

 <p>Agreement on the Conservation of Albatrosses and Petrels</p>	<p><b>Third Meeting of the Population and Conservation Status Working Group</b></p> <p><i>La Serena, Chile, 5 - 6 May 2016</i></p> <p><b>Migratory routes and at-sea threats to Pink- footed Shearwaters</b></p> <p><b><i>Josh Adams<sup>1</sup>, Jonathan Felis<sup>1</sup>, Peter Hodum<sup>2</sup>, Valentina Colodro<sup>2</sup>, Ryan Carle<sup>2</sup>, Verónica López<sup>2</sup></i></b></p> <p><sup>1</sup>U.S. Geological Survey, Western Ecological Research Center, 400 Natural Bridges Drive, Santa Cruz, California, USA.</p> <p><sup>2</sup>Oikonos Ecosystem Knowledge, Yervas Buenas 498, Valparaíso, V Region, Chile</p>
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## SUMMARY

The Pink-footed Shearwater (*Ardenna creatopus*) is a seabird with a breeding range restricted to three islands in Chile and an estimated world population of approximately 56,000 breeding individuals (Muñoz 2011, Oikonos unpublished data). Due to multiple threats on breeding colonies and at-sea, Pink-footed Shearwaters are listed as Endangered by the government of Chile (Reglamento de Clasificación de Especies, 2011), Threatened by the government of Canada (Environment Canada 2008), and are listed under Appendix 1 of the Agreement on the Conservation of Albatrosses and Petrels (ACAP 2013).

A principal conservation concern for the species is mortality from fisheries bycatch during the breeding and non-breeding seasons; thus, identification of areas of overlap between at-sea use by Pink-footed Shearwaters and fisheries is a high priority conservation objective (Hinojosa Sáez and Hodum 1997, Mangel et al. 2013, ACAP 2013). During the non-breeding period, Pink-footed Shearwaters range as far north as Canada, although little was known until recently about migration routes and important wintering areas where fisheries bycatch could be a risk. Additionally, Pink-footed Shearwaters face at-sea threats during the non-breeding season off the west coast of North America. Recently, areas used by wintering Pink-footed Shearwaters have been identified as areas of interest for developing alternative energy offshore in North America (e.g., floating wind generators; Trident Winds 2016). The goal of our study was to track Pink-footed Shearwater post-breeding movements with satellite tags to identify timing and routes of migration, locate important non-breeding foraging habitats, and determine population distribution among different wintering regions.

## 1. METHODS

We deployed satellite tags (Microwave Telemetry and NorthStar Technologies solar PTTs, 12 g) on Pink-footed Shearwater adults during 21 April – 1 May, coincident with the end of their breeding season on colonies in Chile (2006,  $n = 5$ ; 2011,  $n = 9$ ; 2013,  $n = 6$ ; and 2015,  $n = 10$  birds) and in June during the non-breeding season at-sea in southern California (2009,  $n = 5$ ; and 2013,  $n = 7$  birds). Satellite tags typically transmitted for up to 5 months.

## 2. RESULTS

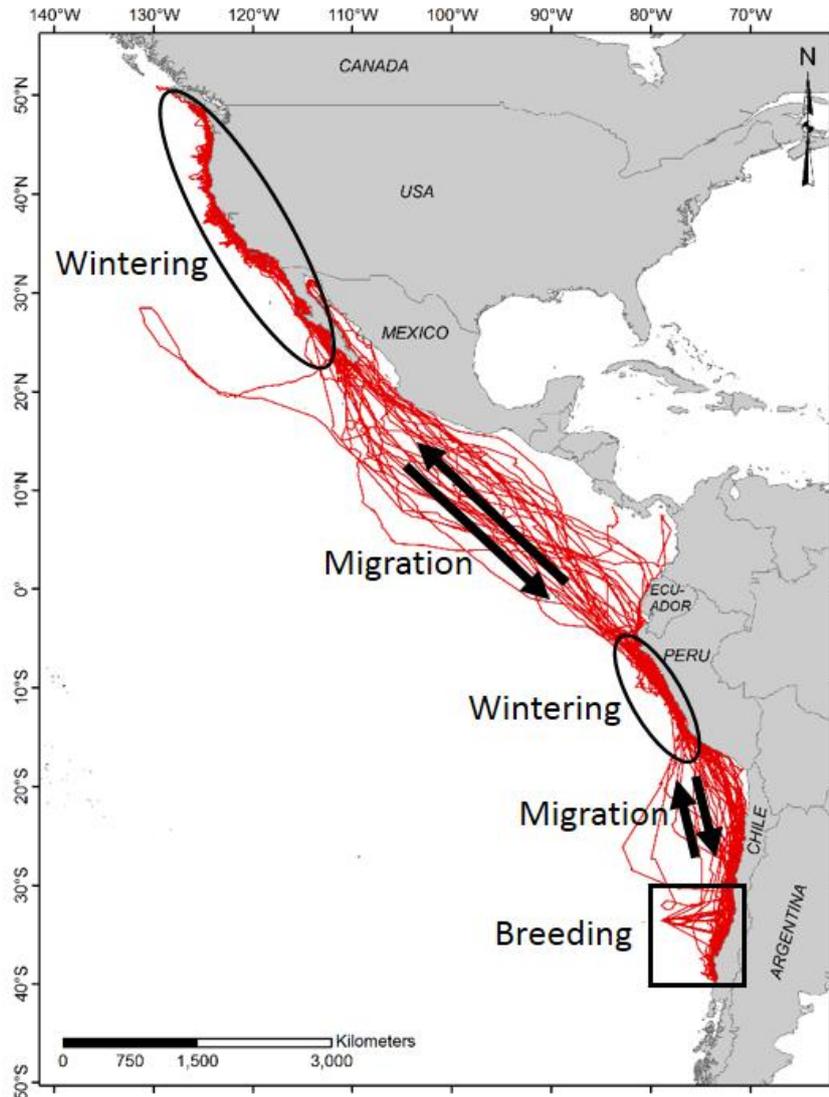
The non-breeding period for Pink-footed Shearwaters lasted approximately 6 months (May–October). Post-breeding adults exhibited two winter migration strategies: approximately 30% of tagged individuals traveled 2500 km north of breeding grounds to winter off Peru (between 16°S and 5°S) and 70% of birds travelled 8,000 – 11,000 km north to winter off western North America (between 22°N and 51°N; Figure 1). This pattern was fairly consistent across years. Birds travelled rapidly between breeding sites and wintering areas, although individuals wintering in North America spent time resting/foraging off Peru on both legs of the migration (no difference in duration between northbound and southbound migration stopovers,  $t_{19} = 0.23$ ,  $p = 0.82$ ; mean stopover  $\pm$  SD =  $16.2 \pm 11.9$  days). Additionally, birds traveled farther offshore while migrating than while foraging/resting in wintering areas, when they used continental shelf and slope waters. Pink-footed Shearwaters entered the territorial waters of at least 9 different countries; however, beyond their breeding grounds in Chile, birds primarily spent time off Peru, Mexico, and the USA, and to a lesser extent, Ecuador and Canada. High-use wintering areas included waters off Trujillo to Lima (Peru), central Baja California (Mexico), southern to central California (USA), and northern Oregon (USA) to southern Vancouver Island (Canada).

## 3. DISCUSSION

Satellite-tagged Pink-footed Shearwaters exhibited clear affinities for specific wintering areas in Peru, Mexico, and the USA that were consistent across years. In addition, this synthesis of multiple years of tracking data has revealed the relative importance of wintering sites in North America vs. Peru for this species. Although only 30% of individuals wintered off Peru, the population overall spent almost half the non-breeding period there when accounting for post- and pre-breeding stopovers together with cumulative time off North America; therefore, the ocean off Peru serves as a migratory bottleneck and is disproportionately important for the entire breeding population. Our findings of the disproportionate importance of Peruvian waters for Pink-footed Shearwaters, indicate this is a high priority region for assessment and mitigation of at-sea threats such as mortality from fisheries bycatch. Although a detailed evaluation of spatial and temporal overlap between shearwater movements and fishing activities has yet to be completed with new tracking data, a study based on interviews with fishers in Peru estimated that 500 – 1,000 Pink-footed Shearwaters are caught as bycatch annually in Peruvian gillnet fisheries (Mangel et al. 2013). Furthermore, on-board observers have confirmed Pink-footed Shearwater bycatch in drift-net fisheries out of the port of Salvaverry, Peru, which was an area used heavily by birds tracked in our study (Mangel et al. 2013). Bycatch in other Peruvian fisheries (e.g. purse-seine fisheries) has not been evaluated but could pose a serious threat as well. Bycatch could also pose a serious risk to non-breeding birds in Mexico and Chile, though information on bycatch rates is limited in these areas.

Future work is planned to compare these data with fisheries information to further assess bycatch risk in the wintering areas identified here. In an effort to evaluate the species' at-sea threats associated with alternative energy development, the U.S. Geological Survey (USGS) and collaborators currently are evaluating the distribution of Pink-footed Shearwaters at sea

(density measured using aerial surveys) off the west coast of North America (Adams et al. 2015) in relation to telemetry-derived utilization data and environmental factors (Adams et al. unpubl. data).



**Figure 1.** All Pink-footed Shearwater satellite tracking data collected 2006-2015 (red lines, n = 42 birds). Adult birds migrate to waters off Peru after breeding, where some remain for the winter while others rest for ~2 weeks before migrating to waters off North America (Baja Mexico to southern Canada) to winter. On the return migration, North American wintering birds again stop to rest off Peru for ~2 weeks.

#### 4. ACKNOWLEDGEMENTS

Funding for this project came from the National Fish and Wildlife Foundation and the American Bird Conservancy, Environment Canada, U.S. Bureau of Ocean Energy Management, National Geographic Society, and the Wallis Foundation. Thanks to Corporación Nacional Forestal and the Servicio Agrícola y Ganadero for logistical and permitting support. Many people assisted with the capture of shearwaters at sea off California: E. Phillips, J.T. Harvey, D. Mazurkiewicz, L. Harvey, and K. Schmidt. We thank

K.D. Hyrenbach and K. Morgan for early analysis and leadership initiating this project. M. Casazza and S. de la Cruz (USGS) provided helpful review. Finally, thanks to the residents of Isla Mocha for their hospitality and ongoing efforts to conserve Pink-footed Shearwaters and their habitat. Any use of trade, product, or firm names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. government.

## **ANNEX 1: REFERENCES**

Adams, J., J. Felis, J. W. Mason, and J. Y. Takekawa. 2015. Pacific Continental Shelf Environmental Assessment (PaCSEA): aerial seabird and marine mammal surveys off northern California, Oregon, and Washington, 2011-2012. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Pacific OCS Region, Camarillo, CA. OCS Study BOEM 2014-003. 266 pp.

Agreement on the Conservation of Albatrosses and Petrels. 2013. Listing of New Species- Pink-footed Shearwater *Puffinus creatopus*. Seventh meeting of the Advisory Committee, Document 24, Agenda Item 14.

Environment Canada. 2008. Recovery Strategy for the Short-tailed Albatross (*Phoebastria albatrus*) and the Pink-footed Shearwater (*Puffinus creatopus*) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. vii + 46 pp.

Hinojosa Saez, A. and Hodum, P. (Eds) 2007. Plan Nacional para la Conservacion de la Fardela de Vientre Blanco *Puffinus creatopus* Coues, 1864 en Chile. Corporación Nacional Forestal & Comisión Nacional del Medio Ambiente. 34 pp.

Mangel, J. C., Adams J., J. Alfaro-Shigueto, P. Hodum, K. D. Hyrenbach, V. Colodro, P. Palavecino, M. Donoso, and J. H. Norris. 2013. Conservation implications of Pink-footed Shearwater (*Puffinus creatopus*) movements and fishery interactions off South America assessed using multiple methods. Agreement on the Conservation of Albatrosses and Petrels: Fifth Meeting of the Seabird Bycatch Working Group, La Rochelle, France, 1-3 May 2013

Muñoz, D.M. 2011. Areas de nidificación y densidad de nidos de fardela de vientre blanco, *Puffinus creatopus*, en la Reserva Nacional Isla Mocha. Master's Thesis, University of Concepción, Chile.

Trident Winds. 2016. UNSOLICITED APPLICATION FOR AN OUTER CONTINENTAL SHELF RENEWABLE ENERGY COMMERCIAL LEASE UNDER 30CFR585.230. Trident Winds LLC; 113 Cherry Street, #34912 Seattle, WA 98104-2205 Online: <http://www.boem.gov/MBO-Unsolicited-OCS-Lease-Request/>

Reglamento para la Clasificación de Especies Silvestres. DS N°75/2005 del Ministerio Secretaría General de la Presidencia