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SHORT NOTE

Status of the flesh-footed shearwater (*Ardenna [Puffinus] carneipes*) in the south eastern Pacific

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The pink-footed shearwater (*Ardenna* [*Puffinus*] *creatopus*) and flesh-footed shearwater (*A.* [*Puffinus*] *carneipes*) are Southern Hemisphere and trans-equatorial migrants; both occurring within the Northern Hemisphere waters during the austral winters. The taxonomy of Dickinson & Remsen (2013) is followed here. The pink-footed shearwater breeds in the south-eastern Pacific Ocean and the bulk of its migration is through the eastern Pacific; however, some individuals reach the southwestern Pacific around New Zealand (Marchant & Higgins 1990; Guicking *et al*. 2001; Gill *et al*. 2010). The flesh-footed shearwater breeds on Ile St Paul (Indian Ocean), Australian and New Zealand islands, primarily migrating through the western Pacific Ocean, with some individuals reaching the northeastern Pacific (Marchant & Higgins 1990; Gill *et al*. 2010; Rayner *et al*. 2011). However, both taxa have a large area of overlap in their wintering grounds, north of the subtropical convergence in the northeastern Pacific, and both occasionally reach the Gulf of Alaska (Loomis 1918; AOU 1983; Marchant & Higgins 1990; Turbott 1990; Gill *et al*. 2010). Here, I review the presence of flesh-footed shearwaters along the Chilean coast of the southeastern Pacific.

Most authors since the 1900's consider the flesh-footed shearwater and the pink-footed shearwater to be separate species (*e.g.,* Loomis 1918; AOU 1957; Morony *et al.* 1975; Blake 1977; AOU 1983; Marchant & Higgins 1990; Brooke 2004; Gill *et al*. 2010; Dickinson & Remsen 2013). Other authors have considered the pink-footed shearwater and the flesh-footed shearwater to form a superspecies e.g., AOU (1983, 1998) and Sibley & Monroe (1990). However, occasionally the pink-footed shearwater has also been treated as conspecific with the flesh-footed shearwater e.g., Palmer (1962) and Penhallurick & Wink (2004). Polymorphism is prevalent in many procellariform seabirds, a condition independent of climatic conditions but might indicate a difference in the geographical range (Loomis 1918); del Hoyo *et al*. (1992) mentioned that the pink-footed shearwater might just be the pale end of a west-east colour morph between the 2 taxa.

In a review on Chilean birds, Marin (2004) summarised the Chilean records of the flesh-footed shearwater. The species was first documented in Chile with a specimen (AMNH # 445753, Fig. 1) collected by R. Beck on 9 February 1914, 14.8 km

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Fig. 1. (A) Specimen of flesh-footed shearwater collected by R. Beck, on 9 February 1914, 14.8 km off Masatierra Island (33°37′S-78°52′W), Archipelago Juan Fernandez AMNH # 445753 (photo by Paul Sweet); (B) Pale and dark morphs of the pink-footed shearwater, from Plate 13 of Loomis (1918), being the original description of the dark morph of this species (reproduced here with permission of the California Academy of Science).

off Masatierra Island [no compass direction was originally given and erroneously Barros (2015) indicated a distance of 18.5 km] (33°37′S-78°52′W), Juan Fernandez Archipelago (Murphy 1930, 1936). The second documented individual was a bird photographed on 11 November 2001, off Quintero, Valparaíso, province (33°S) and reported by Couve & Vidal (2002). Marin (2004), wrongly noted a third record a specimen that was catalogued at Yale Peabody Museum (YPM # 15997) under *Ardenna* [*Puffinus*] *carneipes* and collected by R. Beck off Valdivia, on 20 October 1913. The specimen in question, turns out to be a pink-footed shearwater (see Barros 2015). It was not checked by me previously (Marin 2004) and was labeled as *A. carneipes sensu lato* following treatment of the 2 forms as conspecific by Palmer (1962), hence the confusion. Without examination Barros (2015) dismissed the 1914 R. Beck specimen (see Fig. 1A) of flesh-footed shearwater. Barros (2015) argued that the specimen in question was examined by Steve Howell who concluded, based on measurements [contra Murphy 1930, 1936, see below], that it might be the "dark" morph of the pink-footed shearwater; Barros added that it would require "*a DNA analysis*" for correct identification. Murphy (1930) reported "*This specimen is an adult with worn body plumage but recently renewed wing and tail quills*" and later he concluded "*It matches New Zealand specimens in both appearances and proportions, except for the long claws*". Murphy´s (1930) comparison of measurements of the 1914 specimen (wing = 324 mm, tail = 108.7 mm, exposed culmen = 43.8 mm and tarsus = 55.5 mm) with 12 specimens of flesh-footed shearwater from New Zealand (wing = 317-329 mm, tail = 109-115.1 mm, exposed culmen = 37.6-43.3 mm, tarsus = 51.6-56.3 mm), indicating that the 1914 specimen is well within those ranges. Loomis (1918) reported the existence of a "dusky phase" of the pink-footed shearwater, and described in detail the dark morph and contrasting it with the light morph. He described the dark morph as: "*the chin, throat and jugulum are heavily barred with gray and grayish white and the rest of the lower parts of the body are densely clouded with gray*", never blackish or all dark sooty. The bird described as the darkest of this dusky morph is reproduced in Plate 13 of Loomis (1918) and reproduced here as Fig. 1B. There are at least 3 recent books that clearly illustrate the "dark" morph of the pink-footed shearwater (*e.g.*, Marchant & Higgins 1990; Onley & Scofield 2007; Dunn & Alderfer 2011), and it is clear that the "dark" morph of pink-footed shearwater is never as dark as the flesh-footed shearwater. The darkest pink-footed shearwater has a paler or more grayish belly (see Fig. 1B and Fig. 2C), and so they are clearly separable from flesh-footed shearwaters; contrary to Barros´ (2015) statement that it "*would need a DNA analysis to separate them*". Furthermore, Barros (2015), based on comments by Steve Howell

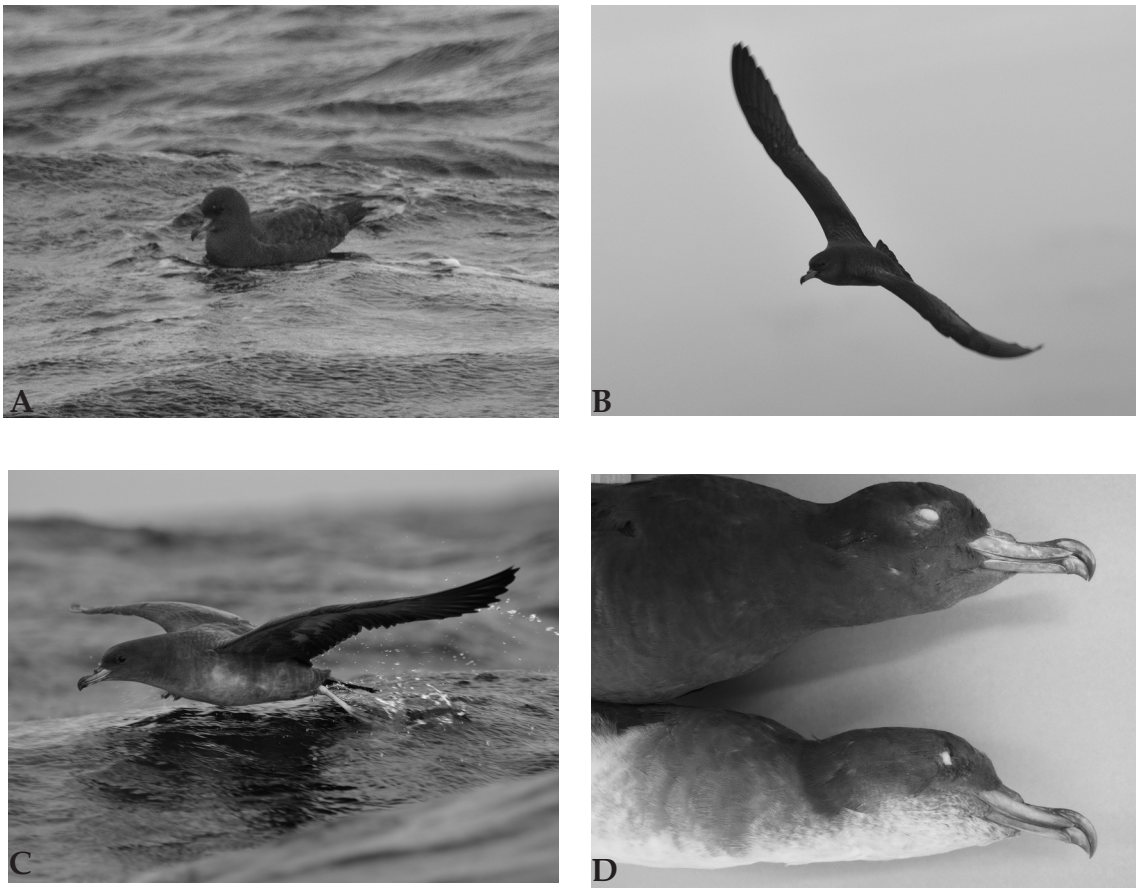

Fig. 2. (A) sitting flesh-footed shearwater observed on 8 October 2016, approximately 19.8 km west of Valparaíso; (B) flying flesh-footed shearwater observed on 8 October 2016, approximately 10 km west of Valparaíso; (C) dusky morph of the pink-footed shearwater observed on 8 October 2016, approximately 8 km west of Valparaíso. (D) flesh-footed shearwater (YPM # 15996) from New Zealand (top) and pink-footed shearwater (YPM # 15997) (pale phase) from Chile, specimens at Yale Peabody Museum (photo by Kristof Zyskowski).

and Alvaro Jaramillo, also dismissed other photos of flesh-footed shearwaters taken by Enrique Couve, on 11 November 2001 off Quintero (see Couve & Vidal 2002 and Barros 2015), attributing those pictures to a "dark morph" of pink-footed shearwaters. However, Barros (2015) did accept, again based on comments of Howell and Jaramillo, that 1 picture taken by Couve on 2 December 2005, 7.5 km north-east of Robinson Crusoe Island, was a flesh-footed shearwater, erroneously indicating that it is the only evidence of this species for Chile. The identification problem of the Chilean birds seems to have originated when Howell (2012: 79), mentioned that there is a "*very rare ≤ 0.1% of population*" of "*dark gray-brown to brown overall including underbody and underwing coverts*" morph of pink-footed shearwater. Howell´s assertions had no analysis nor any data to support such claims and I think such statements, produced an identification confusion between the 2 taxa (see also below). Howell´s darkest individual of pink-footed shearwater is reproduced in Howell (2012: 80) where specks of grayish on the throat and below are clearly visible. Howell (2012) presents only a single picture of a "dark morph", showing only the upperparts and no photo of the underparts. The darkest of all 139 pink-footed shearwaters examined by Loomis (1918) is reproduced in Fig. 1b; the intensity of darkness is not even close to that shown by the Chilean flesh-footed shearwaters described here. Howell (2012) stated that the dark morph of pink-footed shearwater has "*dark gray-brown to brown overall,*

including underbody and underwing coverts" and under flesh-footed shearwater he added "*the rare [Pink-footed] dark morph may not always be separable from Flesh-footed*". It is also important to remark that the worn plumage of flesh-footed shearwaters becomes decidedly brownish (Loomis 1918). Those statements, without a proper analysis, should be treated cautiously, as they confuse species identification and therefore distribution.

During a pelagic trip on 8 October 2016, I observed and photographed 3 flesh-footed shearwaters among large numbers of pink-footed shearwaters approximately 19.8 km west off Valparaíso (Fig. 2A) as well a fourth individual approximately 10 km west off Valparaíso (Fig. 2B). These encounters provide further evidence of the occasional presence of flesh-footed shearwaters in the eastern Pacific. Furthermore, among the large flocks of pink-footed shearwaters occurring in the area, flesh-footed shearwaters might be easily overlooked because of the similarity between these taxa. Depicted in Fig. 2C is a dark morph of pink-footed shearwater, which has a grayish or dark-gray body and a paler underwing, while the flesh-footed shearwater has an overall dark body and darker underwing. These observations show that the flesh-footed shearwater is present in the eastern Pacific, south at least to 34°S, in small numbers in the months of September, October, November, December, and February, and is probably often overlooked.

A question that is not entirely resolved is whether flesh-footed shearwaters and pink-footed shearwaters are a single species exhibiting west-east colour morph, as suggested by del Hoyo *et al*. (1992) and Fig. 2D or 2 separate species (*e.g.* see Palmer 1962). Penhallurick & Wink´s (2004) analysis (based on complete nucleotide sequences of the mitochondrial cytochrome b gene) drew attention to the very low genetic distance (0.70%) between pink-footed and flesh-footed shearwaters relative to other shearwaters; thus supporting the idea that both taxa are the same species differentiated only at subspecies level. However, their work, primarily the methodology, has been heavily criticised (e.g. Rheindt & Austin 2005). Further adding to this complex situation are the unresolved "fossil" records for eastern Polynesia (Rapa Iti 27°35´S-114°20´W, Tennyson & Anderson 2012; Rapa Nui 27°7´S-109°23´W, Marin & Caceres 2010) which could be either taxa. These records may be an indication that eastern Polynesia was a former breeding ground, or the taxa involved formerly occurred there as vagrant. However, there seems to be no present records for either species on either Rapa Iti or Rapa Nui. The idea that these taxa are a single species that exhibits a colour gradation is a subject worthy of further investigation.

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LITERATURE CITED

American Ornithologists' Union. 1957. *Check-list of North American birds*. Fifth edition. Baltimore, American Ornithologists' Union, Port City Press, Inc.

American Ornithologists' Union. 1983. *Check-list of North American birds*. Sixth edition Kansas, American Ornithologists' Union, Allen Press, Inc.

American Ornithologists' Union. 1998. *Check-list of North American birds*. Seventh edition. Kansas American Ornithologists' Union, Allen Press, Inc.

Barros, R. 2015. Algunos comentarios a la lista de las aves de Chile. *La Chiricoca 20*: 57-78.

Blake, E.R. 1977. *Manual of Neotropical birds*. Chicago and London, University of Chicago Press.

Brooke, M. 2004. *Albatross and petrels across the world*. New York, Oxford University Press.

Couve, E.; Vidal, C. 2002. Nuevo registro de *Puffinus carneipes* (Procellariidae) en aguas oceánicas chilenas. *Boletín Chileno de Ornitología 9*: 43-44.

del Hoyo, J.; Elliot, A.; Sargatal, J. (eds.) 1992. *Handbook of the birds of the World, Volume* 1: *ostrich to ducks*. Barcelona, Lynx Edicions.

Dickinson, E.C.; Remsen, J.V. (eds.) 2013. *The Howard & Moore complete checklist of the birds of the World, Volume 1: non-passeriformes*. Eastbourne, Aves Press.

Dunn, J.; Alderfer, J. 2011. *A field guide to the birds of North America.* Sixth edition, Washington D.C., National Geographic.

Gill, B.J.; Bell B.D.; Chambers, G.K.; Medway, D.G.; Palma, R.L.; Scofield, R.P.; Tennyson, A.J.D.; Worthy, T.H. 2010. *Checklist of the birds of New Zealand, Norfolk and Macquarie Islands, and the Ross Dependency, Antarctica.* Fourth edition. Wellington, Te Papa Press and Ornithological Society of New Zealand Inc.

Guicking, D.; Ristow, D.; Becker, P.H.; Schlatter, R.; Berthold, P.; Querner, U. 2001. Satellite tracking of the pink-footed shearwater in Chile. *Waterbirds 24*: 8-15.

Howell, S.N.G. 2012. *Petrels, albatrosses and storm-petrels of North America: A Photographic Guide.* Princeton, Princeton University Press.

Loomis, L.M. 1918. A review of the albatrosses, petrels, and diving petrels. *Proceedings of the California Academy of Science, 4th series, 2*: 1-187.

Marchant, S.; Higgins, P.J. (*eds.*) 1990. *Handbook of Australian, New Zealand & Antarctic birds. Volume 1: ratites to ducks.* Melbourne, Oxford University Press.

Marin, M. 2004. *Annotated checklist of the birds of Chile.* Bellaterra, Lynx Edicions.

Marin, M.; Caceres, P. 2010. Sobre las aves de Isla de Pascua. *Boletin Museo Historia Natural, Chile 59*: 75-95.

Morony, J.J.; Bock W.J.; Farrand, J. 1975. *Reference list of the birds of the world*. New York, American Museum of Natural History.

Murphy, R.C. 1930. Birds collected during the Whitney south sea expedition, XI. *American Museum Novitates:* 419.

Murphy, R.C. 1936. *Oceanic birds of South America, volume* 2. New York, American Museum of Natural History.

Onley, D.; Scofield, P. 2007. *Albatrosses, petrels & shearwaters of the world*. Princeton, Princeton University Press.

Palmer, R. S. (ed.) 1962. *Handbook of North American birds, volume 1: Loons through flamingos*. New Haven and London, Yale University Press.

Penhallurick J. M; Wink, M. 2004. Analysis of the taxonomy and nomenclature of the Procellariiformes based on complete nucleotide sequences of the mitochondrial cytochrome-*b* gene. *Emu 104*: 125-147.

Rayner, M.J.; Taylor, G.A.; Thompson, D.R.; Torres, L.G.; Sagar, P.M; Shaffer S.A. 2011. Migration and diving activity in three non-breeding flesh-footed shearwaters *Puffinus carneipes*. *Journal Avian Biology 42*: 266-270.

Rheindt, F.E.; Austin, J.J. 2005. Major analytical and conceptual shortcomings in a recent taxonomic revision of the Procellariiformes a reply to Penhallurick and Wink (2004). *Emu 105*: 181-186.

Sibley, C.G.; Monroe, B.L. 1990. *Distribution and taxonomy of birds of the world.* New Haven Connecticut, Yale University Press.

Tennyson, A.J.D.; Anderson, A. 2012. Bird, reptile and mammal remains from archeological sites on Rapa Island. pp. 105-114 *In* Anderson, A.; Kennett, D.J. (eds.). *Taking the high ground, the archeology of Rapa, a fortified island in remote east Polynesia*. Terra Australis 37. Canberra, Australian National University ePress.

Turbott; E.G. (convener) 1990. *Checklist of the birds of New Zealand, and the Ross Dependency Antarctica.* Third edition. Auckland, Random Century and Ornithological Society of New Zealand.

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