Abundance of harbour porpoises (*Phocoena phocoena*) on the Dutch Continental Shelf, aerial surveys in July 2010-March 2011

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Abstract: The harbour porpoise (*Phocoena phocoena*) is the most abundant marine mammal species in Dutch waters. Nevertheless until 2010 abundance estimates for the entire Dutch Continental Shelf (DCS) were missing. Aerial surveys along designed track lines in July 2010, October/November 2010 and March 2011 provided density and abundance estimates for the DCS. The highest abundance estimate was made in March 2011 (n=85,572); approximately three times higher than in July 2010 (n=25,998) and October/November 2010 (n=29,963). Distribution patterns of porpoises differed between seasons, but a band of higher densities from the Brown Ridge to the Borkumer Reef was visible in all seasons. Calves were mainly seen in July, indicating that porpoises also reproduce in Dutch waters. The total abundance estimate in March 2011 corresponds to 48% of the southern North Sea population, which implies that a large part of the North Sea population resides in Dutch waters during that season. Such high densities may lead to increased conflict with human activities, making the instigation of local management actions more imminent.

Keywords: abundance, aerial survey, distance sampling, harbour porpoise, North Sea, *Phocoena phocoena*, population size.

Introduction

The harbour porpoise (*Phocoena phocoena*) is the most abundant marine mammal species in Dutch waters. After a sharp decline in the first half of the 20th century, the occurrence of harbour porpoises in Dutch waters has increased significantly in the last decades (Camphuysen 2011). This is probably a result of a southward shift in distribution (SCANS 2008). The reasons for this are not clear. A shift in prey species is a likely cause (Camphuysen 2004), although this remains a matter of debate (MacLeod et al. 2007).

Systematically collected data on harbour porpoise abundance and distribution in Dutch waters are scarce. Most data are a by-product of surveys aimed at seabirds, providing information on the relative occurrence and distribution of porpoises. These data were collected during a land-based sea watching scheme, ship-based surveys (Camphuysen & Leopold 1994) and aerial surveys of the Dutch Continental Shelf (DCS) (Baptist & Wolf 1993, Arts 2011).

In the summer of 1994 and 2005, two large-scale dedicated cetacean surveys (SCANS and

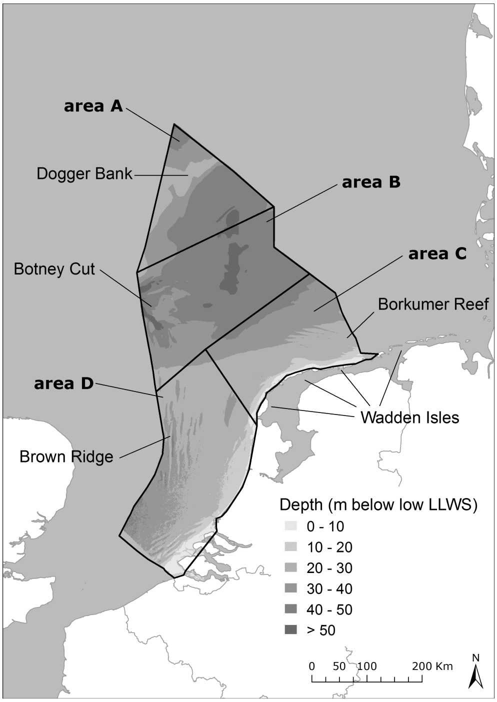

Figure 1. Map of the Dutch Continental Shelf showing the study areas A-D, and some geographical names used in the main text.

SCANS II) resulted in abundance estimates of harbour porpoises in European waters, but the design of the survey areas did not coincide with national borders (Hammond et al. 2002, SCANS 2008). Furthermore, the international survey took place in summer, while in Dutch waters, most porpoises are present in winter and early spring (Camphuysen 2011, Scheidat et al. 2012).

Since May 2008, dedicated aerial surveys were conducted in the Dutch sector of the North Sea. However, in these surveys, the northernmost part was excluded (Scheidat et al. 2012). Hence, an un-biased estimate of porpoise abundance and distribution for the entire Dutch Continental Shelf (DCS) is still lacking. Such baseline data on porpoise abundance and distribution is essential to monitor the effect of human activities and to potentially assess the effectiveness of conservation measures (e.g. Scheidat et al., in press). The objective of this study is to present the results of three aerial surveys in July 2010, October/November 2010 and March 2011, and to estimate the distribution, density and abundance of the harbour porpoise on the entire Dutch Continental Shelf.

Methods

Study area, survey design and data acquisition

Aerial surveys were carried out on the Dutch Continental Shelf, divided into four areas (figure 1): A (9615 km²), B (16,892 km²), C (12,023 km²) and D (20,797 km²), which were surveyed by aircraft along predesigned track lines. The design of the track lines was parallel in 'near shore' areas C and D and zigzag in areas A and B to ensure a representative coverage (figure 2). The direction of transects in areas C and D followed depth gradients in order to minimise potential variance in encounter rate within transect lines caused by depth (Buckland et al. 2001). The zigzag design of the offshore areas aimed at maximising the endurance of the plane and cover as large an area as possible. Additional track lines were surveyed in two smaller areas W1 and W2, within areas D and C, respectively, selected as potential areas for future offshore wind farms (figure 2).

Surveys were conducted with a high-winged twin-engine airplane, the *Partenavia 68*, equipped with bubble windows (allowing observations directly under the plane), flying at an altitude of 183 m (600 feet) with a speed of ca. 186 km.h^{-1} (ca. 100 knots). Every four seconds time and the aircraft's position were recorded automatically onto a laptop connected to a GPS. Surveys were conducted by a team of three people. Details on environmental conditions were entered in a database by the so-called navigator at the beginning of each transect and whenever conditions changed. Observations were made by two dedicated observers each located at the bubble windows on the left and right side of the aircraft. For each observation, the observers acquired data that were entered in real time into a database by the navigator. Observation data included species (all cetaceans and seals), declination angle measured with an inclinometer from the aircraft abeam to the individual or group, group size, presence of calves, behaviour, swimming direction relative to the transect, detection cue, whether the individual or group was above or below the sea surface when abeam, and reaction to the survey plane. Environmental data included sea state (Beaufort scale), turbidity (assessed by visibility of objects below the sea surface), cloud cover (in octaves), glare (area covered and strength) and subjective sighting conditions. These sighting conditions represent each observer's subjective view of the likelihood that the observer would see a harbour porpoise within the primary search area should one be present, and these conditions could be either good, moderate or poor. Furthermore, a category "not possible to observe" is used. Sighting conditions could differ between the left and right side of the plane.

Surveys were conducted in weather conditions safe for flying operations (no fog or rain, no chance of freezing rain, visibility >3 km) and suitable for porpoise surveys (sea state ≤3 Beaufort).

Data analysis

The survey data were collected using distance sampling techniques (Buckland et al. 2001, Buckland et al. 2004). The collected sightings were used to calculate densities and abundance estimates, and to produce distribution maps. For the former only the surveys of the areas A, B, C and D were used (i.e. the extra survey effort in W1 and W2 was omitted), while for the distribution estimates all data were used. Line-transect distance sampling allows for obtaining estimates of absolute densities, i.e. the number of animals.km^{-2} with the associated 95% confidence interval (C.I.) and coefficient of variation (C.V.; Buckland et al. 2001). Animal abundance in each stratum v (i.e. area A, B, C and D) was estimated using a Horvitz-Thompson-like estimator (Buckland et al. 2001, Buckland et al. 2004) as follows:

$$\hat{N}_v = \frac{A_v}{L_v}\left(\frac{n_{gsv}}{\hat{\mu}_g} + \frac{n_{msv}}{\hat{\mu}_m}\right)\bar{s}_v$$

where A_v is the area of the stratum, L_v is the length of transect line covered on effort in good or moderate conditions, n_{gsv} is the number of sightings that occurred in good conditions in the stratum, n_{msv} is the number of sightings that occurred in moderate conditions in the stratum, $\hat{\mu}_g$ is the estimated total effective strip width (ESW) in good conditions, $\hat{\mu}_m$ is the estimated total effective strip width in moderate conditions and S_v is the mean observed school size in the stratum.

The effective strip width is the distance at which the number of animals detected outside the strip width equals the number of animals missed inside the strip width. The ESW is corrected for the proportion of animals missed on the track line by a factor called g(0). For the current survey the g(0) values obtained in a similar German study (Scheidat et al. 2005, Scheidat et al. 2008, Gilles et al. 2009) were applied. These g(0) values are 0.37 for good conditions and 0.14 for moderate conditions, resulting in effective strip widths of 76.5 and 27 m, respectively.

Group abundance by stratum (areas A, B, C and D) was estimated by:

$$\hat{N}_{v(\text{group})} = \hat{N}_v / \bar{s}_v.$$

Total animal and group abundances of the entire study area were estimated by

$$\hat{N} = \sum_v \hat{N}_v \quad \text{and} \quad \hat{N}_{(\text{group})} = \sum_v \hat{N}_{v(\text{group})}$$

respectively. Densities were estimated by dividing the abundance estimates by the area of the associated stratum. Mean group size across strata was estimated by

$$\hat{E}[s] = \hat{N} / \hat{N}_{(\text{group})}.$$

Coefficients of variation (C.V.) and 95% confidence intervals (C.I.) were estimated by a non-

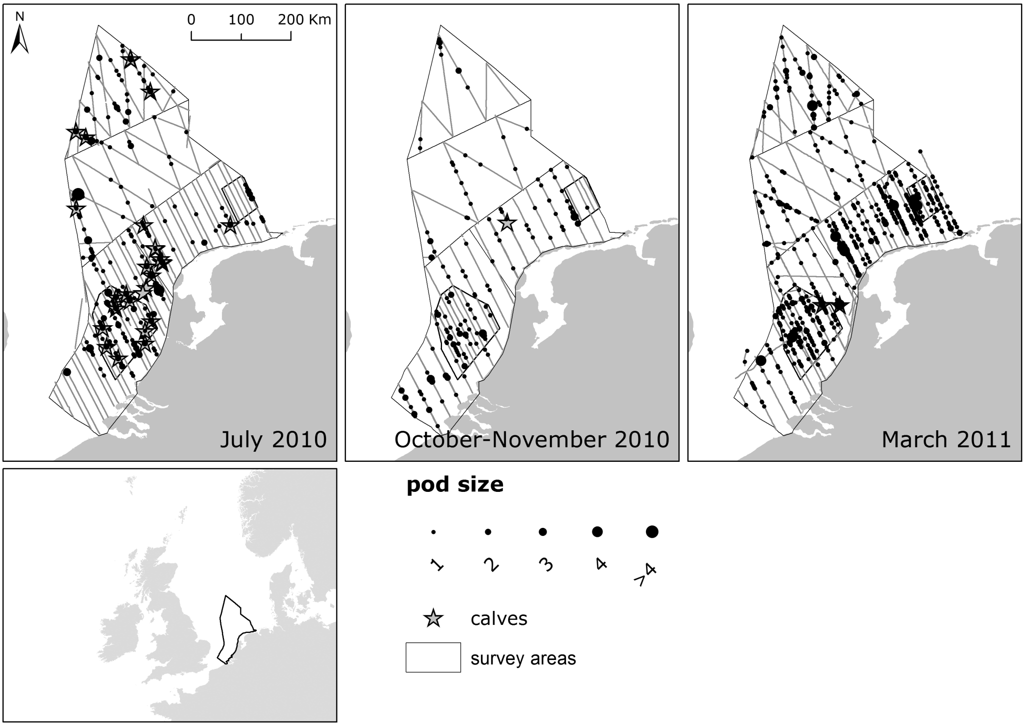

Figure 2. Survey effort in good or moderate sighting conditions on at least one side of the plane (on and off track line) with all sightings of harbour porpoises, including navigator sightings. Stars indicate groups with calves/neonates.

parametric bootstrap (999 replicates) within strata, using transect segments as the sampling units. The variance due to estimation of ESW was incorporated using a parametric bootstrap procedure assuming the ESW estimates to be normally distributed random variables. More details on this method can be found in Scheidat et al. (2008, 2012).

Distribution maps

Distribution maps are presented in two different ways: 1. Uncorrected sightings, and 2. Densities corrected for survey effort and subjective sighting conditions per 1/9 ICES grid cell. Densities are represented spatially on a 1/9 ICES grid. This grid has latitudinal rows at intervals of 10' and longitudinal columns at intervals of 20'. Within the DCS, this corresponds to approximately 20x20 km grid cells, with areas ranging from 388 to 409 km^2.

Densities per 1/9 ICES grid cell were calculated by dividing the total number of animals observed during good and moderate conditions by the total surveyed area. The surveyed area is the distance travelled multiplied by the effective strip width (ESW). Grid cells with low effort, such as grid cells extending outside the borders of the surveyed area (e.g. the Wadden Sea), tend to be less reliable. Therefore, grid cells with an effort less than one km^2 were omitted from the maps (but used for the abundance estimates).

Results

Effort and sightings of harbour porpoises

The July 2010 and March 2011 surveys had the best coverage with both around 6000 km

Table 1. Total survey days, effort, sighting conditions (G – good, M – moderate, P – poor, X – not possible to observe) and harbour porpoise sightings during the three aerial surveys. Calves are included in the number of animals.

		Sighting conditions (%)			Porpoise sightings (n)		
Survey	Effort (km)	G	M	P / X	Sightings	Individuals	Calves
July 2010 (5,6; 8-11; 18-20 July)	6040	35	35	30	263	330	26
October/November 2010 (12-14 Oct; 19, 21, 24 Nov)	4028	12	76	11	137	163	0
March 2011 (18,19; 21 – 27 March)	5945	29	62	9	684	743	2
Total	16,013				1085	1236	28

on effort (table 1). In these months, two sets of track lines in areas A-D plus the extra track lines in W1 and W2 could be surveyed (figure 2). Survey conditions were more adverse in October and November (shorter days, unstable weather) leading to lower survey effort, but one set of track lines could be completed in areas A-D and in the W1 and W2. In total, 1085 sightings of 1236 harbour porpoises were collected. Calves were sighted during the July survey and the March survey, consisting 7.9% and 0.3% of the sighted individuals, respectively. During the October survey, one calf was recorded by the navigator (navigator sightings are not included in the analysis of abundance). The 'calves' in March were big neonates.

Average group size for all surveys combined was 1.14 animals. Average group size was 1.09 (C.V. 0.31) animals in March, 1.25 (C.V. 0.52) in July, and 1.19 (C.V. 0.37) in October/November. The largest group size observed was a pod of eight animals in July. In all seasons over 80% of the sightings consisted of single animals. In summer and in autumn a larger proportion of the sightings consisted of two or more animals compared to early spring.

Density and abundance of harbour porpoises

Table 2 gives an overview of density (animals.km^{-2}) as well as abundance (number of animals) per survey area and survey period. The overall density was similar for the summer (July) and the autumn (October/November) survey; 0.44 and 0.51 animals.km^{-2} respectively. Density was about three times higher during the March survey with 1.44 animals.km^{-2}.

The total numbers of harbour porpoises on the DCS (areas A-D) were estimated at 25,998 (C.I.: 13,988-53,623) and 29,963 (C.I.: 16,098-59,011) animals in summer and autumn respectively. The abundance in March comprised 85,572 animals (C.I.: 49,324-165,443, table 2).

Distribution of harbour porpoises

Figures 3-5 show densities of porpoises (animals.km^{-2}) per 1/9 ICES grid cell. In summer (July), higher densities were observed near the Brown Ridge, the Borkumer Reef, and around the Botney Cut – Dogger Bank, near the UK border. The band of higher densities running from the Brown Ridge to the Borkumer Reef was also visible in the autumn surveys (October/November) and the spring surveys (March). In autumn the offshore density in area B was lower and porpoises were more evenly distributed than in the other two survey periods. In spring, the overall density was much higher. In that period, the densities in areas B and D almost tripled, while area C showed an even stronger increase. The highest density was found in area C, north of the Wadden Isles (figure 6). The high density area in the Dutch part of the Borkumer Reef

Figure 3

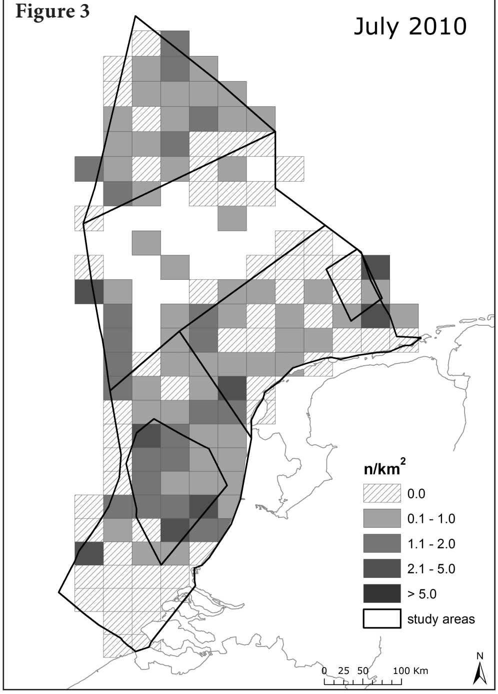

Figure 4

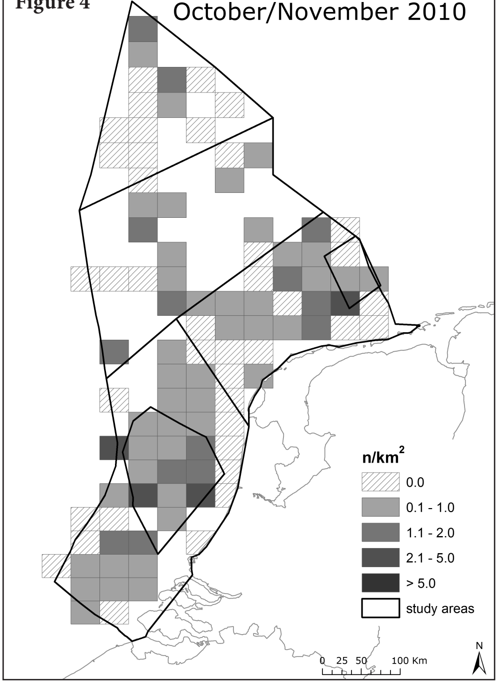

Figure 5

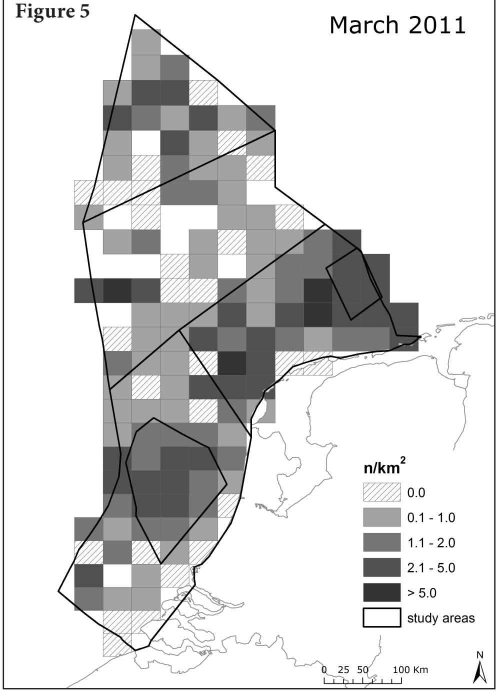

Figure 3. Summer density distribution of harbour porpoises (animals.km^{-2}) per 1/9 ICES grid cell, July 2010. Grid cells with low effort (<1 km^2) are not presented.

Figure 4. Autumn density distribution of harbour porpoises (animals.km^{-2}) per 1/9 ICES grid cell, October/November 2010. Grid cells with low effort (<1 km^2) are not presented.

Figure 5. Spring density distribution of harbour porpoises (animals.km^{-2}) per 1/9 ICES grid cell, March 2011. Grid cells with low effort (<1 km^2) are not presented.

Table 2. Estimates of density and abundance of harbour porpoises from aerial surveys conducted on the Dutch Continental Shelf in July 2010, October/November 2010 and March 2011. Estimates are given with the associated 95% Confidence Interval (C.I.) and Coefficient of Variation (C.V.).

July 2010

Survey Area	Density (animals.km^{-2})	(95% C.I.)	Abundance (*n* animals)	(95% C.I.)	C.V.
A	0.396	0.181 - 0.849	3806	1738 - 8165	0.404
B	0.477	0.212 - 1.058	8055	3589 - 17,872	0.416
C	0.336	0.046 - 0.890	4039	553 - 10,701	0.622
D	0.484	0.208 - 1.056	10,098	4341 - 22,024	0.403
Overall	0.438	0.236 - 0.903	25,998	13,988 - 53,623	0.336

October / November 2010

Survey Area	Density (animals.km^{-2})	(95% C.I.)	Abundance (*n* animals)	(95% C.I.)	C.V.
A	0.391	0.117 - 0.872	3763	1124 - 8384	0.461
B	0.573	0.298 - 1.157	9679	5035 - 19,543	0.352
C	0.683	0.287 - 1.610	8216	3451 - 19,351	0.459
D	0.398	0.212 - 0.733	8304	4431 - 15,296	0.317
Overall	0.505	0.271 - 0.994	29,963	16,098 - 59,011	0.332

March 2011

Survey Area	Density (animals.km^{-2})	(95% C.I.)	Abundance (*n* animals)	(95% C.I.)	C.V.
A	1.029	0.522 - 2.144	9890	5018 - 20,618	0.386
B	0.908	0.521 - 1.791	15,331	8795 - 30,249	0.312
C	2.982	1.645 - 5.806	35,850	19,772 - 69,808	0.325
D	1.174	0.658 - 2.389	24,501	13,726 - 49,833	0.344
Overall	1.441	0.830 - 2.786	85,572	49,324 - 165,443	0.316

extended to the German part. Low densities were found in close proximity of the mainland coast and in the southern part of area D.

Discussion

Seasonal patterns

The results show distinct differences in abundance and distribution of harbour porpoises between surveys; in summer and autumn similar numbers and densities occurred, while in March the numbers almost tripled. This pattern fits the general seasonal occurrence as seen along the Dutch coast during systematic land-based observations of seabird migration and marine mammals (Camphuysen 2011) and previous aerial surveys (Scheidat et al. 2012). These land-based observations show that harbour porpoises are present in coastal waters throughout the year. Peak numbers are observed from winter to early spring (December-March), after which the numbers drop. Observations in June are relatively scarce, but the numbers slightly increase from July onwards (Camphuysen 2004, Camphuysen 2011). In the Belgian part of the North Sea, harbour porpoises are most abundant from February to April, whereas lower numbers tend to occur offshore in the rest of the year (Haelters et al. 2011). French strandings data also indicate a higher occurrence of porpoises in the Channel during the

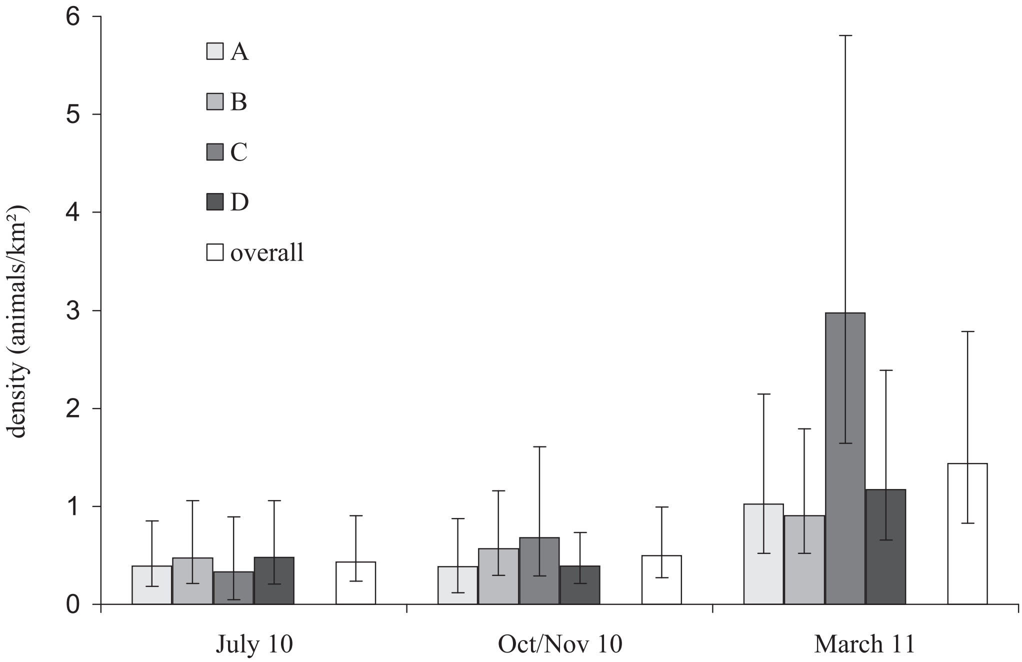

Figure 6. Density of harbour porpoises during the three surveys in the survey areas A-D and the entire study area. The black bars show the 95% Confidence Interval of the estimates.

winter months (Jung et al. 2009). In the German North Sea bordering Dutch waters (area C) the aerial surveys show the highest densities in spring. Further north along the German coast numbers peak in May and June (Gilles et al. 2009). Still further north, along the Danish west coast, porpoise densities are highest from April to August, with a peak in August (data for June-July are lacking however) (Teilmann et al. 2008). In the western North Sea porpoise numbers peak in April off south-eastern England, and later further north (August; Evans et al. 2003). These observations suggest a northward summer migration from the Channel, Belgium and The Netherlands to Danish and British waters and a southward migration in autumn.

Comparison of densities

In 2010-2011, the estimated densities of harbour porpoises in Dutch waters ranged from 0.34–2.98 animals.km^{-2} (table 2). These densities are in the same order of magnitude (0.33-2.53 animals.km^{-2}) as obtained during comparable studies in adjacent waters in Germany (Thomsen et al. 2006, Gilles et al. 2009), and in Belgium (Haelters et al. 2011), and in the relevant survey blocks during the large scale SCANS II survey (SCANS 2008). Data from Gilles et al. (2009) reveal that the highest densities in the entire German North Sea Exclusive Economic Zone were reached in spring with an overall density of 1.34 animals.km^{-2} and a density of 0.85 animals.km^{-2} in the area closest to the Dutch border (East Frisia). The SCANS-II survey (SCANS 2008) showed a porpoise density for SCANS-block H in the southern North Sea of 0.36 animals.km^{-2} in June-July 2005. In the adjacent SCANS-block B (the Channel) a density of 0.33 was estimated for 2005. This density corresponds well with the 0.48 animals.km^{-2} estimated for the Dutch survey area D in July, which overlaps with SCANS-block B.

Table 3. Comparison between density and abundance estimates obtained in the same areas and months (2008–2010) using results from the current study as well as from Scheidat et al. (2012). Estimates are given with the associated 95% Confidence Interval (C.I.) and Coefficient of Variation (C.V.).

Area	Period	Density (animals.km^{-2}) (95% C.I.)	Abundance (95% C.I.)	C.V.
October-December				
Area C	Nov 2008	1.020 (0.34 – 2.10)	12,227 (4038 – 25,285)	0.42
	Oct/Nov 2010	0.683 (0.29 - 1.61)	8216 (3451 – 19,351)	0.46
Area D	November/December 2009	1.511 (0.91 – 3.08)	31,515 (18,976 – 64,157)	0.32
	October/November 2010	0.398 (0.21 - 0.73)	8304 (4431 – 15,296)	0.32
February-March				
Area B	March 2010	0.660 (0.28 – 1.45)	11,141 (4692 – 24,560)	0.42
	March 2011	0.908 (0.52 - 1.79)	15,331 (8795 – 30,249)	0.31
Area C	March 2010	1.107 (0.48 – 2.49)	13,309 (5819 – 29,918)	0.44
	March 2011	2.982 (1.65 - 5.81)	35,850 (19,772 – 69,808)	0.33
Area D	February/March 2009	1.468 (0.78-2.70)	30,534 (16,265 – 56,161)	0.33
	March 2010	2.007 (0.82 – 4.04)	41,878 (17,145 – 84,302)	0.39
	March 2011	1.174 (0.66 - 2.39)	24,501 (13,726 – 49,833)	0.34

In March 2011, both Belgian and German waters were surveyed simultaneously with the Dutch surveys, thus allowing a direct comparison of the corresponding densities. The estimated densities of harbour porpoises were high, with 2.53 animals.km^{-2} and 2.09 animals.km^{-2} in Belgian and German waters respectively. These densities correspond well with the maximum SCANS II density of 2.98 animals.km^{-2} in area C, whereas the density in area D of 1.17 animals.km^{-2} was lower.

Inter-annual variability

Aerial surveys in the DCS using the same methods as the present study have also been carried out from May 2008 to March 2010. In February-May, August, November and December 2008-2010 10,557 km were covered on effort during 16 survey days (Scheidat et al. 2012). Within these surveys it was never feasible to cover the complete DCS, but a comparison per area is possible (table 3). Estimated densities and abundances for the winter months (combined surveys from October to December) were similar for area C in 2008 and 2010 (table 3). For area D the estimates in 2009 seemed higher than in 2010. One reason might be that the difference in timing of the surveys (i.e. November/December versus October/ November) could make a big difference in local density due to migration. When comparing March surveys, densities in the offshore area B were similar in 2010 and 2011, whereas area C showed an increase in density in 2011. Density in area D has been fairly stable in 2009, 2010 and 2011 - all estimates lie within the confidence intervals of each other - but showed a possible decrease from 2010 to 2011. The total abundances for areas B, C and D showed similar numbers (66,328 animals in 2010 and 75,682 animals in 2011), suggesting a shift in distribution between these two years, with more animals present in the central-eastern DCS (i.e. area C) in 2011 than in 2010.

Reproduction

In recent years, stranding records of harbour porpoises along the Dutch and Belgian coast showed increasing numbers of neonates in late summer (e.g. Haelters & Camphuysen 2009). These strandings are assumed to reflect births in coastal waters. Figure 2 shows the locations where calves were seen in Dutch waters, which were clearly not restricted to the coastal zone. The observations of (small) calves in July suggest that harbour porpoises reproduce in Dutch waters. Sexually mature female porpoises can give birth to one calf each year or every second year (Gaskin et al. 1974). Given a gestation period of 10-11 months (Gaskin et al. 1974, Addink et al. 1995, Lockyer 2003), this means that mating will take place shortly after parturition. Hence, areas with calves are also important reproduction areas. Based on the size of the foetus in by-caught porpoises, Börjesson & Read (2003) estimated the mean conception date in the North Sea to be 25 July (± 20.3 days) and Gaskin et al. (1974) predicted a mean birth peak from the end of May till the end of June. In the German Baltic and North Sea the majority of births take place in May-July, with the first births in March (Hasselmeier et al. 2004). This is in line with the virtual lack of sightings of calves in March 2011 and October/November 2010, and the higher number of calves seen during the July 2010 surveys.

Management implications

Harbour porpoises in the Atlantic can be divided in several populations or management units (MUs). Evans et al. (2009) assessed these for the north-eastern Atlantic. Based on Danish telemetry data (Sveegaard et al. 2011) and other available data (e.g. genetics), they concluded that the North Sea should be divided into two MUs along an arbitrary line running NNW–SSE from northern Scotland to Germany-Denmark. The Dutch porpoises would belong to the MU south of this line: the south-western North Sea and the eastern Channel MU. The boundaries of this MU are not well defined, but it lies within the SCANS II survey blocks V, U, H and B (SCANS 2008). An abundance estimate for this MU is lacking, but given the smaller area it has to be less than the sum of the estimates in the survey blocks V, U, H and B during SCANS II (SCANS, 2008). Based on SCANS II, the estimated number of porpoises in this management unit is less than ca. 180 000 animals. Assuming that the population from the south-western North Sea and the eastern Channel MU stays within this area throughout the year and that the population size did not change much since 2005, at least 14% of this population was present in Dutch national waters in July 2010. In March 2011 this proportion increased to at least 48%. At that time The Netherlands harbour a substantial proportion of the porpoise population in the southern North Sea and the eastern Channel. This emphasises the importance of living up to the commitment the Netherlands have within the EU Habitats Directive to achieve and maintain a favourable conservation status for the harbour porpoise in Dutch waters. First steps in this process have been assessing total numbers occurring in Dutch waters (this paper) and the development of a Dutch Harbour porpoise conservation plan (Camphuysen & Siemensma 2011).

Conclusions

By correcting for biases in the detection probability, this study provides the first un-biased estimate of the harbour porpoise population size in Dutch waters and how it differs between three seasons. The results show that there is a strong seasonal variation in density and that there are areas with higher densities of harbour porpoises in Dutch waters. In March 2011, high densities were found in the whole DCS, except for the southernmost parts and a narrow strip in close proximity of the mainland coast. In July, high densities were found near the Brown Ridge, Botney Cut-Dogger Bank and Borkumer Reef. In October, the distribution seems more spatially homogeneous. Mother-calf pairs were mostly sighted in July, off the coast of the mainland (area D). Since these patterns may show (large) variability, repeated surveys will be necessary to ascertain if the established patterns are consistent within and between years. These surveys could be primarily aimed at surveying high density areas, but as the exact locations of these may vary over time, repeated DCS wide surveys should provide the necessary background information.

As harbour porpoises are a wide ranging species, larger scale multi-season surveys in cooperation with adjacent countries would allow a better understanding of the movements and habitat use of porpoises in the southern North Sea. Using such data in combination with an overarching spatial model including environmental parameters, would provide information on distribution and ultimately on habitat preferences. This information is necessary to develop adequate management and protection measures in relation to offshore activities for harbour porpoises in the future.

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Samenvatting

Voorkomen van bruinvissen (*Phocoena phocoena*) op het Nederlands Continentaal Plat: vliegtuigtellingen in de periode juli 2010 - maart 2011

De bruinvis (*Phocoena phocoena*) is de algemeenste zeezoogdiersoort in Nederlandse wateren. Desondanks waren er tot 2010 geen aantalsschattingen beschikbaar voor het Nederlands Continentaal Plat (NCP). In juli 2010, oktober/november 2010 en maart 2011 werden vliegtuigtellingen langs vooraf ontworpen *track lines* uitgevoerd waardoor het mogelijk was dichtheden en aantalsschattingen van bruinvissen op het NCP te berekenen. De hoogste aantallen werden in maart 2011 (*n*=85.572) gevonden, ongeveer drie keer zo veel als in juli 2010 (*n*=25.998) en in oktober/november 2010 (*n*=29.963). Het verspreidingspatroon verschilde per telperiode, maar gedurende alle telperioden waren hogere dichtheden aanwezig in een strook tussen de Bruine Bank en de Borkumse Stenen. In juli werden kalfjes gezien, hetgeen een indicatie vormt voor het feit dat dat bruinvissen zich in Nederlandse wateren voortplanten. De aantalsschatting voor maart correspondeert met 48% van de populatie in de zuidelijke Noordzee; een groot deel van de Noordzeepopulatie verblijft daarmee in die periode in Nederlandse wateren. De gevonden hoge dichtheden kunnen leiden tot een toename in conflicten met menselijke activiteiten. Het nemen van beleidsmaatregelen om deze conflicten te voorkomen of te mitigeren wordt hierdoor urgent.

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