

## SHORT NOTE

Molecular analysis confirms the occurrence of  
*Thalassarche steadi* in Argentinian waters

JUAN PABLO SECO PON\*  
MAGDALENA GRAZIANO  
ROCÍO MARIANO-JELICICH

Instituto de Investigaciones Marinas y Costeras (IIMyC), Facultad de Ciencias Exactas y Naturales,  
Universidad Nacional de Mar del Plata-CONICET. Rodríguez Peña 4046, nivel 1 (B7602GSD), Argentina.

Before the current availability of molecular methods for separating shy (*Thalassarche cauta*) and white-capped albatrosses (*T. steadi*) (Abbott & Double 2003), it was accepted that these two 'shy-type albatrosses' (see Brooke 2004, Penhallurick & Wink 2004; Onley & Scofield 2007) along with Chatham albatross (*T. eremita*) and Salvin's albatross (*T. salvini*) were historically placed under a single polytypic species: the shy albatross (*Diomedea cauta*) (Marchant & Higgins 1990; Carboneras 1992). In modern days the shy albatross complex is divided into four species placed in the genus *Thalassarche* based on morphometric, phylogenetic, and population genetics studies (Robertson & Nunn 1998; Abbott & Double 2003; Sangster *et al.* 2015). Albeit this taxonomy has been adopted by leading organizations such as the Agreement on the Conservation of Albatrosses and Petrels – ACAP (Taxonomy Working Group 2006; ACAP 2011) and BirdLife International (2022), some authors show discrepancies (see Brooke 2004; Onley & Scofield 2007). In this paper we follow ACAP (2011) and BirdLife International (2022) in considering *T. steadi* as a separate species.

*Thalassarche steadi*, a New Zealand breeding endemic species, breeds on Auckland Islands, Antipodes Islands, and occasionally on the Chatham Islands. The vast majority of these birds (up to 90%) breed on Disappointment Islands (50°44'S, 166°06'E). *Thalassarche steadi* is regarded as a biennial breeder with a total population estimated at 203,600 mature individuals (BirdLife International 2022). Population trends of the species show strong inter-annual fluctuations, and despite further data needed to confirm the population trend, this parameter is currently considered as declining (BirdLife International 2022). Currently, *Thalassarche steadi* is listed as 'Near Threatened' due to a combination of at-sea (mainly fisheries bycatch) and on land (chiefly invasive non-native species) threats (Taylor 2000; Baker *et al.* 2007; Francis 2012).

*Thalassarche steadi* has an almost circumpolar distribution outside the breeding season, showing westerly dispersal directions (Shirihai 2008; Howell & Zufelt 2019), mainly reaching productive waters off South Africa, particularly on the Atlantic side, a well-established key foraging area for overwintering and non-breeding individuals (Baker *et al.* 2007; Petersen *et al.* 2009 and references therein). There, the species is bycaught in large numbers by longline fisheries operating off South Africa (Baker *et al.* 2007; Petersen *et al.* 2009). Still, other

---

Received 14 May 2022; accepted 3 September 2022

\*Correspondence: [secopon@mdp.edu.ar](mailto:secopon@mdp.edu.ar)

productive areas included in the range of *T. steadi* during its early stages of life and/or during the non-breeding season are the Argentine Continental Shelf and its shelf-break (White *et al.* 2002; Favero & Silva Rodríguez 2005; Seco Pon & Tamini 2013). This area has long been regarded as an ecosystem of global importance, offering abundant food for a number of local and migratory marine megafauna, including seabirds (Croxall & Wood 2002; Favero & Silva Rodríguez 2005). In other areas of the south-western Atlantic, the species may reach waters off Uruguay (Jiménez *et al.* 2009) and southern Brazil (Pereira *et al.* 2016). Further south, white-capped albatrosses have been sighted at Malvinas/Falkland Islands (White *et al.* 2002) and at Georgias del Sur/South Georgia (Phalan *et al.* 2004).

Although *T. steadi* is listed within known Argentine bird checklists (de la Peña & Rumboll 1998; Narosky & Izurieta 2010; MADYS 2017; Pearman & Areta 2020), to date the occurrence of the species is based on at-sea observations of birds attending commercial fisheries (Seco Pon & Tamini 2013) and a single specimen found stranded in northern Patagonia (40°45'S, 64°57'W) (Savigny & Carabajal 2015). Due to the great resemblance between white-capped and shy albatrosses, especially at sea (see Abbott & Double 2003; Double *et al.* 2003), the study by Seco Pon & Tamini (2013) did not attempt to identify individuals at the specific level. On the other hand, the study by Savigny & Carabajal (2015) suggests the occurrence of the species based solely on biometric data and plumage colouration. According to Double *et al.* (2003), *T. steadi* is on average larger than *T. cauta*, and discriminant functions involving body measurements may assist in the identification. However, *T. steadi* can be accurately separated by a fixed substitution in Domain I of the mitochondrial DNA control region (Abbott & Double 2003). In this paper, we confirm the occurrence of the species in Argentina based on molecular techniques.

On 09 March 2019, a dead shy-type *Thalassarche* albatross on the beach at Punta Mogotes (38°02'55"S, 57°31'52"W), Mar del Plata city, located in the south-eastern Buenos Aires Province, Argentina was reported to one of the authors (JPSP). Prior to the necropsy, morphometric measurements were taken (following Double *et al.* 2003) (using Vernier calliper with an accuracy of  $\pm 0.1$  mm and digital scale with precision  $\pm 1$  g), and primary, tail, and body (head, back, and belly) moult was evaluated (after Ginn & Melville 1983). Body moult was defined as active if at least five growing feathers were found; otherwise body moult was treated as inactive (see Bugoni *et al.* 2015). Upon necropsy, muscle tissue samples were preserved in absolute ethanol.

The carcass was found showing a slight decomposition (i.e. with intact internal organs,

some rotten smell). No oil stains were noted on feathers or skin of the specimen. The bird had a grey head and neck; its crown and chin were white with little to no pale grey. The rump and undersides were white, and the upper wings black; white underwings with narrow black margins and pale primary flight feather bases (Fig. 1). The bill was pale grey with a blackish tip on the mandible. No primary or tail feathers showed active moult, but body feathers were moulting.



**Figure 1.** *Thalassarche steadi* found stranded in Mar del Plata, Buenos Aires Province, Argentina. Photographs: Marco Favero.

Morphometric measurements of the specimen are as follows: head length, 77.2 mm; maximum head width, 65.6 mm; culmen length, 131.5 mm; upper bill depth, 31.5 mm; basal bill depth, 50.1 mm; basal bill width, 35.7 mm; middletoe (without nail), 126.2 mm; middletoe nail, 19.0 mm; tarsus, 90.3 mm; wing cord, 584.0 mm; and tail length, 245.0 mm. By applying the discriminant function developed by Double *et al.* (2003) – which correctly identifies both the sex and species of 84% of specimens from a sample size of 70 birds previously recognized using molecular techniques – the bird was classified as a female *T. steadi*. The specimen was then sexed by dissection and direct examination of gonads as an immature female.

Total genomic DNA was isolated from a portion of pectoral muscle using an adaptation of Chelex DNA extraction method (Walsh *et al.* 1991; Phillips

*et al.* 2012). A small fraction of muscle, c. 5 × 5 mm, was placed in a 1.5 ml tube with 200 µl of Chelex 100 resin™ Matrix (BioRad) 5%. The sample was then incubated at 55°C for 30 minutes, followed by 8 minutes at 100°C. Molecular species identification was done through the PCR amplification of a 325bp fragment of the Domain I of the mitochondrial control region following Abbott & Double (2003). Primers GluR7 and SPECF2 (Abbott & Double 2003) were used. The PCR product was visualized on a 1.5% agarose gel, posterior purification of the PCR product and sequencing was performed at Macrogen Inc. (Seoul, Korea). The sequence was aligned with MUSCLE within the program Mega X (Kumar *et al.* 2018) together with 15 and 23 sequences for shy and white-capped albatrosses, respectively, uploaded from GenBank. The individual was identified as *Thalassarche steadi* based on a single nucleotide polymorphism (SNP), an Adenine to Guanine substitution, detected at the 121 nucleotide position, which corresponds to a fixed difference diagnostic for the species (Abbott & Double 2003). The sequence is deposited in GenBank under accession number OP832372.

From molecular determination we can confirm that the stranded bird analyzed corresponded to a *Thalassarche steadi* individual. This identification method has been previously implemented in the molecular determination of shy-type albatrosses stranded on coastal areas and/or by-caught in fisheries operating in the region (Jiménez *et al.* 2009; 2015; Pereira *et al.* 2016). Molecular techniques as the one used here have been largely applied to the identification of seabirds incidentally killed in fisheries and/or stranded on coastal areas (Abbott *et al.* 2006; Burg *et al.* 2017; Baetscher *et al.* 2022; among others). To our knowledge this would be the first study to identify *T. steadi* as a non-breeding visitor in Argentinian waters.

## ACKNOWLEDGEMENTS

The authors thank Jesús Pascual for reporting the occurrence of a beached albatross in Punta Mogotes, Mar del Plata. Thanks also to Marco Favero for the photographs of the studied specimen. We appreciate the comments and suggestions made by two reviewers and the Editor on an early draft. Financial support was provided by the Universidad Nacional de Mar del Plata (grant EXA 948/2019).

## LITERATURE CITED

Abbott, C.L.; Double, M.C. 2003. Phylogeography of shy and white-capped albatrosses inferred from mitochondrial DNA sequences: implications for population history and taxonomy. *Molecular Ecology* 12: 2747–2758.

- Abbott, C.L.; Double, M.C.; Gales, R.; Baker, G.B.; Lashko, A.; Robertson, C.J.R.; Ryan, P.G. 2006. Molecular provenance analysis for shy and white-capped albatrosses killed by fisheries interactions in Australia, New Zealand, and South Africa. *Conservation Genetics* 7: 531–542.
- ACAP. 2011. ACAP Species assessment: White-capped albatross *Thalassarche steadi*. <http://www.acap.aq> (Accessed: 16 April 2022).
- Baetscher, D.S.; Beck, J.; Anderson, E.C.; Ruegg, K.; Ramey, A.M.; Hatch, S.; Nevins, H.; Fitzgerald, S.M.; Garza, C.J. 2022. Genetic assignment of fisheries bycatch reveals disproportionate mortality among Alaska Northern Fulmar breeding colonies. *Evolutionary Applications* 15: 447–458.
- Baker, G.B.; Double, M.C.; Gales, R.; Tuck, G.N.; Abbott, C.L.; Ryan, P.G.; Petersen, S.L.; Robertson, C.J.R.; Alderman, R. 2007. A global assessment of the impact of fisheries-related mortality on shy and white-capped albatrosses: conservation implications. *Biological Conservation* 137: 319–333.
- BirdLife International. 2022. Species factsheet: *Thalassarche steadi*. Downloaded from <http://www.birdlife.org> on 10 May 2022.
- Brooke, M. 2004. *Albatross and petrels across the world*. New York, Oxford University Press.
- Bugoni, L.; Naves, L.C.; Furness, R.W. 2015. Moulting of three Tristan da Cunha seabird species sampled at sea. *Antarctic Science* 27: 240–251.
- Burg, T.M.; Catry, P.; Ryan, P.G.; Phillips, R.A. 2017. Genetic population structure of black-browed and Campbell albatrosses, and implications for assigning provenance of birds killed in fisheries. *Aquatic Conservation: Marine and Freshwater Ecosystems* 27: 1156–1163.
- Carboneras, C. 1992. Family Diomedidae (albatrosses). pp. 198–214 In: del Hoyo, J.; Elliott, A.; Sargatal, J. (eds.) *Handbook of the birds of the world, volume 1 (ostrich to ducks)*. Lynx Edicions, Barcelona.
- Croxall, J.P.; Wood, A.G. 2002. The importance of the Patagonian Shelf to top predator species breeding at South Georgia. *Aquatic Conservation: Marine and Freshwater Research* 12: 101–118.
- de la Peña, M.R.; Rumboll, M. 1998. *Birds of southern South America and Antarctica*. London, Harper Collins Publishers.
- Double, M.C.; Gales, R.; Reid, T.; Brothers, N.; Abbott, C.L. 2003. Morphometric comparison of Australian shy and New Zealand white-capped albatrosses. *Emu* 10: 287–294.
- Favero, M.; Silva Rodríguez, M.P. 2005. Estado actual y conservación de aves pelágicas que utilizan la plataforma continental Argentina como área de alimentación. *El Hornero* 20: 95–110.

- Francis, R.I.C.C. 2012. Fisheries risks to the population viability of white-capped albatross *Thalassarche steadi*. Ministry for Primary Industries. New Zealand Aquatic Environment and Biodiversity Report No. 104.
- Ginn, H.B.; Melville, D.S. 1983. *Moult in birds*. BTO guide No. 19. Tring, British Trust for Ornithology.
- Howell, S.N.G.; Zufelt, K. 2019. *Oceanic birds of the world*. New Jersey, Princeton University Press.
- Jiménez, S.; Domingo, A.; Marquez, A.; Abreu, M.; D'Anatro, A.; Pereira, A. 2009. Interactions of long-line fishing with seabirds in the western Atlantic Ocean, with a focus on white-capped albatrosses (*Thalassarche steadi*). *Emu* 109: 321–326.
- Jiménez, S.; Marquez, A.; Abreu, M.; Forselledo, R.; Pereira, A.; Domingo, A. 2015. Molecular analysis suggests the occurrence of shy albatross in the south-western Atlantic Ocean and its bycatch in longline fishing. *Emu* 115: 58–62.
- Kumar, S.; Stecher, G.; Li, M.; Knyaz, C.; Tamura, K. 2018. MEGA X Molecular Evolutionary Genetics Analysis across computing platforms. *Molecular Biology and Evolution* 35: 1547–1549.
- Marchant, S.; Higgins, P.J. 1990. *Handbook of Australasian, New Zealand & Antarctic birds: Volume 1. Ratites to ducks*. Melbourne, Oxford University Press.
- Ministerio de Ambiente y Desarrollo Sustentable de la Nación (MADYS). 2017. *Categorización de las Aves de la Argentina*. Buenos Aires, Ministerio de Ambiente y Desarrollo Sustentable de la Nación y Aves Argentinas.
- Narosky, T.; Izurieta, D. 2010. *Aves de Argentina y Uruguay*. Edición total. Buenos Aires, Vázquez Mazzini Editores.
- Onley, D.; Scofield, P. 2007. *Albatrosses, petrels and shearwaters of the world*. Princeton, Princeton University Press.
- Pearman, M.; Areta, J.I. 2020. *Field guide to the birds of Argentina and the southwest Atlantic*. London, Helm Field Guides.
- Penhallurick, J.; 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.
- Pereira, A.; Daudt, N.; Nuss, A.; Tavares, M.; Caio, C.J. 2016. The first confirmed record of the white-capped albatross *Thalassarche steadi* in Brazil. *Revista Brasileira de Ornitologia* 24: 286–289.
- Petersen, S.L.; Honig, M.B.; Ryan, P.G.; Underhill, L.G. 2009. Seabird bycatch in the pelagic longline fishery off southern Africa. *African Journal of Marine Science* 31: 191–204.
- Phalan, B.; Phillips, R.A.; Double, M.C. 2004. A white-capped albatross, *Thalassarche [cauta] steadi*, at South Georgia: first confirmed record in the south-western Atlantic. *Emu* 104: 359–361.
- Phillips, K.; McCallum, N.; Welsch, L. 2012. A comparison of methods for forensic DNA extraction: Chelex-1001 and the QIAGEN DNA Investigator Kit (manual and automated). *Forensic Science International: Genetics* 6: 282–285.
- Robertson, C.J.R.; Nunn, G.B. 1998. Towards a new taxonomy for albatrosses. pp. 13–19 In: Robertson, G.; Gales, R. (eds) *Albatross Biology and Conservation*. Surrey Beatty & Sons, Sydney.
- Sangster, G.; Collinson, J.M.; Crochet, P.-A.; Kirwan, G.M.; Knox, A.G.; Parkin, D.T., Votier, S.C. 2015. Taxonomic recommendations for Western Palearctic birds: 10th Report. *Ibis* 157: 193–200.
- Savigny, C.; Carbajal, M. 2015. El Albatros corona blanca (*Thalassarche steadi*) (Falla, 1933) [sic] en la República Argentina. Primer registro confirmado por espécimen y notas sobre su distribución e identificación en el campo. *Nótulas Faunísticas, Segunda Serie* 180: 1–9.
- Seco Pon, J.P.; Tamini, L. 2013. New records of shy-type albatrosses *Thalassarche cauta/T. steadi* off the Argentine Continental Shelf. *Revista Brasileira de Ornitologia* 21: 263–268.
- Shirihai, H. 2008. *The complete guide to Antarctic wildlife, volume 2*. New Jersey, Princeton University Press.
- Taxonomy Working Group 2006. Report of the Taxonomy Working Group to the Advisory Committee (AC2 Doc11). Second Meeting of the ACAP Advisory Committee (AC2). Brasilia, Brazil, 5–8 June 2006. <http://www.acap.aq/en/advisory-committee/ac-2/ac2-meeting-documents/1702-ac2-doc-11-report-of-taxonomyworking-group/file> (Accessed: 16 April 2022).
- Taylor, G. 2000. *Action plan for seabird conservation in New Zealand, Part A: Threatened species*. Threatened Species Occasional Publication n°16. Wellington, Biodiversity Recovery Unit, Department of Conservation.
- Walsh, P.S.; Metzger, D.A.; Higuchi, R. 1991. Chelex 100 as a medium for simple extraction of DNA for PCR-based typing from forensic material. *Biotechniques* 10: 506–513.
- White, R.W.; Gillon, K.W.; Black, A.D.; Reid, J.B. 2002. *The distribution of seabirds and marine mammals in the Falkland Island waters*. Peterborough, Joint Nature Conservation Committee.

**Keywords:** Argentina, molecular analysis, *Thalassarche steadi*, southwest Atlantic Ocean