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Aberrantly plumaged White-chinned Petrels *Procellaria aequinoctialis* in the Brazilian waters, south-west Atlantic Ocean

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We report on three aberrantly plumaged White-chinned Petrels Procellaria aequinoctialis *from the Brazilian Economic Exclusive Zone in the south-west Atlantic Ocean – the first reports based upon tangible evidence for the region. Two of them showed a low degree of colour aberration (some white around the eyes and on the upper-wing coverts), whereas the third exhibited the highest degree of plumage aberration so far reported for the species: a plumage mostly white with brown freckles on the upper- and under-parts, head and nape. We also commented on problems related to at-sea identification of aberrantly plumaged seabirds.*

Keywords: aberrant colouration, brown mutant, leucism, progressively greying, seabirds

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The colours in feathers of birds are produced by a variety of pigments, microstructures that refract and/or reflect selected wavelengths of light, or by a combination of both. As for pigments, the principal ones are melanins and carotenoids. Carotenoids are red to yellow pigments acquired from the diet; they are either directly incorporated as colorants to integumentary tissues or metabolized into other forms, before being deposited in growing feathers. Colour abnormalities associated with carotenoids result almost exclusively from nutritional imbalances. In contrast, birds synthesize two basic types of melanin: eumelanin and pheomelanin. The former is responsible for black, grey and dark-brown coloration; whereas the latter is responsible for light-brown, reddish and dull-yellow ones. The synthesis of melanins is a genetically controlled, complex biochemical process involving the oxidation of the aminoacid tyrosine; therefore, any alteration in this process is expected to influence plumage colouration (Sage, 1962; Lucas & Stettenheim, 1972; van Grouw, 2006).

The most commonly reported genetically based plumage abnormalities in birds are melanism, albinism and leucism. Melanism results from the increased production of one type of melanin over another. So far, simultaneously high concentrations of both types have not been detected in birds. Albinism is the complete absence of melanins, not only in the feathers but also in the eyes and skin, as a result of an inherited absence of the enzyme tyrosinase. Leucism is the partial or total lack of both melanins in feathers, due to inherited disorders in the transfer of theses pigments into feathers cells. The extent of white feathering can vary, from just a few feathers (partially leucistic) to a completely white plumage. Partially leucistic birds may have a normally coloured bare parts (i.e. bill, legs and feet), depending on where the colourless patches occur, but all leucistic birds have normally coloured eyes (Sage, 1962; Lucas & Stettenheim, 1972; van Grouw, 2006, 2013).

Leucism is regarded as the most common plumage colour aberration in birds and has been reported for several groups, including seabirds (e.g. Garrett, 1990; Thompson *et al.*, 2000; Mancini *et al.*, 2010; Delord *et al.*, 2012). However, there are other causes for reduction or absence of pigments in feathers that are more common than leucism. For example, the 'progressive greying', which can be defined as the total or partial lack of both melanins in feather due to progressive loss of melanocytes in some or all of the skin areas with age (van Grouw, 2013). Progressively greying birds exhibit all-white plumage or all white-feathers mixed with normal-coloured ones; the bill and feet may be pinkish or normally coloured, and eyes are always normally coloured (van Grouw, 2013).

Here, we report several cases of plumage aberrations in White-chinned Petrels *Procellaria aequinoctialis* (Procellariidae) from the Brazilian Economic Exclusive Zone (EEZ) in the south-west Atlantic Ocean. These are, to the best of our knowledge, the first reports based upon documented evidence for the region (Table 1).

The White-chinned Petrel is a medium-sized (length 51–58 cm; wingspan 134–147 cm) seabird showing a horn-coloured bill, and a mainly sooty black plumage with a variable amount of white on the chin and throat. The species breeds on a few sub-Antarctic islands of the southern Atlantic, southern Indian and south-western Pacific Oceans, but ranges widely at sea, from the pack-ice to the subtropics,

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Table 1. Published records of plumage aberration in White-chinned Petrels *Procellaria aequinoctialis*.

Locality	Description	Evidence	References
Cape coast	'Whole head and neck white, and with white flecks on the back and secondaries; legs, feet and bill dirty white.'	Observation	Shewell (1952)
Cape coast	'Normal, except that all primaries of the left wing was white.'	Observation	Shewell (1952)
Western Cape coast	'...birds with irregular white patches on the posterior abdomen approximately in the line with the trailing edge of the wing.'	Observation	Nicholls (1978)
Southern African waters	'...two white feathers in the mantle and one behind the right eye.'	Ringed bird/Personal communication	Nicholls (1978)
South African coast	'...partial albinism in several birds, the parts affected being the wings and body and the patches sometimes large. In addition he has seen one apparently total albino.'	Not informed/Personal communication	Nicholls (1978)
Delagoa Bay, southern Mozambique	'...with nearly completely whitish primaries in the left wing...'	Observation	Lambert (2005)
Not informed	'...with a narrow white eye-ring in addition to its white chin...'	Figure not shown in the text	Howell (2006)

including the Brazilian waters (Howell, 2006; Onley & Scofield, 2007; Carlos, 2009). In the Atlantic, the White-chinned Petrel may well be confused with the very similar-looking Spectacled Petrel *Procellaria conspicillata*, but the latter has diagnostic white eye-rings and dark-tipped bill (Howell, 2006; Onley & Scofield, 2007).

On 6 October 2011, G.F. photographed an apparently aberrantly plumaged White-chinned Petrel from a fishing boat operating about 1.8 nautical miles (3.3 km) off Tramandaí (*circa* 29°59′29.63″S 50°06′06.85″W) in the State of Rio Grande do Sul, south Brazil. The plumage of this bird was mostly sooty black except for some dark-based, white-tipped feathers on the upper-wing coverts and primaries besides its white chin; the eyes and the bare parts were normally coloured (Figure 1A). The presence of such strange, partially non-pigmented feathers is puzzling, but at least leucism can be ruled out (cf. van Grouw, 2013; Table 1).

On 16 June 2012, N.W.D. photographed a second aberrantly plumaged petrel off Torres (*circa* 29°21′21.68″S 49°39′43.52″W), also in Rio Grande do Sul. This bird, like the previous one, displayed a predominantly sooty black plumage, but besides the white chin, it also exhibited a narrow white eye-ring; its bare parts had a normal colouration (Figure 1B). According to the identification key by van Grouw (2013), this bird can be identified either as a partial leucistic or as a progressively greying mutant.

Finally, on 19 September 2013, G.F. observed and photographed a medium-sized and extremely light-plumaged

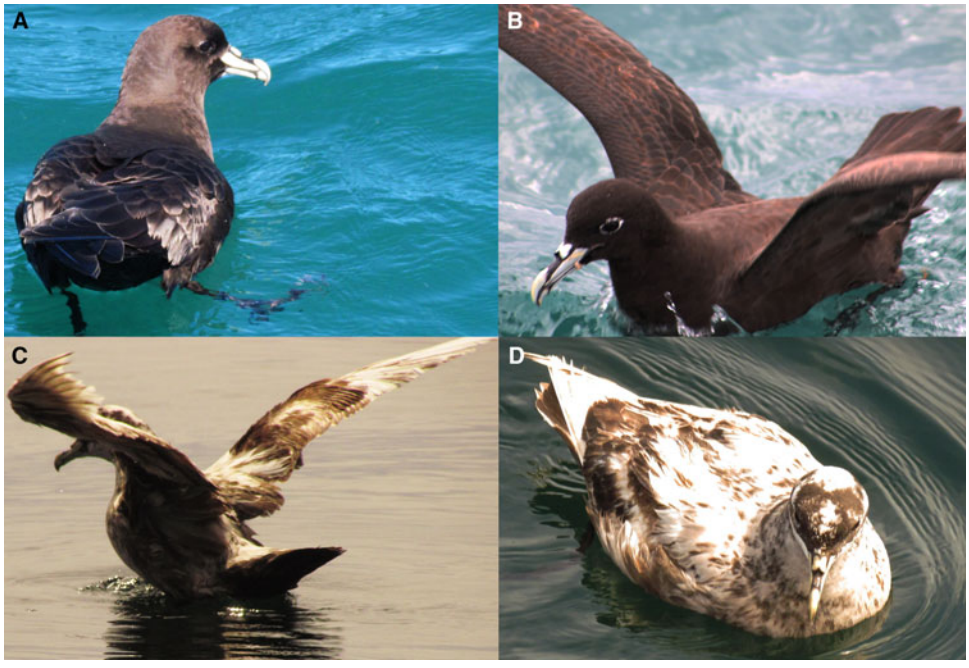

Fig. 1. Aberrantly plumaged White-chinned Petrels *Procellaria aequinoctialis* from Brazil: (A) 6 October 2011; (B) 16 June 2012; and (C, D) 19 September 2013. Photographs: G.F. (A, C, D) and N.W.D. (B).

petrel while aboard a fishing boat about 4 nautical miles off Passo de Torres (*c*irca 29°21′26.30″S 49°36′39.52″W), State of Santa Catarina, southern Brazil. This bird had a flight style similar to that described for *Procellaria* petrels – glides and wheels over the water followed by glides on slightly bowed wings with bouts of strong but fairly languid, loose flapping, the wings held fairly straight out from the body (Howell, 2006). Most of the bird's plumage was whitish with brown freckles on its upper- and underparts, head and nape (Figure 1C, D); the eyes, bill, legs and feet had a colouration similar to that of the previously described individuals. The uniform, horn-coloured bill lacked a dark tip, confirming the bird as a White-chinned Petrel (cf. Howell, 2006; Onley & Scofield, 2007); therefore, ruling out the possibility of an aberrantly plumaged Spectacled Petrel. The plumage colour of this bird is most likely the result of a brown mutation, which consists in the reduction of eumelanin due to its incomplete oxidation. Feathers with incompletely oxidized eumelanin bleach very fast under the sunlight, hence the many whitish (worn) feathers in that bird (van Grouw, 2013; Figure 1C, D).

In albatrosses and petrels, as in other birds, albinism and leucism have been erroneously regarded the most common melanin-pigmentation anomalies. However, most cases of aberrant colourations may actually involve either brown or progressively greying mutants (van Grouw, 2013). Anyway, 'albinism' and 'leucism' have been recorded for at least 19 genera, including *Procellaria* (Bried & Mougeot, 1994; Bried *et al.*, 2005; Mancini *et al.*, 2010). In both leucistic and progressively-greying birds, the white patches, as well as the extent of white, can show a great variability, irrespective of species. In White-chinned Petrels, the extent and positioning of white colouration in aberrantly plumaged birds varies from just a narrow ring around the eyes to large patches on the head, belly and wings (Table 1).

The leucistic/progressively-greying bird photographed in June 2012 was similar to those reported by Howell (2006) and A. Thomas (in Nicholls, 1978): all these individuals showed the lowest degree of colour aberration recorded for the species. In contrast, the individual from September 2013 was among those with the highest degree of abnormally coloured feathers (Table 1). The other cases of supposedly high degree of 'leucism' for White-chinned Petrel were those reported by J.C. Sinclair (in Nicholls, 1978) and Shewell (1952): the former author erroneously mentioned an 'apparently total albino' bird, whereas, the latter described an individual with about half of the plumage and bare-parts whitish. However, both records lack documentation (i.e. a photograph or even a museum specimen) that enables their verification and validation. It should be remembered that besides being similar to each other, White-chinned and Spectacled Petrels were considered conspecifics until the late 1990s (Ryan, 1998). To date, only one case of 'leucism' has been reported in the Spectacled Petrel: a bird with a 'white abdominal patch accompanied by white on the head' (Nicholls, 1978). As far as we know, plumage aberrations have not been reported for the remaining three species in the genus – Black Petrel *Procellaria parkinsoni*, Westland Petrel *Procellaria westlandica* and Grey Petrel *Procellaria cinerea*.

The identifications of the individuals from October 2011 and June 2012 were straightforward, as both exhibited a nearly normal plumage colouration. In contrast, the individual from September 2013 was identified only when it came close to boat, thus enabling the observer to see its bill colour and structure. At-sea identification of seabirds often depends on close observation of plumage colour pattern, body shape and structure, and flight style – the so-called 'jizz' (e.g. Howell, 2006; Carlos & Voisin, 2008). In this context, the occurrence of plumage aberrations adds complications not only by changing the overall colour of a bird, but also because it may affect its flight performance and, consequently, flight style: feathers with low levels, or absence, of melanin are much more susceptible to wear (Lee & Grant, 1986). So, every supposedly aberrantly plumaged seabird must be observed at close range and under good light to confirm its identification. Garrett (1990), for example, mentioned aberrantly plumaged Black-vented Shearwaters *Puffinus opisthomelas*, that could be confused with Cape Petrels *Daption capense* or Streaked Shearwaters *Calonectris leucomelas*, unless seen extremely well at close range.

Here, we presented the first records of aberrantly plumaged White-chinned Petrels from Brazil (Table 1). They correspond to the third report of plumage colour abnormalities in petrels occurring in this country (Murphy & Pennoyer, 1952; Sick, 1997; Mancini *et al.*, 2010). This scarcity of reports of aberrantly plumaged seabirds in the Brazilian EEZ is due to the inherent difficulties of identifying them and to the still relatively low effort of at-sea observation in the region.

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