BRILL

Animal Biology 60 (2010) 273–281

Animal Biology
brill.nl/ab

Albinistic common seals (*Phoca vitulina*) and melanistic grey seals (*Halichoerus grypus*) rehabilitated in the Netherlands

Nynke Osinga[1, 2, *], Pieter 't Hart[1], Pieter C. van Voorst Vader[3]

[1]Seal Rehabilitation and Research Centre, Pieterburen, The Netherlands
[2]CML and IBL, Leiden University, Leiden, The Netherlands
[3]Deptartment of Dermatology, University Medical Centre Groningen, Groningen, The Netherlands

Abstract
The Seal Rehabilitation and Research Centre (SRRC) in Pieterburen, The Netherlands, rehabilitates seals from the waters of the Wadden Sea, North Sea and Southwest Delta area. Incidental observations of albinism and melanism in common and grey seals are known from countries surrounding the North Sea. However, observations on colour aberrations have not been systematically recorded. To obtain the frequency of occurrence of these colour aberrations, we analysed data of all seals admitted to our centre over the past 38 years. In the period 1971-2008, 3000 common seals (*Phoca vitulina*) were rehabilitated, as well as 1200 grey seals (*Halichoerus grypus*). A total of five albinistic common seals and four melanistic grey seals were identified. This results in an estimated incidence of albinism in common seals of approximately 1/600, and of melanism in grey seals of approximately 1/300. The seals displayed normal behaviour, although in the albinistic animals, a photophobic reaction was observed in daylight.

Keywords
Phoca vitulina; *Halichoerus grypus*; albinism; melanism; rehabilitation

Introduction

The Seal Rehabilitation and Research Centre (SRRC) in Pieterburen, The Netherlands, rehabilitates seals from the waters of the Wadden Sea, North Sea and Southwest Delta. At present, approximately 200 seals enter the centre each year. The seals that undergo rehabilitation are orphaned pups and sick or injured seals, most often common seals (*Phoca vitulina* Linnaeus, 1758) and grey seals (*Halichoerus grypus* (Fabricius, 1791)). Occasionally arctic pinnipedia are also admitted, treated and released.

*) Corresponding author; e-mail: nynke@zeehondencreche.nl

DOI 10.1163/157075610X516493

In common seals and grey seals, there is substantial individual variation in pelage colour and pattern. Regional differences also exist: common seals from Scottish waters, for instance, tend to have a darker colour than those living along the Dutch coast. In contrast to common seals, grey seals display sexual dimorphism in colour and pattern; males are usually darker with light spots whereas females are lighter with dark spots (Lockley, 1966). In addition to individual and regional differences in pelage colour and pattern, pigment disorders also occur. Occasionally, albinistic common seals and melanistic grey seals are reported from countries surrounding the North Sea (SCS, 2001; BBC news, 2007). Here we describe all cases of albinistic and melanistic seals encountered during 38 years of seal rehabilitation at the SRRC facility.

Material and methods

The SRRC database was analysed for colour aberrations in common seals and grey seals. In the period 1971-2008, 3000 common seals were rehabilitated, as well as 1200 grey seals. Although most seals were stranded on the Dutch coast, occasional seals that stranded in other countries have been transported to the SRRC for rehabilitation. Since the colour aberrations do not appear to affect the health or behaviour of the seals, they were assumed not to be causally related to the stranding events. The rehabilitated seals are therefore considered to represent random samples of the populations. The frequencies of occurrence of albinism and melanism in common and grey seals were surveyed. Seals with a complete lack of pigment in the skin, a white pelage and red eyes were diagnosed to be albinistic (fig. 1). Seals with a complete black pelage and a normal eye colour were diagnosed to be melanistic (fig. 2). Other colour aberrations, such as leucism, which is a reduced level of pigment in the pelage (fig. 3), were occasionally observed in seals rehabilitated at the SRRC. However, these seals were not included in the present study, given that these colour aberrations are not always very distinctive.

Results

The first albino common seal admitted to the SRRC was found on the Dutch North Sea coast (Noordwijk) in 1987 (fig. 4). It was a recently weaned male which was successfully released that same year. The second and third individuals were both females younger than two months old. They were found in 1988 on the Wadden Sea island Ameland and on the North Sea coast (Bloemendaal), respectively. Both animals died at the SRRC during the phocine distemper epidemic in 1988. An additional female albino common seal was found in 1997, this time on the Belgian coast. This animal was an orphaned pup, which was then rehabilitated successfully and released back into the wild. The most recent record of an albino common seal dates from January 2000 when a female seal of approximately six months old was found on the coast of France. The animal was transferred to our facilities and rehabilitated successfully. None of the rehabilitated albinistic seals displayed abnormal behaviour. No signs of impaired vision were observed in these animals. They did, however, display a photophobic reaction in

Figure 1. Albinistic common seal. This figure is published in colour online, see http://www.brill.nl/ab.

daylight that was strongest with high light intensities. Nystagmus, a non-voluntary ocular movement disorder observed in albinistic humans with oculocutaneous albinism, was not present.

The first grey seal admitted to the Centre with melanism was found in 1991. It was a male younger than two months old, which washed up on the Wadden Sea island Terschelling. The seal was then successfully rehabilitated and released, but was unfortunately reported dead on Terschelling in 2002. Necropsy showed that the animal died of a torsion of the intestines. The second melanistic grey seal, a male orphaned pup, stranded in December 1991 in Belgium. This animal was successfully released from our centre in 1992. The third melanistic grey seal was a female which washed up on the Wadden Sea island Vlieland in 2006. This was a completely black, underweight grey seal younger than two months old. The animal was released after a few months of rehabilitation. In March 2008, the fourth melanistic grey seal, a male younger than two months old, washed up on the coast of the Southwest Delta area (Brouwersdam). This

Figure 2. Melanistic grey seal (Photo: Jos Schuurman This figure is published in colour online, see http://www.brill.nl/ab.

Figure 3. A leucistic common seal with normally coloured common seals in the background. This figure is published in colour online, see http://www.brill.nl/ab.

animal was also rehabilitated successfully. Thus, melanistic seals were rehabilitated successfully and, furthermore, the aberrant colour did not appear to affect the behaviour or health of the animals.

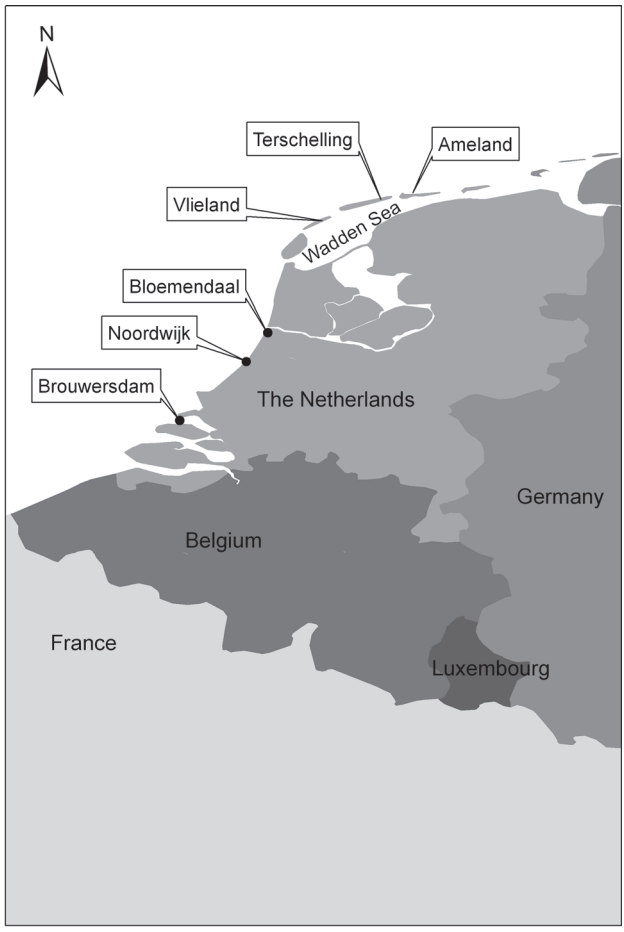

Figure 4. Map of the stranding locations of albinistic and melanistic seals.

In total, five albinistic common seals and four melanistic grey seals were recorded among 3000 common and 1200 grey seals rehabilitated at the SRRC. This results in estimated incidence of albinism in common seals of approximately 1/600, and of melanism in grey seals of approximately 1/300.

Discussion

Differences in skin and hair colour are principally genetically determined, and are due to variation in the amount, type and packaging of melanin polymers produced by melanocytes secreted into keratinocytes (Rees, 2003). Defects in the melanin synthesis pathway can occur resulting in reduced formation of melanin. In humans, there are two main categories of albinism (or amelanism): 1) oculocutaneous albinism, in which pigmentation is lacking in the skin and its appendages, i.e. hair and nails,

plus the eye; and 2) ocular albinism, in which only the eyes lack pigment (Ortonne, 2008). Oculocutaneous albinism is a recessive disorder, which can result from a diversity of different gene mutations, as shown by DNA analysis in humans (Hutton and Spritz, 2008). The estimated incidence of oculocutaneous albinism in humans is 1/20,000, but appears to be higher in certain populations (Okulicz *et al.*, 2003). All five albinistic seals had a total lack of pigment in the skin, hair, and nails, as well as the eyes. We observed that albinism in common seals was associated with photophobia, but not with nystagmus, as in humans. The absence of nystagmus in seals is possibly related to the absence of a clear macula in the pinniped eye (van der Pol *et al.*, 1998).

Melanism is the opposite of albinism in terms of pigmentation, and is caused by an increased production of melanin. The pelage of melanistic seals has a uniformly black colour, although it may show shades of a pattern. Pseudo-melanism (or abundism) is another variant of pigmentation, characterized by dark spots or enlarged stripes, which cover a big part of the body of the animal making it appear melanistic. Pseudo-melanism has never been observed in seals rehabilitated at the SRRC.

Leucism is a colour aberration characterized by a variable lack of pigment in the pelage. These animals are dark-eyed and are extraordinarily light coloured. Leucism regularly occurs in common seals rehabilitated at the SRRC. However, the actual incidence has not been determined as this colour aberration is not very distinctive. Piebaldism is another disorder, which is characterised by amelanotic patches at anatomic sites most distant from the neural crest (Tomita and Suzuki, 2004). Piebaldism was never observed in the common or grey seals rehabilitated at the SRRC.

Aberrant coloured pinnipedia are known and they have been described in some species. For the United Kingdom, three cases of rehabilitated albinistic common seals have been recorded (SCS, 2001; BBC news, 2007). Acevedo *et al.* (2009) reported an albinistic Weddell seal (*Leptonychotes weddellii* (Lesson, 1826)) sighted on Livingston Island, Antarctica in 1998. Albino Steller's sea lions (*Eumetopias jubatus* (Schreber, 1776)) have been referred to by King (1983). Scheffer (1962) estimated an incidence of albinism between 1/30,000 and 1/100,000 for the Northern fur seal (Callorhinus ursinus (Linnaeus, 1758)). It should be noted that in the studies of King and Scheffer, leucistic specimens were not listed as a separate category and might therefore have been included in the albinistic category. Melanism has been previously reported for grey seals. Hickling (1962) mentions melanistic grey seals with a "jet-black" coat as rare and infrequent. Van Haaften (1974) reported on two juvenile melanistic grey seals observed in The Netherlands. The first was a male caught alive in fisheries in the North Sea in 1972 and the second was a female, which beached on the Dutch island of Texel in 1973. Leucistic pinnipeds have been described by amongst others Bonner (1968), Hofmeyr *et al.* (2005), de Bruyn *et al.* (2007), Bester *et al.* (2008), Acevedo and Aguayo (2008), Reisinger *et al.* (2009). Scheffer (1962) described the colour aberration piebaldism as well as another colour aberration, called chocolate. Acevedo *et al.* (2008) reported a piebald Antartic fur seal (*Arctocephalus gazella* (Peters, 1875)) as well as four partially leucistic fur seals. Sometimes aberrant colours are observed which are not caused by pigment disorders. In the Netherlands, common seals with a (partly) red pelage have been observed. Neumann and Schmahl (1999) attributed the red pelage in

common seals in Humboldt County, California, United States of America, to man-made deposits of iron-oxides.

In our analysis, albinism was observed only in common seals, whereas melanism was seen in grey seals only. In the same period, sixty arctic seals of three different species were rehabilitated: ringed seals (*Pusa hispida* Schreber, 1775), harp seals (*Pagophilus groenlandicus* Erxleben, 1777) and hooded seals (*Cystophora cristata* (Erxleben, 1777)). Colour aberrations were not observed in these arctic seals.

Differences in skin and hair colour are principally genetically determined. Melanistic coat colouration occurs in 11 of 37 felid species and according to Eizirik *et al.* (2003), melanism arose independently at least four times in the family Felidae. A colour aberration may have a single mutant origin or several distinctive mutations may have occurred in one species. Molecular studies are required to determine the genetic basis of albinism and melanism in seals. All recorded individuals with a particular colour aberration may thus be related and represent descendents of the same pedigree from a single ancestral mutation event in the past. Small populations or descendents from a small population may have a high or low frequency of particular alleles (Hedrick, 2005). Bonner (1968) found a relatively high number of leucistic Antarctic fur seals in newly settled minor populations. The number of common seals in the Wadden Sea has been reduced multiple times during the last century due to hunting ('t Hart, 2007) and phocine distemper virus epidemics (Osterhaus and Vedder, 1988; Jensen *et al.*, 2002). It is believed that grey seals disappeared from the Dutch waters in the period 1000-1500 ('t Hart, 2007). Grey seals always visited the Wadden Sea on occasions, but they only began to settle again from the 1980s onward. In 1985, a grey seal pup which was born in the Dutch Wadden Sea was observed ('t Hart *et al.*, 1988). Thereafter, the number of grey seals in Dutch waters showed an exponential growth. It is not unlikely that these population dynamics could have played a role in the observed incidence of albinism and melanism in seals. The finding that three of the nine seals with colour aberrations came from the Belgian or French coast, where smaller numbers of seals occur, supports this hypothesis.

All aberrantly-coloured animals were either pups or animals under one year of age. No conclusion with respect to the survival chances of aberrant coloured seals can be drawn from this observation, since the majority of seals admitted for rehabilitation to the SRRC are animals in their first year of age (Osinga and 't Hart, in press). The aberrant colours in rehabilitated seals did not appear to affect the behaviour or health of the animals. After release, both albinistic and melanistic individuals were regularly observed again in the surroundings of the release area over prolonged periods of time, demonstrating that the release of these aberrant coloured seals had been successful.

Acknowledgements

First of all we would like to thank the volunteers of the EHBZ first aid network for their dedication to the help of seals in distress. We are very grateful to Dr. P.J.H. van Bree, B.A.E. van der Pol, prof. H.A. Udo de Haes, prof. P.M. Brakefield and two anonymous reviewers for their constructive comments on the manuscript. Finally we would like to thank B.H.G. van Engeldorp Gastelaars for drawing the map.

References

Acevedo, J. & Aguayo, M. (2008) Leucistic South American sea lion in Chile, with a review of anomalously color in otariids. *Rev Biol Mar Oceanogr*., 43(2), 413-417.

Acevedo, J., Torres, D. & Aguayo-Lobo, A. (2008) Rare piebald and partially leucistic Antarctic fur seals, *Arctocephalus gazella*, at Cape Shirreff, Livingston Island, Antarctica. *Polar Biol*., 32, 41-45.

Acevedo, J., Aguayo-Lobo, A. & Torres., D. (2009) Albino Weddell seal at Cape Shirreff, Livingston Island, Antarctica. *Polar Biol*., 32(8), 1239-1243.

BBC News (2007) Albino seal to go back to the sea. In: One-minute World News. Available via web http://news.bbc.co.uk/2/hi/uk_news/england/lincolnshire/6354255.stm. Accessed 26 October 2009.

Bester, M.N., de Clercq, H., Hofmeyr, G.J.G. & de Bruyn, PJ.N. (2008) Leucistic southern elephant seal at Marion Island? *Polar Biol*., 31, 255-257.

Bonner, W.N. (1968) The fur seal of South Georgia. *British Antarctic Survey Scientific reports* No. 56.

De Bruyn, P.J.N., Pistorius, P.A., Tosh, C.A. & Bester, M.N. (2007) Leucistic Antartic fur seal *Arctocephalus gazella* at Marion Island. *Polar Biol*., 30, 1355-1358.

Eizirik, E., Yuhki, N., Johnson, W.E., Menotti-Raymond, M., Hannah, S.S. & O'Brien, S.J. (2003) Molecular genetics and evolution of melanism in the cat family. *Curr Biol*., 13, 448-453.

Hedrick, P.W. (2005) *Genetics of populations*. Jones and Bartlett Publishers, Boston, Toronto, London and Singapore.

Hickling, G. (1962) *Grey seals and the Farne Islands*. Routledge and Kegan Paul, London.

Hofmeyr, G.J., Bester, M.N. & Kirkman, S.P. (2005) Leucistic Antarctic fur seals at Bouvetøya. *Polar Biol*., 29, 77-79.

Hutton, S.M. & Spritz, R.A. (2008) Comprehensive analysis of oculocutaneous albinism among non-Hispanic caucasians shows that OCA1 is the most prevalent OCA type. *J Invest Dermatol*., 128, 2442-2450.

Jensen, T., van de Bildt, M., Dietz, H.H., Andersen, T.H., Hammer, A.S., Kuiken, T. & Osterhaus, A. (2002) Another phocine distemper outbreak in Europe. *Science*, 297, 209.

King, J.E. (1983) *Seals of the world*. British Museum (Natural History) and Cornell University Press, New York.

Lockley, R.M. (1966) *Grey seal, common seal*. A survival book on seals. Andre Deutsch Ltd, London.

Neumann, D.R. & Schmahl, W.W. (1999) Red-pelaged harbour seals, in Humboldt County, California: why some seals rust. *Mar Pollut Bull*., 38(12), 1177-1183.

Okulicz, J.K., Shah, R.S., Janniger, C.K. (2003) Oculocutaneous albinism. *J Eur Acad of Dermatol Venerol*., 17, 251-256.

Ortonne, J.P. (2008). Vitiligo and other disorders of hypopigmentation. In: Bolognia, J.L., Jorizzo, J.L. & Rapini, R.P. (Eds.) *Dermatology*. Mosby/Elsevier, 2nd ed. pp. 920-924.

Osinga, N. & 't Hart, P. (in press) Common seals and rehabilitation, *NAMMCO Sci. Publ*., 8.

Osterhaus, A.D.M.E. & Vedder, E.J. (1988) Identification of virus causing recent seal death. *Nature*, 335, 20.

Rees, J.L. (2003) Genetics of hair and skin color. *Annu Rev Genet*., 37, 67-90.

Reisinger, R.R., Mufanadzo, N.F., de Bruyn, P.J.N., & Bester, M.N. (2009) Leucistic southern elephant seal at Marion Island, *Polar Biol*., 32, 509-511.

Scheffer, V.B. (1962) Pelage and surface topography of the northern fur seal. U.S Fish and Wildlife Service, *North American Fauna*, 64, 35-36.

SCS (Seal Conservation Society) (2001) Two albino seal pups held at U.K. rescue centres. In: 2001 New Digests. Available via web http://www.pinnipeds.org/sealne01.htm#TwoAlbino. Accessed 26 October 2009.

't Hart, L., Mosker, A., Vedder, L. & van Bree, P.J.H. (1988) On the pupping period of grey seals, *Halichoerus grypus* (Fabricius, 1791), reproducing on a shoal near the island of Terschelling, The Netherlands. *Z. Säugetierkunde*, 53, 59-60.

't Hart, P. (2007) *Zeehondenjacht in Nederland, 1591-1962*. PhD thesis, Vrije Universiteit, Amsterdam.

Tomita, Y. & Suzuki, T. (2004) Genetics of Pigmentary Disorders. *Am J Med Gen Part C*, 131C, 75–81.

Van der Pol, B.A.E., 't Hart, P. & van Bree, P.J.H. (1998) Oculocutaneous albinism in a common seal (*Phoca vitulina*). Poster presentation at the *26th E.A.A.M. Annual Symposium 1998*.

Van Haaften, J.L. (1974) Zeehonden langs de Nederlandse kust. *Wetenschappelijke mededelingen K.N.N.V.* 101, *Mededelingen R.I.N.*, 104, 26-29.