

# Cetaceans stranded in the Netherlands from 1998 to 2007

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**Abstract:** Between 1998 and 2007, 2063 cetaceans were found stranded in the Netherlands, representing at least 14 species. Two species, humpback whale (*Megaptera novaeangliae*) and Blainville's beaked whale (*Mesoplodon densirostris*), are additions to the Dutch list. Apart from the first humpback whales, relatively many balaenopterid whales were found in comparison with previous decades. Range extension of recovering populations may explain part of this trend. However, the decline in strandings frequency in sperm whales (*Physeter macrocephalus*), another species with a slowly recovering Atlantic population but with a distinct peak in strandings in the 1990s, suggests that the factors underlying these changes are complex. During the 20th century, the strandings frequency of some dolphin species regularly occurring in the North Sea has changed markedly. Bottlenose dolphins (*Tursiops truncatus*) disappeared in the 1960s, common dolphins (*Delphinus delphis*) were fairly numerous during some decades in the mid-20th century, and white-beaked dolphins (*Lagenorhynchus albirostris*) became abundant and virtually replaced bottlenose dolphins in the strandings records since the 1970s. Numbers of stranded harbour porpoises (*Phocoena phocoena*) continued to increase over the years. All individual cases other than harbour porpoises are listed in this paper, reporting species, date, locality, reporter, sex, total length (TL), collected remains, and remarks. A total of 1968 reports of stranded harbour porpoises were received, ranging from 59 in 1998 to 539 in 2006. It is estimated that along the North Sea coast at least 19% more porpoises were washed ashore than were actually recorded. On the Wadden Sea islands, this discrepancy is estimated as at least 30%. The mean length of porpoises declined gradually with time and the sex ratio was male-biased in all subregions. From measurements (TL) it is concluded that circa 72% were juveniles, with small proportions of adults (15.5%; unsexed and ♂♂ animals of TL>150 cm, ♀♀ animals of TL>145 cm) and neonates or stillborns (12.4%; all porpoises of TL<90 cm). The predominance of males is evident only in juveniles (62.8%), whereas the sex ratio in adults and neonates is not significantly skewed. 20.2% of the females and 12.1% of the males are large enough to be regarded as sexually mature. The overall strandings pattern of the harbour porpoise is bimodal, with peaks in strandings in March-April and August. Presumed adults were proportionally numerous in winter (December-January) and in June, whereas about a quarter of all porpoises found in July, August and September were neonates or stillborn. At least ten porpoises were very large (TL estimated or measured >170 cm) and a minimum of 14 females were either pregnant or had recently given birth. It should be noted, however, that only a small proportion of the porpoises was checked for reproductive status. Foetuses ranged in length from 22 cm (December 2006) to 75 cm (May 2004). Many porpoises were decomposed when found and these were buried or removed and destroyed. At least 38 cases were reported with evident external signs of by-catches, another 17 carcasses had been heavily mutilated with knives. A combination of histopathology and gross pathology of 255 harbour porpoises found in the period 1990-2000 and in 2006 and 2007 suggested that between 50 and 60% of the animals showed signs of definite or probable by-catch in fishing gear. Many of the stranded porpoises found had come into conflict with fisheries and had died, as several of the larger (baleen) whales did. A dialogue with fisheries organisations is proposed to explore the issue further and to try and mitigate the problem.

**Keywords:** cetaceans, strandings, the Netherlands, North Sea, Wadden Sea, fin whale, sei whale, minke whale, humpback whale, sperm whale, Sowerby's beaked whale, Blainville's beaked whale, long-finned pilot whale, bottlenose dolphin, striped dolphin, common dolphin, white-beaked dolphin, white-sided dolphin, harbour porpoise.

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## Introduction

Stranded cetaceans found on the Dutch coast have received considerable attention, in particular since the early 20th century when A.B. van Deinse published his thesis on recent and fossil cetaceans in the Netherlands (van Deinse 1931). Following some earlier papers, his thesis and his review of cetaceans stranded from 1931 to 1944 (van Deinse 1946b), he produced annual reports until his death, reporting strandings from 1942 through 1964 (van Deinse 1943-1966). The regular publication of reviews, first in the format of biennial, later triennial reports, was resumed in the early 1970s, covering 1970 and later years (van Utrecht & Husson 1968, Husson & van Bree 1972, van Bree & Husson 1974, Husson & van Bree 1976, van Bree & Smeenk 1978, van Bree & Smeenk 1982, Smeenk 1986, Smeenk 1989, Smeenk 1992, Smeenk 1995, Smeenk 2003). The most recent paper (Smeenk 2003) covered five years of data (1993-1997) and was the last comprehensive review so far. As in the previous decades, during the past ten years stranded cetaceans have been documented by the staff of the National Museum of Natural History (*Naturalis*) in Leiden. Several spectacular strandings have occurred, including two species not earlier recorded from the Dutch coast: the humpback whale (*Megaptera novaeangliae*) (Smeenk et al. 2003) and Blainville's beaked whale (*Mesoplodon densirostris*). Perhaps even more significant, however, was a drastic increase in the frequency of harbour porpoise (*Phocoena phocoena*) strandings, from  $26.3 \pm 2.0$  (mean  $\pm$  SE) porpoises annum<sup>-1</sup> from 1971 to 1997 to as many as  $194.2 \pm 23.2$  annum<sup>-1</sup> from 1998 to 2007. These events were noticed (cf. Camphuysen 2004) and, in response to an urgent demand for updated strandings data, C.J. Camphuysen digitised published and unpublished data and made an effort to update the resulting database with new strandings. The database was transferred to and is currently managed by Hein van Grouw at *Naturalis*. The database is frequently updated and made available on the internet ([www.walvisstrandingen.nl](http://www.walvisstrandingen.nl)).

Chris Smeenk, author or co-author of seven of the previous reviews reporting strandings of cetaceans in the Netherlands (covering 1976-1997), retired in 2005. With his retirement, and in the absence of a full-time successor at *Naturalis*, there was a risk that the series of carefully documented reviews would come to an end. Some may consider the online database a sufficiently accurate replacement of these publications. However, the authors feel that a printed review providing the possibility of re-assessing reported strandings is a valuable and much needed step in the process of documentation of stranded cetaceans. Strandings data add considerably to our knowledge and understanding of these animals and their occurrence in the (southern) North Sea. Remarkable changes in abundance have occurred over the last century, many of which are touched upon in this review. The possible correlation of these changes with environmental conditions including climate change, make a careful documentation urgent. Some of the data reported here have been included in other recent publications evaluating the status of cetaceans in the Dutch sector of the North Sea (Camphuysen & Peet 2006, van der Meij & Camphuysen 2006). Concerning the validation of the strandings data, the conclusions given in the present paper and in the earlier reviews should be followed.

## Methods

Following conventions in previous reviews of stranded cetaceans, details are listed for each individual found ashore, dead or alive, including species, date, locality, total length (TL, cm), sex ( $\sigma$ ,  $\rho$  or unknown), reporter, registration numbers of any remains in museum collections, and interesting facts such as the proximate cause of death, physical condition or other circumstances. Indications of the status of cetaceans in the Netherlands in the headlines of the species accounts follow the proposals formulated by van der Meij and Camphuysen (2006). A complete listing was impossible for the harbour porpoise, with nearly 2000 documented strandings between 1998 and

2007. For some of the analyses in that species, the data were grouped for 15 subregions, including: the North Sea shoreline of the Wadden Sea islands: Rottum, Schiermonnikoog, Ameland, Terschelling, Vlieland, and Texel (1-6); four stretches of mainland coast: Noord-Holland N (north), Noord-Holland M (central), Noord-Holland Z (south), and Zuid-Holland (7-10), the Voordelta, including the North Sea beaches of Voorne-Maasvlakte (11), and the former Delta islands Goeree, Schouwen, Walcheren, as well as Zeeuws-Vlaanderen (12-15; figure 3). A more simple subdivision used in this paper comprises only five subregions, separating the North Sea shoreline from more inland sites: all sandy beaches and dikes bordering the North Sea of the Wadden Sea islands, the mainland coast of Noord- and Zuid-Holland and the Voordelta as three separate areas, to be distinguished from the inner Delta and Wadden Sea area (including the Wadden Sea sides of the islands). The latter are mainly estuarine areas, consisting of a mixture of beaches, dikes, dams, sluice-complexes, salt

marshes, flood plains and river mouths, and none of these are directly exposed to the North Sea.

Some of the frequent contributors to the strandings database are associated with institutes or organisations, which are indicated by abbreviations. The following were used: EHBZ (Eerste Hulp bij Zeezoogdieren: rescue organisation for stranded marine wildlife, co-ordinated by seal rescue centre Zeehondencreche Pieterburen), KNRM (Koninklijke Nederlandse Redding Maatschappij: life-boat organisation), and NZG/NSO (Nederlands Stookolieslachtoffer-Onderzoek (NSO): national beached bird survey, organised by the Nederlandse Zeevogelgroep (NZG), or Dutch Seabird Group). *Ecomare* is an educational centre based on Texel (with natural history exhibitions and a seal rescue centre). Dolfinarium Harderwijk is the cetacean rescue centre, currently named SOS Dolfijn. The seal rescue centre Zeehondencreche Pieterburen, as frequently referred to in this paper, has recently been renamed “Zeehondencreche Lenie ‘t Hart”. Two natural history museums were regularly in-



Photo 1. Fin whale, 24 August 2004, Noordwijk aan Zee. *Photograph: L. van Duijn.*

Table 1. Stranded whales and dolphins on the Dutch coast, 1998-2007.

|                               | 1998 | 99 | 00 | 01  | 02  | 03  | 04  | 05  | 06  | 07  | Totals |
|-------------------------------|------|----|----|-----|-----|-----|-----|-----|-----|-----|--------|
| unidentified whale or dolphin |      |    |    | 1   |     |     |     |     |     |     | 1      |
| fin whale                     |      | 1  |    | 1   |     | 2   |     |     | 1   |     | 5      |
| sei whale                     |      |    |    |     |     |     |     | 1   |     |     | 1      |
| minke whale                   |      | 2  | 1  | 1   |     |     |     | 2   |     |     | 6      |
| humpback whale                |      |    |    |     | 2   | 1   |     |     |     |     | 3      |
| sperm whale                   |      |    |    |     |     | 4   |     |     |     |     | 4      |
| Sowerby's beaked whale        |      |    |    |     | 1   |     |     |     |     |     | 1      |
| Blainville's beaked whale     |      |    |    |     |     |     |     | 1   |     |     | 1      |
| long-finned pilot whale       |      |    |    |     | 1   |     |     |     | 1   |     | 2      |
| bottlenose dolphin            |      |    |    |     |     |     |     |     |     | 1   | 1      |
| striped dolphin               |      |    | 1  |     |     | 1   |     |     | 1   |     | 3      |
| common dolphin                |      |    |    |     |     | 1   |     |     | 1   |     | 2      |
| white-beaked dolphin          |      | 4  | 3  | 11  | 7   | 4   | 6   | 6   | 3   |     | 49     |
| white-sided dolphin           |      |    | 1  | 1   |     |     |     |     | 1   | 1   | 4      |
| harbour porpoise              | 59   | 89 | 69 | 115 | 107 | 148 | 196 | 306 | 539 | 340 | 1968   |
| unidentified dolphin          | 1    |    | 3  |     |     | 1   | 1   | 1   |     | 1   | 8      |
| unidentified small cetacean   | 67   | 94 | 85 | 125 | 114 | 157 | 211 | 318 | 547 | 345 | 2063   |

volved: the National Museum of Natural History *Naturalis* in Leiden, with RMNH as collection number (from the former name: Rijksmuseum van Natuurlijke Historie), and the Natural History Museum Rotterdam, with collection numbers abbreviated as NHMR. The Royal Netherlands Institute for Sea Research (NIOZ) and Wageningen IMARES based on Texel jointly conducted mass autopsies on harbour porpoises and on some dolphins in 2006 and 2007. Work referring to these autopsies is abbreviated NIOZ/IMARES.

E.J.O. Kompanje compiled lists of accepted and unaccepted historical identifications (distinguishing between records with and without physical or other unambiguous evidence such as photographs or recognisable drawings) of bottlenose dolphins (*Tursiops truncatus*) (Kompanje 2001, 2005a), killer whales (*Orcinus orca*) (Kompanje 1995a) and common dolphins (*Delphinus delphis*) and striped dolphins (*Stenella coeruleoalba*) (Kompanje 2005b). In those publications, which include some of the cases

reported in the present paper, both categories were numbered case by case. For bottlenose dolphin and common dolphin hitherto unknown cases were unearthed later by C.J. Camphuysen while checking logbooks of the Zoological Station in Den Helder (1931-1950) and diaries of F. Niesen (1930-1971), an amateur ornithologist who was based in Haarlem. These are included in some of the long-term reviews of strandings provided in the present paper and explain some of the differences in numbers between this and earlier publications on cetacean strandings in the Netherlands.

O.E. Jansen scrutinised and corrected the lists of white-beaked dolphin (*Lagenorhynchus albirostris*) strandings and combined autopsy reports with strandings data. In anticipation of a complete historical review, including a corrected list of strandings of white-beaked dolphins in the Netherlands, we have used the updated information for 1998-2007, but refrained from listing corrections and additions to earlier publications.

Goodness-of-fit tests were carried out using



Photo 2. Fin whale afloat, 21 August 2004, off Goeree (Z). Photograph: J. Rooks.

Table 2. Known strandings of large whales in the Netherlands, per century (1200-1900) and per decade (1900-2007). The bottom line gives the number of large whales stranded in the period 1998-2007 (overlapping two decades).

|             | fin whale | sei whale | minke whale | humpback whale | sperm whale |
|-------------|-----------|-----------|-------------|----------------|-------------|
| 1200-1299   |           |           |             |                | 2           |
| 1300-1399   |           |           |             |                | 1           |
| 1400-1499   |           |           |             |                | 1           |
| 1500-1599   | 1         |           |             |                | 11          |
| 1600-1699   | 1         |           |             |                | 12          |
| 1700-1799   | 1         |           |             |                | 12          |
| 1800-1899   | 8         | 1         | 4           |                |             |
| 1900-1909   | 1         |           |             |                |             |
| 1910-1919   | 7         |           | 2           |                |             |
| 1920-1929   |           |           | 3           |                |             |
| 1930-1939   |           |           | 2           |                | 2           |
| 1940-1949   | 1         |           | 6           |                |             |
| 1950-1959   | 1         |           | 1           |                | 1           |
| 1960-1969   |           |           |             |                |             |
| 1970-1979   |           | 1         | 1           |                | 2           |
| 1980-1989   |           | 1         | 1           |                |             |
| 1990-1999   | 1         |           | 4           |                | 10          |
| 2000-2007   | 4         | 1         | 4           | 3              | 4           |
| (1998-2007) | 5         | 1         | 6           | 3              | 4           |

the *G*-test. For two-cell comparisons the value of *G* was adjusted using Williams' correction to avoid Type I statistical errors (Sokal & Rohlf 1981). The student's *t*-test was used to test the null hypothesis that the means of two (normally distributed) groups of means were equal.

### Strandings between 1998 and 2007

Reported strandings in the Netherlands comprise 2063 individual whales and dolphins representing at least 14 species, found between 1998 and 2007 (table 1). Twelve species had been recorded before; two species, humpback whale and Blainville's beaked whale, were new for the Dutch list.

**Fin whale** (*Balaenoptera physalus*) gewone vinvis

Irregular visitor; 1900-1997: 10 strandings; 1998-2007: 5 strandings

Fin whales normally occur in deeper waters in the North Atlantic region. Sightings within the North Sea are rare, even in deeper parts further to the north. Five strandings or near-strandings were reported between 1998 and 2007, which is rather more than could be anticipated from numbers recorded in the rest of the 20th century (table 2). The strandings coincided with three recent sightings of apparently healthy fin whales off the Dutch coast in August and September 1998 and in April 2000 (Camphuysen & Peet 2006, van der Meij & Camphuysen 2006). Tall vertical blows produced by large, probably balaenopterid whales were observed from the Dutch coast in



Photo 3. Sei whale, 1 August 2005, Texel. *Photograph: C.J. Camphuysen.*

March and December 2000. Of the strandings listed below, one involved a fin whale that died after having entered the Sloehaven (Vlissingen harbour, Walcheren) in January 2001. The recent sightings and this live-stranding confirm that fin whales enter the southern North Sea and are often capable of leaving the area again. The carcass of an individual found at the bulge of a Stena Line freighter was not fresh, and the same holds true for the other strandings in 1998, 2004 and 2006. These carcasses may have drifted over considerable distances before being washed ashore on the Dutch coast.

4 Aug 1998, afloat off Egmond (NH), ♂, TL circa 1800 (estimated), dragged ashore for examination, badly decomposed, skeleton in Fort Kijkduin (Den Helder). Publications: Kompanje 1998, Trouw 6 Aug 1998 erroneously reported a length of 23m.

14 Jan 2001, alive in Sloehaven, Vlissingen (Walcheren), reported by J. van der Hiele (EHBZ

Zeeland), ♀, TL 1254, 10.500 kg. Entered the harbour earlier on the day, but drowned when it got stuck behind wooden mooring poles at the quayside. Autopsy, by M. García Hartmann, revealed infections in the inner ear, many bones broken during life; various infections and internal bleedings. Skull and incomplete skeleton collection *Naturalis*, RMNH 41217, many photographs available at *Naturalis*. Publications: Provinciale Zeeuwse Courant 15 Jan 2001, 16 Jan 2001, Meininger et al. 2003.

5 Jun 2004, southern North Sea (52°1.5'N, 2°08'E), off Hoek van Holland (ZH), reported by Stena Line, ♂, TL unknown, found at the bulb of the Stena Line freighter *Discovery* while still at sea. Carcass discovered by the pilot and mate when the ship seemingly lost power. The carcass was again reported 7 June 2004 by the crew of *Nordsea Trader* near Noordhinder. Several slides made during both encounters revealed the sex of the animal and facilitated identification.

25 Aug 2004, Noordwijk aan Zee (ZH), ♀, TL 1735, reported by L. van Duijn (EHBZ Katwijk), badly decomposed but complete carcass (photo 1), reported and photographed 21 Aug while still afloat and more intact at sea off Goeree (several slides; photo 2). Several internet publications.

13 Nov 2006, Maasvlakte, Westplaat (ZH), sex unknown, flukes and tail-stock missing, TL>1000 (estimated), reported by KNRM and RWS, corpse badly decomposed. Skull, vertebrae and scapula collection *Naturalis*, RMNH 41465, EHBZ 159/06. Possibly related to a corpse seen at the bulb of SS *California Luna*, off Cherbourg (F) in October 2006.

**Sei whale** (*Balaenoptera borealis*) noordse vinvis

Vagrant; 1900-1997: 2 strandings; 1998-2007: 1 stranding

Not many observers are familiar with the identification characters of the sei whale and possibly as a result, little is known of its status in the North Sea.

There is no evidence, however, to suggest that this species is anything but rare. The stranding reported here is only the third sei whale reliably documented for the Netherlands in the past 100 years and the first since November 1986. The carcass was incomplete and not fresh and may thus have drifted over a fairly long distance.

1 Aug 2005, Texel p24, ♀, TL circa 1000 (estimated), reported by C.J. Camphuysen, incomplete carcass, head and flippers (partly) missing, remaining parts less than 9 m total length. Incomplete skeleton, including scapula and vertebrae collection *Naturalis*, RMNH 41459 (photo 3).

**Minke whale** (*Balaenoptera acutorostrata*) dwergvinvis

Irregular visitor; 1900-1997: 18 strandings; 1998-2007: 6 strandings

Minke whales, largely piscivorous baleen whales, are common in the northern half of the North Sea. Several recent sightings indicate that minke



Photo 4. Minke whale, 7 January 2005, Ameland. Photograph: J. Krol / Natuurmuseum Ameland.



whales at least incidentally use foraging areas to the south of the Dogger Bank, such as the Klaverbank and at the Frisian Front (Camphuysen & Peet 2006, C.J. Camphuysen & M.F. Leopold, unpublished data). Over the past 100 years, however, only 24 strandings have been documented, six of which within the period 1998-2007 (table 2). Two recent cases concerned live-strandings, the other animals were washed ashore in various states of decomposition and these may have drifted over some distance. Only three minke whales were recorded between 1950 and 1990, against at least 13 between 1910 and 1950. Even if some of these strandings were related to war activities, this higher frequency could point to a more regular occurrence closer to the Netherlands in the early 20th century. The total of eight stranded minke whales found since 1990 could indicate a return or range extension of a nearby stock, which would be concurrent with a recent increase in sightings south of the Dogger Bank (Camphuysen & Peet 2006, van der Meij & Camphuysen 2006).

- 20 Mar 1998, Terschelling p17, sex unknown, TL 450, reported by R. Hoffland (Brandaris). Live-stranding, pushed back into the sea. No further reports.
- 23 Jun 1998, Texel p16, sex and TL unknown, reported by C. Ellen, badly decomposed and incomplete carcass.
- 30 Jul 2000, Vliehors (Vlieland), sex and TL unknown, reported by C.J. Camphuysen and C. Zuhorn. Identification based on vertebrae by C. Smeenk, *Naturalis*, found again in Aug 2000 (NZG/NSO 200288). Not collected.
- 15 Apr 2001, Noordwijk aan Zee (ZH), ♂, TL 429, reported by KNRM and C. Kooimans (EHBZ Noordwijk). Live-stranding, rescue attempts failed, euthanized and autopsied by N. van Elk. Extensive middle ear infection on one side.
- 7 Jan 2005, Ameland, sex unknown, TL 405, reported by J. Krol (Natuurcentrum Ameland), badly decomposed, skeleton in Natuurcentrum Ameland (photo 4).

20 Aug 2005, Katwijk aan Zee p86.5 (ZH), ♀, TL 460, reported by L. van Duijn (EHBZ Katwijk). Skull, scapula and other skeletal parts collection *Naturalis*, RMNH 41460. Flukes cut off, probably by-catch.

**Humpback whale** (*Megaptera novaeangliae*)  
bultrug

Vagrant; 1900-1997: not recorded; 1998-2007: 3 strandings (new species)

Since 1751, when a baleen whale was found near Blankenberge in Belgium, identified 255 years later as a humpback whale on the basis of an old painting (Camphuysen & Peet 2006), there had been no record of this species anywhere near the Dutch or Belgian coast. An exception was a fairly recent find of an apparently fresh (dripping with whale oil) scapula of a young humpback whale in February 1995 on the sea-floor near the Klaverbank (53°40' N, 3°50' E) by the Dutch beam-trawler UK43 from Urk (Kompanje 1995b, 1996). The stranding of a fairly fresh carcass in October 2003 was surprising (Smeenk et al. 2003), and even more so were several further sightings and strandings in the Netherlands (5x) and Belgium (1x) in 2003 and in 2004. Unfortunately, all strandings were the result of an unnatural death. A humpback whale calf died off Katwijk in December 2003 under suspect circumstances. Since flukes and one flipper had been cut off, this animal probably had drowned in fishing gear, with the carcass subsequently removed. This stranding occurred after an adult with calf had been seen foraging off the coast up to the previous day, so the damage to the calf must have been inflicted overnight. A lonely adult was seen feeding in that same area for up to a few months after the stranding (Camphuysen & Peet 2006). A young whale found at the Vliehors in 2004 had a rope around its body behind the head, which had inflicted deep wounds and apparently had strangled the animal to death. Finally, a whale stranded in nearby Nieuwpoort (Belgium), 5 March 2006, had died from loss of blood, probably resulting from a collision with a ship's propeller (Haelters et al. 2006). Several humpback whales have vis-

ited the southern North Sea and even successfully foraged off the Dutch coast for some time. The most recent event so far was a sighting of a young humpback whale foraging in the Marsdiep area near Den Helder in May 2007, subsequently reported off SW Ireland in September 2007 and back again near IJmuiden in November 2007 (Camphuysen 2007, Strietman 2008). The sightings and strandings follow an increase in sighting frequency in the North Sea as a whole since 1992, which may be due to a general increase in stocks in the Atlantic Ocean, and an extension of range.

7 Oct 2003, Maasvlakte (ZH), ♀, TL 850, first discovered 29 Sep 2003 when afloat in the Nieuwe Waterweg, dragged into open sea after misidentification as minke whale, seen afloat offshore and finally washed ashore in bad condition at the Maasvlakte. Skull and incomplete skeleton collection *Naturalis*, RMNH 41367.

20 Dec 2003, Katwijk aan Zee (ZH), ♂, TL circa 950 (estimated), seen alive the previous day, accompanied by adult whale, found freshly dead

with part of flipper and flukes cut off. Skeleton collection *Naturalis*, RMNH 41368; many photographs available at *Naturalis*.

22 Jun 2004, Vliehors (Vlieland), ♂, TL 800, reported by M. Nijman and C. Zuhorn, fresh and intact carcass, buried at first, retrieved the next day by *Ecomare* (Texel) (photo 5). Skeleton with baleens in *Ecomare*, Texel. Skin samples for DNA. Animal had been strangled by a rope around the head which had inflicted deep cuts into blubber, flesh and organs.

Of all stranded humpback whales, ectoparasites (barnacles and whale lice) were sampled and are preserved in museum collections (*Naturalis*, NHMR, *Ecomare*).

**Sperm whale** (*Physeter macrocephalus*) potvis  
Irregular visitor; 1900-1997: 15 strandings (individuals); 1998-2007: 4 strandings (individuals)

The sperm whale occurs worldwide in deep oceans and seas. Males of the populations in the North Atlantic Ocean migrate north in summer,



Photo 5. Humpback whale, 22 June 2004, Vlieland. Photograph: D. Bruin.

as far as Iceland and northern Norway. Occasionally, sperm whales stray into the North Sea, where strandings occur mainly in the period November-February. There is a long history of documented sperm whale strandings around the North Sea, with evidence of 'influxes' followed by prolonged periods with none or very few strandings and sightings (Sliggers & Wertheim 1992, Smeenk 1997); for a discussion of this aspect, see Pierce et al. (2007). One such peak in strandings occurred in the 1990s (table 2), leading to several mass (live-) strandings in Britain, Denmark, Germany, the Netherlands and Belgium (Smeenk 1997). The frequency appears to have declined again, with only four animals recorded stranded or washed ashore in the Netherlands and few elsewhere around the North Sea over the past ten years. All recent strandings on the Dutch coast occurred in 2004; the live-stranding of two individuals at the Richel (near Vlieland) in November 2004 is remarkable, because the animals were pushed off the sandbank and not seen again (photographs in Camphuysen & Peet 2006).

- 5 Jun 2004, Noordpolderzijl (G), ♂, TL unknown, reported by Zeehondencreche Pieterburen, incomplete carcass, lower jaw removed by Zeehondencreche Pieterburen. Remains were left on the scene and were reported several times, up to Jan 2005 (NZG/NSO 204181, 205005).
- 24 Jun 2004, Vlieland dam 22, ♂, TL 1500, reported by W. Stel, decomposed carcass. Skeleton in collection Vlieland's Natuurmuseum.
- 2 Nov 2004, Richel (Vlieland), two ♂♂, TL unknown, reported by Doeksen ferry *Oost-Vlieland*, live-stranding, both animals pushed back into the sea (H. Wiegman and KNRM) (photo 6). No further reports since rescue operation.

**Sowerby's beaked whale** (*Mesoplodon bidens*)  
 gewone spitsnuitdolfijn  
 Irregular visitor; 1900-1997: 13 strandings;  
 1998-2007: 1 stranding

All beaked whales (Ziphiidae) are deep-diving species. Sowerby's beaked whale occurs in the North



Photo 6. Sperm whale, 2 November 2004, live-stranding, Richel (Vlieland). Photograph: D. Bruin.

Atlantic Ocean, where it is commonly found along the shelf-break in the Bay of Biscay and off the British Isles. It is the only species that regularly enters the North Sea (Evans 2008). Several (live-) strandings in the Netherlands and Belgium were of pregnant females or females with calves. Most strandings have occurred in July-September (Smeenk et al. 1993).

31 Aug 2002, Schiermonnikoog, ♀, TL 354, reported by Dolfinarium Harderwijk, found alive by birdwatchers, but dead when the rescue team arrived on the scene. Autopsy by N. van Elk (Dolfinarium Harderwijk) and T. Jauniaux (University of Liège) revealed a severe bacterial infection (*Aeromonas salmonicida*). Skeleton collection *Naturalis*, RMNH 41153.

**Blainville's beaked whale** (*Mesoplodon densirostris*) spitssnuitdolfijn van De Blainville  
Vagrant; 1900-1997: not recorded; 1998-2007: 1 stranding (new species)

Blainville's beaked whale is new to the Dutch list.

The species occurs worldwide in tropical and subtropical, deep oceanic waters, in the Atlantic Ocean occasionally as far north as the Bay of Biscay. Extra-limital strandings have occurred in Wales in July 1993 (Herman et al. 1994) and in Iceland (MacLeod 2000). The stranding in the Netherlands constitutes the first record for the North Sea.

12 Apr 2005, Ameland p11, ♀, TL 435, reported by J. Krol (Natuurcentrum Ameland), pregnant female, estimated mass 1000 kg, TL foetus 118. Autopsy on the beach by T. Kuiken (Erasmus University, Rotterdam). CT-scan and MRI-scan made of the head of the adult animal at Erasmus University. No significant diagnosis could be made. Skeleton and foetus collection *Naturalis* RMNH 41458; many photographs available at *Naturalis* (photos 7 and 8).

**Long-finned pilot whale** (*Globicephala melas*) griend  
Irregular visitor; 1900-1997: 12 strandings; 1998-2007: 2 strandings



Photo 7. Blainville's beaked whale, 12 April 2005, Ameland. Photograph: J. Krol / Natuurmuseum Ameland.



Photo 8. Blainville's beaked whale (head), 12 April 2005, Ameland. Photograph: J. Krol / Natuurmuseum Ameland.

Long-finned pilot whales are rare in the southern North Sea, even though rather large pods may be encountered in the English Channel and around Shetland and Orkney. Given the small number of sightings and strandings in the Netherlands (Camphuysen & Peet 2006), there appears to be no regular passage from north to south or vice versa. There are two historical accounts of mass strandings in the Delta area: near St Annaland in April 1825 (38 animals) and near Ouddorp in April 1856 (61 animals stranded, 300-400 escaped; van Deirse 1931). Recent sightings of up to 175 pilot whales off the Belgian coast (Van Gompel 1991) suggest that such strandings would still be possible, but even confirmed sightings of individual pilot whales in Dutch waters are very rare (van der Meij & Camphuysen 2006).

24 May 2003, Hondsbossche Zeewering (NH), ♀, TL 222, reported by A. Gronert. Skeleton collection *Naturalis*, RMNH 41369. Publication: De Windbreker, maart 2004: 14.

23 May 2006, Schiermonnikoog, ♀, TL 465, fresh carcass, numerous photographs (photo 9). Autopsy Pieterburen. Skeleton collection *Naturalis*, RMNH 41463. Publication: Leeuwarder Courant 24 May 2006.

**Bottlenose dolphin** (*Tursiops truncatus*) tuimelaar

Irregular visitor (until recently common resident), 1900-1997: 387 strandings; 1998-2007: 1 stranding

Van der Meij and Camphuysen (2006) listed the bottlenose dolphin as a regular visitor in the southern North Sea, based on strandings and sightings in the past 35 years (being represented in 23 of these years). Earlier in the 20th century, the bottlenose dolphin was a common resident in Dutch waters. However, with only a single stranding of an animal that stayed in the Oosterschelde for some time, and only few well-documented sightings in recent years, the qualification 'regular visitor' as in van der Meij and Camphuysen (2006) is currently unjustified. One or more large herds were seen entering the Wadden Sea in August and September 2004. Otherwise, only solitary dolphins were encountered, most of them with a rather 'dubious' history (individually recognisable, nick-named, stray dolphins from the Channel population, showing aberrant behaviour and making frequent contact with humans).

12 Sep 2007, Lodijsche Gat (Oosterschelde), ♀, TL 262, reported by J. van der Hiele (EHBZ Zeeland), known to have stayed for some weeks in the Oosterschelde basin. Autopsy by T. Jauniaux (NIOZ/IMARES autopsies 2007): 221 kg, fresh corpse, rake-marks on skin and possible rope- or line-marks on flukes, not emaciated, trauma and infections. Skeleton collection *Naturalis*, RMNH 41469.

**Striped dolphin** (*Stenella coeruleoalba*) gestreepte dolfin

Irregular visitor; 1900-1997: 5 strandings; 1998-2007: 3 strandings



Photo 10. Striped dolphin, 14 November 2004, live-stranding, Brouwersdam. *Photograph: L. Provoost.*

Striped dolphins occur worldwide in tropical and warm-temperate waters. The species is abundant in the western Mediterranean, off NW Africa and west and northwest of the Iberian Peninsula as far as the Bay of Biscay. In the North Sea and English Channel, striped dolphins are rare, with most records from the Southwest Approaches to the Channel and off southern Ireland, occasionally as

far north as Shetland. Any status changes cannot readily be assessed through lack of quantitative data, but records of striped dolphins have become more frequent in Britain during the 1990s, suggesting a recent northward extension of range (Evans 2008). The few, relatively recent strandings in the Netherlands (table 3) and recent records from Denmark, Norway, the Faeroes and Iceland, seem to fit that picture. There are no sightings in Dutch waters, but the three stranding records below were probably all of live animals.

- 5 Nov 1999, Ter Heijde (ZH), ♂, TL 180, live-stranding. Animal was transported to Dolfinarium Harderwijk and named “Sten”, where it died the next day. Kompanje (2005b): case #6.
- 14 Nov 2004, Brouwersdam (Schouwen-Goeree), ♂, TL 168, live-stranding, reported by J. van der Hiele and M. Geerse (EHBZ Zeeland) (photo 10). Animal was transported to Dolfinarium Harderwijk and named “Indra”, died later. Kompanje (2005b): case #7. Skull collection *Naturalis*, RMNH 41479.



Photo 9. Long-finned pilot whale, 23 May 2006, Schiermonnikoog. *Photographer: unknown.*

Table 3. Documented strandings of dolphins in the Netherlands, per century (1800-1900) and per decade (1900-2007). The bottom line gives the number of dolphins stranded in 1998-2007 (overlapping two decades). For bottlenose dolphin and white-beaked dolphin, the lists include records that were recently recovered from diaries and old data files (C.J. Camphuysen, O.E. Jansen & C. Smeenk, unpublished data).

|             | bottlenose dolphin | striped dolphin | common dolphin | white-beaked dolphin | white-sided dolphin |
|-------------|--------------------|-----------------|----------------|----------------------|---------------------|
| 1800-1899   | 11                 |                 | 1              | 2                    | 1                   |
| 1900-1909   | 1                  |                 | 1              | 1                    |                     |
| 1910-1919   | 12                 |                 | 2              | 1                    |                     |
| 1920-1929   | 35                 |                 | 5              | 1                    |                     |
| 1930-1939   | 88                 |                 | 16             | 1                    |                     |
| 1940-1949   | 75                 |                 | 36             | 3                    |                     |
| 1950-1959   | 80                 |                 | 17             | 4                    |                     |
| 1960-1969   | 75                 | 1               | 2              | 16                   | 1                   |
| 1970-1979   | 12                 |                 |                | 17                   | 1                   |
| 1980-1989   | 8                  | 1               | 3              | 54                   | 4                   |
| 1990-1999   | 1                  | 4               | 1              | 69                   | 1                   |
| 2000-2007   | 1                  | 2               | 2              | 44                   | 4                   |
| (1998-2007) | 1                  | 3               | 2              | 49                   | 4                   |

2 Mar 2006, Posthuiskwelder (Vlieland), ♀, TL 144, 36.5 kg, reported by V. Kikstra, very fresh with marks in the sediment indicating a live-stranding. Skeleton collection *Naturalis*, RMNH 41462.

**Common dolphin (*Delphinus delphis*) gewone dolfijn**

Irregular visitor; 1900-1997: 83 strandings; 1998-2007: 2 strandings

For some decades in the first half of the 20th century, common dolphins were fairly common in the North Sea and strandings occurred regularly in the Netherlands (Camphuysen & Peet 2006, table 3). Offshore sightings of these dolphins, which would be easily recognised during the frequent ship-based and aerial surveys of the area, are now rare, as are strandings. Some recent sightings were of common dolphins that took up residency: in the Westerschelde, in Scheveningen harbour and in the Marsdiep

area. These dolphins showed aberrant behaviour and were often closely associated with buoys marking shipping lanes. The Westerschelde individual, a pseudo-hermaphrodite, was one of only two documented strandings in the study period.

8 Apr 2003, Verdrongen Land van Saeftinge (Zeeuws-Vlaanderen), known to have been resident from Nov 2001 to at least Feb 2003 in Westerschelde (Camphuysen & Peet 2006). Autopsy by *Naturalis*: genetically ♂, but with female characteristics ('pseudo-hermaphrodite'), TL 154. Skeleton collection *Naturalis*, RMNH 41214, urogenital organs preserved in formalin. Kompanje (2005b): case #50.

15 May 2006, Brouwersdam (Schouwen-Goeree), ♀, TL 120, reported by M. Geerse (EHBZ Zeeland), fresh corpse of young animal. Skeleton collection *Naturalis*, RMNH 41478.

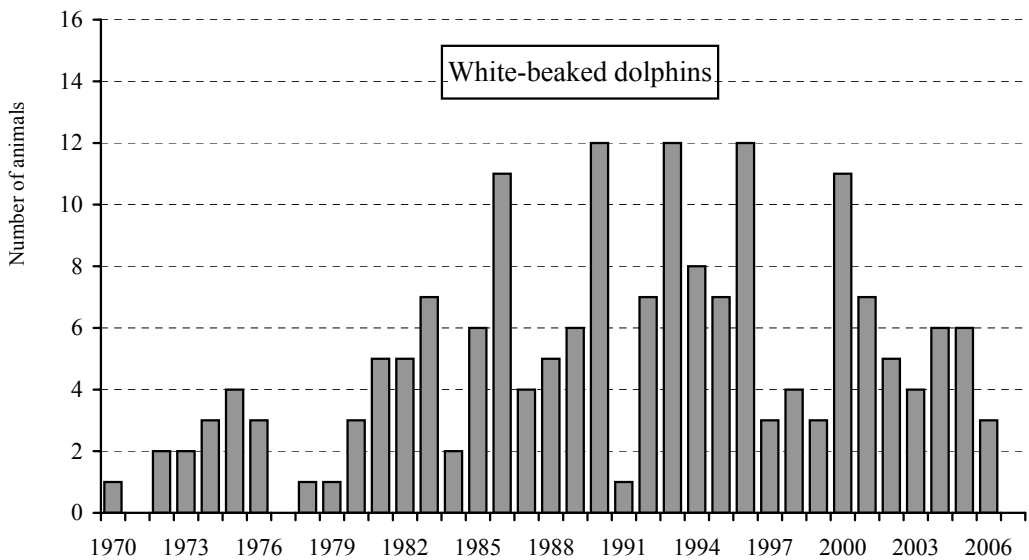


Figure 1. Documented strandings of white-beaked dolphins in the Netherlands in 1970-2007, including records that were recently recovered from diaries and old data files (O.E. Jansen & C. Smeenk, unpublished data).

**White-beaked dolphin** (*Lagenorhynchus albirostris*) witsnuitdolfijn

Resident or annual visitor; 1900-1997: 160 strandings; 1998-2007: 49 strandings

The white-beaked dolphin is a cold-water species, endemic to the North Atlantic Ocean; it is abundant in the northern and central North Sea. Since 1970, stranded white-beaked dolphins have been found nearly every year, with a maximum of twelve individuals per year (figure 1, table 3). White-beaked dolphins do not normally enter shallow coastal waters and therefore seldom approach the Dutch sandy shorelines. Most sightings are made at least 10 km from the coast. Occasionally, large pods are seen, mostly in winter (Camphuysen & Peet 2006). A total of 49 white-beaked dolphins were found from 1998 to 2007, and all cases are listed below.

27 Jan 1998, Scheveningen (ZH), ♂, TL 173, reported by E.J.O. Kompanje. Autopsy *Naturalis*, La980127: by-caught in set net. Skeleton Natural History Museum Rotterdam, NHMR 193.

3 Aug 1998, Razende Bol (Texel), ♀, TL 256, reported by Fort Kijkduin. Autopsy *Naturalis*, La980805. Skeleton in Fort Kijkduin (Den Helder). Publications: Algemeen Dagblad 4 Aug 1998, Kompanje 1998.

15 Sep 1998, Texel p14, sex unknown, TL circa 300 (estimated), reported by A. Oosterbaan (*Ecomare*), badly decomposed, not collected.

1 Oct 1998, Braakmanhaven (Zeeuws-Vlaanderen), ♀, TL 258, reported by Zeeland police. Skeleton collection Natural History Museum Rotterdam, NHMR 197.

9 Nov 1999, Texel p28, sex unknown, TL circa 250 (estimated), reported by Rijkswaterstaat, ropes around head, flippers and tail, badly decomposed, not collected.

23 Dec 1999, Het Kuitje, Balgzand (NH), ♀, TL 251, reported by C. de Greeuw, live-stranding, lactating female that had recently given birth. Autopsy *Naturalis*, La991224, blubber layer 19 mm, cysts in thyroid gland, pneumonia, partly calcified abdominal blood vessels. Skull and part of skeleton collection *Naturalis*, RMNH 41213, rest of skeleton (the last thoracic and first three





Photo 11. White-beaked dolphin, 4 March 2006, Noordwijk aan Zee. Photograph: P. Thomas and J. Wierda.

lumbar vertebrae, longitudinally divided) with Schmorl's nodes (in formalin) collection Natural History Museum Rotterdam, NHMR 475. Publications: De Windbreker Jan 2000, Kompanje 2000, Kompanje & Garcia Hartmann 2001.

Insufficient details are known of a possible third stranding: 6 Jan 1999. Locality, sex and TL unknown. Skeleton collected by E.J.O. Kompanje for Natural History Museum Rotterdam, apparently reported by Zeehondencreche Pieterburen (needs confirmation).

4 Jan 2000, Schoorl aan Zee (NH), ♂, TL 172, reported by C. de Greeuw, live-stranding, transported to Dolfinarium Harderwijk, died the same day. Autopsy Harderwijk, LalSh 014. Severely emaciated (blubber layer 1 cm, plastic in first stomach, bleedings and worm-infested second stomach, estimated age 1-1.5 yrs).

6 Jan 2000, Noordpolderzijk (G), two animals, sex and TL unknown, reported by J. de Boer, live-stranding, successfully released into the

Wadden Sea (observed swimming, no strandings reported soon thereafter; but see 30 Jan 2000).

30 Jan 2000, Noordpolderzijk (G), ♂, TL 235, reported by Zeehondencreche Pieterburen. Autopsy by T. Kuiken, La010200, body mass circa 200 kg, blubber layer 20 cm, tip of fluke missing, heamorrhage in lower jaw, full stomach but ulcerated, worm-infested, and containing part of beer-tin; lung oedema.

30 Jan 2000, Texel p23, ♂, TL 210, reported by M. Brugge (*Ecomare*), head badly damaged and lower jaw missing. Skull and partial skeleton collection Natural History Museum Rotterdam, NHMR 1337.

14 Feb 2000, Kornwerderzand (Afsluitdijk, F), ♀, TL 256, reported by Zeehondencreche Pieterburen, badly decomposed. Skeleton probably in collection Natura Docet, Denekamp.

6 Jun 2000, Texel p15, sex unknown, TL >300 (estimated), reported by R. van der Zwaag

- (*Ecomare*), badly decomposed and buried on the spot, identification not verified.
- 19 Jun 2000, Bloemendaal/Velzen (NH), ♂, TL>200 (estimated; 180 without head), reported by Gemeente Bloemendaal. Skull collection *Naturalis*.
- 13 Jul 2000, Julianadorp (NH), sex unknown, TL circa 200 (estimated), reported by M. Roeper (tourists had reported a living seal on the beach), badly decomposed, not collected.
- Dec 2000, Camperduin p26 (NH), sex and TL unknown, old skeleton uncovered at old tide-line, no flesh remaining. Note that a decomposed carcass of a white-beaked dolphin had been reported on the same locality, 25 Feb 1990 (reported by C.J. Camphuysen, NZG/NSO 90045, TL 230, several slides available), listed as ‘probably washed away’ in Smeenk (1995). It is likely that the skeleton in 2000 was of the same animal.
- 14 Dec 2000, Groote Keeten p9 (NH), ♀, TL 242, reported by R. Roos, very fresh corpse. Autopsy by N. van Elk and T. Jauniaux, *Naturalis*, La001216, lung oedema. Skeleton/skull collection *Naturalis*, RMNH, also NZG/NSO 114121.
- 29 May 2001, Texel p19, ♀, TL 180, reported by M. Zijm (Rijkswaterstaat), badly decomposed, flippers and dorsal fin decayed or absent, not collected.
- 9 Sep 2001, Texel p22-23, ♂, TL 290, reported by K. Uitgeest, no further details known. Publication: *Texelse Courant* 15 sep 2001 (the total length is provided there).
- 30 Sep 2001, Hoek (Zeeuws-Vlaanderen), ♀, TL 280, reported by M. Geerse (EHBZ Zeeland), badly decomposed, destroyed.
- 5 Nov 2001, afloat off Vlissingen, Westerschelde (Walcheren), ♀, TL 239, reported by J. van der Hiele (EHBZ Zeeland). Autopsy *Naturalis*, La011106, haematomes. Skeleton collection Natural History Museum Rotterdam, NHMR 1336.
- 9 Nov 2001, Nieuw Haemstede (Schouwen), ♀, TL 241, reported by S. Hart (later reported by J. van der Hiele, 12 Nov 2001, EHBZ 053/01). Lower jaws sent to *Naturalis* for identification.
- 23 Nov 2001, Langevelderslag (ZH), ♀, TL 228, reported by KNRM Zandvoort. Autopsy *Naturalis*, La011126, pregnant, female foetus TL 28. Skeleton collection *Naturalis*, RMNH 34670.
- 27 Dec 2001, Wassenaarseslag (ZH), sex and TL unknown, reported by Dierenambulance Den Haag, badly decomposed, not collected.
- 9 Feb 2002, Texel p22, ♂, TL 290, reported by M. de Jong and E. Wieman, carcass not fresh, not collected (NZG/NSO NSO 122624). Publication: *Texelse Courant* 12 Feb 2002.
- 7 Apr 2002, Renesse (Schouwen), ♀, TL 282, reported by J. van der Hiele (EHBZ Zeeland). Autopsy *Naturalis*, La020420. Skeleton collection *Naturalis*, RMNH 41152.
- 6 Jul 2002, Zandvoort (NH), ♂, TL unknown, reported by Dierenambulance Zandvoort, badly decomposed. Skeleton collection *Naturalis*, RMNH 41151.
- 18 Sep 2002, Texel p20, sex unknown, TL circa 160 (estimated), reported by A. Oosterbaan (*Ecomare*), badly decomposed, destroyed.
- 27 Nov 2002, IJmuiden (NH), ♀, TL 160, reported by IJmuider *Courant*, very fresh corpse, body mass 49.5 kg, several dozens of whale lice (*Scutocyamus parvus*) (collection *Naturalis*). Autopsy *Naturalis*, La011201, severely emaciated.
- 9 May 2003, Texel p12, sex unknown, TL circa 200 (estimated), reported by H. Brugge (*Ecomare*), rope around tail, no head, destroyed.
- 9 Jun 2003, Vliehors p36 (Vlieland), sex unknown, TL 270, reported by W. Stel, buried on the spot, slides provided by C. Zuhorn (Staatsbosbeheer) used for identification.
- 21 Sep 2003, Texel p12, sex and TL unknown, reported by S. de Wolf (*Ecomare*), a very decomposed white mass, identification based on teeth, destroyed.
- 23 Oct 2003, Kwade Hoek (Goeree), ♀, TL 178, reported by K. Margry, fresh carcass, total mass 55 kg. Autopsy by T. Jauniaux (University of Liège); emaciated, anemia, pneumonia.

- 3 Mar 2004, Griend, sex unknown, TL circa 200 (estimated), reported by A. Liebrand, photographs of skeleton used for identification.
- 11 May 2004, Balgzanddijk (NH), sex unknown, TL < 200 (estimated), reported by H. Kleef, photographs of rather fresh carcass used for identification.
- 13 May 2004, Brouwersdam (Schouwen-Goeree), ♂, TL 274, reported by J. van der Hiele (EHBZ Zeeland). Autopsy *Naturalis*. Skull collection *Naturalis*, RMNH 41471.
- 22 Oct 2004, Texel p28, ♀, TL 247, reported by A. Oosterbaan (*Ecomare*), fresh corpse. Autopsy *Naturalis*, La041022, worn teeth, not pregnant.
- 18 Nov 2004, Ouddorp (Goeree), ♀, TL 248, reported by J. van der Hiele (EHBZ Zeeland), live-stranding, died on the beach. Autopsy *Naturalis*, La041118, worn teeth. Skull collection *Naturalis*, RMNH 41474.
- 22 Nov 2004, Verklikkerstrand, Nieuw-Haemstede (Schouwen), ♀, TL 245, reported by J. van der Hiele (EHBZ Zeeland), not fresh. Autopsy *Naturalis*, La041124. Skeleton collection *Naturalis*, RMNH 41472.
- 4 Jan 2005, Renesse (Schouwen), ♀, TL 187, reported by M. Geerse (EHBZ Zeeland), very fresh corpse. Autopsy *Naturalis*.
- 23 Feb 2005, Nieuw Haemstede (Schouwen), ♀, TL 170, reported by J. van der Hiele (EHBZ Zeeland), badly decomposed, destroyed.
- 22 May 2005, Westenschouwen (Schouwen), ♂, TL 240, reported by J. van der Hiele (EHBZ Zeeland), first seen afloat some 15 m offshore, dragged ashore, total mass 250 kg, rake-marks of conspecifics on skin. Autopsy *Naturalis*, La050523, large lung abscess. Skeleton collection *Naturalis*, RMNH 41475.
- 22 Aug 2005, Marrum (F), sex unknown, TL circa 250 (estimated), reported by P.W. van Leeuwen (IMARES), old corpse, skeleton with remains of skin and some flesh, identification based on slides.
- 19 Dec 2005, Oostvoornsemeer (Oostvoorne), ♂, TL 278, reported by M. Lievaart and R. Pronk, and J. van der Hiele (EHBZ Zeeland), very fresh carcass, numerous photographs. Autopsy *Naturalis*. Skeleton collection *Naturalis*, RMNH 41125.
- 30 Dec 2005, Noordwijk aan Zee (ZH), ♂, TL 175, reported by L. van Duijn (EHBZ Katwijk), very fresh carcass. Autopsy *Naturalis*, La060407-2. Skeleton collection *Naturalis*, RMNH 41470.
- 4 Mar 2006, Noordwijk aan Zee p74.7 (ZH), ♂, TL 185, reported by P. Thomas and J. Wierda, very fresh carcass, transported to *Naturalis* by C. Kooimans (EHBZ Noordwijk aan Zee) (photo 11). Autopsy *Naturalis*, La0600407-1. Skeleton collection *Naturalis*, RMNH 41477.
- 18 May 2006, Blauwe Slenk (Griend), ♀, TL 250, reported by A. Hazekamp (Zeehondencreche Pieterburen) and Brandaris. Autopsy Zeehondencreche Pieterburen. Skeleton collection *Naturalis*, RMNH 41476.
- 10 Dec 2006, De Hors p6 (Texel), ♀, TL 240, reported by S. de Wolf (*Ecomare*). Autopsy T. Jauniaux (NIOZ/IMARES autopsies 2007): not fresh, rake-marks of various size but consistent with conspecifics, 214 kg, moderately emaciated, blubber 13-16 mm, cause of death unclear. Skeleton collection *Naturalis*, RMNH 41467.
- No strandings reported in 2007.

**White-sided dolphin** (*Leucopleurus acutus*)  
witflankdolfijn

Irregular visitor; 1900-1997: 6 strandings; 1998-2007: 4 strandings

The white-sided dolphin is another cold-water species that is endemic to the North Atlantic Ocean. In the (southern) North Sea it is much less common than the white-beaked dolphin. Generally, the species occurs in deeper waters, with frequent sightings, often in larger groups, in the north-central North Sea and west of the British Isles (Evans 1980). Several live-strandings have been documented. The four animals listed below too, were either still alive or were only just dead when found, and all animals were found on the Wadden



Photo 12. White-sided dolphin, 10 April 2007, Schiermonnikoog, just prior to autopsy. *Photograph: C.J. Camphuysen.*

Sea islands. As with the striped and white-beaked dolphins, most strandings on the Dutch coast have occurred in the last 25 years (table 3).

- 23 Jan 1999, Ameland p2, ♂, TL 241, reported by Rijkswaterstaat, live-stranding, died the same day. Autopsy Dolfinarium Harderwijk, LaSh 002, 134 kg. Skeleton collection *Fries Natuurmuseum*, Leeuwarden.
- 11 Dec 2000, Terschelling, ♀, TL 216, reported by Dolfinarium Harderwijk, live-stranding, “Wieke”, died next day. Autopsy Dolfinarium Harderwijk, LaSh 004: pregnant female, foetus 25 cm.
- 8 Mar 2006, Balg, Schiermonnikoog, ♀, TL 222, reported by T. Talsma, transported to *Naturalis* via Zeehondencreche Pieterburen. Autopsy *Naturalis*, Lac060407: had recently given birth, uterus still very large; *Crassicauda* in milk-duct. Skeleton collection *Naturalis*, RMNH 41473.
- 10 Apr 2007, Schiermonnikoog p7, ♂, TL 256, reported by T. Talsma, very fresh, transported to *Naturalis* via Zeehondencreche Pieterburen. Autopsy T. Jauniaux (NIOZ/IMARES autopsies 2007): 156 kg, lamprey marks and rake-marks of conspecifics, severely emaciated, probable by-catch, lung oedema (photo 12). Skeleton collection *Naturalis*, RMNH 41468.

### Harbour porpoise (*Phocoena phocoena*) bruinvis

Resident or annual visitor; 1900-1997: >2000 strandings (incomplete count); 1998-2007: 1968 strandings

The harbour porpoise is in fact the only indigenous species in the Netherlands that can often be seen from land and is commonly found on beaches throughout the year in varying numbers. The decline in abundance in the 1950s and 1960s as well as the recent increase, particularly since the mid 1990s, has been documented in considerable detail and is not again dealt with here (see Kinze et al. 1987, Smeenk 1987, Addink & Smeenk 1999, Camphuysen 2004, Camphuysen & Peet 2006). It is important to remember that harbour porpoises were so numerous in the first half of the 20th century, that systematically recording corpses was not feasible with the limited strandings network of those days. Van Deinse (1931) indicated the number of porpoises found stranded with the symbol ∞ (infinite) and only listed individuals he considered noteworthy for various reasons such as pregnant females, sharp-pointed snout, abnormalities of flippers and flukes, and so forth. Somewhere in the 1950s, when he received repeated comments suggesting a decline in abundance, van Deinse called for strandings data, and from 1951 onwards started listing stranded harbour porpoises (van Deinse 1952). It is unlikely that his figures have ever been anywhere close to representative, and the



Photo 13. Harbour porpoise, neonate (TL 79), 3 June 2006, Noordwijk aan Zee. *Photograph: Arie van Dijk.*

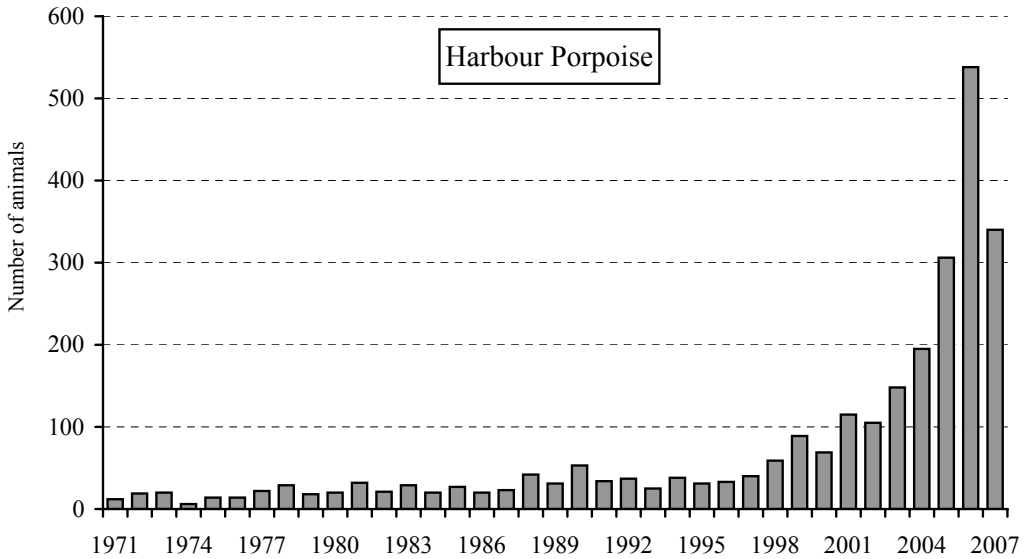


Figure 2. Strandings of harbour porpoises reported in the Netherlands since 1970 ( $n=2697$ ).

decline and near-extinction occurred almost immediately after this initiative.

Harbour porpoises are currently widespread in the southern North Sea and fairly common off the Netherlands, Belgium and northern France. In near-shore waters in the Netherlands, peak numbers are found in winter and spring (December-April) and very low numbers are observed in June (Camphuysen 2004, Camphuysen & Peet 2006). Following a steep increase in sightings, strandings reports have increased in frequency, particularly during the last decade (figure 2), to the extent that it is now impossible to list individual cases in this review.

We received 1968 reports of stranded harbour porpoises, with a minimum of 59 in 1998 and a maximum of 539 in 2006. This means that the number of porpoises reported each year within this period is higher than in any other year since 1970 (max 53 in 1990). The increase in strandings is evident in all subregions of the Dutch coast (figure 3), but it should be emphasised that some recorded patterns are influenced by regional differences in observer effort (i.e. the presence of sufficient observers and the willingness to report strandings to *Naturalis*). This bias

in observer effort may lead to wrong conclusions regarding any regional differences in stranding frequencies. Assuming that spatial patterns in the frequency of strandings, or densities (number of animals per km coastline per unit time) of stranded porpoises along the Dutch sandy North Sea shoreline would be gradual rather than abrupt, the data suggest that strandings may be under-reported in at least four of these subregions (Rotterdam, Schiermonnikoog, Vorne-Maasvlakte, and Zeeuws-Vlaanderen; figure 3B-C). Each of these areas could qualify as relatively 'remote', with limited or sometimes even strictly seasonal access, or are simply off range for many regular contributors to the *Naturalis* database. We therefore may assume that the lower densities found in these subregions are indeed artefacts (bias in observer effort) rather than a representation of true spatial patterns.

Similarly, given the densities on the other Wadden Sea islands, it is clear that the number of porpoises recorded on Terschelling was also too low from 1998 to 2005, but normal in the last two years (figure 3). Densities in the central part of the mainland coast (Noord-Holland M) are slightly on the low side. Both trends agree with

Table 4. North Sea beach length (km), number of documented strandings of harbour porpoises, regional densities ( $n \text{ km}^{-1}$ ), adjusted densities (adjusted  $n \text{ km}^{-1}$ ), and estimated total numbers of stranded harbour porpoises per subregion in the Netherlands, North Sea beach areas only, 1998-2007 ( $n=1733$ ). Adjusted densities marked with ● are adjusted to regional levels (for Wadden Sea islands, mainland coast and Delta area, see text).

|                   | km | totals reported | $n \text{ km}^{-1}$ | adjusted $n \text{ km}^{-1}$ |   | totals estimated |
|-------------------|----|-----------------|---------------------|------------------------------|---|------------------|
| Rottum            | 9  | 9               | 1.00                | 6.43                         | ● | 58               |
| Schiermonnikoog   | 19 | 29              | 1.53                | 6.43                         | ● | 122              |
| Ameland           | 27 | 163             | 6.04                | 6.04                         |   | 163              |
| Terschelling      | 27 | 103             | 3.81                | 6.43                         | ● | 174              |
| Vlieland          | 29 | 195             | 6.72                | 6.72                         |   | 195              |
| Texel             | 32 | 208             | 6.50                | 6.50                         |   | 208              |
| Noord-Holland N   | 31 | 147             | 4.74                | 4.74                         |   | 147              |
| Noord-Holland M   | 29 | 121             | 4.17                | 4.17                         |   | 121              |
| Noord-Holland Z   | 26 | 149             | 5.73                | 5.73                         |   | 149              |
| Zuid-Holland      | 36 | 187             | 5.19                | 5.19                         |   | 187              |
| Voorne-Maasvlakte | 25 | 43              | 1.72                | 4.62                         | ● | 115              |
| Goeree            | 16 | 55              | 3.44                | 3.44                         |   | 55               |
| Schouwen          | 24 | 95              | 3.96                | 3.96                         |   | 95               |
| Walcheren         | 37 | 206             | 5.57                | 5.57                         |   | 206              |
| Zeeuws-Vlaanderen | 14 | 23              | 1.64                | 4.62                         | ● | 65               |
|                   |    | 1733            |                     |                              |   | 2060             |

the fact that reporting tendencies in these subregions have been inconsistent over the years. If we correct these outlying low densities with values based on surrounding areas (table 4), we could estimate that at least 19% more porpoises may have washed ashore along the North Sea shoreline than were actually reported (2060 rather than 1733 individuals). The difference between reported and expected strandings is particularly substantial in the Wadden Sea area (a 30% correction).

Such calculations are impossible for strandings within the inner Delta and Wadden Sea areas, given the heterogeneity in exposure and geography, with all sorts of local effects on the likelihood of strandings and recordings. Moreover, harbour porpoises live predominantly offshore and are uncommon in inshore waters. Within the Wadden Sea itself, along a meandering shoreline of circa 300 km in length with estuaries, dikes, salt-marshes, and floodplains, 158 harbour porpoises were retrieved ( $0.53 \text{ km}^{-1}$ ). In the Delta

area (again excluding the North Sea beaches), with approximately 430 km of inlets, salt-marshes, salt or brackish lakes, creeks, sluices, barriers, dams, and dikes, a total of 73 porpoises were found ( $0.17 \text{ km}^{-1}$ ). It is highly likely that individuals may have been overlooked in these areas, but we cannot estimate how many.

Of 1968 reported harbour porpoises, 1092 were sexed (55.6%) and 59.0% of these were males. Males predominated in all major subregions, and there is no significant difference in the sex ratio between any of these (table 5). The mean total length (TL) of 1353 individuals for which this was measured or estimated, was  $117.4 \pm 23.0 \text{ cm}$  (mean  $\pm$  SD, range TL 42-183). Note that the smallest individual reported was a stillborn (a foetus), carefully measured, of 42 cm in length. The data suggest a slight decline in mean length over the past decade, from  $120.9 \pm 25.8$  (range TL 60-183,  $n=354$ ) between 1998 and 2002, to  $116.2 \pm 21.8$  (range TL 42-180,

$n=998$ ) between 2003 and 2007. The difference in mean total length of porpoises found stranded in these two periods is statistically significant ( $t_{1350}=3.35$ ,  $P<0.001$ , two-tailed  $t$ -test), but the decline is in fact gradual, and with some ups and downs. The TL for males ( $116.9 \pm 20.1$ , range 42-178,  $n=569$ ) was significantly smaller than for females ( $121.6 \pm 24.2$ , range 71-183,  $n=392$ ;  $t_{959}=3.28$ ,  $P<0.005$ ). Plotting the mean length for either sex in time, we see a rather erratic pattern, with a distinct dip in mean length in 2006 (figure

4), when overall numbers washing ashore were higher than ever (figure 2).

Ageing cetaceans is a more delicate matter, but total length was used here as a proxy for age, to be able to include as many individuals as possible. Harbour porpoises with a TL of  $\leq 90$  cm were classified as neonates (or stillborns) (photo 13). Males with TL  $\geq 145$  cm and females with TL  $\geq 150$  cm were classified as adults, and animals of intermediate size as juveniles. Because not all measured individuals could be sexed, we have

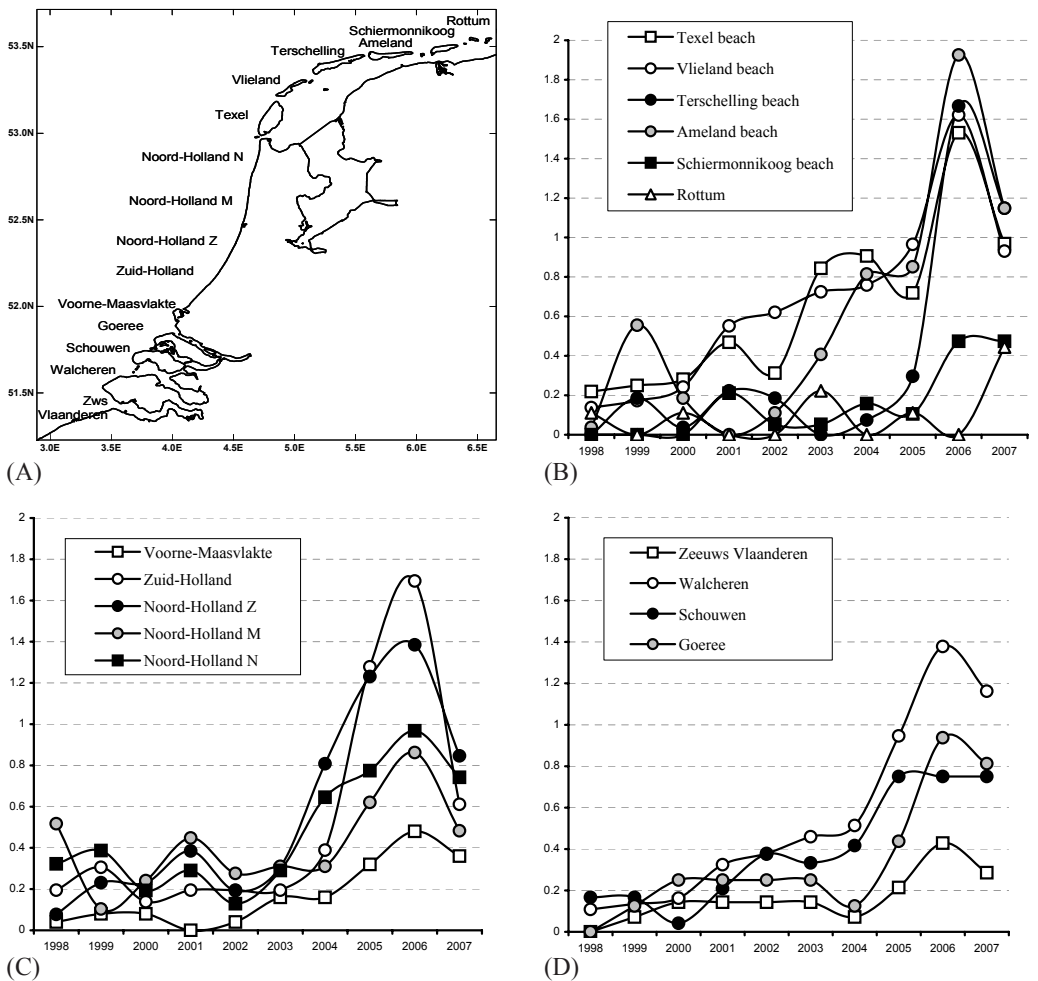


Figure 3. Annual densities ( $n$  per km) of documented strandings of harbour porpoises per subregion in the Netherlands (North Sea beach areas only), 1998-2007 ( $n=1733$ ). The figures show an outline map (A) and regional trends in strandings on the Wadden Sea islands (B), along the mainland coast (C) and in the Delta area (D) (all graphs the same scale).

Table 5. Sex ratio of harbour porpoises stranded from 1998 to 2007 per subregion in the Netherlands. G-tests were applied for subsequent regions (all  $P > 0.05$ ).

|                  | female | male | unknown | % male | sample | $G_{adj}$ |      |
|------------------|--------|------|---------|--------|--------|-----------|------|
| Voordelta        | 128    | 188  | 106     | 59.5   | 316    |           |      |
| Delta            | 22     | 38   | 13      | 63.3   | 60     | 0.31      | n.s. |
| Mainland         | 167    | 204  | 233     | 54.9   | 371    | 1.47      | n.s. |
| Wadden Sea Isles | 109    | 175  | 423     | 61.6   | 284    | 2.90      | n.s. |
| Wadden Sea       | 22     | 39   | 97      | 63.9   | 61     | 0.11      | n.s. |
|                  | 448    | 644  | 872     | 59     | 1092   |           |      |

Table 6. Age composition based on total length (TL) of harbour porpoises stranded from 1998 to 2007 per subregion in the Netherlands (neonates  $TL \leq 90$  cm, juveniles  $TL > 90, < 145$  ( $\delta$ ) or  $< 150$  ( $\text{♀}$ ), adults  $\geq 145$  ( $\delta$ ) or  $\geq 150$  ( $\text{♀}$  and unsexed)).

|                | adult | juvenile | neonate | unknown | % adult | % neonate | sample |
|----------------|-------|----------|---------|---------|---------|-----------|--------|
| Voordelta      | 49    | 256      | 44      | 73      | 14.0    | 12.6      | 349    |
| Delta          | 9     | 46       | 6       | 12      | 14.8    | 9.8       | 61     |
| Mainland       | 72    | 300      | 38      | 194     | 17.6    | 9.3       | 410    |
| Wadden S Isles | 74    | 317      | 73      | 243     | 15.9    | 15.7      | 464    |
| Wadden Sea     | 6     | 55       | 7       | 90      | 8.8     | 10.3      | 68     |
|                | 210   | 974      | 168     | 612     | 15.5    | 12.4      | 1352   |

Table 7. Age composition based on total length (TL) with sex of harbour porpoises stranded from 1998 to 2007 in the Netherlands. See table 6 for conventions.

|           | female | male | unknown | % male | sample |
|-----------|--------|------|---------|--------|--------|
| adult     | 80     | 69   | 61      | 46.3   | 149    |
| juvenile  | 267    | 450  | 257     | 62.8   | 717    |
| neonate   | 46     | 50   | 72      | 52.1   | 96     |
| unknown   | 55     | 75   | 482     | 57.7   | 130    |
| totals    | 448    | 644  | 872     | 59.0   | 1092   |
| % adult   | 20.4   | 12.1 | 15.6    |        |        |
| % neonate | 11.7   | 8.8  | 18.5    |        |        |
| sample    | 393    | 569  | 390     |        |        |

classified unsexed individuals as adults when  $TL \geq 150$  cm, thereby providing a conservative estimate of the fraction of adult, potentially sexually active individuals.

Following this classification, it appeared that the proportion of adults was lower in the Wadden Sea (8.8%), but fairly consistent around 15% in other subregions (table 6). The proportion of

neonates (including stillborns) found, 12.4% overall, varied from 9.3% along the mainland coast to 15.7% on the Wadden Sea islands. When combining the data on sex and expected age (table 7), it appears that the sex ratio in juveniles was strongly biased towards males (62.8%  $\delta$ ,  $G_{adj}$  23.8,  $P < 0.001$ ). The sex ratio of adults and neonates was not significantly different from even. As a re-



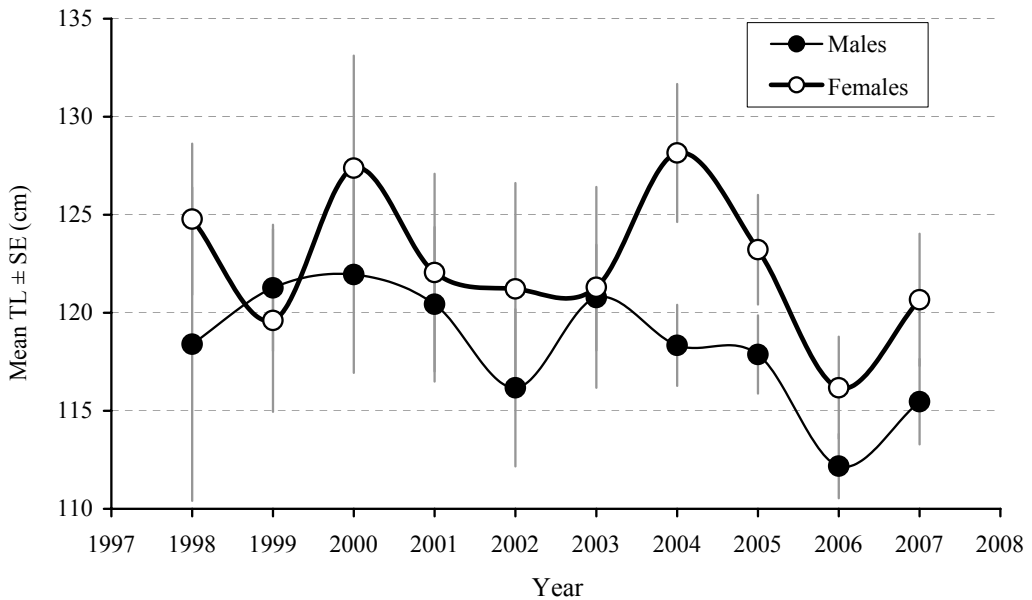


Figure 4. Mean length ( $\pm$  SE) of sexed harbour porpoises, 1998-2007 ( $n=960$  individuals measured and sexed).

sult, the sex ratio in juveniles was significantly different from that in adults ( $G_{adj}$  13.6,  $P<0.01$ ) and neonates ( $G_{adj}$  3.97,  $P<0.05$ ). Overall, 20.4% of the female porpoises were adults, against only 12.1% of the males.

The monthly pattern in strandings was bimodal, with distinct peaks in March-April (23.0% of all animals found,  $n=1968$ ) and August (12.6%). The relative abundance of animals identified as sexually mature was also bimodal, but with distinct peaks in June (27.0%,  $n=89$  aged individuals) and December through January (25.8%,  $n=178$ ; figure 5), indicating that the proportion of adults was highest when frequencies were relatively low. About one quarter of all porpoises in late summer (July-September) were classified as neonates (23.6%,  $n=433$ ), but small individuals were found in low frequencies (<10%) throughout the year (figure 5). The majority of the stranded porpoises were classified as juveniles, throughout the year, with a weak bimodal pattern showing peaks in March (89.2%,  $n=157$ ) and October (79.5%,  $n=73$ ) and relatively low numbers in July (59.2%,  $n=120$ ).

Harbour porpoises are known to reach a maximum length in the order of about 180 cm, but such large animals are uncommon in Dutch waters. Between 1998 and 2007, ten individuals were reported with a TL>170 cm (0.7%,  $n=1352$ ), but unfortunately, the length of most of these animals was estimated rather than carefully measured. Four large animals were measured, and three of these were females:

- 17 Jun 1998, Julianadorp (NH), adult ♂, TL 178, reported by Gemeente Den Helder.
- 14 Dec 2000, Petten p19 (NH), adult ♀, TL 183, reported by A. Gronert, NSO 114084, carcass sent to *Naturalis*.
- 14 Aug 2001, Dishoek (Walcheren), ♀, TL 171, reported by J. van der Hiele (EHBZ Zeeland). Autopsy *Naturalis*, Pp020531-1: large uterus, stomach collected.
- 7 Mar 2007, Ameland p14.4, ♀, TL 171, reported by J. Krol (Natuurcentrum Ameland). Autopsy Zeehondencreche Pieterburen: mass 65.2 kg, pregnant, foetus 50 cm.

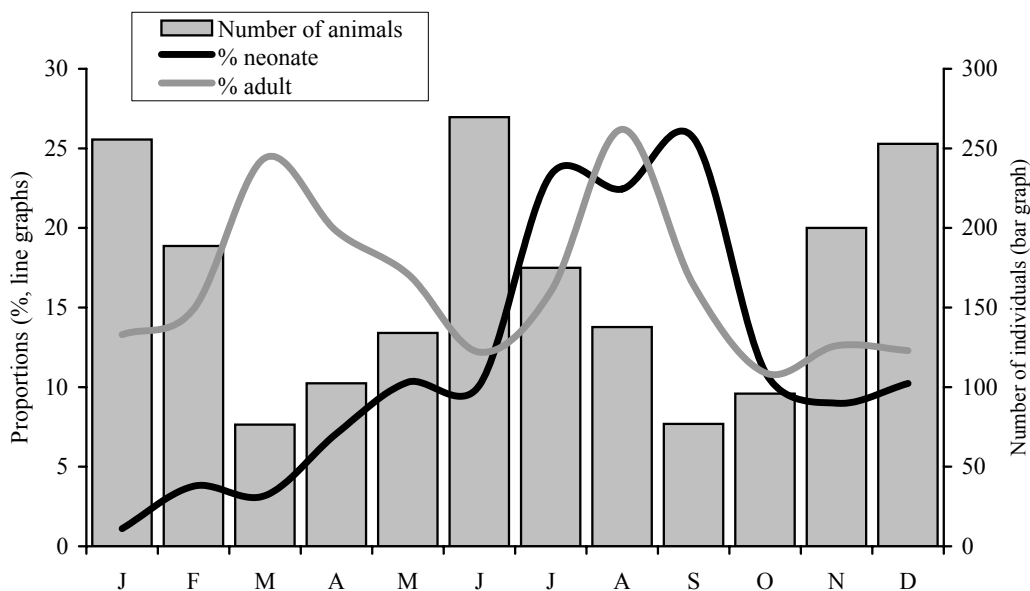


Figure 5. Monthly proportions (%) of harbour porpoises classified as adults and neonates (including stillborns), 1998-2007 ( $n=1349$  individuals aged on the basis of total length; see text), relative to the monthly total reported number of stranded harbour porpoises ( $n=1968$  individuals, bar-graph).

These three large females were either pregnant or had recently given birth. Since only a small fraction of the porpoises found was dissected, we have little idea about the reproductive status of harbour porpoises in the southern North Sea. Including animals dissected at *Naturalis* and during mass-necropsies conducted by NIOZ/IMARES in 2006 and 2007, at least thirteen more females appeared to be pregnant, and these were at least 142 cm in total length. Foetuses ranged in length from 23 cm (Nov 1998, ♀ TL 150, Texel) to 75 cm (May 2004, ♀ TL 149, Vrouwenpolder, Z). One porpoise was found with a calf half-way down the vagina (tail protruding; May 2006, ♀ TL 152, Schoorl aan Zee). The adult had the flukes cut off, suggesting it was a by-catch, released from the net after the flukes had been removed.

Live-strandings were frequent. At least 83 of the reported porpoises were live-stranded (4.2%,  $n=1964$ ), but this is an underestimate given that many more individuals showed signs of having been stranded alive, but were dead when found. Of the known live-strandings, 55 animals were

transported to Harderwijk (66.2%) for treatment and care. Several of these were successfully released after treatment.

Necropsies often revealed signs that the animals found were actually by-catches in fishing gear, drowned in and removed from nets, with or without showing clear external damage (García Hartmann et al. 2004, Leopold & Camphuysen 2006). Many porpoises were decomposed when found and were buried or otherwise disposed of, but even with fresh material, the cause of death can rarely be determined in the absence of a proper necropsy. At least 38 casualties were reported with evident external signs of by-catch. Signs of by-catches included clear net-marks on the body, hooks and nylon line sticking out of the mouth, cut-off flippers and flukes, long, linear knife-cuts from anus to throat, or pieces of fishing net still attached to the animal. Another 17 porpoises were heavily mutilated with knives. We suspect that these were by-catches used for other purposes (flesh and/or blubber taken for consumption

or as bait), or deliberately damaged to make the carcass sink more rapidly. Mutilated individuals were often fresh, with blubber or skin, and sometimes the 'best meat' carefully cut away (suggesting consumption by humans or dogs), or the animal was simply destroyed and parts were found scattered over some distance along the shoreline. Possible ship's propeller's marks were reported only twice, suggesting that this may be a rather insignificant threat. Emaciation was reported very frequently, as were reports of all kinds of skin lesions and occasional (shark?) bites in the bodies of the stranded animals. Scavenging pressure is so high, however, with abundant gulls Laridae, crows Corvidae and red foxes (*Vulpes vulpes*) roaming the Dutch shores, that external damage is often caused well after death, confusing the strandings reporter.

One individual was described as having a colour pattern remarkably lighter than normal (12 November 2001, Bergen aan Zee, photographs *Naturalis*), but otherwise, no anomalies were reported.

## Discussion and conclusions

During the ten-year period discussed here, 14 species of cetaceans were found stranded on the Dutch coast. In anyone year since recording began, between three and five species were reported; only in two years, 1935 and 2006, as many as seven species were found. The average number and diversity of baleen whales found stranded (and observed alive; van der Meij & Camphuysen 2006) was higher than in previous years, with the appearance of the humpback whale as an addition to the Dutch fauna. The frequency of humpback and minke whale, and perhaps also of fin whale, may be signs that populations from more northerly waters are extending their range into the southern North Sea. The increase in sightings and strandings of humpback whales in the southern North Sea may be related to a population increase of this species in the At-

lantic Ocean, which could have led to a range extension into new habitats (Camphuysen 2007). Repeated sightings of the same individual humpback whale in the Netherlands and SW Ireland suggest that at least some whales reach Dutch waters via the English Channel (Camphuysen 2007, Strietman 2008).

The pattern of sperm whale strandings seen in the last decades indicates that population recovery and a possible associated range extension alone may not explain all trends. After a peak in strandings in the 1980s and 1990s in the countries around the North Sea and the adjacent NE Atlantic (Christensen 1990, Berrow et al. 1993, Smeenk 1997), the frequency has declined again. Even though the North Atlantic sperm whale stock has been slowly recovering from centuries of over-exploitation, factors leading to strandings in the North Sea are clearly more complex than just stock size. One or more comparable peaks in strandings occurred in the past, particularly in the last decades of the 18th century, before the onset of sperm whale hunting. Climatic vicissitudes, possibly associated with the distribution and availability of food, may play a part (discussion in Pierce et al. 2007).

Annual or biennial strandings reports give no more than a state of affairs, but overseeing a long series of data reveals interesting trends. Even though the quality and coverage of a strandings network shows considerable variations with time (the early 20th century was a build-up phase for A.B. van Deirse and during the first decades, strandings were not systematically recorded), the comparison of strandings frequencies of some dolphin species, particularly as expressed in the relative numbers in the strandings, points to important changes in the biodiversity of the area. Killer whales, irregular visitors to the southern North Sea during much of the 20th century, have not been found or seen since the early 1960s (Kompanje 1995, Camphuysen & Peet 2006, van der Meij & Camphuysen 2006). Bottlenose, white-beaked and common dolphins show striking changes in strandings frequency over the past century (figure 6). A high frequency of strandings of bottlenose dolphins was record-

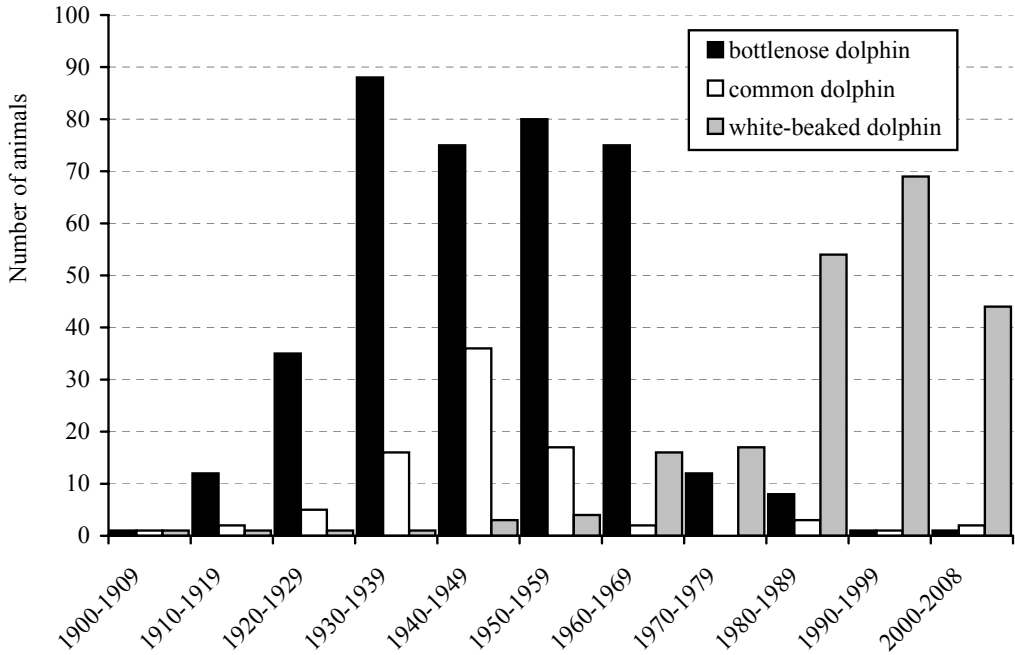


Figure 6. Documented strandings of bottlenose, common and white-beaked dolphins in the Netherlands, 1900-2008, including unpublished records that were recently recovered from diaries and old data files (C.J. Camphuysen, O.E. Jansen & C. Smeenk, unpublished data).

ed up to the 1960s (the first two decades of the 20th century are almost certainly under-reported and therefore unclear for any species), whereas white-beaked dolphins increased in frequency only after the 1950s (Kinze et al. 1997). In the strandings records, this species is now the most numerous dolphin on the Dutch coast, though its numbers have never reached the levels formerly shown by the coastal bottlenose dolphin. Both habitat choice and foraging ecology of bottlenose dolphins and white-beaked dolphins within the North Sea, for as far as currently understood, are rather different. Therefore, the disappearance of the bottlenose dolphin may not have been directly related to the appearance of white-beaked dolphins in the strandings records. The common dolphin, nowadays a rarity, was fairly common in the strandings during the 1930s-1950s. The common dolphin is an oceanic species and it is interesting to note that

other oceanic species such as bluefin tuna (*Thunnus thynnus*) and several oceanic seabirds (van Blerkom et al. 1936, van der Heide 1938, Gullick 1949) were unusually common in the North Sea in those years, at least in comparison with present abundance estimates. A tuna fishery developed, flourished and subsequently collapsed in these years (Tiewes 1978). This co-occurrence could be just coincidental, but a possible link between the abundance of common dolphins and bluefin tuna (these dolphins are known to associate with hunting tuna in the Atlantic Ocean), is at least intriguing. However, these observed trends in strandings can only be explained satisfactorily when we know more about the spatial and temporal patterns in distribution and abundance of each species in the North Sea at large and the underlying ecological conditions. Unfortunately, high-quality sightings data for the North Sea only exist for the past three to four decades. For

the earlier period, we only have the strandings records, however imperfect these may be. The intriguing changes recorded over the past century clearly illustrate that a careful recording of strandings data is very valuable for our understanding of the cetacean fauna of the North Sea, and the possible impact of changing ecological conditions. It is beyond the scope of this paper to explore these issues further.

The number of harbour porpoises found in this period, particularly since the turn of the century, was very large in comparison with the 1970s, 1980s and early 1990s. Unfortunately, we will never know how many porpoises were washed ashore annually earlier in the 20th century. The increase is mainly caused by larger numbers of juveniles, mostly males, travelling into the southern North Sea from areas further north. DNA studies which included samples of stranded Dutch porpoises, suggest that males may disperse further than females (Walton 1997). Also, Dutch samples were genetically heterogeneous and likely comprised a mixture of individuals of diverse origin, many of them probably migrants from the British and Danish North Sea (Andersen et al. 2001). Although the DNA material used in the above studies was collected in the 1990s, before the recent large increase in Dutch strandings, it may help explain the significantly higher numbers of especially juvenile males.

Relatively few adults were found, but pregnant females and numerous neonates illustrate the fact that porpoises currently reproduce successfully in the southern North Sea. The smallest of pregnant females (TL 142 and 149) indicate that an arbitrary minimum length set at TL 150 for adult females, as used in this analysis, is a somewhat conservative estimate of the proportion of mature animals. We have only a limited understanding of the reproductive status of harbour porpoises in the southern North Sea. Pierce et al. (2008) conclude that recent studies mainly suggest that the pregnancy rate in North Sea porpoises is lower than in the western Atlantic and in Icelandic waters and, coupled with evidence of high PCB levels in North Sea animals, they consider this a cause for concern. Also, in view

of the present distributional changes of harbour porpoises in the North Sea, an estimate of the overall pregnancy rate for the North Sea as a whole would seem more realistic, rather than an attempt to provide details of small samples. Finally, a possible bias in our samples is that there may well be differences in pregnancy rate as calculated from samples of by-caught and non-by-caught animals, respectively.

The most recent trends in sightings and strandings of harbour porpoises in the Netherlands (since 2006) seem to point to a decline (Camphuysen 2008a), and the need for continuation of an effective strandings network covering the whole Dutch shoreline is urgent. The network is currently maintained by researchers who have other duties and hence priorities. We therefore express here our hope that in the near future some dedicated person or group of persons will rise to safeguard a permanent nation-wide strandings network, as this provides a rich source of valuable data, complementary to sightings records. In view of the rapidly changing marine environment, only such a network can provide reliable data and other material for future monitoring of cetacean populations in our waters, in close cooperation with *Naturalis* and other institutes.

### **The effect of fisheries**

Over the period 1990-2000, 130 stranded porpoises were intensively dissected under the responsibility of the National Museum of Natural History (*Naturalis*) in Leiden. Of these, at least 58.5% consisted of by-catches in fishery operations, washed ashore after death (García Hartmann et al. 2004). For that study, gross post-mortem autopsy was combined with further histological examination. Based on histopathological criteria, 43.0% of the porpoises examined were diagnosed as by-catch, against 46.1% based on gross pathology alone, whereas 15.3% were diagnosed as 'definitely not by-catch', against 24.6% by gross pathology. The category 'equivocal by-catch' increased from 19.2% by gross pathology to 29.2% by histopathology. By gross

pathology and histopathology combined, 10.1% and 12.5%, respectively, could not be evaluated with certainty, due to constraints in the interpretation of tissue or other data. By combining both techniques, 58.5% of the animals were definitely identified as 'by-catch', 27.7% as 'not by-catch', 7.7% as 'equivocal', and 3% as either 'not classifiable' or 'absolute discrepancy'. About half of the porpoises examined were found in the period reported in the present paper, the other half had been collected before 1998.

It took some years before a similar set of data could be collected, during mass necropsies concerning animals stranded in 2006 (Leopold & Camphuysen 2006) and 2007 (NIOZ/IMARES, unpublished data), respectively. Using largely the same techniques, a combination of gross pathology and histopathology, autopsies were carried out according to the 'Kuiken protocols' (Kuiken & García Hartmann 1992, 1993, Kuiken 1994), under the responsibility of T. Jauniaux (University of Liège, Belgium) in 2006 and 2007, supervised by A. Gröne (Utrecht University) in 2007. In 2006, 64 harbour porpoises (24 females and 40 males, of which 7 neonates, 45 juveniles and 12 adults) were examined and sampled following the standard necropsy procedure. Frequent observations included net-marks on the skin, sub-cutaneous and muscular bruises, emaciation, pulmonary and gastric parasites, acute pneumonia, pulmonary congestion and oedema. In 26 cases, the animals were too putrefied to identify lesions. In the remaining porpoises, two causes of death were significant: by-caught in fishing gear and infectious disease. By-catch in fishing gear (64%) was mostly observed in animals stranded in March and April, whereas infectious disease (30%; mainly acute pneumonia) occurred throughout the year. External evidence of by-catch (net-marks, incisions penetrating into the body cavity) was observed in 57% of the porpoises diagnosed as by-caught. In addition, 43% of the by-caught animals were healthy, others showed evidence of slight to severe emaciation, acute pneumonia or mild to severe parasitosis. At least eleven animals had still food remains in the digestive tract. The study confirmed that

the diagnosis of by-catch in many cases cannot be based solely on external observations, and that not all by-caught porpoises are healthy individuals. Preliminary results over 2007 suggest that slightly less than half of the porpoises were either definite or probable/possible by-catch, but a further histopathological study should confirm and refine this preliminary outcome (NIOZ/IMARES, unpublished data).

All studies indicate that, generally spoken, cetaceans and fisheries are often in conflict. Set nets and anglers (sports fishermen included) seem to cause most problems for cetaceans, but proof is difficult to obtain. It should be realised, however, that the recent increase in strandings of harbour porpoises cannot be attributed to by-catch. Almost certainly, changes in distribution have caused an increase in sightings, first in the NW of the Netherlands, later in the Delta area (Camphuysen & Heijboer 2008), and still later in Belgium and the north of France (Kiszka et al. 2004). Strandings increased in frequency when the numbers of porpoises observed in the southern North Sea increased. The use of set nets, which is among the potentially most dangerous fishing gear for porpoises, has increased in recent years, due to soaring prices of gasoline. But those fisheries were already operational when the influx of porpoises arrived. Lack of appropriate action (by acknowledging and mitigating the problem) has caused so many animals to drown in nets, or to get hooked by anglers. We hope that by emphasizing the problem once more, immediate measures will be taken to reduce by-catch. Such measures can only be effective and satisfactory in co-operation with the fisheries themselves.

Evidence of conflicts with fisheries was not restricted to harbour porpoises. At least two humpback whales were killed directly as a result of fisheries interactions. The humpback whale found on Vlieland, however, was not the victim of a local incident, but must have become entangled long before the stranding, when a loop of a rope got stuck around its head. Several of the recently found minke whales too, including animals recently found in Belgium (Jan Haelters, personal communication), had drowned in

fishing gear, or had their flukes or flippers cut off, evidence that someone must have released the animal or the corpse from entanglement. All these problems are fairly new, but with an apparent increase in abundance of porpoises and other cetaceans nearer to the Dutch coast, our responsibility to try and solve the problem has become more urgent. Providing reliable information is the first step toward solving the problem, to be followed by acknowledging the issue, and to trying to identify the exact circumstances and other details of the by-catch. Only then will we be able to formulate measures to mitigate the problem.

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## Samenvatting

### Strandingen van Cetacea op de Nederlandse kust in 1998-2007

Tussen 1998 en 2007 zijn er van de Nederlandse kust 2060 gestrande of aangespoelde walvisachtigen gerapporteerd, behorend tot tenminste 14 soorten. Twee soorten, de bultrug (*Megaptera novaeangliae*) en de spitsnuitdolfijn van De Blainville (*Mesoplodon densirostris*), waren nieuw voor de Nederlandse lijst. In dit artikel worden per soort alle strandingen (behalve die van de bruinvis, *Phocoena phocoena*) vermeld, met gegevens over datum, vindplaats, geslacht, lengte (TL), vinder, collectie nummers en eventuele nadere bijzonderheden. Deze lijsten worden voorafgegaan door een korte samenvatting van het voorkomen van de soorten in onze wateren.

In vergelijking met eerdere jaren spoelden er opvallend veel vinvissen aan, waaronder voor het eerst ook bultruggen. Waarschijnlijk staat dit in verband met het toenemen van de vinvispopulaties (*Balaenoptera physalus* en *Megaptera novaeangliae*) in de Atlantische Oceaan en noordelijke Noordzee. Strandingen van potvissen (*Physeter macrocephalus*) in de landen rondom de Noordzee bereikten een piek in de jaren '80 en '90; daarna namen de aantallen weer af. Waarschijnlijk speelden hierbij klimaatfactoren (mede) een rol. De strandingsreeksen van de drie algemeenste dolfijnen laten zien dat er zich in de loop van de 20ste eeuw belangwekkende veranderingen hebben voorgedaan. De tuimelaar (*Tursiops truncatus*) verdween in de jaren '60-'70 van onze kust, terwijl de aantallen witsnuitdolfijnen (*Lagenorhynchus albirostris*) in de jaren '70 en vooral '90 sterk toenamen. De ge-

wone dolfijn (*Delphinus delphis*) werd opvallend vaak gevonden in de jaren '30-'50, een periode waarin ook enkele andere oceanische diersoorten talrijk voorkwamen in de Noordzee.

Het aantal aangespoelde bruinvissen nam in de studieperiode zo sterk toe, dat opgave van elk exemplaar ondoenlijk was. Hiervoor verwijzen wij naar de strandingslijsten op [www.walvisstran-dingen.nl](http://www.walvisstran-dingen.nl), waar alle bekende gevallen zijn te vinden en waar men ook nieuwe strandingen kan melden. In totaal werden er 1968 meldingen van bruinvissen ontvangen, uiteenlopend van 59 in 1998 tot maar liefst 539 in 2006. Voor een nadere analyse van deze strandingen is de Nederlandse kust verdeeld in 15 zones. Aangenomen dat de regionale verschillen in aantallen strandingen langs de Noordzeekust voor een belangrijk deel het gevolg zijn van verschillen in dichtheid en activiteit van waarnemers en rapporteurs, schatten wij dat er in werkelijkheid 19% meer bruinvissen zijn aangespoeld dan er werden gemeld, op de Waddeneilanden zelfs 30% meer. De gemiddelde lengte van de gevonden bruinvissen nam in de loop van de jaren geleidelijk af en in alle zones werden meer mannetjes dan wijfjes gevonden. Op grond van de opgegeven lengtematen (deels bevestigd tijdens sectie) bleek, dat het merendeel van de aangespoelde bruinvissen onvolwassen dieren waren, voor 15,5% volwassen (TL ♀♀ >150 cm, ♂♂ >145 cm, sexe onbekend >150 cm) en voor 12,4% pas geboren dieren (= alle bruinvissen TL < 90 cm). Het overschot aan mannetjes was alleen significant onder de juveniele bruinvissen; bij de volwassen en pas geboren dieren was de geslachtsverhouding vrijwel gelijk. Ongeveer 20,2% van het totale aantal wijfjes en 12,1% van de mannetjes werd geclassificeerd als adult en geslachtsrijp.

Het jaarlijkse patroon van bruinvisstrandingen vertoonde twee seizoenspieken: in maart-april en in augustus. Adulte dieren waren naar verhouding talrijk in de winter (december-januari) en in juni; ongeveer een kwart van de bruinvissen uit de maanden juli-september werd op grond van de lengte als pas geboren (neonaat) of dood geboren (geaborteerd) geclassificeerd. Er werden tien bijzonder grote bruinvissen gemeld (TL > 170), maar slechts vier daarvan werden nauwkeurig gemeten; deze zijn in de tekst genoemd. Tenminste 14 wijfjes waren drachtig of hadden kort tevoren geworpen. Dit aantal is echter een minimum, daar slechts een klein deel van de dieren op de snijtafel is onderzocht. De lengte van de foetussen varieerde van 22 cm (december 2006) tot 75 cm (mei 2004). Veel van de gevonden bruinvissen waren al in staat van ontbinding; deze werden begraven of afgevoerd ter destructie. Op grond van uitwendige kenmerken (littekens, verwondingen) werden 38 gevallen van bijvangst herkend; nog eens 17 dieren waren met messen bewerkt, ontspekt of opengesneden kort na of vlak voor de dood. Pathologisch onderzoek aan bruinvissen, gevonden in de jaren 1990-2000 (Naturalis) en in 2006 en 2007 (NIOZ/IMARES), waarbij inwendige, microscopische weefselkenmerken, gegevens over de algehele conditie en uitwendige kenmerken werden gecombineerd, wees uit dat zo'n 50-60% van de onderzochte dieren vermoedelijk in vistuig was omgekomen. Ook enkele baleinwalvissen waren het slachtoffer van verdrinking of verstikking in vistuig. Een goed begrip van de omstandigheden waaronder deze zeezoogdieren verdrinken, is van essentieel belang om deze sterfte terug te dringen.

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