

Recent trends and spatial patterns in nearshore sightings of harbour porpoises (*Phocoena phocoena*) in the Netherlands (Southern Bight, North Sea), 1990-2010

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Abstract: The harbour porpoise (*Phocoena phocoena*) returned in Dutch waters in the late 20th century after a near-absence of three decades. Gradually increasing numbers of sightings in the early 1990s were followed by a proportional rate of increase of 41% per annum over a period of 15 years until 2003. More data have been collected since and this paper reports on the most recent trends, changes in seasonality and spatial patterns in nearshore sightings between 1990 and 2010. The results show that the rapid increase came to a halt, but current sightings frequencies are on a higher level than before 2005. The highest numbers are now recorded in the northern half of Noord-Holland, whereas sightings rates in Zuid-Holland have declined. Sightings were made almost year-round, but with very low frequencies in May and June. During July-November a gradual increase was found, followed by some stabilisation in numbers during December-January and a marked further increase in February-March. The frequency in sightings crashed every year in early April. Additional (ecological) research is needed to enhance our understanding of the observed patterns and to link the nearshore sightings data with offshore population assessments during aerial surveys.

Keywords: Cetacea, *Phocoena phocoena*, sightings, seasonality, trends, Netherlands.

Introduction

The harbour porpoise (*Phocoena phocoena*) returned as an abundant, indigenous species in Dutch waters in the late 20th century, after a virtual absence of three decades (1960-1990; Camphuysen 2004, Camphuysen & Peet 2006). The causes of this decline in the 1950s and 1960s in the Southern Bight (North Sea south of 54°N) are not well understood and also the return in recent years remains largely unexplained (Smeenk 1987, Addink & Smeenk 1999, Camphuysen & Peet 2006). Results of two synoptic surveys of harbour

porpoises in the North Sea (Hammond et al. 2002, SCANS II 2008) suggest that a distributional shift from more northerly areas to the south has been underlying the recent increase in Dutch waters. A decline in prey resources in the north, whether or not influenced by climate change, could have been responsible for this shift, but the factual evidence is slender (Camphuysen 2004, MacLeod et al. 2007, Thompson et al. 2007).

Camphuysen (2004) has documented the return of the harbour porpoise in Dutch nearshore waters, based on an analysis of sightings obtained from systematic, effort-corrected seawatches from headlands and vantage points along the coast (1972-2003). A small, but gradually increasing number of sightings

Table 1. Hours of observation at each of the observatories along the Dutch coast ($n = 73,332$ hours) and the proportion of time spent observing during periods of peak abundance of harbour porpoises in Dutch nearshore waters (February–March; mean $\pm$ SD = 10. $\pm$ 4.8 percent of time).

Observatory	Vlieland	Texel	Huisduinen	Camperduin	Egmond	Bloemendaal	Noordwijk	Katwijk	Scheveningen	Maasvlakte	Westkapelle
Latitude	53.28°N	53.06°N	52.95°N	52.73°N	52.62°N	52.4°N	52.25°N	52.18°N	52.1°N	51.99°N	51.53°N
Longitude	04.98°E	04.72°E	04.72°E	04.64°E	04.62°E	04.54°E	04.42°E	04.36°E	04.25°E	04.01°E	03.45°E
Region	W-Wadden Sea area		Noord- Holland			Zuid-Holland			Delta area		
1990	15	23	40	816	428	361	126	2	1274	0	0
1991	2	18	24	792	534	327	152	7	1334	10	0
1992	10	47	29	1091	356	294	137	0	721	143	18
1993	30	37	32	1220	419	341	60	109	989	93	15
1994	48	53	42	1287	247	224	66	136	1288	102	164
1995	144	29	49	1256	119	232	89	21	1595	20	120
1996	80	34	386	1090	31	143	146	27	2449	52	212
1997	8	13	584	925	54	91	75	25	1686	56	102
1998	19	11	718	320	25	111	92	10	1503	57	42
1999	5	0	707	434	19	188	64	102	1005	76	11
2000	8	9	770	530	6	270	58	15	828	90	30
2001	0	15	894	464	27	288	84	12	1302	68	156
2002	11	25	918	543	37	267	161	25	1070	60	281
2003	21	31	986	550	20	344	221	102	940	36	459
2004	0	0	1046	516	14	241	372	134	863	76	633
2005	9	15	1019	489	180	231	496	189	1034	80	502
2006	3	0	1068	560	234	74	454	203	887	94	273
2007	1	18	1070	538	231	201	461	245	961	109	377
2008	39	37	907	565	263	132	428	183	926	107	326
2009	31	28	805	703	391	53	479	223	557	120	137
2010	28	11	641	556	273	117	418	237	458	79	246
Totals	512	454	12735	15245	3908	4530	4639	2007	23670	1528	4104
% peak	2.1	5.9	13.2	13.9	14.1	15.2	13.2	10.9	13.8	5.9	3.4

in the mid-1980s to early 1990s was followed by a proportional rate of increase of 41% per annum over a period of 15 years. With its return in waters under Dutch jurisdiction, the harbour porpoise also returned on the animal conservation agenda. Its status was re-evaluated and has been described as “*vulnerable*” (VZZ 2007). Reasons for concern were the unexplained recent shift in harbour porpoise distribution within the North Sea at large, and the age structure (many immatures, few adults), reproductive condition (low number of calves, infrequent birth rates), and incidental by-catches in fishing gear of porpoises in Dutch waters (VZZ 2007, Jak et al. 2009).

Two factors triggered the analysis presented in this contribution. Firstly, the concerns regarding the conservation status of these elusive cetaceans, which simply called for more data on current abundance and trends. Secondly, a recent merge between two large, non-overlapping datasets (the seawatching data mentioned earlier and similar, but more recent data stored online at www.trektellen.nl [see methods]) facilitated a more comprehensive analysis and an update of recent trends in abundance in nearshore waters. Three main issues are addressed in this paper: 1. did nearshore numbers continue to increase in recent years, 2. did the tendency of an increase in

sightings throughout the year continue, or are we still dealing with peak abundances in late winter and early spring, and 3. is there any evidence of spatial patterns through the year in the frequency of sightings along the Dutch coast?

Methods

Harbour porpoise abundance was analysed by extracting sightings from the seawatching databases of the Dutch Seabird Group (Nederlandse Zeevogelgroep NZG/CVZ database; 1972-2005) and www.trektellen.nl (2006-present). The analysis is based on material collected during seawatches at: 1. Westkapelle and Maasvlakte ("Delta area"), 2. Scheveningen, Katwijk, Noordwijk and Bloemendaal (mainland coast "Zuid-Holland"), 3. Egmond, Camperduin and Huisduinen (mainland coast "Noord-Holland"), and 4. Texel and

Vlieland ("Wadden Sea islands").

over a period of 21 years (1990-2010). The counts are basically conducted year-round, but with slightly increased intensity during periods of (waterbird) migration: spring (March-May) and autumn (August-October). The results from sites in the Delta and Wadden Sea areas must be treated with some caution, because relatively few hours of observation were conducted in February-March, the period of prime abundance of porpoises in Dutch nearshore areas (table 1).

Observations are from vantage points (dune-tops, piers, dikes), with observatories normally at a height of 5-15 m a.s.l., to provide excellent views over at least the nearshore strip (up to 5-10 km distance) of coastal sea (Camphuysen 1985). Porpoises were normally detected only within 2 km from the observers. Observers recorded date, duration of the observation (start- and end-time),

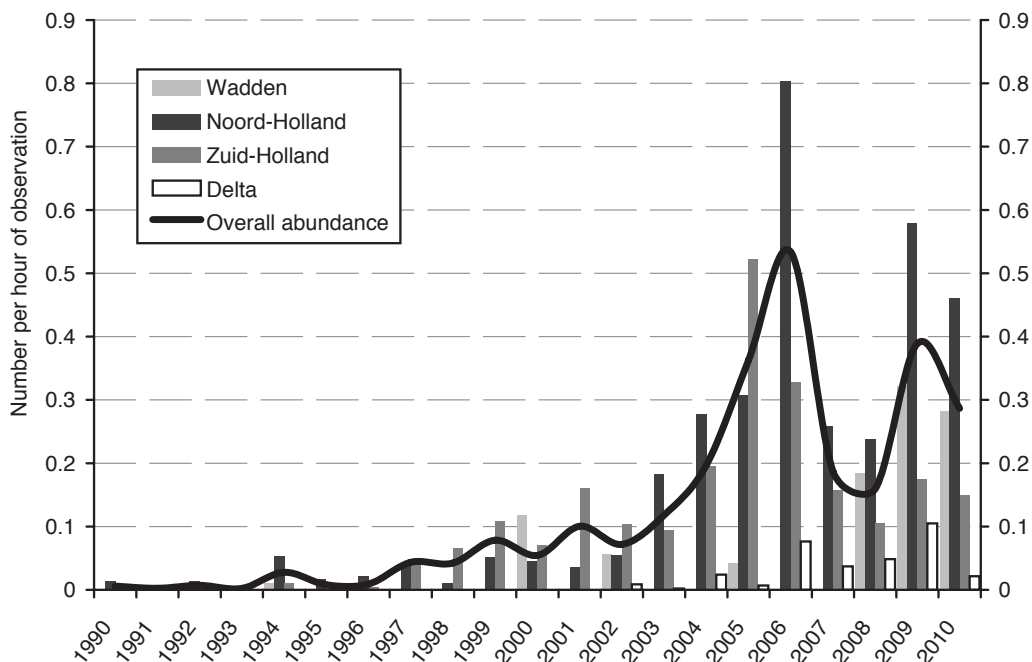


Figure 1. Numbers of harbour porpoises per hour of observation per year in the W-Wadden Sea area (Vlieland and Texel), in the north of Noord-Holland (Egmond, Camperduin, Huisduinen), in Zuid-Holland (Noordwijk, Katwijk, Scheveningen plus Bloemendaal in the south of Noord-Holland) and in the Delta area (Maasvlakte and Westkapelle), 1990-2010.

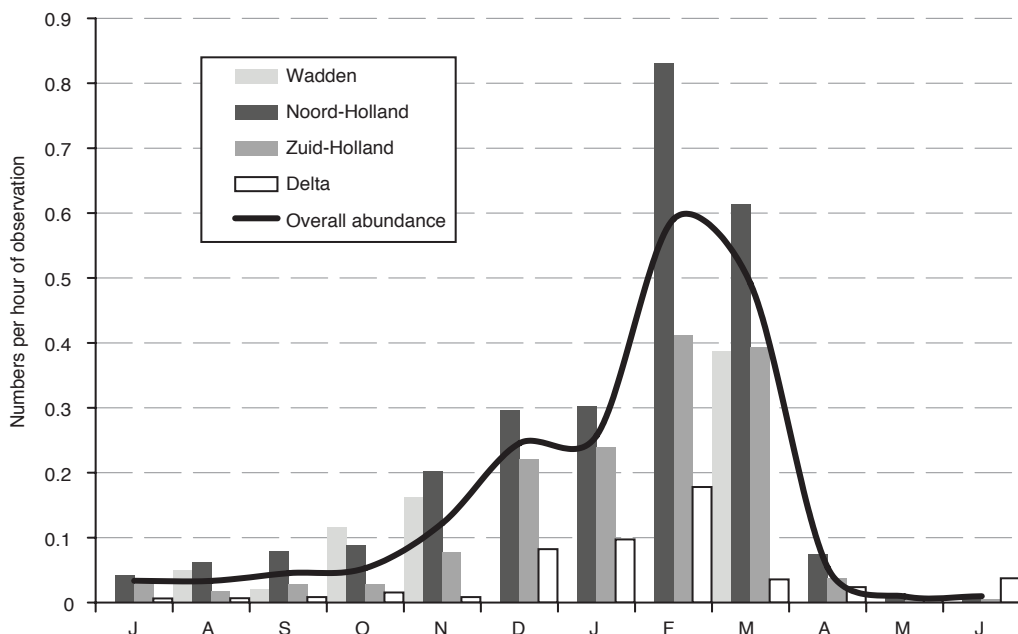


Figure 2. Seasonality in sightings of harbour porpoises per hour of observation per year in the W-Wadden Sea area, in the north of Noord-Holland, in Zuid-Holland and in the Delta area, 1990-2010. See figure 1 for conventions.

and weather characteristics and logged their sightings usually per hour of observation. The observers are well-trained and sufficiently experienced in cetacean identification. The data are expressed as “number per hour of observation” ($n\ h^{-1}$) unless otherwise indicated. The database is currently not sufficiently geared up to correct for differences in wind and weather.

Results

The frequency in sightings per annum increased until 2006, followed by two years with relatively modest numbers and rather high numbers again in 2009 and 2010 (figure 1). Sightings were almost year-round, but with very low frequencies in May and June (figure 2). During late summer and autumn (July-November) a gradual increase was found, followed by some stabilization in numbers in mid-winter (December-January) and a marked further increase in sightings in

February-March. The frequency in sightings crashed early April, followed by the annual low abundance in early summer. Over the years, the seasonal pattern of harbour porpoise sightings has been fairly consistent. Notably in the southern half of the mainland, however, relatively high numbers of porpoises could be observed as early as in December. A December peak was also prominent in much of the material collected in the most recent years in the north of Noord-Holland (2008-2010), and this has contributed to the ‘hump’ (or first peak) in overall abundance in figure 2 for the mid-winter period. Extreme peak-abundances for February and March occurred in 2005-07, but the frequency of sightings in these months was much less extreme in comparison with the rest of the winter in later years. Typical in *every* year, however, were the rapidly dwindling numbers in April, leading to the summer dip with extremely low frequencies of sightings in nearshore waters.

During the period of nearshore peak-abundance in February-March, the highest fre-

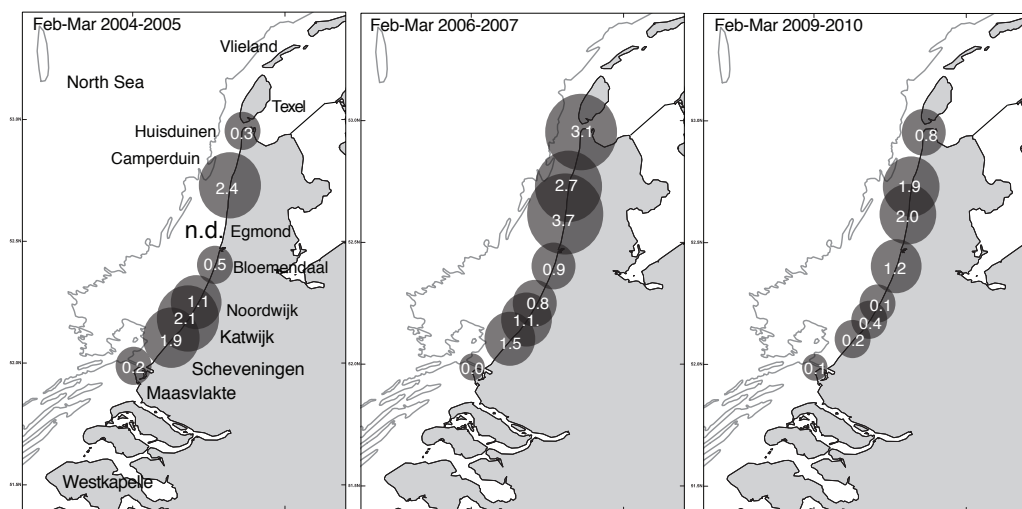


Figure 3. Relative abundance of harbour porpoises (number per hour of observation) at eight observatories along the mainland coast during peak appearances in February-March in 2004-2005, 2006-2007, and 2009-2010.

quencies of sightings in Zuid-Holland were recorded in Scheveningen and Katwijk; clearly lower numbers were recorded in Bloemendaal (except 2009-2010), Noordwijk and the nearby Maasvlakte (Delta area; figure 3). Further north along the mainland coast, Egmond tended to produce slightly higher numbers than the nearby site Camperduin and the frequency at Huisduinen varied markedly, but was very high in 2006-2007. It is clear that the peak abundances in 2006 were caused largely by a very high number of sightings at the northernmost observatories. Just prior to 2006, Zuid-Holland produced the higher sightings frequencies (figures 1 and 3). Now that the numbers are apparently stabilising (>2006), sightings frequencies are significantly higher in the northern part of the mainland and in fact fairly low in Zuid-Holland. Yet, mean abundances of 3-4 porpoises per hour of observation at any of the observatories, as in 2006, are currently rather rare, even during the late winter months.

Discussion

The sightings from vantage points along the coast could be indicative of the overall abun-

dance of harbour porpoises in the Southern Bight. The fact that nearshore sightings and strandings are so strongly, positively correlated (annual sightings frequency from this study and annual number of harbour porpoise strandings from www.walvisstrandingen.nl, 1990-2010; Spearman test, $r_s=0.95$, $n=21$, $P<0.001$) would support that suggestion. As such, the return of porpoises in the southern North Sea has already been documented by the very long time-series that sea-watching data provide (1972-today; cf. Camphuysen 2004). Yet, the seasonal pattern in strandings (Camphuysen et al. 2008) does not fit the picture described here from nearshore sightings: summer strandings are common, and a late winter peak in strandings frequency does not occur. In nearshore waters, harbour porpoises are still mostly winter visitors, whereas strandings records point at a year-round occurrence of animals.

Several of the most recent, dedicated aerial surveys for harbour porpoises have been conducted in the period of peak-abundance in nearshore sightings. The results have been staggering, in a sense that while only half of the Dutch sector of the North Sea has been surveyed (between 3 February and 3 April 2009),

37,000 harbour porpoises (95% C.I. 19,000–68,100) were estimated to be present (Scheidat & Verdaat 2009). In March 2010, when the exercise was repeated, but while covering $\approx 80\%$ of the Dutch sector, an estimated 66,250 animals (95% C.I. 34,250–134,750) were found (Scheidat et al. 2011). An earlier survey in May in roughly the same study area produced a considerably more modest estimate of 6300 (95% C.I. 1300–15,000) porpoises (Scheidat 2008). In the adjacent waters of Belgium, combined data derived from aerial surveys, passive acoustic monitoring and strandings revealed a clear seasonal pattern, with porpoises being typically abundant in late winter and early spring, whereas lower numbers tended to stay in more offshore and northerly waters from late spring to autumn (Haelters et al. 2010). This pattern certainly did fit the picture derived from Dutch nearshore observations. Also, the substantial lower numbers recorded offshore during aerial surveys in May (2008) in comparison with surveys in March/April (2009–2010) seem to confirm a similar seasonal trend. Rather different results were reported by Arts (2010), who found the highest densities of porpoises during aerial seabird surveys in a not precisely defined part of the Dutch sector of the North Sea in April/May, and rather lower densities in February/March. More work is needed to complete the picture and to allow us to sketch the seasonality in overall abundance in the Southern Bight, which would help interpret the nearshore sightings reported in this and previous studies (Camphuysen & Leopold 1993, Camphuysen 2004).

The seawatching results point to some stabilisation in recent years: the period of rapid increase is over. Current sightings frequencies are on a considerably higher level than before 2005 and rather higher numbers are nowadays recorded by the northernmost observatories (Bloemendaal and further to the north). Within the Wadden Sea area, accidental sightings are frequent, notably in the period of peak abundance (late winter), but constant effort sites such as along the mainland coast are

non-existent. Our understanding of the ecology of harbour porpoises is running behind, unfortunately, and new studies to try and help understand the current trends and processes are urgently required. Are the animals in later winter attracted to nearshore waters by some rich but as yet unidentified food source? Is the sudden disappearance in spring simply a contraction away from the coast, or an overall movement north towards open (deeper) sea for the calving period? Are the animals generally doing rather well in Dutch waters, or are we in fact looking at ‘refugees’, driven away from their original wintering areas as a result of food shortages further north (MacLeod et al. 2007, VZZ 2007)? These and other questions should trigger more directed studies of an animal that can be regarded once more as a common and much appreciated indigenous species of Dutch waters (cf. van Deinse 1925, Verwey 1975).

Acknowledgements: The material described here was collected by hundreds of observers over a 21-year period. Gerard Troost (www.trektellen.nl) and Erik van Winden (SOVON) were instrumental during the data merge of the NZG/CvZ database and the online database of www.trektellen.nl, in a project that was funded by the Ministry of Transport and Public Works under co-ordination of Marc van Roomen. Chris Smeenk and Kees Canthers kindly commented on a draft version of this article.

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Samenvatting

Recente veranderingen, seizoenpatroon en ruimtelijke verdeling van waarnemingen van bruinvissen (*Phocoena phocoena*) langs de Nederlandse Noordzeekust, 1990-2010

De bruinvis (*Phocoena phocoena*) is aan het einde van de 20e eeuw teruggekeerd als een talrijke, inheemse soort in de Nederlandse Noordzee na een schijnbare afwezigheid van minstens 30 jaar waarin zo goed als geen enkel levend dier in onze omgeving werd gezien. Zowel de redenen voor de afname in de loop van de jaren vijftig en zestig van de vorige eeuw als voor de toename of terugkeer in de loop van de jaren negentig zijn onbekend. Tijdens twee uitgebreide tellingen van bruinvissen in de Noordzee, de eerste in de zomer van 1994, de tweede in de zomer van 2004, werd geconstateerd dat er een verschuiving in voorkomen van noord naar zuid was opgetreden. Waren bruinvissen in 1994 zo goed als afwezig in de Zuidelijke Bocht (de zuidelijkste punt van de Noordzee), tijdens de tellingen van 2004 werden hier heel wat dieren gezien, vooral langs de Engelse oostkust. Doordat zeetrekwaarnemers (tellers van zeevogelbewegingen langs de Nederlandse kust) al een enorme toename in het aantal bruin-



Harbour porpoises near Texel, March 2011. *Photograph: G. Aarts.*

vissen hadden geconstateerd, kwam deze verschuiving in ons land niet als een verrassing. Vooral in het begin van deze eeuw namen de aantallen snel toe. Om de ontwikkelingen te blijven volgen is een nieuwe analyse van de gegevens van de zeetrekwaarnemers uitgevoerd. De redenen daarvoor waren: 1. de terugkeer van de bruinvis op de agenda van de soortbescherming in Nederland (er waren nu immers weer dieren in ons gebied), en 2. het samenvoegen van twee grote gegevensbestanden: de zeetrektellingen van de Club van Zeetrekwaarnemers (Nederlandse Zeevogelgroep, vooral 1972-2005) en de trektellingen die online werden verzameld door Stichting Trektellen (www.trektellen.nl, vooral 2006-2010). Dankzij deze samenvoeging ontstond een continue reeks van waarnemingen, die nu gecorrigeerd kunnen worden voor variatie in waarnemingsinspanning, aangezien de tellers precies bijhouden wanneer en waar zij gegevens verzamelen. Voor de belangrijkste kustposten, waar sinds 1990 gedurende ongeveer 73.000 uren werd waargenomen, worden de

gegevens hier gepresenteerd. Het blijkt dat de eerder al gerapporteerde, snelle toename in aantallen langs de kust na 2006 niet verder heeft doorgezet. Na twee relatief magere jaren (2007-2008) volgde weer een opleving (2009-2010), maar de aantallen waren niet zo groot als in het topjaar 2006. De bruinvis wordt nu gedurende bijna het gehele jaar gezien, maar is dicht onder de kust vrij zeldzaam in mei en juni, neemt dan geleidelijk in aantal toe tot in december, piekt in februari/maart en verdwijnt in de loop van april uit beeld. Deze snelle afname houdt vermoedelijk met een vertrek uit de directe kustzone, maar waarnemingen op zee (vooral gerichte tellingen van bruinvissen vanuit de lucht zijn geschikt om de aantallen nauwkeurig vast te stellen) ontbreken nog om het seizoenspatroon goed te begrijpen. Uit recente tellingen op zee is gebleken dat in de piekperiode langs de kust (maart 2009-2010) in de zuidelijke helft van het Nederlandse Continentale Plat ongeveer 40.000-50.000 bruinvissen voorkomen. Tellingen in mei (2008) leverden een schatting op van bijna 7000 dieren.

Tegenwoordig worden langs de kust de meeste bruinvissen in de kop van Noord-Holland gezien. In Zuid-Holland, waar de soort al een jaar eerder piekte (2005), lijken tegenwoordig iets kleinere aantallen voor te komen. Het wordt nu tijd om gericht ecologisch onderzoek aan bruinvissen op te zetten, zodat we kunnen begrijpen wat de dieren (vooral) in de late win-

ter en het vroege voorjaar zo dicht naar de kust lokt en waarom ze in april daar weer zo plotseling vertrekken. Voortzetting van de tellingen langs de kust is belangrijk om ook in de toekomst een vinger aan de pols te houden.

Received: 29 April 2011

Accepted: 12 May 2011