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# SHORT NOTE

## A review of isabellinism in penguins

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Isabellinism is a term used for a form of partial albinism, where a uniform lightening of pigmentation results in a greyish-yellow coloration instead of black. The 6th edition of *The concise Oxford dictionary* (Sykes 1978) defines Isabella (noun) as "Greyish yellow; hence isabelline". Some authors (e.g., Sage 1962; Schlatter 1977; Forrest & Naveen 2000) have used the term leucistic to describe birds with very pale or washed-out plumage; we here assume leucistic to be synonymous with isabelline. As leucistic implies white or colourless, we suggest that isabelline is a more appropriate term for birds with this "faded" plumage. Here, we refer to all penguins previously described as leucistic or with diluted dorsal pigmentation as isabelline.

One reported origin of the adjective 'isabelline' is itself rather off-colour, and belies the actual beauty of the birds. It is said to follow a vow made by Archduchess Isabella of Austria in 1600 not to remove her underwear, even for washing, until her husband, Archduke Albert of Austria, took the city of Ostend by siege, so uniting the northern and southern provinces of the Low Countries. This unification was part of a plan by Isabella's father King Philip II of Spain, who gave the whole of the Netherlands (the United Provinces) to the young couple as a wedding gift. It took 3 years until 1604 to unite the provinces at the cost of 40,000 Spanish lives. The color Isabella is supposedly a description of the lady's soiled underwear (Brewer 1980; Hendrickson 1987). However, this derivation is refuted in the *Shorter Oxford dictionary* (Onions 1973).

Isabellinism has, to our knowledge, been observed in 12 of the 17 species of penguin from 5 of the 6 genera: king penguin (*Aptenodytes patagonica*); yellow-eyed penguin (*Megadyptes antipodes*) (Plate 1A); Adélie penguin (*Pygoscelis adelie*) (Plate 1B); gentoo penguin (*P. papua*) (Plate 1C, 1D); chinstrap penguin (*P. antarctica*); Snares crested penguin (*Eudyptes robustus*) (Plate 2A); macaroni penguin (*E. chrysolophus*); royal penguin (*E. schlegeli*) (Plate 2B); rockhopper penguin (*E. chrysocome*); Magellanic penguin (*Spheniscus magellanicus*) (Plate 2C); Humboldt penguin (*S. humboldti*); and African penguin (*S. demersus*) (Plate 2D). This is the 1st report of isabelline penguins from the genus *Spheniscus*. Details of all known observations are given in Table 1.

Penguin species not so far observed to exhibit the isabelline condition are emperor penguin (*Aptenodytes forsteri*), Fiordland crested penguin (*Eudyptes pachyrhynchus*), erect-crested penguin (*E. sclateri*), Galapagos penguin (*Spheniscus mendiculus*), and little (blue) penguin (*Eudyptula minor*).

Isabelline penguins are rare. Stirling (1969) noted 2 isabelline adult Adélie penguins out of an estimated population of 80,000 birds on Franklin I. in the Ross Sea. Falla (1937) described a single immature isabelline royal penguin from Macquarie I., where the estimated population was 1,000,000 birds, and Merilees (1983) commented

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**Table 1** Observations and specimens of isabelline penguins. HANZAB, Marchant & Higgins (1990); NMNZ, Museum of New Zealand Te Papa Tongarewa.

| Species | Date | Location | Comments and references |
|---|---|---|---|
| King penguin *Aptenodytes patagonicus* | 2 Nov 1986 | Macaroni Bay, Marion I. | 1 ad. (Gartshore 1987) |
| | 23 Oct 1993 | Kildaluky Bay, Marion I. | 1 ad. Probably the same bird was resighted at Blue Petrel Bay on 1 Nov 1993 (Van Wyk 1995) |
| Yellow-eyed penguin *Megadyptes antipodes* | 19 Jan 1975 | Enderby I., Auckland Is | 1 ad. male, NMNZ 118702 |
| | 1983 | Sandy Bay, Catlins | 1 ad. (HANZAB) (Plate 1A) |
| | 1987 | Enderby I. | 1 ad. (HANZAB) |
| | 1987 | Sandy Bay, Catlins | 1 juv. & 1 chick (HANZAB) |
| Adélie penguin *Pygoscelis adeliae* | 9 Nov 1902 | Cape Crozier, | 2 ads, 1 in each of 2 consecutive years (Wilson 1907) |
| | 10 Jan 1967 | Franklin I., Ross Sea | 2 ads (Stirling 1969) |
| | 1967-68 & 1970-71 | Cape Bird, Ross I., Antarctica | 2 ads, 1 with normal coloured chicks and partner (E. Spurr. pers. comm.) (Plate 1B) |
| | Feb 1974 | Hawker I., Davis Station | 1 ad. (D. Field. pers. comm.) |
| | Dec 1977 | Hawker I. | 1 ad. (Everitt 2000) |
| | 1981 | Hawker I. | 1 ad., possibly the same bird as above (Lindsey 1986) |
| | 31 Dec 1987 | Cape Bird, Ross Sea | 1 ad. incubating (P. Carey pers. comm.) |
| | 1996 | Paulet I., Antarctic Pen. | Forrest & Naveen (2000) |
| | 1996 | Brown Bluff, Tabarin Pen., Antarctic Pen. | 1 chick (Forrest & Naveen 2000) Forrest & Naveen (2000) |
| | 1997 | Gourdin I., Antarctic Pen. | 1 ad. female (Forrest & Naveen 2000) |
| | 1997 | Torgersen I. Antarctic Pen. | 1 ad. female (Forrest & Naveen 2000) |
| | 1997 | Admiralty Bay, Arctowski Stn, Antarctic Pen. | 3 ads (P.D. Boersma, pers. comm.) |
| | Jan 2001 | Brown Base, Paullet I. | |
| Gentoo penguin *P. papua* | 1949-1950 | Heard I. | 1 ad. produced isabelline chick (Downes et al. 1960) |
| | 1973 | Gonzalez Videla Stn, Paradise Bay, Antarctic Pen. | Schlatter (1977) |
| | 1997 | Waterboat Point, Gonzales Videla Stn | Forrest & Naveen (2000) |

Table 1 Continued

| Species | Date | Location | Comments and references |
|---|---|---|---|
| Gentoo penguin *P. papua* continued | Jan 1998 | Gonzales Vildas | 1 ad. female, observed to regularly breed with normal birds producing normal offspring (G. Jacobs. pers. comm.) (Plate 1D) |
| | Jan 1999 & Jan 2000 | Waterboat Point | 1 ad., probably same bird in 2 seasons (P. Carey pers. comm.) |
| | 1999-2001 | Gourley Pen., Signy I. | 2 chicks fledged (A. Lynnes & J. Croxall. pers. comm.) |
| | 9 Feb 2000 | Cuverville I., Antarctic Pen. | Moulting juv. (L. Halpin pers. comm.) (Plate 1C) |
| | Jan/Feb 2001 | Waterboat Point | 1 chick in nest with normal sibling (P. Carey. pers. comm.) |
| | Feb 2001 | Gonzales Vildas | 3 birds (P.D. Boersma, pers. comm.) |
| Chinstrap penguin *P. antarctica* | 5 Feb 1992 | Laurie I., Sth Orkneys | 1 ad. (P. Carey pers. comm.) |
| | 1995 | Point Lookout, Elephant I. | Forrest & Naveen (2000) |
| | 2 Dec 1998 | Gourley Pen., Signy I. | 1 ad. incubating (A. Lynnes & J. Croxall. pers. comm.) |
| | 23 Dec 1998 | North Pt, Signy I. | 1 ad. incubating (A. Lynnes & J. Croxall. pers. comm.) |
| | 12 Jan 2001 | Pantomine Pt, Signy I. | 1 ad. (A. Lynnes & J. Croxall. pers comm.) |
| Macaroni penguin *Eudyptes chrysolophus* | 1947-1955 | Heard I. | Downes *et al.* (1960) |
| Royal penguin *E. schlegeli* | No date | No location | Specimen in Otago Museum (Oliver 1955) |
| | 16 Oct 1913 | Macquarie I. | 1 imm. (Falla 1937) |
| | 1967 | Macquarie I. | 1 1-year-old (Merilees 1983) |
| | 1986 | Macquarie I. | 1 ad. (M. Mallis pers. comm.) (Plate 2B) |
| Rockhopper penguin *E. chrysocome* | 1915 | Cochon I. | 1 ad. (Murphy 1936) |
| | 1979-80<br>1980-81 | Settlement Colony, New I., Falkland Is | 1 female, presumed same bird in 2 seasons (Strange 1982) |
| | 1995 | New I. | 1 ad. (P.D. Boersma. pers. comm.) |
| Snares crested penguin *E. robustus* | 1982-83 | Snares Is | 1 chick (Miskelly *et al.* 2001) |
| | 1985-86 | Snares Is | 2 chicks (Miskelly *et al.* 2001) (Plate 2A) |
| Magellanic penguin *Spheniscus magellanicus* | Dec 2001 | Punta Tumbo, Argentina | 1 ad. (P.D. Boersma pers. comm.) (Plate 2C) |
| Humboldt penguin *S. humboldti* | 1995 & 1996 | Punta San Juan, Marcona-Ica , Peru | 1 ad. each year (possibly the same bird, R. Paredes pers. comm.) |
| African penguin *S. demersus* | 1999 | Bird I., Algoa Bay, Sth Africa | 1 juv. N. Klages, R. Crawford & J. Cooper (pers. comm.) (Plate 2D) |

that "pied and isabelline [royal] penguins are probably as uncommon as one in 100,000". Forrest & Naveen (2000) estimated the frequency of "leucism" in the 3 pygoscelid penguins on the Antarctic Peninsula as 1:114,000 (Adélie), 1:146,000 (chinstrap), and 1:20,000 (gentoo).

Based on counts undertaken over 5 consecutive seasons 1982-1987, the incidence of isabellinism in Snares crested penguin chicks was *c.* 1:26,000 (Miskelly *et al.* 2001; CMM pers. obs.). Given that no isabelline adults or immatures were seen over the same period, the actual incidence of isabellinism in Snares crested penguin is likely to be < 1:50,000 (CMM pers. obs.).

The rarity of the isabelline condition in *Spheniscus* penguins probably explains why it has not been reported before. N. Klages, R. Crawford , and J. Cooper (pers. comm.) have observed only 1 isabelline African penguin in 15 years of observation. P.D. Boersma (pers. comm.) has seen only a single isabelline magellanic penguin from an estimated several million birds over 20 years of observation, and has seen none in Galápagos penguins. She suggests (pers. comm.) that the rarity or absence of the isabelline condition in *Spheniscus* penguins with small populations is probably a function of sample size. The Galápagos penguin population was estimated to be 6000-15,000 birds in 1970-71 (Reilly 1994). Isabellinism has, however, been observed in the Humboldt penguin (R. Paredes pers. comm.), which had an estimated population of fewer than 10,000 birds in 1993 (Reilly 1994).

Controlled breeding of domestic birds with aberrant plumage has revealed that such aberrations conform to classical Mendelian genetics (Sage 1962). Bruckner (1941) and Morgan (1958) showed that albinistic plumage in pheasants resulted from a single autosomal recessive gene often showing incomplete dominance. Studies of albinism in wild bird populations are rare, but Owen & Shimmings (1992) demonstrated that a single recessive allele caused leucism in barnacle geese *Branta leucopsis*. Forrest & Naveen (2000) speculated that "leucism" in gentoo penguins resulted from the presence of homozygous recessive genes, to account for the persistence of this condition over several years and generations at Gonzalez Videla station on the Antarctic Peninsula.

Extreme plumage aberrations are thought to decrease life expectancy as a result of increased rates of predation and intra-specific conflict (Holt *et al.* 1995). These disadvantages may not apply to isabelline penguins, because isabelline individuals are known to have survived for several years (Table 1). Successful nesting has often been observed, suggesting a normal life expectancy and reproductive success in some species. Apparently healthy isabelline chicks or juveniles have been observed in gentoo penguins (A. Lynnes & J. Croxall pers. comm.), royal penguins (Falla 1937; Merilees 1983), Snares crested penguins (Miskelly *et al.* 2001), and African penguin (N. Klages, R. Crawford & J. Cooper pers. comm.), implying normal development. Increased intra-specific aggression has, to our knowledge, not been seen directed towards isabelline penguins. However, Kearton (1930) recorded several instances in which full albino African penguins were ostracised by normal adults.

Perhaps the most surprising finding of this review is that there seem to have been no observed cases of isabellinism in the *Eudyptula* penguins so familiar to Australian and New Zealand bird watchers. Although (with a few notable exceptions) these birds do not typically form the dense colonies of most larger penguin species, many thousands have been recovered storm-wrecked on beaches. For example, over 32,000 were recorded in the New Zealand beach patrol scheme from 1960 to 1996 (Powlesland 1984; annual summaries in *Notornis* up to 1999). We hope that the apparent absence of isabellinism in this genus will provide a challenge to antipodean ornithologists.

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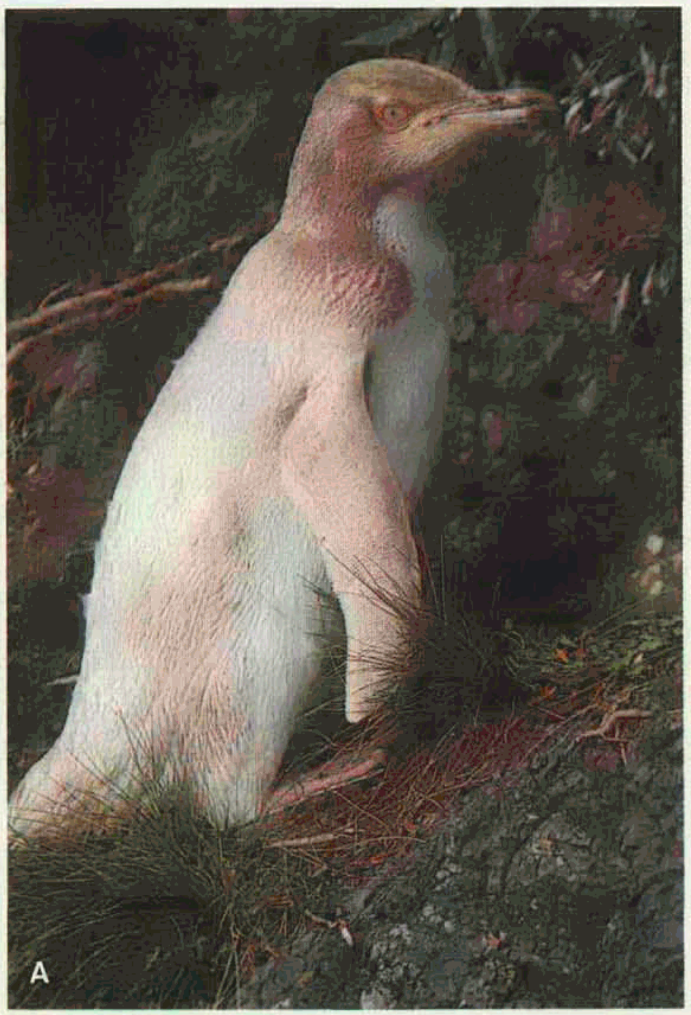



**Plate 1** Isabelline penguins, in the genera *Megadyptes* and *Pygoscelis*: **A,** adult yellow-eyed penguin (*Megadyptes antipodes*), Sandy Bay, Catlins Coast, Otago 1983. Photo: R. de Hamel. **B,** adult Adélie penguin (*Pygoscelis adeliae*), Cape Bird, Ross I., Antarctica 1971. Photo: E. Spurr. **C**, moulting juvenile gentoo penguin (*Pygoscelis papua*), Cuverville I., Antarctica 2000. Photo: L. Halpin. **D**, adult female gentoo penguin (*P. papua*), Gonzales Vildas, Paradise Bay, Antarctica 1998. Photo: G. Jacobs.



**Plate 2** Isabelline penguins, in the genera *Eudyptes* and *Spheniscus:* **A**, juvenile Snares crested penguin (*Eudyptes robustus*), North East I., Snares Is 1985. Photo: C. Miskelly. **B**, adult royal penguin (*Eudyptes schlegeli*), Macquarie I. 1986. Photo: M. Mallis. **C**, adult Magellanic penguin (*Spheniscus magellanicus*), Punta Tumbo 2001. Photo: P.D. Boersma. **D**, juvenile African penguin (*Spheniscus demersus*), Bird I., Algoa Bay, South Africa 1999. Photo: N. Klages.


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