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ABSTRACT

Twenty-five Antarctic blue whales (21 left sides, 21 right sides) were photo-identified during the AAD ENRICH 2019 multi-disciplinary research voyage in IWC Management Area V. Identification photographs were compared to the Antarctic Blue Whale Catalogue with the result of one inter-annual match. Whale #1306 was seen previously in 2013 (six-year time interval) with a 384 km straight-line distance between sighting locations. No whales were photographically recaptured within the voyage, whereas recapture rates from the Antarctic Blue Whale Voyages in 2013 and 2015 and three IWC SOWER voyages ranged from 7 to 22%. The 24 new IDs from the voyage were incorporated into the Antarctic Blue Whale Catalogue, which now totals 552 identified blue whales. The photo-identification data collected during the voyage will contribute towards a new abundance estimate of Antarctic blue whales using capture-recapture methods.

KEYWORDS: ANTARCTIC, BLUE WHALE, PHOTO-ID, MOVEMENTS, MARK-RECAPTURE

INTRODUCTION

In 2019 the Australian Antarctic Division (AAD) conducted the multi-disciplinary ENRICH Voyage (**E**uphausiids and **N**utrient **R**ecycling **I**n **C**etacean **H**otspots) in IWC Management Area V, from 64°S to 67°S and between 138°E and 154°E (Fig. 1). During the voyage, data were collected on large baleen whales – in particular Antarctic blue whales (*Balaenoptera musculus intermedia*) – krill swarms, physical and biological oceanography, using acoustic, visual, trawl, water sampling, and other methods (see Double *et al*. 2020 for a full report).

One of the research objectives of the voyage was to collect identification photos of Antarctic blue whales for estimating abundance using capture-recapture methods. Obtaining a current estimate of abundance is considered fundamental for the assessment of the status of the Antarctic blue whale population and for monitoring its recovery (Bell, 2019). The photo-ID data will also provide information on blue whale population structure and movement patterns. Photo-identification of Antarctic blue whales was undertaken previously during the 2013 and 2015 Antarctic Blue Whale Voyages and during IWC IDCR/SOWER (1990/1991-2008/2009) surveys. Photographs from these cruises, and from those collected from other sources, are compiled in the Antarctic Blue Whale Catalogue (Olson *et al*., 2020). Identification photographs collected during the ENRICH Voyage expands upon that work.

METHODS

The voyage was conducted from 19 January to 5 March 2019 (49 days) aboard Australia's Marine National Facility research vessel, RV *Investigator*. Systematic line-transect and targeted, adaptive survey methods were employed. Blue whales were located and tracked using visual survey and passive acoustic methods Further details on the

methods undertaken to locate and direct the ship to vocalising Antarctic blue whales using passive acoustics are outlined in Miller *et al.* 2015. Blue whales were approached for photo-ID from the RV *Investigator* (there were no small boat operations). One member of the research team guided the ship for the best approach to the whale(s). The photographers worked from the bow using DSLR cameras with image-stabilized zoom lenses. The left and right sides of each whale were photographed whenever possible. A focal follow of the whale(s) was often conducted for approximately an hour prior to a close approach for photo-ID.

Photographs of blue whales were judged to meet minimum quality criteria based on distance to the subject (whale), focus, angle and lighting. Photographs meeting these criteria were considered suitable for identifying individual blue whales and were analysed for this report.

Identification photographs from the voyage were compared within season and to the Antarctic Blue Whale Catalogue, which contains photographs from the circumpolar Antarctic 1980-2020. Methods followed those outlined in Sears *et al*. (1990) and Gendron and Ugalde de la Cruz (2012).

RESULTS and DISCUSSION

Nineteen groups of Antarctic blue whales were approached for photo-ID and identification images were obtained from 17 of the groups. Due to the multi-disciplinary nature of the voyage, not every group detected was approached. From the images 25 blue whales (21 left sides, 21 right sides; including 14 whales with both sides) were identified as unique individuals, including one mother/calf pair, and a single blue whale that was found within a group of fin whales.

For such a large ship (93.9 m, 6082 GT), the RV *Investigator* proved more effective at getting close enough for photo-ID images than might be expected. The RV *Investigator* is a quiet vessel, conforming to or exceeding the DNV Silent-R class notation from Det Norske Veritas (Duncan, Kloser, and Sherlock, 2015). That may have been a factor in the limited behavioural responses of the whales to the vessel's approach for photo-ID. This is a noteworthy finding as it lends support for the use of large vessels as a photo-ID platform in the future when small boat operations are not available.

One whale, with a distinctive dorsal fin, was recognized in the field as having been previously photographed in 2013 during the Antarctic Blue Whale Voyage that year (ID #1306). The resight was confirmed with photographs. The distance between the two sighting locations in 2013 and 2019 is 384 km (Fig. 1). The smaller survey area in 2019 (spanning longitude 138°-154°E) covered the western portion of the study area of the voyage in 2013. During the 2013 voyage, 25 whales were photo-identified from the 140°-154°E longitudinal span, but only the single whale, ID #1306, was re-sighted in the same longitudinal span in 2019. However, this result is consistent with the overall, circumpolar inter-annual re-sight rate of 3% (Olson *et al.*, 2020).

None of the blue whales were photographically recaptured within the voyage. Previous voyages with research time dedicated to blue whales (i.e., Antarctic Blue Whale Voyages in 2013 and 2015, and IWC SOWER voyages in 2005/2006, 2006/2007, and 2008/2009) yielded re-sighting rates of 7-22% (Olson *et al*. 2016).

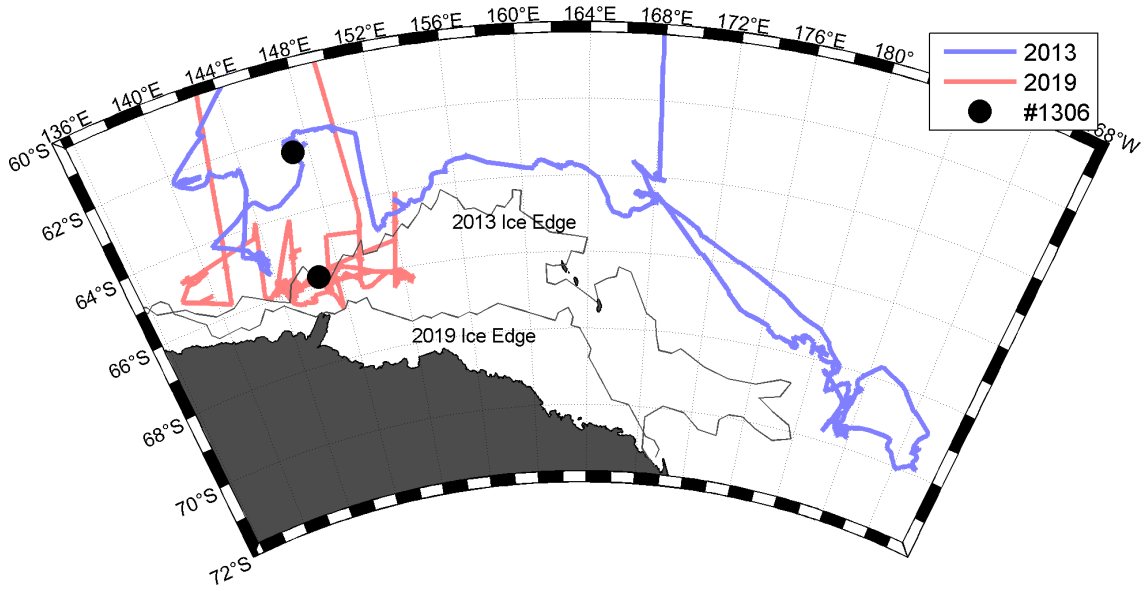

Figure 1. Survey tracklines (south of 60°S) from the 2013 and 2019 SORP[1] research voyages and the sighting locations of Antarctic blue whale #1306.

The 24 new IDs from the voyage were incorporated into the Antarctic Blue Whale Catalogue, which now totals 552 identified blue whales. This total represents 24% of the most recent population estimate of 2,280 (from 1997/1998; Branch, 2007). These data are providing the foundation for a contemporary estimate of abundance for Antarctic blue whales using capture-recapture methods (See Olson *et al*., 2021).

All the identification photos have been uploaded into the internationally collaborative Southern Hemisphere Blue Whale Catalogue (Galletti Vernazzani *et al*., 2020) for comparisons with other regional photo-ID catalogues, exploring potential exchange of individuals between geographic areas and yielding information on population structure.

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