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# Photo-identification of Antarctic Blue Whales: new data from 1998 and 2015-2018

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ABSTRACT

Newly available collections of identification photographs of individual Antarctic blue whales were compared to the images of 441 individuals in the Antarctic Blue Whale Catalogue. The sources of photographs include the IWC IDCR/SOWER cruises in 1989/1990, 1993/1994, and 1997/1998, and opportunistic photographs collected by collegial scientists, naturalists, and tourists 2015-2018. Seventeen new individual blue whales were identified: 4 from the SOWER cruise in 1998 and 14 from the opportunistic photos. There were no matches between any of the newly identified whales or to the Antarctic Catalogue. The 17 new identifications brings the total number of photo-identified Antarctic blue whales up to 458 whales, represented by 342 left sides and 332 right sides. The minimum (332) and maximum (458) number of unique individuals represents 15% and 20%, respectively, of the most recent accepted estimate of abundance of Antarctic blue whales, 2,280 in 1997/1998 (Branch, 2007). All 17 of the new identifications came from IWC Management Areas underrepresented in the catalogue, Areas I and II. The collection of Antarctic blue whale identification photographs provide data for capture-recapture estimates of abundance as well as information on the movement of individual blue whales within the Antarctic region.

KEYWORDS: ANTARCTIC, SOUTHERN OCEAN, PHOTO-ID, MOVEMENT

## INTRODUCTION

The population status of the endangered Antarctic blue whale (*Balaenoptera musculus intermedia*) is of interest to the IWC Scientific Committee and is the focus of the IWC-SORP[1] Antarctic Blue Whale Project. The Project aims to broaden the knowledge of the conservation status of Antarctic blue whales by conducting research toward providing an updated circumpolar abundance estimate, by improving understanding of population structure, and by discovering linkages between feeding and breeding grounds (Bell, 2017). The use of photo-identification data in a capture-recapture analysis for the production of a contemporary (new) estimate of abundance of Antarctic blue whales is a component of the Antarctic Blue Whale Project (Bell, 2012).

The Antarctic Blue Whale Catalogue was established in 2007; photographs from the IWC IDCR/SOWER[2] cruises, obtained from Areas I-VI, formed the foundation of the catalogue (Olson, 2010)[3]. Over the years the number of photo-identified Antarctic blue whales has increased, with photographs collected during voyages conducted under

[1] Southern Ocean Research Partnership

[2] International Decade of Cetacean Research/Southern Ocean Whale Ecosystem Research

[3] The catalogue is maintained at the Southwest Fisheries Science Center (SWFSC), USA. Photos and data are archived on three hard drives and a SWFSC institutional server.

IWC-SORP in 2013, 2014, and 2015 in Areas V and III (Double *et al*., 2013; Findlay *et al*. 2014; Double *et al*., 2015), with photographs from the Institute of Cetacean Research, Japan, from its whale research in Areas III-VI (Matsuoka and Pastene, 2009; Olson *et al*., 2013, Olson *et al*., 2014, Olson *et al*. 2016), with opportunistic photographs contributed by scientists working on other projects in the Antarctic and by citizen scientists (Olson *et al*. 2016).

As of 2017, the catalogue contained the sighting histories of 441 individual blue whales in the circumpolar Antarctic (Olson *et al*. 2017). The photo-identification data from this catalogue have produced information on inter-annual whale movement (Olson *et al*., 2016), within season sighting rates (Olson *et al.*, 2016), and was the basis for a capture-recapture study using data 1990/91-2014/15 (Olson *et al*., 2018) and a pilot study based on data 1992/93 to 2008/09 (Olson and Kinzey, in press).

Recently, photographs of Antarctic blue whales became available (recovered from storage) from the IWC IDCR and SOWER cruises conducted in 1989/1990, 1993/1994, and 1997/1998. (The bulk of the IWC IDCR/SOWER cruises had been analysed previously; Olson, 2010). In the past year opportunistic photographs collected by collegial scientists, naturalists, and tourists in the Antarctic 2015-2018 were contributed to the Antarctic Blue Whale Catalogue. This study identified and compared individual identification photographs of Antarctic blue whales from the new photo collections to the existing catalogue (of 441 individuals).

## METHODS

Ninety black and white film photographs of Antarctic blue whales collected during IWC IDCR and SOWER cruises in 1989/1990, 1993/1994, and 1997/1998, were recently recovered from storage and made available by the IWC for photo-identification analysis. The films had been digitized prior to dispensation. An assortment of 264 photographs of Antarctic blue whales were collected opportunistically in the South Georgia and Antarctic Peninsula region by scientists conducting other (non-blue whale) research in 2018 and by naturalists and citizen scientists aboard tourist vessels in 2015-2018.

All 354 photographs were judged to meet minimum criteria of quality based on distance to the subject (whale), angle, exposure, and focus. Only photos containing a whale's dorsal fin were used for identification, as the fin is necessary for comparison to the identification photos in the Antarctic catalogue as well as other photo collections. Whales were examined for unique natural markings and identified as individuals following methods outlined in Gendron and Ugalde de la Cruz (2012) and Sears *et al.* (1990).

Photographs of newly identified individuals were compared to one another and to the Antarctic Blue Whale Catalogue.

## RESULTS AND DISCUSSION

The photographs yielded a total of 17 new ID's: 4 from IWC/SOWER in 1998 and 13 from the opportunistically collected photographs (Table 1). There were no matches between any of these newly identified individuals or to the Antarctic Blue Whale Catalogue.

The 17 new ID's from these photo collections brings the total number of photo-identified Antarctic blue whales up to 458 whales, represented by 342 left sides and 332 right sides. The minimum (332) and maximum (458) number of unique individuals represents 15% and 20%, respectively, of the most recent accepted estimate of abundance of Antarctic blue whales, 2,280 in 1997/1998 (Branch, 2007). To date, a relatively small number of whales have been re-sighted inter-annually: 3% (14/458). There is evidence that the Antarctic blue whale population has indeed been increasing (Branch *et al.*, 2004; Branch, 2007) which would explain the low re-sighting rate.

Table 1. Number individual Antarctic blue whales identified from photographs analyzed in 2017/2018.

| Year | IWC Area | No. of photos | No. left side ID's | No. right side ID's | Total no. identified blue whales | Source |
|---|---|---|---|---|---|---|
| 1989/1990 | I | 5 | 0 | 0 | 0 | IWC/IDCR |
| 1993/1994 | I | 13 | 0 | 0 | 0 | IWC/IDCR |
| 1997/1998 | IIE | 72 | 2 | 2 | 4 | IWC/SOWER |
| 2015/2016 | II | 3 | 0 | 2 | 2 | N. Hartley |
| 2016/2017 | II | 199 | 3 | 4 | 6 | M. de Boer[4]; B. Haggar[5] |
| 2017/2018 | IE, II | 62 | 2 | 4 | 5 | Kennedy/Jackson[6]; Happywhale[7] |
| TOTAL | | 354 | 6 | 11 | 17 | |

All 17 of the identifications came from Areas underrepresented in the catalogue, Areas I and II. In recent summer seasons, there are anecdotal reports that blue whales are occurring more frequently now at South Georgia and in the Drake Passage. It is hoped this will provide the opportunity for more identification photographs to be collected opportunistically in the future from these areas. The catalogue has benefited from the contribution of opportunistic photos. Currently 38 of the 458 identified whales come from opportunistic photographs.

The photographs from 1998 are a valuable contribution to the Catalogue; a future recapture of any of the identified whales from this year would improve the estimate of survival in an abundance model. To date the longest recapture interval is 12 years, 1995-2007 (Olson *et al*., 2016).

**Conclusion**

A cornerstone of the Antarctic Blue Whale Project is to generate new estimates of abundance (Bell, 2017). The most recent accepted estimate of abundance (Branch, 2007) is based on line-transect data now over 20 years old. The continued collection of identification photographs from the Antarctic will provide data toward a set eventually large enough to obtain new estimates of abundance. This subpopulation of blue whales remains on the IUCN Red List as Critically Endangered.

More data are needed to fully understand the movements of Antarctic blue whales between and within seasons, especially with the major climate changes taking place in the Antarctic. The continued collection and analysis of photographs from the Antarctic, along with other research methods, will yield more information on these patterns and will contribute to the understanding of blue whale population structure in the Southern Hemisphere.

[4] Atlantic Odyssey 2017

[5] Ocean One Expeditions

[6] South Georgia Right Whale Project

[7] Citizen science contributors via Happywhale include C. Croxson, J. Daltry, J Reynolds, D. Tatooles

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