J. Black Sea/Mediterranean Environment
Vol. 23, No. 1: 66-74 (2017)

RESEARCH ARTICLE

Records of anomalously white harbour porpoises and atypical pigmented short-beaked common dolphin in the Georgian Black Sea waters

Natia Kopaliani[1*], Zurab Gurielidze[1,2], Levan Ninua[1]

[1] Institute of Ecology, Ilia State University, Tbilisi, 0162, GEORGIA
[2] Tbilisi Zoological Garden, Tbilisi, 0171, GEORGIA

[*]**Corresponding author:** natia_kopaliani@iliauni.edu.ge

Abstract

In Georgian territorial waters of the Black Sea, three leucistic harbour porpoises and one piebald short beaked common dolphin were spotted during the years 2012-2016. All images of the specimens with atypical pigmentation were collected while conducting cetacean counts near the Georgian Black Sea coast. Repeated sightings of the atypical pigmentation of small cetaceans in the Black Sea may be due to isolation and relatively low selection pressure against abnormally coloured specimens in this basin, compared to populations in the Mediterranean or Atlantic Basins.

Keywords: harbour porpoise, common dolphin, leucism, piebaldism

Received: 04.01.2017, **Accepted:** 24.02.2017

Introduction

Atypical white or patchy coloration, caused by partial or complete lack of pigmentation, is rare in cetaceans (Fertl and Rosel 2002; Fertl *et al.* 2004; Tonay *et al.* 2012; Lodi and Borobia 2013). Three types of hypopigmentation patterns are described for mammals: complete absence of pigmentation (albinism); reduced pigmentation, that causes white or patchy coloration of the skin, with normally coloured eyes (leucism); and finally, partial leucism, or piebaldism, when some areas on the skin of otherwise normally coloured animals have no pigments (Rook *et al.* 1998; Acevedo *et al.* 2009). Atypically pigmented individuals are described for harbour porpoises (*Phocoena phocoena*) and short-beaked common dolphins (*Delphinus delphis*) (Perrin *et al.* 1995; Stockin and Viesser 2005; Keener *et al.* 2011; Tonay *et al.* 2012; Robinson and Haskins 2013).

For over 100 years, only 35 records of leucistic harbour porpoises are known. Seven occasions were recorded from the North Sea, six from the north-eastern Atlantic, seven from the north-western Atlantic, five leucistic porpoises were seen in the Baltic Sea, six were seen in the Black Sea, two in the Istanbul Strait and two from the north-eastern Pacific (Keener *et al.* 2011; Tonay *et al.* 2012; Robinson and Haskins 2013). Tonay *et al*. (2012) even offered to separate three types of atypical pigmentation in harbour porpoises.

Individuals with an atypical pigmentation pattern in short-beaked common dolphins (*Delphinus delphis*) are even rarer. Albino common dolphin was detected in New Zealand in the 1960's and 70's (Webb 1973). Altogether, twelve atypically coloured short-beaked dolphins were recorded in the Eastern Pacific between 1979 and 1993, considering that the same animals could be seen more than once. One atypically coloured animal was sighted in 1978, near northern New Zealand, south-western Pacific. An anomalously pigmented short-beaked dolphin was found dead in the Bay of Biscay, eastern Atlantic (Perrin *et al.*1995). Common dolphins with a spectrum of atypical pigmentation were known from New Zealand (Neumann *et al*. 2002; Stockin and Visser 2005). We could not find any well-documented records of albino or leucistic short-beaked dolphins from the Black Sea. Mal'm (1933) mentioned that "completely white *Delphinus delphis* was killed near Balaclava (Black Sea) in 1928", although Kleinenberg (1956) hypothesized that the individual was misidentified with a harbour porpoise.

Coloration is functionally important for cetaceans. Harbour porpoise usually has dark grey back and white belly. The flanks are grey, the flippers and lips are dark. They have a thin, dark grey gape-to-flipper stripe. Common dolphins have dark brownish grey back, white belly, and tan to ochre anterior flank patch dipping below the dorsal fin. Combined with streaks of light grey on the tail stock it produces an hourglass pattern on the side (Jefferson *et al*. 1993).

Due to characteristic patterns of coloration, specifically countershading, small cetaceans avoid being seen by their potential prey. Species-specific prominent markings are important for normal behaviour in groups, for fast swimming, and for increasing effect of demonstrative behaviour at the surface, hence functioning in intraspecific communication (Caro *et al.* 2011). Thus, aberrant pigmentation could have negative effects on individual survival. The costs associated with the atypical pigmentation might include visual impairment, conspicuousness to predators, thermoregulatory limitations, or ontogenetic survival rates (Fertl and Rosel 2002; Keener *et al.* 2011). Therefore, higher than normal frequency of unusually coloured individuals might be associated with lack of potential negative consequences in a specific habitat. In Georgian territorial waters of the Black Sea, three leucistic harbour porpoises and one

piebald short beaked common dolphins were spotted during 2012-2016. Below we document sightings of these specimens where these sightings took place.

Materials and methods

All images of the specimens with atypical pigmentation were collected while conducting cetacean surveys in the Georgian territorial waters of the Black Sea (42°23.269N; 41°32.350E; 41°31.249N; 41°32.269E;). Observations were conducted from the research vessel of Ilia State University (length 31m, width 7 m, speed 9 knots). Images were taken with a camera (Canon 7D, lens: Canon EF 300 mm f/4L IS USM). Subsequent to sighting of an atypically coloured specimen, further observations were conducted with Nikon 16x56 binocular and Bushnell telescope 10-30x60.

Results

On 23 June 2012, a white harbour porpoise was first sighted between the mouths of the Rivers Rioni and Khobi, in waters falling within Kolkheti National Park (42° 11.717N; 41° 20.441E). This specimen is included in the list of atypically white harbour porpoises of the world (Tonay *et al*. 2012). The white porpoise was swimming along with four normally pigmented harbour porpoises. The calf was detected among adult individuals. The specimen had black patches on the dorsal fin and on the forehead, in front of blowhole (pattern a, according Tonay *et al*., 2012) (Figure 1).

Figure 1. Leucistic harbour porpoise sighted in 2012

The same individual was sighted and filmed in the following year, on 22 April 2013, in the northern part of Georgian territorial waters in the Black Sea (42° 18.826N; 41° 30.725E). On this occasion, the animal was swimming alone.

The second leucistic specimen was detected near Batumi Sea Port on 20 May 2015 (41°40.679N; 41°30.725E). It was swimming with three normally coloured harbour porpoises. Different from the first specimen, the second one had a broad black stripe starting from the base of the dorsal fin and extended to the blowhole (pattern c according Tonay *et al.* 2012). In front of the blowhole, the porpoise had a black patch (Figure 2).

One more anomalously pigmented individual was spotted near the mouth of the Chorokhi River in April, 2015 (41°38.775N; 41°32.856 E). The forward part of the animal was normally pigmented, but from the dorsal fin backwards, the animal was pure white. It was feeding in a group of normally coloured porpoises. The observer could not photograph the animal with a camera.

Figure 2. The second leucist harbour porpoise near the Georgian coast sighted in 2015

Besides the harbour porpoises, the unusual coloration was seen in short-beaked common dolphin. The specimen was recorded on 18 February 2016, near the mouth of the Chorokhi River (41°36.685N; 41°33.977E). The specimen likely represented a case of piebaldism. The dolphin had atypical pigmentation on the dorsal fin (white with black dots near the upper edge), on underpart and white stripe above the rostrum ("white glasses"). The animal was feeding together with the normally coloured calf. The specimen had atypically small right eye, or only eyehole (Figure 3).

Figure 3. Short-beaked common dolphin with atypical pigmentation sighted in 2016

Discussion

One of the genes which cause leucism in mammals is melanocortin 1 receptor (*MC1R*), which plays a key role in the regulation of pigment production (Bried and Haubreux 2006). This intronless gene encodes the receptor protein for melanocyte-stimulating hormone (MSH). *MC1R* gene mutations either can create a receptor that constantly signals, even when not stimulated, or can reduce the receptor's activity. Alleles for constitutively active *MC1R* are dominantly expressed and result in a black coat/skin colour, whereas alleles for dysfunctional *MC1R* are recessive and result in a light skin/coat colour (Robbins

et al. 1993; Fontanesi *et al.* 2006; Peters *et al.* 2016). We suggest that the relatively high frequency of the recessive allele in the Black Sea population of harbour porpoises due to long-term isolation from the nearest Atlantic populations of the same species, and consequent inbreeding, may explain the frequency of leucistic individuals. The estimated period of isolation is at least over 9 Kya (Fontaine *et al.* 2007; 2010; 2012) or even more.

The specimen of the short-beaked common dolphin with pigmentation disorder seems to present piebaldism. This abnormality is associated with the distribution of depigmented patches on the anterior part of the body, abdomen, extremities, and the frontal part of the scalp (Mosher and Fitzpatrik 1988), and is very rare autosomal dominant disorder with congenital hypomelanosis (Passeron *et al.* 2005; Agarwal and Ojha 2012). Piebaldism has been described in the Atlantic spotted dolphin (*Stenella frontalis*) (Lodi and Borobia 2013), but never documented in the short-beaked common dolphin. In the case of piebaldism, only melanocytes are involved in formation of the colour pattern, and the pattern is limited to hair and skin without, neurological, ocular, or hearing defects (Passeron *et al.* 2005; Oiso *et al.* 2013), whereas our photograph (Figure 3) revealed atypical development of at least the right eye.

The presence of depigmented areas in mammals indicate disrupted neural-crest-cell-related development. The main reason is receiving delayed migration of neural crest cells during embryogenesis (Wilkins *et al.* 2014).

The function of normal countershading pattern in small cetaceans is to prevent detection by predator or prey species via self-shadow camouflage (Caro *et al.* 2011). We suggest that pigmentation disorders and resultant lack of concealment could affect cetaceans in the Black Sea to a lesser extent than in larger marine basins. Relatively high turbidity of water and limited penetration of surface light negates the advantage that normal pigmentation could offer.

Furthermore, the harbour porpoise, common dolphin and bottlenose dolphin are all apex predators of the Black Sea ecosystem. Neither harbour porpoises nor common dolphins have any natural predators in the Black Sea, and hence, the function of defensive pigmentation for the Black Sea cetacean populations is less important than in other distributional ranges.

Although there are not sufficient quantitative data to conclude whether or not the proportion of atypically coloured individuals in the Black Sea is higher than in other marine basins, it is obvious that the number of sightings of atypically coloured animals here is remarkable. We assume that repeated records of the atypical pigmentation of small cetaceans in the Black Sea may be associated with the relaxed selection pressure against abnormally coloured specimens in this basin, compared to the Mediterranean or Atlantic basins.

Acknowledgements

The authors thank David Tarkhnishvili and Cort Anderson for their useful suggestions, and Kolkheti Protected Areas Development Fund for supporting Cetaceans Monitoring Program in Georgian territorial waters.

References

Acevedo, J., Torres, D., Aguayo-Lobo, A. (2009) Rare piebald and partially leucistic Antarctic fur seals, *Arctocephalus gazelle*, at Cape Shirreff, Livingston Island, Antarctica. *Polar Biol.* 32(1): 41-45.

Agarwal, S., Ojha, A. (2012) Piebaldism: A brief report and review of the literature. *Indian Dermatol Online J.* 3(2): 144-147.

Bried, J., Haubreux, D. (2006) An aberrantly pigmented southern elephant seal (*Mirounga leonina*) at Iles Kerguelen, southern Indian Ocean. *Marine Mammal Science* 16(3): 681-684.

Caro, T., Beeman, K., Stankowich, T., Whitehead, H. (2011) The functional significance of colouration in cetaceans. *Evol Ecol.* 2011(25): 1231-1245.

Fertl, D., Barros, N.B., Rowlett, R.A., Estes, S., Richlen, M. (2004) An update on anomalously white cetaceans, including the first account for the pantropical spotted dolphin (*Stenella attenuata graffmani*). *LAJAM* 3(2): 163-166.

Fertl, D., Rosel, P. (2002) Albinism. In: Encyclopedia of Marine Mammals (eds. Perrin W.F., Wursig B., Thewissen, J.G.M), Academic Press, San Diego, pp. 24-26.

Fontaine, M.C., Baird, S.JE., Piry, S., Ray,, N., Tolley K.A., Duke, S., Birkun, A., Ferreira, M., Jauniaux, T., Llavona, A., Öztürk, B., Öztürk, A.A., Ridoux, V., Rogan, E., Sequeira, M., Siebert,U., Vikingsson, G..A., Bouquegneau, J.M., Michaux, J.R. (2007) Rise of oceanographic barriers in continuous populations of a cetacean: the genetic structure of harbour porpoises in Old World waters. *BMC Biology* 5: 30.

Fontaine, M.C., Snirc, A., Frantzis, A., Koutrakis, E., Öztürk, B., Öztürk, A. A., Austerlitz, F. (2012) History of expansion and anthropogenic collapse in a top marine predator of the Black Sea estimated from genetic data. *Proceedings of the National Academy of Sciences of the United States of America* 109(38): 2569-2576.

Fontaine, M.C., Tolley, K.A., Michaux, J.R., Birkun, A.Jr., Ferreira, M., Jauniaux, T., Liavona, A., Ozturk, B., Ozturk, A.A., Ridoux, V., Rogan, E., Sequeira, M., Bouquegneau, J.M., Baird, S.J.E. (2010) Genetic and historic

evidence for climate-driven population fragmentation in a top cetacean predator: the harbour porpoises in European water. *Proc.R.Soc B.* doi: 10.1098/ rspb.2010.0412.

Fontanesi, L., Tazzoli, M., Beretti, F., Russo, V. (2006) Mutations in the melanocortin 1 receptor (MC1R) gene are associated with coat colours in the domestic rabbit (*Oryctolagus cuniculus*). *Anim. Genet.* 37 (5): 489–493.

Jefferson, T.A., Leatherwood,S., Webber, M.A. (1993) Marine Mammals of the World. FAO Species Identification Guide, FAO, Rome. 320 pp.

Keener, W., Szczepaniak, Ü, A., Webber, M., Stern, J. (2011) First records of anomalously white harbor porpoises (*Phocoena phocoena*) from the Pacific Ocean. *Journal of Marine Animals and their Ecology* 4(2): 19-24.

Kleinenberg, S. E. (1956) Mammals of the Black Sea and the Sea of Azov. Results of Joint Biological-Commercial Whaling Studies. USSR Academy of Science. Canada: Fisheries and Marine Service Translation Series 4319.

Lodi, L., Borobia, M. (2013) Anomalous coloration in an Atlantic spotted dolphin (*Stenella frontalis*) from southeastern Brazil. *Braz. J. Aquat. Sci. Technol.* 17(2): NB1-3.

Mosher, D.B., Fitzpatrick, T.B. (1988) Piebaldism. *Arch Dermatol* 124: 364-365.

Neumann, D.R., Leitenberger, A., Orams, M.B. (2002) Photo-identification of short-beaked common dolphins (*Delphinus delphis*) in north-east New Zealand: A photo catalogue of recognisable individuals. *New Zealand Journal of Marine and Freshwater Research* 36(3): 593-604.

Oiso, N., Fukai, K., Kawada, A., Suzuki, T. (2013) Piebaldism. *The Journal of Dermatology* 40: 330-335.

Passeron, T., Mantoux, F., Ortonne, J.P. (2005) Genetic disorders of pigmentation. *Clinics in Dermatology* 2005(23): 56–67.

Perrin, W., Armstrong, W.A., Baker, A.N., Barlow, J., Scott, R.B., Collet, A.S., Cotton, J.M., Everhart, D.M., Farley, T.D., Mellon, R.M., Miller, S.K. Philbrick, V., Quan, J.L., Rodriguez, H.R.L. (1995) An anomalously pigmented form of the short-beaked common dolphin (*Delphinus delphis*) from the southwestern Pacific, eastern Pacific and eastern Atlantic. *Marine Mammal Science* 11(2): 241-247.

Peters, L., Humble, E., Kröcker, N., Fuchs, B., Forcada, J., Hoffman, J. (2016) Born blonde: a recessive loss-of-function mutation in the melanocortin 1 receptor is associated with cream coat coloration in Antarctic fur seals. *Ecology and Evolution* 6(16): 5705-5717.

Robbins, L.S., Nadeau, J.H., Johnson, K.R., Kelly, M.A., Roselli-Rehfuss, L., Baack, E., Mountjoy, K.G., Cone, R.D. (1993) Pigmentation phenotypes of variant extension locus alleles result from point mutations that alter MSH receptor function. *Cell* 72(6): 827-834.

Robinson, K.P., Haskins, G.N. (2013) Rare sightings of anomalously white harbour porpoise (*Phocoena phocoena*) in the Moray Firth, north-east Scotland. *Marine Biodiversity Records* 6: e23.

Rook, A., Wilkinson, D.S., Ebling, F.J.B, Champion, R.H., Burton J.L. (eds). (1998) Textbook of Dermatology. 4th ed. Blackwell Scientific Publications. 4144pp.

Stockin, K.A., Visser, I.N. (2005). Anomalously pigmented common dolphins (*Delphinus* sp.) off northern New Zeland. *Aquatic Mammals* 31(1): 43-51.

Tonay, M.A., Bilgin, S., Dede, A., Akkaya, A., Yesilcicek, T., Kose, Ö., Ceylan, Y. (2012) First records of anomalously white harbour porpoises (*Phocoena phocoena*) in the Turkish seas with a global review. *Hystrix, the Italian Journal of Mammalogy* 2: 75-86.

Webb, B.F. (1973) Dolphin sightings, Tasman Bay to Cook Strait, New Zealand, September 1968-June 1969. *New Zealand Journal of Marine and Freshwater Research* 7(4): 399-405.

Wilkins, A.S., Wrangham, R.W., Tecumseh Fitch, W. (2014) Domestication syndrome in mammals: a unified explanation based on neural crest cell behavior and genetics. *Genetics* 197: 795-808.