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The Antarctic Blue Whale Catalogue: new data from 2021/2022 to 2023/2024

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ABSTRACT

Recently available identification photographs (2021/2022-2023/2024) of 29 individual Antarctic blue whales were compared to the images of 552 individuals in the Antarctic Blue Whale Catalogue. The photographs were collected by scientists conducting other (non-blue whale) research in the Antarctic region and by naturalists and citizen scientists aboard tourist vessels. None of the 29 whales had been re-sighted previously. The 29 new identifications bring the total number of photo-identified Antarctic blue whales up to 581 whales, represented by 434 left sides and 426 right sides. The minimum (426) and maximum (581) number of unique individuals represents 19% and 25%, respectively, of the most recent accepted estimate of abundance of Antarctic blue whales, 2,280 in 1997/1998 (Branch, 2007). The Catalogue has benefitted from the contribution of opportunistically collected photographs. Currently 15% (88/581) of the identified whales in the Catalogue come from opportunistic photographs. The new identification photographs add valuable data to Areas I, II, and VI, which are under-represented in the Catalogue. The number of photo-identifications from the sub-Antarctic island at 54°15'S 36°45'W has increased to 51. 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

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-SORP¹ 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, 2023). 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.

The Antarctic Blue Whale Catalogue was established in 2007; photographs from the IWC IDCR/SOWER² cruises, obtained from IWC Management 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 from 219 identified individuals when the catalogue was established to 552 individuals in 2021 (Olson *et al.*, 2021). Post-SOWER photographs were collected during voyages conducted under IWC-SORP in 2013, 2014, 2015, and 2019 in Areas III, IV and V. (Double *et al.*, 2013; Findlay *et al.* 2014; Double *et al.*, 2015, Double *et al.* 2019). Photographs were made available from the Institute of

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.

Cetacean Research (ICR), Japan, from its whale research in Areas III-VI (Matsuoka and Pastene, 2014, Matsuoka *et al.*, 2015; Matsuoka *et al.*, 2016, Isoda *et al.*, 2017), and opportunistic photographs were contributed by scientists working on other projects in the Antarctic and by citizen scientists aboard tourist vessels (Olson *et al.* 2016, Olson *et al.* 2018, Olson *et al.* 2020).

The photo-identification data from this catalogue have produced information on inter-annual whale movement (Olson *et al.*, 2016; Olson *et al.*, 2022), within-season sighting rates (Olson *et al.*, 2016) and movement patterns (Calderan *et al.*, 2023).

A pilot capture-recapture study was conducted based on data from 1992/93 to 2008/09 (Olson and Kinzey, 2024). In a subsequent study, estimates of abundance for 2003/2004 to 2018/2019 were derived from the capture-recapture model parameters (Olson *et al.*, 2023; submitted for publication).

This study identified and compared individual identification photographs of Antarctic blue whales from the newly available photographs to the existing catalogue.

METHODS

Photographs of Antarctic blue whales were made available by multiple people working in the Southern Ocean while conducting other (non-blue whale) research and also by naturalists and citizen scientists working aboard tourist vessels. Happywhale and Ted Cheeseman facilitated the sharing of photographs in several cases.

All of the photographs were judged to meet minimum criteria of quality based on distance to the 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 (Table 1) were compared to one another and to the 552 previously identified whales in the Antarctic Blue Whale Catalogue.

Table 1. Number of individual Antarctic blue whales identified from photographs, by IWC Management Area, 2021/2022 - 2023/2024, and compared to one another and to the Antarctic Blue Whale Catalogue.

| Year | IWC Area | No. left side ID's | No. right side ID's | Total no. identified blue whales | Source |
|-----------|----------|--------------------|---------------------|----------------------------------|---|
| 2021/2022 | I | 4 | 1 | 4 | Olio/Viot |
| 2021/2022 | II | 5 | 3 | 8 | Cheeseman/Hopkins/Marie/ Niederberger/Ryan |
| 2022/2023 | II | 3 | 5 | 6 | Cheeseman/Niederberger/Ryan |
| 2022/2023 | V | 1 | 2 | 2 | Ryan |
| 2023/2024 | I | 1 | - | 1 | Reid |
| 2023/2024 | II | 4 | 4 | 5 | Kennedy/Reid/Ryan |
| 2023/2024 | VI | 2 | 2 | 3 | Ryan |
| TOTAL | | 20 | 17 | 29 | |

RESULTS AND DISCUSSION

The analysis of photographs from 2021/2022 - 2023/2024 did not result in any recaptures. The 29 whales had not been not previously identified and were added to the Catalogue as new individuals.

The 29 new identifications bring the total number of photo-identified Antarctic blue whales up to 581 whales, represented by 434 left sides and 426 right sides. The minimum (426) and maximum (581) number of unique individuals represents 19% and 25%, 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% (16/581). There is evidence that the Antarctic blue whale population has been increasing (Branch *et al.*, 2004; Branch, 2007; Olson *et al.*, submitted) which would explain the low recapture rate.

The majority of identified whales in the Catalogue (75%) were sighted in Areas III or V. Dedicated blue whale research during IWC SOWER cruises in IWC Management Area III (2006, 2007, 2009) and IWC SORP voyages in Area V (2013, 2015, 2019) resulted in a large number of identification photographs from these Areas. Areas I and VI are the most under-represented in the Catalogue; identification photographs collected during 2021/2022 to 2023/2024 added 5 IDs to Area I (previously 8 IDs total) and 3 IDs to Area VI (also previously 8 IDs total). In recent years the Catalogue has benefitted from the contribution of opportunistic photographs from scientists and naturalists aboard vessels in regions other than Areas III and V, including the Antarctic Peninsula and the sub-Antarctic island at 54°15'S 36°45'W (Area II). The number of IDs at the sub-Antarctic island at 54°15'S 36°45'W in particular has increased steadily since 2011/2012, all from contributed photographs (Table 2). (Prior to 2011/2012 there were no identification photographs from the sub-Antarctic island at 54°15'S 36°45'W.) The majority of photographs in the year 2019/2020 were collected during the Right Whale Project at the sub-Antarctic island at 54°15'S 36°45'W (Kennedy *et al.*, 2020). To date there are no recaptures of whales photo-identified at the sub-Antarctic island at 54°15'S 36°45'W.

Table 2. Number of individual Antarctic blue whales identified from photographs collected at the sub-Antarctic island at 54°15'S 36°45'W.

| Year | No. left side ID's | No. right side ID's | Total no. identified blue whales |
|-----------|--------------------|---------------------|----------------------------------|
| 2011/2012 | 1 | - | 1 |
| 2014/2015 | 7 | 3 | 8 |
| 2017/2018 | 2 | - | 2 |
| 2018/2019 | 4 | 2 | 4 |
| 2019/2020 | 25 | 23 | 29 |
| 2021/2022 | 1 | 1 | 2 |
| 2022/2023 | - | 2 | 2 |
| 2023/2024 | 2 | 3 | 3 |
| TOTAL | 42 | 34 | 51 |

The Catalogue has benefitted from the contribution of opportunistically collected photographs. Currently 15% (88/581) of the identified whales in the Catalogue come from opportunistic photographs. Two of the 16 inter-annual recaptures (Table 3) were made with photographs contributed by scientists working in the Antarctic on non-blue whale projects.

Within the Catalogue, 16 whales have been recaptured between years including one whale (#0623) that was sighted in three subsequent years (Table 2). The time intervals ranged between 1 and 12 years. Ten whales were re-sighted long distances, over 2,000km from their original sighting. Whale #0758 exhibits the greatest distance between sighting locations with a distance of 6,650km.

Table 3. Sighting histories of Antarctic blue whales re-sighted between years. Distances were calculated using rhumb lines on a Mercator projection measured between points.

| Whale ID | Capture Date/Area | Recapture Date/Area | Time interval (years) | Distance (km) |
|--------------------|-------------------|---------------------|-----------------------|---------------|
| #0761 | Jan 2005/III | Feb 2007/III | 2 | 19 |
| #1343 | Feb 2013/V | Feb 2015/V | 2 | 103 |
| #0623 | Feb 2005/III | Jan 2006/III | 1 | 302 |
| #0623 ¹ | Feb 2006/III | Feb 2007/III | 1 | 355 |
| #1306 | Feb 2013/V | Feb 2019/V | 6 | 384 |
| #0622 | Jan 2006/III | Jan 2007/III | 1 | 447 |
| #0104 | Jan 2001/VI | Feb 2004/V | 3 | 753 |
| #0607 | Jan 2006/III | Dec 2007/III | 2 | 1,560 |
| #1005 | Jan 2010/V | Feb 2013/V | 3 | 1,796 |
| #0802 | Feb 2008/IV | Feb 2013/V | 5 | 1,848 |
| #0772 | Jan 1995/III | Feb 2007/III | 12 | 2,222 |
| #1322 ² | Feb 2006/IV | Feb 2013/V | 7 | 2,543 |
| #0738 | Jan 2007/III | Feb 2010/II | 3 | 2,818 |
| #J062 | Jan 2003/V | Mar 2015/IV | 12 | 3,307 |
| #1313 | Feb 2006/IV | Feb 2013/V | 7 | 3,433 |
| #0617 ¹ | Jan 2002/V | Jan 2006/III | 4 | 5,677 |
| #0758 | Feb 2007/III | Feb 2013/V | 6 | 6,650 |

¹ Genetic recapture reported in Sremba *et al.* (2012), Table 3.

² Whale #1322 satellite tagged in 2013 (Andrews-Goff *et al.*, 2022).

Generally it is not known if Antarctic blue whales show site fidelity for feeding areas or if they forage widely and randomly. The small sample size of recaptures here does not shed light on a specific pattern as both small and large inter-annual movements are represented. An interesting sighting history is that of whale #0623, which was sighted three years in a row, within 400km of its initial detection, seemingly to indicate fidelity for that region in Area III. Whale #0761 was re-sighted only 19km from its first detection two years earlier, also in Area III. That contrasts with the sighting histories of whales with thousands of kilometers between recapture locations. Results of the Discovery tag data show similar small and large inter-annual movement patterns (Branch *et al.*, 2007; Olson *et al.*, 2022).

Conclusion

A cornerstone of the Antarctic Blue Whale Project is to generate new estimates of abundance (Bell, 2023). The continued collection of identification photographs from the Antarctic will eventually 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 analysis of photographs from the Antarctic, along with other research methods, will yield more information and contribute to the understanding of blue whale population structure in the Southern Hemisphere.

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