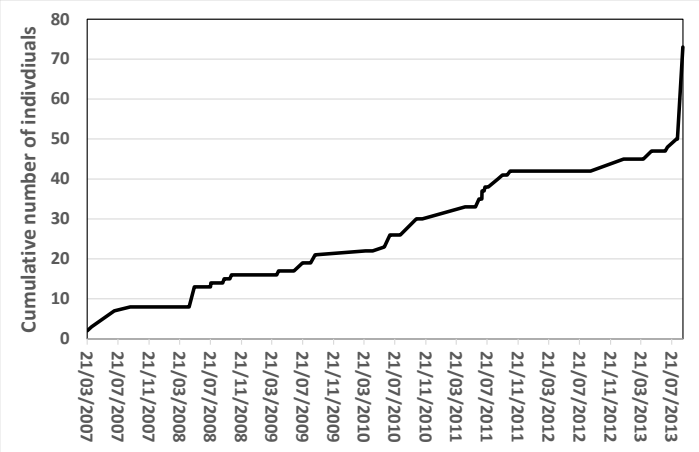

Figure 2: Discovery curves of identified common bottlenose dolphins off south west England between 2007 - 2013.

3.2 Regional distribution

In the English Channel, photo-id images were obtained from inshore waters (within the 12 nm limit) of five south coast of England counties, and adjacent offshore UK waters (beyond the 12nm limit) waters, Channel Islands and French waters (Figure 3).

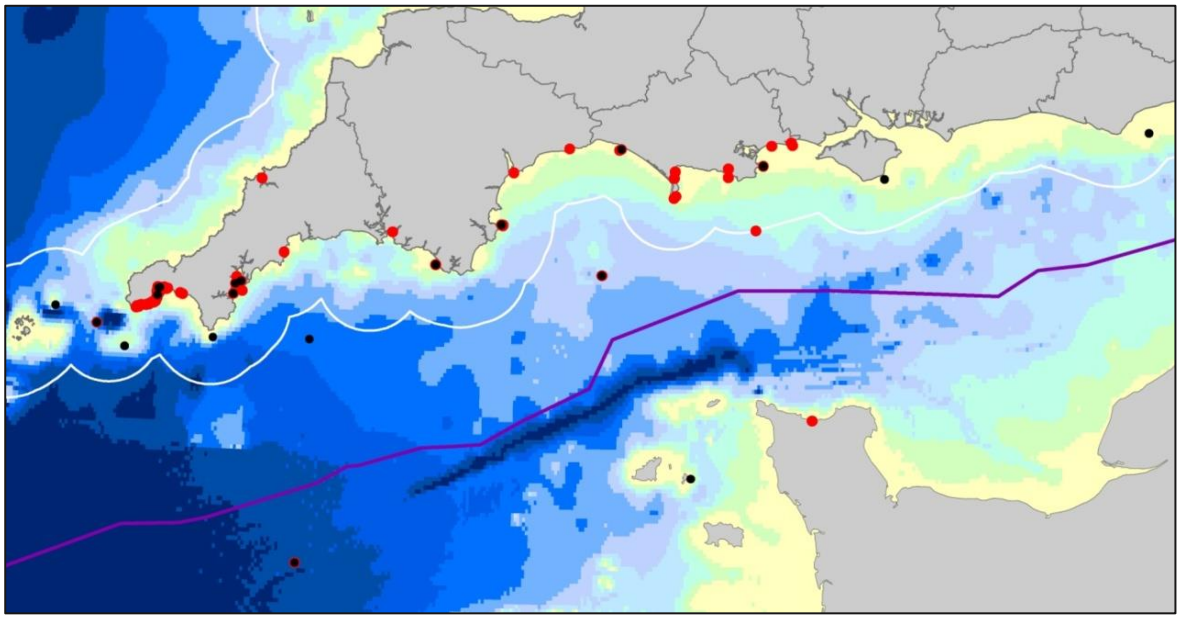

Figure 3: Location map of photo-identified animals.

Red circles represent re-sighted animals; black circles represent animals sighted once only. The white line represents the 12 mile limit and for Cornwall, Devon and Dorset the boundary of south west waters. The dark line represents the southern limit of UK territorial waters in the Channel and is the limit of offshore UK waters. Water depth runs from less than 20m (yellow) through to more than 200m (dark blue shading).

The majority of animals (two-thirds of individuals) were recorded off south west England, especially Cornwall (56% of individuals), which may in part reflect the higher intensity of sampling effort in this area. Devon and Dorset recorded two-thirds fewer individuals than Cornwall. There were 20 individuals identified from three groups encountered in offshore UK waters.

Table 1: Number of individual animals sighted and re-sighted by region.

	Number of individuals re-sighted									
	No. individuals	All regions	Cornwall	Devon	Dorset	Hants	Sussex	Offshore UK	Channel Islands	France
Cornwall	64	28	27	14	13	0	0	0	0	1
Devon	19	15	14	9	11	0	0	0	0	0
Dorset	19	15	13	11	10	0	0	0	0	1
SW England	74	29*								
Hampshire	3	0	0	0	0	0	0	0	0	0
Sussex	1	0	0	0	0	0	0	0	0	0
Offshore UK waters	20	1	0	0	0	0	0	1	0	0
Channel Islands	5	0	0	0	0	0	0	0	0	0
France	12	2	1	0	1	0	0	0	0	0
All areas	113									

Note: * of the SW (south west)

3.3 Regional and county-level site fidelity off south west England

The majority of dolphins encountered (63%) were classed as transient (Table 2), with 21% classed as probable residents and 10% occasional visitors. In Cornwall, there were 19 animals considered to be probably resident, six (32% of the total) of which were only encountered in Cornish waters, including one animal recorded 46 times between March 2007 and August 2013. This data suggests that a small proportion of dolphins encountered in coastal Cornish waters have a highly restricted distribution. The other 13 probable resident animals together with occasional visitors were chiefly seen elsewhere in Devon and Dorset waters. A single movement was detected between French and Cornish waters, but only between deeper waters areas (>50m deep), indicating a mobile offshore population, rather than interchange between offshore and coastal animals.

Movements detected between Devon and Dorset, were chiefly of animals that were also recorded off west Cornwall. There were no probable resident individuals found to be restricted to either Devon or Dorset. There were a number of instances where animals moved back and forth between Devon/Dorset and Cornwall within a single season, with movement to Cornwall made within a week at times.

Movement was detected between France and Dorset, and Devon and France but on both occasions these were of lone sociable dolphins.

Interchange was detected between groups recorded in deeper Offshore UK waters, though no offshore animals were re-sighted in coastal areas. There were no re-sightings of photo-id animals from the Channel Islands, Hampshire and Sussex, though few animals were photographed (Table 2).

Table 2: Site fidelity in south west English waters (n=78 individuals).

	No. residents	**Occasional visitors**	**No. transient**
Cornwall	19 (29%)	6 (9%)	41* (62%)
Devon	1 (5%)	7 35%)	12 (60%)
Dorset	0	9 (45%)	11 (55%)
SW England	20 (27%)	8 (10%)	49* (63%)

*Note that some animals recorded in Falmouth Bay in 2013 and classed as inshore transients based on proximity to land. However, their behaviour suggested they may have been from an offshore pod.

3.4 Associations

Across all years, re-sighted animals were associated with an average of 23 other catalogued animals (range 8-35 animals). There was considerable interchange between groups. Individual dolphins moved regularly between groups of different sizes, this varying between weeks, seasons, years and in some cases within single days. For example, one animal was recorded in 12 different group sizes, ranging from 3-20 animals from 2008-2013 (Figure 4).

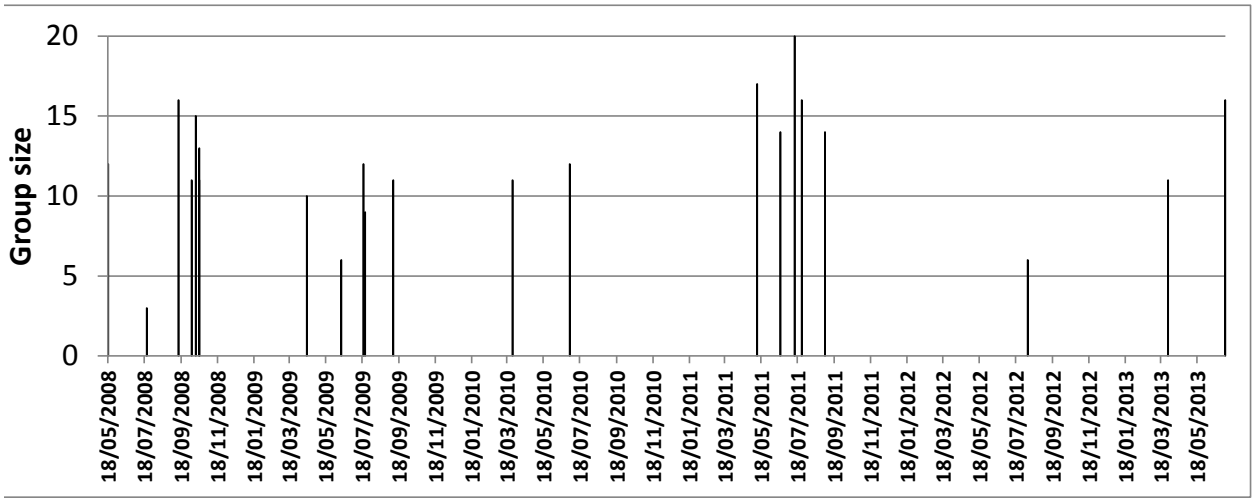

Figure 4: Examples of group sizes one individual common bottlenose dolphin was recorded in 2008 - 2013.

3.5 Abundance

Using method 1, a minimum of ~140 adult/well grown juvenile animals were estimated to have occurred within the sampled areas of the western English Channel between 2007 and 2013, including ~100 in SW England/surrounding UK waters and ~80 animals in Cornish waters (Table 3). Using method 2 (Chapman 1951), abundance for south west England for the period 2008-2013 was estimated at 113 animals (range 87-142 95% CL), compared with an estimate of 82 using method 1.

Table 3: Minimum numbers of animals estimated to have been present in the western Channel 2007 - 2013 using Method 1.

	Estimated no. animals – all years	**Estimated no. animals - peak year**	**Peak year(s)**
Cornwall	78	60	2013
Devon	25	17	2009
Dorset	29	22	2011
SW England	90	60	2013
SW England & offshore UK	102	60	2013
All regions (W. Eng. Channel)	138	65	2009, 2013

3.6 Matches with other catalogues

No matches were found between animals in this catalogue and those for northern France, Ireland, Scotland and Wales. However, given the large body of animals to check over, it is possible that some shared animals may have been overlooked. Extensive work has been undertaken to look for matches between French Channel dolphins (Normandy/NE Brittany) and Wales and Ireland, but no matches have yet been found (Marie Louse pers. comm.). Similarly, a study by (Liret et al 1998) did not detect any movements between Normandy/the Channel Islands and the south coast of England. However, there has been a recapture along the French coast, from a transient group recorded in the Bay of Mont Saint Michel in 2007 and recaptured near La Rochelle in 2012 (Marie Louse pers. comm.)

3.7 Data representativity

Photo-identification images of one or more animals were obtained from 7% of common bottlenose dolphins groups detected on effort related Marinelife surveys (n=75 groups totalling 538 animals, mean group size 7, max 44) and 16% of casual sightings of common bottlenose dolphin groups collated by Marinelife from public sources (n=213 groups totalling 2536 animals, mean group size 12, max ~100) in the western English Channel (data source: (Brereton et al 2012) (Figure 5). The distribution of coastal animals from Marinelife surveys reflected that from photo sightings. However, there were relatively few photo sightings captures from deeper mid-Channel waters where common bottlenose dolphins are regularly recorded (Figure 5) and within the large population of ~400 animals found in east Brittany/Normandy/Channel Islands.

3.8 Sociable animals

Two lone common bottlenose dolphins were recorded, including Georges/Randy recorded off the Devon, Dorset and Normandy coastlines and George II/Nobby/Clett recorded off the Devon coast. Georges is wide-ranging, with records stemming back to 1999 from France (Brittany, Isle of Ushant, Cherbourg, Dieppe, and Calais), Belgium (Zeebrugge) and the Netherlands (Rotterdam), whilst George II has also been recorded in Ireland, the Isle of Man, Scotland and Wales. Other sociable animals have been recorded in the Channel in recent years but are not contained within this catalogue including 'Dave' (a female dolphin) which was regularly recorded off Kent from at least 2007-2011 (Simmonds et al 2008) and a fourth 'flipper' was recorded in several locations off the Dorset coast including Weymouth and Kimmeridge in the early 2000s (Marinelife unpublished data).

The presence of four lone animals is more than expected and it is possible that other lone dolphins may have been overlooked, given that animals seen by the public area often reported as well-known animals, which may not always be the case.

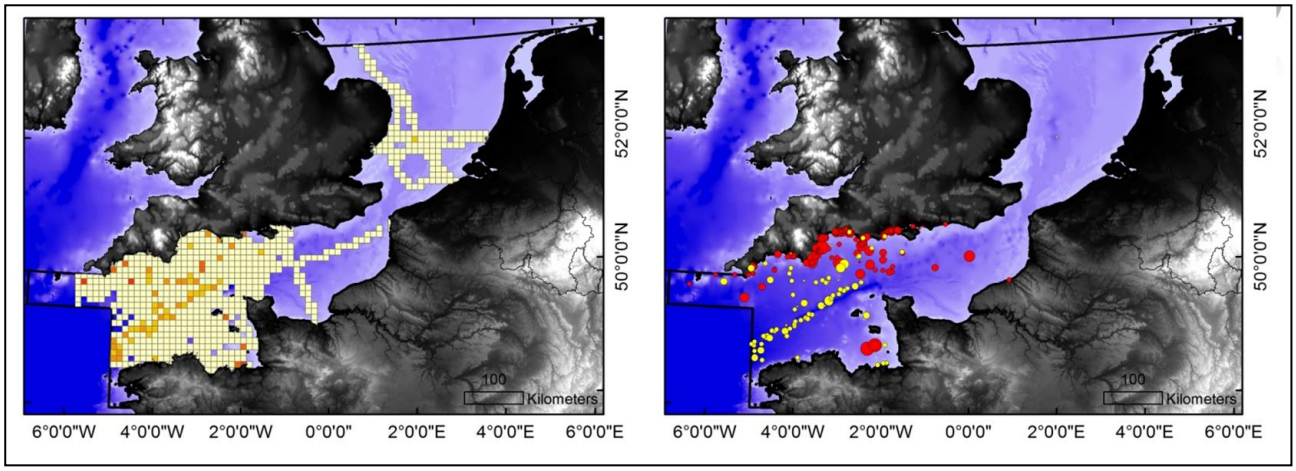

Figure 5: Relative abundance at 10 km2 scale (left side plot) and mapped sightings (right side plot).

Taken from Marinelife surveys and mapped casual sightings submitted to Marinelife (red dots) of bottlenose dolphin in the English Channel, including all non-photographed animals (taken from (Brereton et al 2012). Relative abundance categories in squares are: none seen (white cells), <0.01 counted per km (light orange), 0.01-0.049 per km (orange), 0.05-0.49 (dark orange), 0.5-0.99 per km (light red), >1/km (red). Cetacean sightings categories: 1 (smallest circle), 2 - 9, 10 - 49, 50 - 99, 100 - 999, >1000 (largest circle). Marinelife surveys were undertaken over the period 1995-2012 in all seasons, whilst casual sightings were collated 2004-2012 (Brereton et al 2012).

4 Discussion

4.1 Population structure

The available evidence from this and other studies suggest three separate sub-populations of common bottlenose dolphins in the western English Channel, with no documented interchange and demarcated by bathymetry, with no interchange detected, other than for lone, sociable animals. These are:

1) A large population coastal, shallow waters of E Brittany/ W Normandy/Channel Islands (estimated at 387 in 2010, with ~600 individuals identified through photo-id). This is one of the largest coastal populations in Europe (Louis and GECC pers. comm.).

2) An offshore pelagic population of unknown size and limit that is likely to form part of a much larger population of pelagic shelf waters, covering the Celtic Sea, the Western Approaches and the Bay of Biscay (SCANS II 2008).

3) A small and well mixed population in coastal waters of south west England centred on Cornwall, extending to the inshore waters of Devon and Dorset, estimated at 60 adults/sub-adults in 2013 and ~100 individuals occurring 2007-2013, including 30 probable resident animals. Both estimates for south west England may be biased high. Method 1 assumes, all coastal sightings were classed as inshore transients rather than stray offshore animals, which may not hold true, especially for the large group of new animals recorded in 2014 off east Cornwall, which showed characteristics in size and behaviour of offshore animals. Secondly, method 2 assumes no recruitment or mortality from the population, over the eight year study period.

The detection of separate sub-populations in the western Channel is broadly consistent with the findings of (Louise, et al. 2014) who showed from biopsy analysis that common bottlenose dolphins inhabiting offshore waters in the north east Atlantic form separate population to those occurring inshore, with the coastal south of England apparently supporting a separate population. Similarly photo-ID studies by (Liret et al 1998) found no exchange of animals between Normandy, France and English waters. The existence of separate coastal and offshore populations of bottlenose dolphin has been documented throughout its range (Würsig and Würsig 1977) (Hoelze et al 1998). River estuaries, headlands and sand banks with uneven seabed relief and/or strong tidal currents are often favoured in coastal waters (Reid et al 2003). In the North Atlantic, offshore and coastal forms have been identified (Mead and Potter 1995). Coastal forms may also exhibit a regional subpopulation structure, based on toxicology, diet (Borrel, et al. 2005) , genetics (Natoli, et al. 2005) and habitat characteristics including seabed topography, salinity and water temperature (Natoli, et al. 2005). Coastal populations, bottlenose in the north east Atlantic dolphins have been known to maintain definable, long-term multi-generational home ranges (Hammond et at. 2008).

Common bottlenose dolphins are infrequently seen east of Dorset/Cherbourg Peninsula (Reid et al 2003) (Evans et al 2003) and this found no evidence from photo-identification study that a regular population is present in English waters of the Eastern English Channel.

Previous studies have indicated that the south west England population of common bottlenose dolphins is precariously low at less than 20 animals (Wood 1998)(Nick Tregenza pers. obs., and (Pikesey et al 2011) and that the population is in decline (Doyle et al 2008), suggested there had been a 73% decrease in sightings rate from 1990-2007; a period over which recording effort has increased. Evans (Evans et al 2003) detected an apparent decline since 1996, whilst Pikesey (Pikesey et al 2011) found a reduction in pod numbers of Cornwall to between 5 and 10 since 1996. The results from this study do not concur with these results. Abundance was at least three times

higher (based on the number of individuals photographed) than previous estimates from regional studies, suggesting that either the population has been underestimated in the past and/or the population is increasing rather decreasing of late. The SCANS-II survey estimated 395 (CV = 0.74) bottlenose dolphins in the English Channel and contiguous southern North Sea, and 5,370 (CV = 0.49) individuals in the Celtic Sea and adjacent shelf waters in July 2005, with this estimate grouping sub-populations together (Hammond et at. 2008).

The northern limits of the south west England coastal population were not determined in this study, but it is likely to extend along the north coast, including in areas with regular sightings such as St Ives Bay, Newquay and perhaps as far north as Bideford Bay (Russ Wynn, Peter Evans pers. comm.). Sightings of common bottlenose dolphins between here and the large population found in Cardigan Bay, west Wales are scant (Baines and Evans 2012), further highlighting the separation of the south west England coastal population from other well-known populations.

Seasonal patterns in common bottlenose dolphins have been detected in English Channel waters in past studies (Evans. 1990) (Williams, et al. 1996) (Wood 1998) (Evans et al 2003), although the evidence does not give a consistent picture, whilst the studies were hampered by the common problem of low levels of survey outside summer months. More recent analyses, with wider temporal and spatial coverage, including sightings data used in this study (Brereton et al 2012) (McClellan, et al. 2014) suggest a more even year-round distribution of common bottlenose dolphin off south west England and the wider Channel, though across the UK as a whole a peak period between July to October is evident (Reid et al 2003) (Evans et al 2003) (Paxton et al. 2013).

Although comparisons with other catalogues, did not detect any movements between south west England, France, Wales and Scotland, given the large volume if images, it is possible that matches were overlooked. Analyses of photo-identification data from multiple studies elsewhere have shown that common bottlenose dolphins can make long-distance movements between the east and west coasts of Scotland, and between Scottish and Irish waters (Robinson et al. 2012), so a small degree of connectivity is likely.

4.2 Implications of a new management unit

The data presented in this report supports the suggestion to reconsider management units in the coastal waters, to consider the south west of England as a discrete management unit for common bottlenose dolphins of both UK and national importance in conservation terms. Although there are a much greater number of bottlenose dolphins offshore that may occasionally visit UK inshore waters, this report supports the theory of a separate inshore population. Given that there may be in the region of u to ~600 animals regularly occurring in UK coastal waters (combined totals from Cardigan Bay, west Scotland, Moray Firth/Aberdeenshire, SW England), it is crudely estimated that south west coastal waters may hold ~10% of the total UK coastal population over a period of several years, with more than 1% present in any one year. The south west likely represents the only region in England supporting a discrete resident (with year round sightings) population of common bottlenose dolphins..

The presence of neonates and calves in a high proportion of groups in coastal south west England waters (Marinelife and Marine Discovery, unpublished data, with for example, 90% of groups in Mounts Bay, Cornwall comprised of 12 or more animals) highlights the importance of coastal south west waters as a nursery area for common bottlenose dolphins. In addition, a small proportion of dolphins encountered in coastal Cornish waters appeared to have a highly restricted distribution, remaining only in Mounts Bay.

The evidence presented in this study suggest the coastal English Channel waters of south west England from Cornwall to Dorset represent the only known consistent region of high density in England, acting as an important feeding and nursery area.

Similarly, the two established SACs for coastal bottlenose dolphins: the Moray Firth, Scotland and Cardigan Bay, Wales (JNCC 2013). Candidate Special Areas of Conservation (SACs) are clearly identifiable areas which make a significant contribution to conserving the species and which represent “the physical and biological factors essential to [its] life and reproduction” (EC 1992).

4.3 Future survey work recommended

Given the findings in this study, there is a need for a more concerted effort to continue to build evidence on the distinctions between the inshore and offshore populations, the range of the restricted distribution of the inshore group, and a need to monitor changing status. Further analysis in the future to further compare with other growing catalogues would be worthwhile, in particular a separate catalogue in Cardigan Bay (Natural Resource Wales/ Seawatch Foundation catalogue), which has since been highlighted.

Due to the relatively low level of sampling effort in this study, it is possible that the size of the coastal population has been underestimated, whilst the past level of sampling effort lacks power to detect annual change. In addition, a number of assumptions are made in the model (e.g. that it is a closed population), although these were considered to be appropriate, more resources would allow further investigation of differences in model choice.

A systematic survey of inshore waters is recommended from the Isle of Wight to Hartland Point to more accurately estimate absolute population size and to determine key feeding, calving and nursery areas. Once a robust baseline has been established, a risk-based monitoring strategy could be developed and implemented to enable any policy relevant changes in status to be identified, to help assess and refine conservation actions. It is not clear the extent to which the population extends westwards, including to the Scilly Isles, and northwards (North Devon) which further survey work would help to determine this.

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