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Research Article

First records of anomalously white harbour porpoises (*Phocoena phocoena*) in the Turkish seas with a global review

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Abstract

Three anomalously white harbour porpoises (*Phocoena phocoena*) were reported in Turkish Seas. One of them was bycaught on 19 June 2011 in bottom gill nets off the eastern coast of the Turkish Black Sea. The second one was observed four times in May and early June 2012 in the Istanbul Strait. The last one was stranded alive on 7 July 2012 in the Istanbul Strait. Records (published and unpublished) of anomalously white harbour porpoises in the world were reviewed. In total, 34 records were found from the world seas: the Black Sea, North Sea, Baltic Sea, North Atlantic Ocean and North Eastern Pacific Ocean. According to these records, three patterns of pigmentation were suggested.

Figures S1 (video), S2, S3, S4, S5, S6, S7, S8 and S9 are available as supplemental material on the Journal web site.

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The harbour porpoise, of which the Black Sea subpopulation (*Phocoena phocoena relicta*) and Baltic Sea subpopulation are classified by IUCN as endangered and critically endangered, respectively (Birkun and Frantzis, 2008; Hammond et al., 2008), lives in cold temperate to sub-polar waters of the Northern Hemisphere.

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Pigmentation of their body is typical of the countershading patterns found in most small odontocetes (Mitchell, 1970). The back and tail flukes are dark grey/black and the belly is white. The border area is with paler grey patches on both sides, lips are dark, with a grey line from jawline to flippers (Bjørge and Tolley, 2009; Evans, 1987; Jefferson et al., 1993). Pigmentation patterns of harbour porpoises are unique to each individual and are not gender related (Koopman and Gaskin, 1994).

Cetacean skin has specific features and is different from other animals, including mammals (Behrmann, 1998; Williams, 2009). In the dark areas on the back, flukes and flippers, melanosomes dominate and are produced by melanocytes. Melanocytes exists in all regions of the epidermis, but they do not produce melanin in white coloured regions. Other skin colours have their own quantity of the melanin pigments that influence colouring. However, the greyish colour of skin is originated from white areas with little production of melanin. Calcareous and keratinous concretions and chromatophores of the cetacean ancestors were preserved in the skin of cetacean (Behrmann, 1998). The skin of harbour porpoise has chromatophores such as melanophores (black), lipidophores (from bright to dark blue), chromatophores (blueish and grey-blueish), and iridescent chromatophores (blue-green colour) (Behrmann, 1998).

Certain genetic conditions cause absence of thirosinase, resulting in a lack of melanin in the eyes, hair and skin, which is known as albinism. The red or pink colour of eyes or skin is caused by blood being seen through colourless tissue (Van Grouw, 2006). Anomalously white individuals are often presumed to be true albinos. Albinism, which is controlled by several different genes (Summers, 2009) is differentiated from piebaldism (body pigmentation missing in only some areas), and leucism (dark-eyed anomalously white animals) which is controlled by a single recessive allele (Owen and Skimmings, 2008). However, it is recommended that pigmentation patterns should not be the only criteria (Fertl and Rosel, 2009) to identify albinism. According to Van Grouw (2006), even though "partial albinism" is a widely used term, it is not a valid concept (*contradictio in terminis*).

According to Hain and Leatherwood (1982), the effects of this aberrant pigmentation in marine mammals may include reduced heat absorption in colder waters, increased conspicuousness to predators, increased skin and eye sensitivity to sunlight and impaired visual communication. Therefore, having such pigmentation might be unfavourable for a harbour porpoise as it is limiting its survival skills.

Anomalously white cetaceans are rare although they have been reported in 24 cetacean species (Fertl et al., 1999, 2004; Nascimento et al., 2007). In total, 14 anomalously white harbour porpoise individuals were reported in the last 100 years (Berrow and Rogan, 1998; Fertl et al., 1999; Hain and Leatherwood, 1982; Keener et al., 2011; Kleinenberg, 1956; Koopman and Gaskin, 1994; Quigley and Flannery, 2002; Rogan and Berrow, 1996; Tsalkin, 1938; Ü, 2009). All the published descriptions of anomalously white harbour porpoises, except for one Black Sea porpoise in 1937 (Tsalkin, 1938) which was possibly a form of piebaldism (Keener et al., 2011), appear to be of leucistic animals rather than albinos. Two individuals (Van Deinse, 1935) were not considered, because Hain and Leatherwood (1982) had suggested that these cetaceans were not anomalously white individuals, given that the pigmented epidermis was absent due to the advanced decomposition.

The abundance of Black Sea harbour porpoises (*P. p. relicta*) has declined in the 20th century due to dolphin fishery, which continued for 2300 years (Tonay and Öztürk, 2012). According to Birkun (2008), the population has not recovered since 1983, when the cetacean fishery was banned in all Black Sea countries. As opposed to the other seas from which anomalously white harbour porpoises have been recorded, the Black Sea is almost an enclosed sea, which makes it very sensitive to various threats. Presently, Black Sea harbour porpoises are threatened mostly by bycatch and habitat degradation.

The aim of this study is to present records of anomalously white porpoises from the Turkish seas and to update the list of world records, to understand the distribution and types of pig-

mentation pattern of this rare phenomenon.

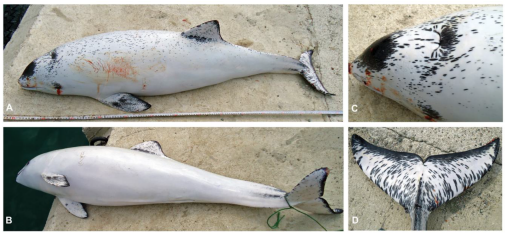

Figure 1 – Anomalously white harbour porpoise bycaught in the Turkish Eastern Black Sea (A: dorsal view, B: ventral view, C: head, D: fluke).

Materials and methods

Although commercial turbot gill net fishery is banned in the Turkish Black Sea coast between May and June, a survey was conducted with a special permit for turbot fishery to determine the interaction between turbot fishery and cetaceans. On 19 June 2011, a 137 cm (total length) adult female anomalously white harbour porpoise (Fig. 1) was bycaught in turbot bottom gill nets about 910 m off the shore of Ardeşen, Rize, on the eastern coast of the Turkish Black Sea (41° 13.241' N, 41° 02.833' E). The water depth where it was caught was 30.6 m. The eyes were pigmented. The lateral and ventral sides of the body were pure white. The dorsal side of the body, flippers, dorsal fin, and the dorsal of fluke were dotted. Shape of dots was elliptic. The lateral sides of the caudal peduncle had spots. The ventral side of flippers and fluke were less dotted than the dorsal side. The posterior margin of the flippers, dorsal fin, flukes and the middle of the dorsal fin base were pigmented. The melon, posterior edge of the blowhole and the area around the eyes had black spots. The innerside of the genital opening was white. After the external photos were taken, morphometric data were collected, skin samples were collected for further DNA analyses and the whole body of the porpoise was preserved in formaldehyde solution at the Museum of Faculty of Fisheries, Recep Tayyip Erdoğan University.

Almost after a year of this record from the Black Sea, the second case of anomalously white harbour porpoise (Fig. 2) was documented in the Istanbul Strait. The first sighting was on the Anadolu Kavağı coast (Anatolian side of the Strait) and was recorded as a short video, which is the first documentation of a young live anomalously white harbour porpoise, by Veterinary A.E. Kütükçü (Fig. S1) on 7 May 2012. According to his observation, the white harbour porpoise was travelling alone before it was spotted out of the other normally pigmented harbour porpoises with a group size of three to five. Meanwhile, there was another group offshore with a group size of six or seven.

Subsequently, three sightings of the same anomalously white harbour porpoise on different dates were documented in the middle part of the Strait during cetacean surveys in May and early June. The white harbour porpoise was observed during the midday for all the sightings for around 15 minutes. The first sighting was recorded at Rumeli Hisari (European side of the Strait) on 18 May 2012. The porpoise was followed by another harbour porpoise, bigger in size, at a distance of less than 2 m. Both porpoises were near the European coast and they were observed mainly when they were diving.

The second sighting was recorded from the Hidiv Tower (Anatolian side of the Strait) after four days, on 22 May 2012. Due to the high elevation (97 m above the sea level) of the observation spot, we had the chance of observe the whole group in detail. The young white harbour porpoise was accompanied by 8 to 10 other harbour porpoises. All of the group members were less than 5 m apart from each other, and they were repeatedly diving close to the shore. The white harbour porpoise seemed generally to remain close to the centre of the group.

The last sighting was also recorded from the Hidiv Tower on 12 June 2012. This time porpoises were about 500 m offshore and the white harbour porpoise was in a group with 8 to 10 other harbour porpoises. Generally, individuals of the group were spread out, but the young white harbour porpoise was always at a close distance with other harbour porpoises. When the observation started, the young anomalously white harbour porpoise was alone and placed in front of the group, while the rest was following, but after a while the young white harbour porpoise was in the centre of the group again. One of the harbour porpoises was observed continuously staying close to the porpoise. The observation was over when they all dived due to the probable effect of a high speed boat crossing within 50 m from them. According to the low resolution photographs and video, the body looks pure white. The edges of dorsal fin were pigmented.

The third case was reported by Coast Guard and local fishermen, within the framework of IU/TUDAV Cetacean Stranding Network. On 7 July 2012, a 133.5 cm (total length), 21 kg adult female anomalously white harbour porpoise was stranded alive at Kireçburnu in the northern Istanbul Strait (41° 8.985' N, 29° 2.675' E) and died an hour later. The eyes were pigmented. Ventral and lower half of the lateral side of the body were pure white (Fig. 3). Dorsal

Figure 2 – Anomalously white harbour porpoise which were sighted four times in May and June 2012 in the Istanbul Strait (photo: A. Beird).

Figure 3 – Live stranded anomalously white harbour porpoise in the Istanbul Strait (A: left lateral view, B: right lateral view, C: ventral view, D: head right lateral view, E: left pectoral fin dorsal view, F: anterior view, G: fluke, H: posterior view).

and upper half of the lateral body (caudal peduncle were lighter) and both sides of the fluke were black. The dark area on the lateral sides changed abruptly to the white colour of the ventral side without any pale grey area. The flippers were dotted, but ventral side of them was less dotted. Mouth edge, except its anterior part and around the ear holes, was white. The line between jaw edges and flippers continued halfway, until near the orthogonal projection of the ear hole. Palate was white, but had few dots. The inner side of the genital opening was black. After the examination, morphometric data were collected and a necropsy was made. Skin and myocardium tissue samples were taken for further DNA analyses. The whole body was preserved in neutral buffered formalin solution (10%) at the Faculty of Fisheries, Istanbul University (Fig. S2).

Results and Discussion

We compiled a list of all reports of anomalously white harbour porpoises including those in Fertl et al. (1999, 2004) and Hain and Leatherwood (1982). Unpublished records were collected through several personal communications with NGOs, research teams, and researchers. In total, there are 16 published (including this paper) and 18 unpublished records of anomalously white harbour porpoises from all distributional ranges of the species, namely the Black Sea, North Sea, Baltic Sea, North Atlantic Ocean and North eastern Pacific Ocean, except North western Pacific Ocean (Tab. 1, Fig. 4). Some of these sightings might have been referring to the same individuals, such as those in the Danish and German waters, English Channel and the Gulf of St. Lawrence, based on the dates and locations of sightings, which are close to each other. Skin pigmentation disorders in harbour porpoises occurs only rarely, but their features are common worldwide, with the exception of the North-western Pacific Ocean for which there are no records until now.

According to the available photographs or detailed pigmentation description of 20 individuals, all of them have pigmentations on their extremities (flippers, dorsal fin, flukes) or on

the dorsal side of the body, or on the head, including the porpoise from Ireland (1988, record no. 7). Although her pigmentation was recorded as completely white (Quigley and Flannery, 2002), light diffuse pigmentation above the eye and dorsally on the snout can be seen on her photographs (Fig. S6). It seems there are three types of pigmentation patterns in general: a) body colour is pure white, but extremities or some areas of body are dotted (records no. 1, 2, 3, 7, 12, 26, 27, 28, 31, 34); b) body colour is white/grey or yellowish, with black dorsal fin (records no. 10, 16, 18, 24, 25, 29); c) body colour is generally normal but in some areas white (records no. 4, 22, 30, 32). Pattern (a) is a type of leucism, but this pigmentation pattern could also be acromelanism, where some colours are retained in the coolest parts of the body of harbour porpoises that live in cold temperate to sub-polar waters of the Northern Hemisphere. This mutation is allelic with albinism (Van Grouw, 2006). Pattern (b) is also a type of leucism. But body colours can also be diluted or brown. Some individuals showing this pattern might be confused with an hybrid of Dall's porpoise (*Phocoenoides dalli*) which is known as present in the Pacific Ocean (Baird et al., 1998). Pattern (c) is a type of leucism but four cases, including the one desribed in this paper, are possibly a form of piebaldism, in which body pigmentation is missing in only some body areas such as for the two individuals from the Black Sea, Baltic Sea and Gulf of Maine. Our possibly piebaldistic individual showed an asymmetric pigmentation, which is well known in harbour porpoises (Koopman and Gaskin, 1994). When we compared this pigmentation with normal pigmentation, we realized that the dorsal side was darker and the gray-blueish color tone on the lateral side was missing. Therefore, the skin tissue of the porpoise must be examined to check whether chromatophores, which are responsible for blueish and grey-blueish colour (Behrmann, 1998) exist or not. Individuals like this may be difficult to recognize in the field, because the dorsal side is dark as in normal individuals and the rare white part is underwater. This kind of coloration, thus, can be more present in nature as expected, without being recognized.

The other 14 individuals which were not photographed, or whose pigmentation was not described in detail, were recorded as only "white". Some of these records may be real albino or pattern (a) individuals. But it could be very difficult to see the red eye or small black dots from far away.

There has been no record of anomalously white cetaceans on the Turkish western Black

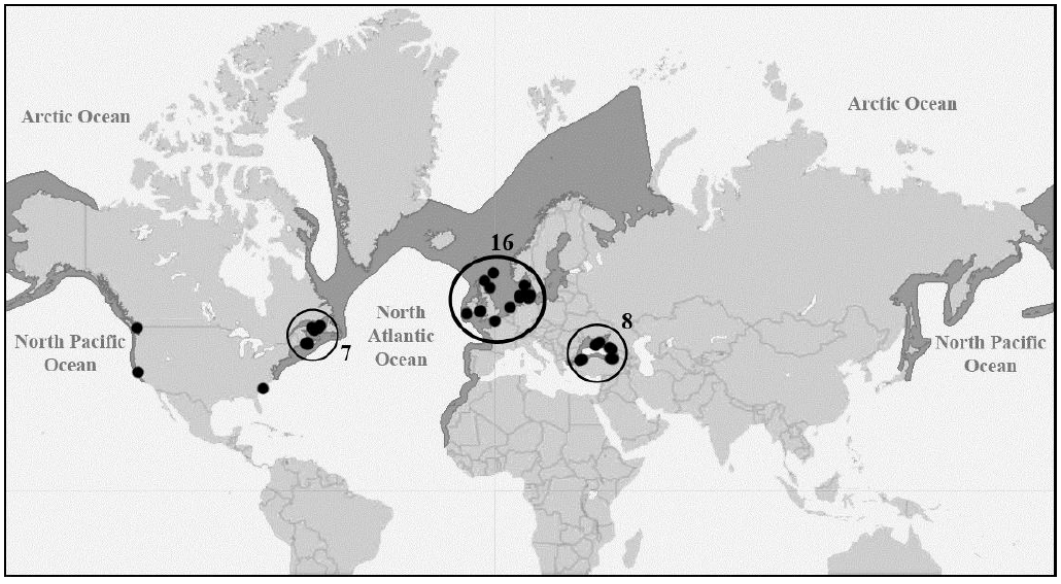

Figure 4 – Geographic range (IUCN, 2008) and number of anomalously white harbour porpoises records in the world oceans.

Sea coast since 1993, when systematic studies on bycatch and cetacean stranding began in the area. The first individual in this study was the first anomalously white harbour porpoise caught in the world seas in the last 25 years. This and the third individual were adult according to their body lengths. As it was mentioned in (Gol'din, 2004), the mean body lengths of adult males and females of Black Sea harbour porpoises are 122-124 cm and 132-134 cm, respectively, and during our surveys between 2007 and 2009, there were not any harbour porpoise over 140 cm length in the Turkish western Black Sea coast (Tonay et al., 2012).

According to the necropsy performed, the third individual which was live stranded was in bad nutritive condition, its blubber was thin, *longissimus dorsi* and neck clearly concave and the nutritive condition code – NCC (Jauniaux et al., 2005) – was 5. Macroscopic findings included anaemia, cachexia, splenic atrophy and stomach was empty. There were three cysts in the stomach walls: one at the junction between the fore stomach and the main stomach, approximately 1 cm in diameter, and the others were in the pyloric stomach, approximately 2 cm in diameter. Searle (1968) mentioned that a wide range of pathological conditions such as lowered fertility, anaemia, sensory and central nervous system defects, and increased susceptibility to infection (Hain and Leatherwood, 1982) is associated with a partial or complete absence of pigments. After gross necropsy, the cause of mortality was found as anaemia and hypoxia due to strangulation. Pathological analyses were continued to find if there was more significant disorders in the individual. Except two young porpoises, the records reported here concern adult individuals, that is, many of such anomalously white harbour porpoises might have died at an early stage of life.

In April, May and June the number of cetacean sightings increases in the Istanbul Strait and the peak months are in May and June for harbour porpoises (Dede at al., 2008). It is known that one of the main reasons behind this increase in the sightings number is due to the fish migration to the Black Sea. Besides, according to the passive acoustic monitoring study in the Strait, cetaceans use the middle part of the Strait for feeding on pelagic fish (Dede et al., 2011). The four live sightings of young white harbour porpoises were recorded also between May and June 2012 in the Istanbul Strait and the dominant behaviour of harbour porpoises, including the white harbour porpoise, was diving.

These sightings in the Istanbul Strait prove that the observed young white harbour porpoise was associated with a group instead of being isolated as an outsider. The white harbour porpoise seemed generally to stay close to the centre of the group. This behaviour was described for pilot whales with a young white individual in the pod (Hain and Leatherwood, 1982).

According to the 25 sightings of this data review, 15 individuals (records no. 9, 10, 12, 17, 18, 20, 21, 24, 25, 26, 27, 29, 30, 31, 34) were in pods or with another porpoise, and one of them (record no. 21) was a white porpoise with a normal calf next to it (I. Hasselmeier, *pers. comm.*). Moreover, Shetland Isles' porpoise (record no. 12) was seen repeatedly in 1992-1994 and was sometimes alone but mostly in the vicinity of other porpoises (P.G.H. Evans, *pers. comm.*). In addition to those 15 individuals, 4 individuals (records no. 11, 13, 14, 15) were alone but there were other porpoises nearby. Four individuals (records no: 16, 19, 22, 23) were alone with no sign of any other porpoise around, and for two individuals (records no. 8, 33) there was no information about their group size. As a result of our sightings and from the available sightings data of the reviewed records, we can assume that pigmentation differences in harbour porpoises may not create remarkable problems on their social behaviours in general.

As said in Hain and Leatherwood (1982) these naturally marked individuals may be used to gain information on populations movement patterns. This is the case of the porpoise (record no. 26), which was observed first in the eastern coast of Turkish Black Sea, and was seen two years later over 100 nautical miles further, in Georgian waters. Likewise, we observed a white porpoise (record no. 31) with its pod four different times in the Istanbul Strait. As far as we understand, the same pod used the Strait during all May and early June. Therefore, white porpoises are like a "flag" of the pod, thus are a golden opportunity for mark-recapture studies

which are difficult for harbour porpoise populations due to their body size and behaviour.

If the harbour porpoise is compared to other large odontocetes, it matures at an earlier age, reproduces more frequently and lives for a shorter period (Read and Hohn, 2006). With comparable frequencies of the recessive alleles, the shorter generation time might be contributing to the higher prevalence of albinism in *Phocoena phocoena*, as the number of individuals in a population expressing a recessive trait is equal to the product of the population size by the frequency of the recessive genotype (Hartl and Clark, 2000). Therefore, harbour porpoises might express recessive hereditary problems more than other cetaceans.

It is essential to carry out the necessary genetic and cytological examination on anomalously white cetaceans to understand these mutations and share observational data to obtain a clear picture of this mechanism.

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Table 1 – Records of anomalously white harbour porpoises .

No.	Date	Location	Length (cm)	Sex	Pigmentation	References
1†	10 August 1911	St. Andrews Bay (North Sea)	84	♀	*Body*: dull yellowish white, *Dark areas*: longitudinal band along dorso-lateral regions, band from eye to mouth. *Eye*: pigmented.	McIntosh (1912)[1]; Prince (1913)[2]
2†	28 April 1928	Balaklava-Yalta (N Black Sea)	-	-	*Body*: white, *Dark areas*: lips, narrow longitudinal stripe on the forehead, a crescent behind blowhole, upper tips of dorsal fin, small spots on its posterior and on upper of flukes, *Eye*: pigmented.	Kleinenberg (1956) (Fig. S3)[3]
3†	July 1929	Skagerrak (North Sea)	150	♂	*Body*: white, *Dark areas*: around lips, large spot on forehead was extending to occipit in a thin stripe along crest, this band reaching dorsal fin along spine, tip of dorsal fin, few small spots on flukes. *Eye*: pigmented.	Peters (1929)[2]
4†	1937	Yalta (N Black Sea)	146	♂	*Body*: white, *Dark areas*: dorsal surface of head and around eyes, broad stripe along back of dorsal of body, lower half of dorsal fin along anterior edge, spots on upper of flukes.	Tsalkin (1938) (Fig. S4)[2]
5†	1948	Novorossiysk (NE Black Sea)	-	♀	*Body*: white	Kleinenberg (1956)
6†	1948	Novorossiysk (NE Black Sea)	-	♂	*Body*: white	Kleinenberg (1956)
7†	12 July 1988	Dingle (NE Atlantic)	176	♀	*Body*: white, *Dark areas*: light diffuse pigmentation above the eye and dorsally on the snout, *Eye*: pigmented	Rogan and Berrow (1996); Berrow and Rogan (1998); Quigley and Flannery (2002); Kerry Eye (1988) (Fig. S5); Photos by Quigley (Fig. S6); K. Flannery and D. Quigley *pers. comm.*[4]
8	-	Waters of Colleton, S Carolina (NW Atlantic)	-	-	*Body*: white	Quigley and Flannery (2002)
9	July-August 1990	Strumble Head, W Wales (NE Atlantic)	-	-	*Body*: white	Quigley and Flannery (2002); P.G.H. Evans *pers. comm.*[5]
10	6 August 1992	Bay of Fundy, Canada (NW Atlantic)	-	-	*Body*: white, *Dark areas*: dorsal fin and mottling on body.	Koopman and Gaskin (1994); L. Murison *pers. comm.*; Photo by Murison (Fig. S7)[6]
11	22 July 1992	Gulf of St. Lawrence (NW Atlantic)	-	-	*Body*: white	R. Sears *pers. comm.*[7]

(continue)

Table 1 – Records of anomalously white harbour porpoises *(continued)*.

No.	Date	Location	Length (cm)	Sex	Pigmentation	References
12	June-September 1992-1994	Mousa Sound, Shetland Isles, N Scotland (NE Atlantic)	-	-	*Body*: white, *Dark areas*: partial	Quigley and Flannery (2002)[8]; P.G.H. Evans *pers. comm.*[5]
13	20 August 1998	Gulf of St. Lawrence (NW Atlantic)	-	-	*Body*: white	R. Sears *pers. comm.*[7]
14	24 July 1999	Gulf of St. Lawrence (NW Atlantic)	-	-	*Body*: white	R. Sears *pers. comm.*[7]
15	16 July 2000	Gulf of St. Lawrence (NW Atlantic)	-	-	*Body*: white	R. Sears *pers. comm.*[7]
16	8 August 2004	Årøsund, Little Belt, Denmark, (Baltic Sea)	-	-	*Body*: white/silver gray, *Dark areas*: dorsal fin.	C.C. Kinze *pers. comm.*; Hvaler web site[9a]
17	17 November 2007	Grønsund, between Falster and Sealand, Denmark (Baltic Sea)	-	-	*Body*: white / cream	C.C. Kinze *pers. comm.*; Hvaler web site[9b]
18	2 August 2007	Point Doughty, Orcas Island (NE Pacific)	-	-	*Body*: white/cream, *Dark areas*: dorsal fin	Ü (2009); Keener et al. (2012)
19	6 June 2008	Off Kerteminde, Great Belt, Denmark (Baltic Sea)	120-130	-	*Body*: white	C.C. Kinze *pers. comm.*; Hvaler web site[9c]
20	Summer 2007-2008	Skomer Island, Pembrokeshire, SW Wales (NE Atlantic)	adult	-	*Body*: white	P.G.H. Evans *pers. comm.*[5]
21	31 August 2008	Sylt Island, Germany (North Sea)	adult	-	*Body*: white (mother with normal coloured calf)	I. Hasselmeier *pers. comm.*[10]
22	4 May 2008	Northern Little Belt, off Løverodde (Baltic Sea)	-	-	*Body*: Gray, *Dark areas*: only forehead and around mouth and around blowhole, above left eye white, the rest is normal.	C.C. Kinze *pers. comm.*; Hvaler web site[9d]
23	13 April 2009	Sylt Island, Germany (North Sea)	adult	-	*Body*: white	I. Hasselmeier *pers. comm.*[10]

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Table 1 – Records of anomalously white harbour porpoises *(continued)*.

No.	Date	Location	Length (cm)	Sex	Pigmentation	References
24	29 June 2009	Between Rudkøbing and Korsør, Great Belt, Denmark (Baltic Sea)	-	-	*Body*: white, *Dark areas*: dorsal fin	C.C. Kinze *pers. comm.*; Hvaler web site[9c]
25	29 August 2009	The English Channel (NE Atlantic)	-	-	*Body*: white, *Dark areas*: a spot around the blowhole, dorsal fin, tail and flippers.	S. Pezeril *pers. comm.*; OCEAMM[11a] blog news; MARMAM mailbase[11b]
26	24 April 2010, 23 June 2012	Trabzon (Turkey, SE Black Sea), Rioni (Georgia, E Black Sea)	-	-	*Body*: white, *Dark areas*: patches on anterior and tip edge of dorsal fin, forehead, small spots on left[12a] and right[12b] surface of dorsal fin, *Eye*: pigmented.	A. Gök *pers. comm.*[12a]; Z. Gurielidze *pers. comm.*; Photos by Gurielidze (Fig. S8)[12b]
27	30 April, 1 October, 24 October 2011, 6 June, 27 October, 2 November 2012	San Francisco Bay (NE Pacific)	-	-	*Body*: white, *Dark areas*: patches crescent posterior of blowhole, smudge anterior of blowhole, eyes surrounded by small patches (supra-orbital "eyebrow" over left eye), edge of left flipper, grey dorsal fin tipped black, fluke lobes were light grey, *Eye*: pigmented.	Keener et al. (2012); W. Keener *pers. comm.*; photo by Keener (Fig. S9)[13]
28†	19 June 2011	Ardeşen Işıklı, Rize (SE Black Sea)	137	♀	*Body*: white, *Dark areas*: melon, posterior blowhole, around eyes, posterior of flippers, edge of dorsal fin, posterior of fluke, dorsal of body, flippers, dorsal fin, fluke were dotted. Lateral of caudal peduncle have spots. Ventral side of flippers and fluke have less dotted than dorsal side, *Eye*: pigmented.	This paper
29	28 July 2011	Bay of Fundy, Canada (NW Atlantic)	-	-	*Body*: white, *Dark areas*: dorsal fin and mottling on body.	L. Murison *pers. comm.*[6]
30	12 Sept. 2011, 25 Sept. 2011	Gulf of Maine, New Hampshire (NW Atlantic)	-	-	*Body*: white, *Dark areas*: band on anterior of blowhole, between blowhole/eye and dorsal fin decreasingly of width, continue as a line on ridge to caudal peduncle, vertically two small lines on the dorsal fin and edges of dorsal fin, *Eye*: pigmented.	D. Schulte *pers. comm.*; Blue Ocean Society blog news[14]; Video by L. Hutchings/Joppa Flats Education Center[15]
31	7 May 2012, 18 May 2012, 22 May 2012, 12 June 2012	Istanbul Strait, Turkey (Turkish Strait System)	-	-	*Body*: white, *Dark areas*: edges of dorsal fin.	This paper
32†	7 July 2012	Istanbul Strait, Turkey (Turkish Strait System)	133.5	♀	*Body*: ventral and lower half of lateral sides were white, *Dark areas*: dorsal and upper half of the lateral of the body (caudal peduncle were lighter), both sides of the fluke. Crossing line black to white and flippers were dotted, but ventral side were less. Edge of the mouth except anterior of mouth and around of ear holes are white. *Eye*: pigmented.	This paper

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Table 1 – Records of anomalously white harbour porpoises *(continued)*.

No.	Date	Location	Length (cm)	Sex	Pigmentation	References
33	March 2012	Texel, Holland (North Sea)	adult	-	*Body*: white	Robinson and Haskins (submitted)[16]
34	24 August 2012	Moray Firth, Scotland (North Sea)	150	-	*Body*: white, *Dark areas*: edges of the dorsal fin, lines from edges to centre of fin, dotted surface of the fin, tinier grey marks on right flank	Robinson and Haskins (submitted)[16]

† Dead animal.

⋆ Cited in Keener et al. (2012). In Hain and Laetherwood (1982) and Kleinenberg (1956) it is 84 and 90 cm, respectively.

[1] Cited in Hain and Laetherwood (1982) and Fertl et al. (1999).

[2] Cited in Kleinenberg (1956).

[3] Kleinenberg (1956) corrects that this cetacean was not an albino common dolphin as described by Mal'm (1933).

[4] Kerry Eye Newspaper, 14 July 1988, Fig. S5 (Quigley and Flannery, *pers. comm.* September 2012) D. Quigley, Sea Fisheries Protection Authority, Eastern Region, Auction Hall, West Pier, Howth, Co Dublin, Ireland. photo: Quigley Fig. S6 (*pers. comm.*, September 2012) K. Flannery, Dingle Oceanworld (Mara Beo Teo), The Wood, Dingle, Co Kerry, Ireland. (*pers. comm.*, September 2012).

[5] P.G.H. Evans, Sea Watch Foundation, Oxford, U.K. (*pers. comm.*, August 2011).

[6] L. Murison, Grand Manan Whale and Seabird Research Station, NB Canada. photo: Murison Fig. S7 (*pers. comm.*, August 2011).

[7] R. Sears, The Mingan Island Cetacean Society, Québec, Canada. (*pers. comm.*, July 2011).

[8] Although Quigley and Flannery (2002) report an albino porpoise, P.G.H. Evans corrects that it was only partial.

[9] C.C. Kinze, Zoological Museum, University of Copenhagen, Denmark (*pers. comm.*, July 2011) Kinze, C.C., Jensen, T., Loos, P., and Deimer, P. Recent sightings of white harbour porpoises (*Phocoena phocoena*) in Danish Waters 2004-2010. (in preparation).

[9a] http://www.hvaler.dk/testnyheder\%20juli\%20august.htm [accessed 25 September 2012]

[9b] http://www.hvaler.dk/testnyheder2007.htm [accessed 25 September 2012]

[9c] http://www.hvaler.dk/nyheder_2009.htm [accessed 25 September 2012]

[9d] http://www.hvaler.dk/_DSC0099_600px.jpg, http://www.hvaler.dk/nyheder_2009.htm [accessed 25 September 2012] Only left half of body was photographed, but C.C. Kinze confirmed that the rest of the body had normal pigmentation.

[10] I. Hasselmeier, Kiel University, Research and Technology Centre, Germany (*pers. comm.*, July 2011).

[11] S. Pezeril, Observatoire pour la Conservation et l'Etude des Animaux et Milieux Marins (OCEAMM), Zuydcoote, France (*pers. comm.*, July 2011).

[11a] http://web.mac.com/OCEAMM/english/blognews/files/archive-aug-2009.html [accessed 15 August 2011]

[11b] https://lists.uvic.ca/pipermail/marmam/2009-September/002504.html [accessed 28 September 2012]

[12] According to the comparison of the photographs, pod size and location of the sightings, there is a high probability that these individual were the same animal. Unfortunately there was no photograph from both sides in both sightings.

[12a] A. Gök, Veterinary of the Foça Municipality, Izmir, Turkey (*pers. comm.*, August 2011).

[12b] Z. Gurielidze, Ilia State University, Institute of Ecology, Kakutsa Cholokashvili Ave 3/5 Tbilisi 0162, Georgia. photo: Gurielidze Fig. S8 (*pers. comm.*, September 2012).

[13] W. Keener, Golden Gate Cetacean Research, 9 Edgemar Way, Corte Madera, CA, USA. Photo (27 October 2012): Keener Fig. S9 (*pers. comm.*, November 2012.

[14] D. Schulte, Blue Ocean Society for Marine Conservation, Portsmouth, NH, USA (*pers. comm.*, May 2012) http://whalesightings.blogspot.com/2011/09/september-25-prince-of-whales.html [accessed 20 May 2012]

[15] L. Hutchings, Massachusetts Mass Audubon Society, Joppa Flats Education Center, Newburyport, MA, USA (*pers. comm.*, 2 October 2012) video: http://secure.smilebox.com/ecom/openTheBox?sendevent=4d6a63344e4455324f545a384d6a49304d7a67324e6a553d0d0a&sb=l [accessed 27 September 2012]

[16] Robinson K., Haskins G. (submitted). Rare sighting of an anomalously white harbour porpoise (*Phocoena phocoena*) in the Moray Firth, northeast Scotland. Marine Biodiversity Records.