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SHORT NOTE

"Ino" colour aberration in gentoo penguin (*Pygoscelis papua*) in Antarctica

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Two main types of pigments, carotenoids and melanin, primarily determine plumage colouration in birds (Fox 1976). Carotenoids are obtained from food, while melanin formation involves metabolic processes and is genetically determined (Roulin & Dijkstra 2003). Melanin pigments comprise pheomelanin (red/brown) and eumelanin (brown/black). Any change in the formation of these types of pigments may lead to abnormal colouration of an individual (van Grouw 2006). For example, a strong qualitative reduction of both types of melanin defines a colour mutation called "ino" (van Grouw 2006). In this case, phaeomelanin almost disappears and there is a poor oxidation of eumelanin. As a result, black feathers turn very pale brown although the natural colour pattern of the species remains highly visible. However, over time sun exposure can bleach the plumage to a nearly white colour. Additionally, ino individuals present reddish eyes but with better eyesight, and higher probability of reaching adult age, than albino individuals. According to van Grouw (2006), "any adult *white* bird with red eyes in nature is an ino, not an albino".

On 15 Dec 2003, an ino chick of a gentoo penguin (*Pygoscelis papua;* Fig. 1) was observed at Stranger Point, 25 de Mayo/King George I, South Shetland (62° 16′ S, 58° 37′ W). The following year, on 5 Dec

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Fig. 1. Ino chick of a gentoo penguin at Stranger Point colony on Dec 2003.

Fig. 2. Ino adult gentoo penguin at Stranger Point colony during 2006/07 breeding season.

2004, an ino prebreeder gentoo penguin was seen at the same locality. During the 2006/07 breeding season, an ino adult of the same species successfully reared 2 normally coloured chicks (Fig. 2). In the subsequent 2 seasons (2007/08 and 2008/09) an ino adult was recorded nesting at the same breeding group, but reproductive performance in these seasons was not determined. Due to the philopatry of Pygocelid penguins (Williams 1995) and the low occurrence of the colour aberrations in natural populations (Hosner & Lebbin 2006), we assumed that all cases reported here corresponds to different life stages of the same individual.

The ino penguin we observed showed pale brown colour in the normally dark areas of the plumage in this species. It had reddish eyes and grey claws. The beak remained orange but the normally dark culmen was grey (Fig. 3). In summary, the ino penguin showed a clear reduction of the darkest areas of the body changing from black to pale brown in plumage and from black to grey in other tissues such as beak and claws. Nevertheless, the distinctive colour pattern of a gentoo penguin was still recognisable.

Colour aberrations are sometimes thought to lead to a low rate of survival due to increasing risk of predation or decreasing foraging success. Moreover, colour aberrations are thought to affect breeding success by increasing intraspecific conflicts, mainly during the courtship stage (see Holt *et al.* 1995; Alaja & Mikkola 1997). Nevertheless, the ino individual reported here bred successfully. Successful breeding has also been reported in other instances of Pygocelid penguins with colour aberrations (Stirling 1969; Valencia *et al.* 1997; Forrest & Naveen 2000; Nishikawa *et al.* 2000).

To our knowledge this is the 1st report of an ino gentoo penguin, following van Grouw's (2006) classification. A brief review (Table 1) of the literature regarding colour aberrations in other species of Antarctic penguins shows a great diversity of terms and classification adopted, thus it is possible that this type of colour aberration in gentoo penguins was previously reported for other localities under other names. We recommend that future reports of abnormally coloured penguins include a complete description of the colour of plumage, skin, eyes, beak and other parts of the body. This would avoid confusion and allow for comparisons between species and/or individuals of different localities beyond the classification scheme adopted.

Table 1. List of published colour aberrations in Antarctic penguins, and the type of mutation based on van Grouw´s (2006) classification.

Authors	Species	Location	Classification by authors	Classification by van Grouw (2006)
Novatti (1959)	Adélie	Laurie I	Albinism	Brown
Bellisio (1964)	Chinstrap	Laurie I	Albinism	Leucism
Bellisio (1967)	Adélie	Antarctic Peninsula	Partial albinism	Dilution
	Adélie chick		Albinism	Albinism or leucism
Stirling (1969)	Adélie	Franklin I	Albinism "imperfect"	Leucism
Araya & Arrieta (1971)	Adélie	25 de Mayo I	Leucism	Dilution
Van Wyk (1995)	King	Marion I	Isabelline	Brown
	King		Isabelline	Leucism
	Rockhopper		Partial albinism	Leucism
	2 Macaroni		Partial albinism	Leucism
	Macaroni		Albinism	Albinism or leucism
	17 Macaroni		Whitefaced	Leucism
Valencia *et al.* (1997)	Gentoo	Antarctic Peninsula	Leucism	Leucism
	Gentoo chick		Leucism	Brown
	Gentoo		Leucism	Brown or dilution
	2 Gentoo chicks		Leucism	Brown or ino
Nishikawa *et al.* (2000)	Adélie	Amundsen Bay	Albinism incomplete	Leucism
Forrest & Naveen (2000)	Pygoscelid	Antarctic Peninsula	Leucism	Brown
Voisin *et al.* (2002)	2 King (N° 9, 10)	Crozet Is	Total isabellinism	Possibly Brown
	King chick (N° 11)		Total isabellinism, partial albinism	Possibly Leucism
	2 King chicks (N° 12, 13)		Partial isabellinism	Description does not allow clear classification
	King (N° 14)		Partial albinism	Leucism
Oosthuizen & de Bruyn (2009)	King	Marion I		Isabellinism

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Fig. 3. Two views of the same ino adult gentoo penguin at Stranger Point colony, showing the pattern of coloration.

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