



## RESEARCH NOTE

## A white humpback whale (*Megaptera novaeangliae*) in the Atlantic Ocean, Svalbard, Norway, August 2012

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### Abstract

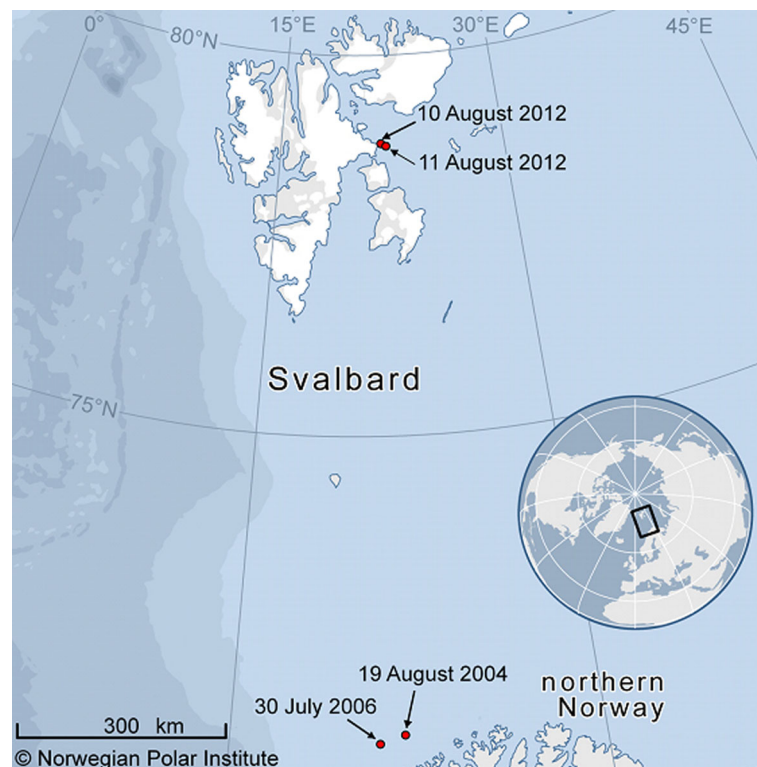
A white humpback whale (*Megaptera novaeangliae*) was observed on several occasions off Svalbard, Norway, during August 2012. The animal was completely white, except for a few small dark patches on the ventral side of its fluke. The baleen plates were light-coloured, but the animal's eyes had normal (dark) colouration. This latter characteristic indicates that the animal was not an albino; it was a leucistic individual. The animal was a full-sized adult and was engaged in "bubble-feeding", together with 15–20 other humpback whales, each time it was seen. Subsequent to these sightings, polling of the marine mammal science community has resulted in the discovery of two other observations of white humpback whales in the Barents Sea area, one in 2004 and another in 2006; in both cases the observed individuals were adult animals. It is likely that all of these sightings are of the same individual, but there is no genetic or photographic evidence to confirm this suggestion. The rarity of observations of such white individuals suggests that they are born at very low frequencies or that the ontogenetic survival rates of the colour morph are low.

Humpback whales (*Megaptera novaeangliae*) occur in all of the world's oceans, and most populations migrate to high latitudes during the summer to feed while spending winters in lower latitude, tropical waters for breeding and calving, where they generally do not feed (Winn & Reichley 1985). Humpback whales in the North Atlantic move from wintering areas in the Caribbean (Katona & Beard 1990) to specific northern feeding grounds ranging from the Gulf of Maine in the south-west to Norway in the north-east. The northernmost distribution area for this species is around the Svalbard Archipelago, Norway, where humpback whales are recorded on an annual basis north of 80°N in the Norwegian Polar Institute's Marine Mammal Sighting Database (<http://mms.data.npolar.no>).

Humpback whales are normally black on the dorsal surface with variable pigmentation on the ventral side that ranges from entirely black to entirely white, with mottled black and white colouration being the norm.

This species often raises the fluke when they are about to dive; the fluke's shape and the underside colour pattern are unique individual characteristics that can be used for identification (Katona et al. 1979). Reference libraries of humpback whale flukes for photo-identification of individuals have been used in mark-recapture studies to estimate population size and for documenting migratory connections (e.g., Stevick, Allen, Berube et al. 2003; Stevick, Allen, Clapham et al. 2003).

During the summer of 2012, a white humpback whale was observed in Svalbard, Norway, on two occasions. On 10 August 2012, this individual was found along with 15 other humpback whales at about 78.83°N, 21.73°E (Fig. 1). The group was composed entirely of adult-sized animals, which were actively foraging in sub-groups in association with seabirds, mainly black-legged kittiwakes (*Rissa tridactyla*). The white individual was involved in bubble-feeding with two conspecifics. Bubble-feeding



**Fig. 1** Map of Svalbard and northernmost mainland Norway. Red dots indicate positions where white humpback whales have been observed in the North Atlantic.

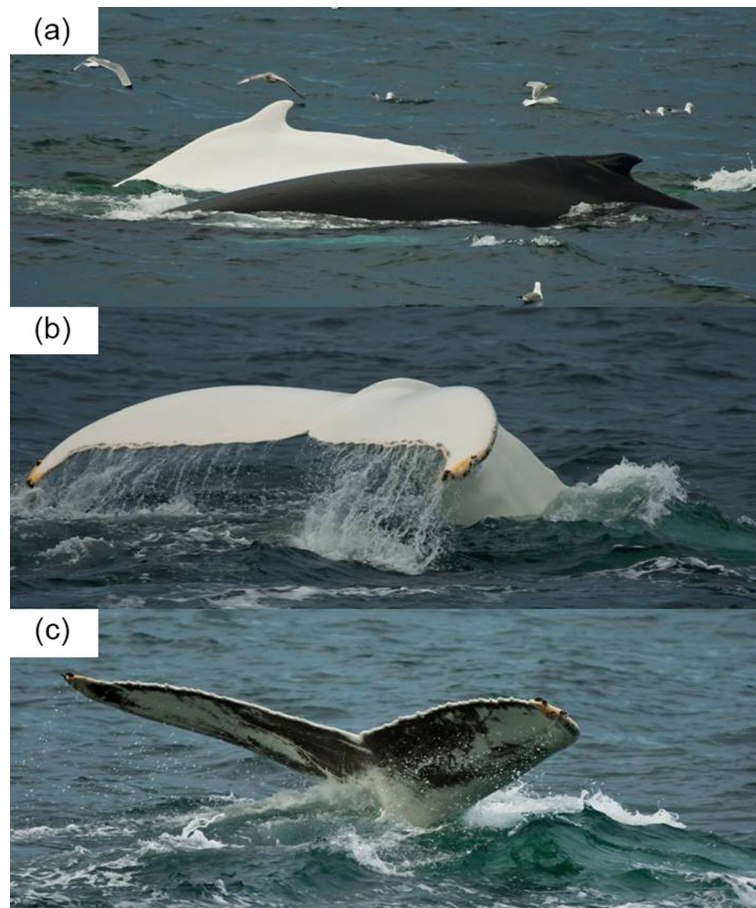
involves the whales swimming underwater while exhaling air, making a bubble net that concentrates prey into a tight school (Ingebrigsten 1929; Jurasz & Jurasz 1979). The white humpback whale was seen again on 11 August, at 78.80°N, 22.07°E (Fig. 1) in a group of 20 adult humpback whales; the whales were again feeding actively in small groups in association with black-legged kittiwakes.

The anomalously coloured humpback was completely white on the dorsal side (Figs. 2, 3) but had some black patches of pigmentation on the underside of the fluke (Fig. 2c). Although humpbacks' baleen plates can be white towards the tip of the jaw (Clapham 2009), they are normally black; those of the observed individual were completely white as far back in the mouth as could be seen (Fig. 3c). Pictures taken from height (up the mast of a sailboat) revealed that the eyes of this white individual had normal (dark) colouration rather than albino pink (Fig. 3a, b).

Colouration in mammals is almost entirely dependent on the presence of melanin pigment in the skin, hair and eyes (Fertl & Rosel 2009). Melanin is produced from the amino acid tyrosine via a stepwise biochemical pathway that involves the enzyme tyrosinase. Mutations or alterations in the tyrosinase gene affect the ability to

produce melanin (Fertl & Rosel 2009). If this production is stopped completely, the result is albinism, which is characterized by a complete lack of pigment in the skin, hair and eyes. However, if the production of melanin is reduced but not entirely blocked, it can result in so-called leucism, where the hair and skin can be white while the eyes are coloured normally. Other anomalies resulting from unusual melanin production can produce piebaldism, in which pigmentation is missing in some areas of the body, and melanism, in which animals are anomalously dark due to overproduction of melanin (Fertl & Rosel 2009).

Records of cetaceans with anomalously white pigmentation are available for at least 20 different species (Fertl et al. 1999; Fertl et al. 2004). However, white humpback whales are extremely rare and have been reported previously only in Australian waters. In a review of white cetaceans, Fertl et al. (1999) refer to a personal communication regarding a white humpback whale in Australian waters during the 1990s. This refers to the locally famous "Migaloo" (<http://migaloo.com.au/>) that was first photographed near Byron Bay in Australia in 1991 (Forestell et al. 2001). This all-white individual, which has been genetically confirmed to be a male, has been seen regularly in eastern Australia over the past two decades,



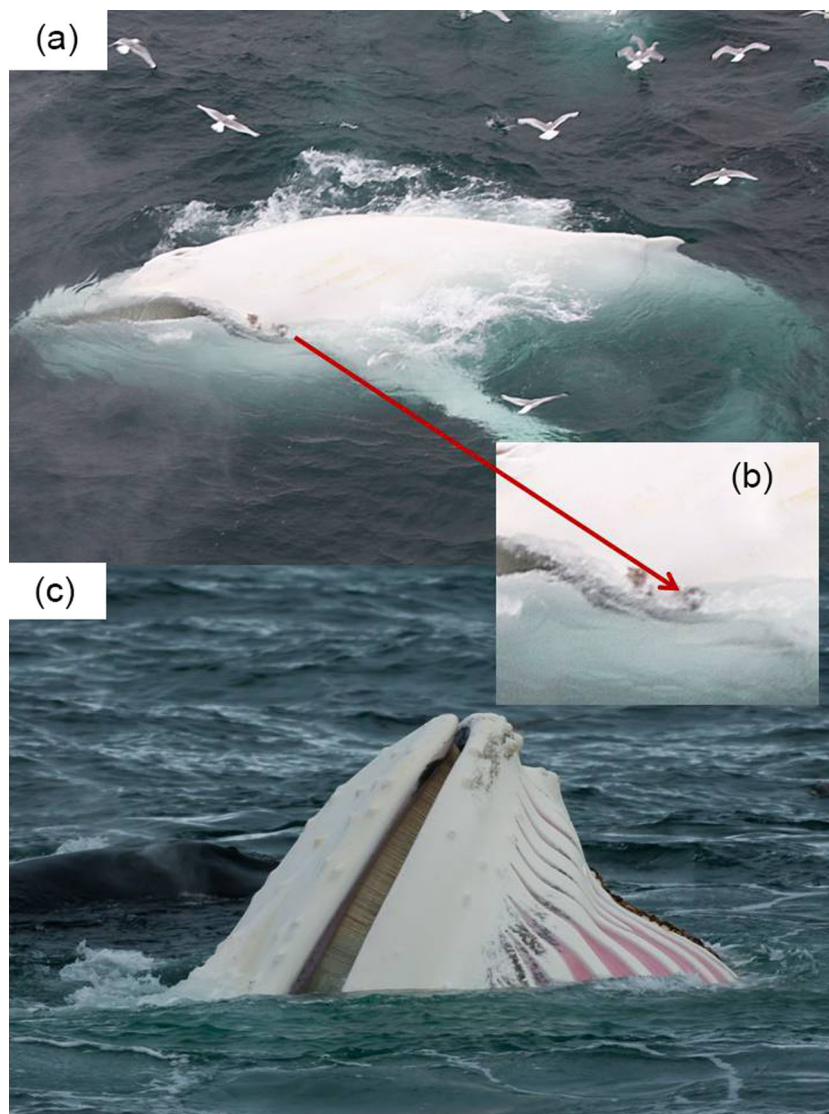
**Fig. 2** Photographs of a white humpback whale from Svalbard, taken on 10 August 2012, showing (a) the animal swimming with an individual of normal colouration; (b) the white individual's dorsal side and serrated trailing edge of the fluke; and (c) the underside of the fluke, with dark patches of pigmentation.

including 2012. Migaloo has been photographed numerous times, but according to Polanowski et al. (2012) no picture clearly showing the eyes is available. However, this individual is reported to have an unusual amount of pink pigmentation around the blowhole. A genetic investigation of biopsy samples from a number of humpback whales from Australia, including Migaloo, revealed that Migaloo is homozygous for a cytosine deletion in the tyrosinase gene (Polanowski et al. 2012). In 2012, another white humpback whale with some dark markings on the dorsal surface was observed and photographed in eastern Australia (<http://migaloo.com.au/sightings/12th-july-not-migaloo-but-a-relative/>).

The fluke pattern and colouration on the humpback sighted in Svalbard in 2012 (Fig. 2) confirm that this whale is not Migaloo or the other white humpback whale from Australia (see <http://www.everseradio.com/call-me-migaloo/> and <http://migaloo.com.au/> for photographs of the two Australian specimens). This was

expected to be the case based on general knowledge of migration patterns of baleen whales, even if general beliefs regarding cetacean movement patterns have been challenged in recent years by humpback whales migrating from the Indian Ocean into the Atlantic Ocean (Pomilla & Rosenbaum 2005), Antarctic minke whales (*Balaenoptera bonsarensis*) moving to the Northern Hemisphere (Glover et al. 2010) and grey whales (*Eschrichtius robustus*) moving from the Pacific Ocean into the eastern end of the Mediterranean Sea (Scheinin et al. 2011).

There are photographic reference libraries for humpback observations with identification pictures of the flukes for most of the world's oceans. The North Atlantic photo-identification library (Humpback Whale Catalogue, Allied Whale–College of the Atlantic, <http://www.coa.edu/nahwc.htm>) contains information for over 6000 individuals. This library has no records of white animals. However, in a sighting database kept at the Institute of Marine Research in Bergen, Norway,



**Fig. 3** Photographs of a white humpback whale from Svalbard, taken on 11 August 2012, from the mast of a sailboat, showing (a) the dorsal surface and parts of the ventral side of the animal; (b) normal pigmentation of the eye; and (c) the white baleen plates.

there is a record from 19 August 2004 from the southern Barents Sea close to the Norwegian mainland (see Fig. 1) of a large white humpback whale travelling with a similar sized individual of normal colouration (N. Øien unpubl. data). In addition, there are photographs of a white humpback whale taken by a Faroese fishing vessel 30 July 2006, also from the southern Barents Sea close to the Norwegian mainland (Fig. 1; Mikkelsen unpubl. data). This individual was a large animal, but it is difficult to assess its relative size within the group based on available photographs. During this latter sighting, the humpback whale group was associated with some medium-sized gulls and a group of white-beaked dolphins (*Lagenorhynchus albirostris*), indicating that foraging

was taking place. Unfortunately, there are no fluke pictures from this white humpback whale of sufficient quality to enable photo-identification comparison with the Svalbard individual. The 2004 and 2006 observations were made approximately 850 km south of the Svalbard sightings. The size of the white humpback whale observed in Svalbard in 2012 relative to the other animals in the group indicates that it is an adult individual. Humpback whales generally reach sexual maturity at 5–10 years of age (Clapham 2009) and attain adult body size some years later. If the Svalbard animal is the same individual reported from the Norwegian mainland coast in 2004, it would now be at least 20 years old. Humpback whale calves grow fast and attain lengths of 8–10 m by

the end of their natal year (Clapham et al. 1999). Fidelity to summering areas is strong among humpback whales and depends on where the mother takes the calf during their first migration and, at least for humpback whales summering in Iceland and Norway, this fidelity has been shown to be maintained over evolutionary timescales (Palsbøll et al. 1995; Larsen et al. 1996).

It is impossible with the available data to determine whether the observations reported herein are of the same individual, due to the lack of fluke pictures or genetic samples that could provide conclusive evidence. The humpback whales that feed in the Barents Sea, including Svalbard, reach this area following a migration from the south-west, along the Norwegian coast, including the areas where the early observations were made (N. Øien, unpubl. data). All three observations could therefore be of the same individual. The strong fidelity of summering humpback whales makes it reasonable to assume that this white whale has been summering in the vicinity of Svalbard for many years since it is an adult individual. It is therefore surprising that it has not been observed before given the high level of marine cruise tourism in the region and the fact that the Norwegian Polar Institute has been operating a marine mammal sighting programme since 2004. Most commercial tour operators, scientific cruises and private tours report observations of marine mammals in the Svalbard Archipelago to the Norwegian Polar Institute on an annual basis. This marine mammal sighting programme is the source of the current white humpback observation. Perhaps an inshore distributional shift has taken place recently in response to the retreat of the northern ice edge and the influx of cod and herring that have accompanied increased temperatures in Atlantic water masses reaching Svalbard in the last few years, bringing humpbacks that have traditionally used ice edges closer to shore (Sætersdal & Loeng 1987).

Little is known about potential problems associated with anomalously white colouration in marine mammals. Similar to all animals, cetaceans have over evolutionary timescales evolved a colouration that has functional significance related to cryptism, intraspecific communication or enhancement of prey acquisition (Caro et al. 2011). White colouration of a normally dark species could make an individual more conspicuous to predators and more visible to potential prey (Hain & Leatherwood 1982). Skin colour is also important for protecting skin from UV radiation, and darker pigmentation has recently been shown to be advantageous for protection of whales from sun damage (Martinez-Levasseur et al. 2011). For mammals, in general, there is also a range of pathological conditions associated with

pigment anomalies related to anaemia, reduced fertility, sensory system defects and increased susceptibility to infections (Searle 1968). The rarity of observations of anomalously white-coloured cetaceans suggests that they are born rarely or alternatively that the ontogenetic survival rates of such individuals is low. However, some anomalously white-coloured individuals clearly do survive to adulthood.

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