Progress of between region comparison under Southern Hemisphere Blue Whale Catalogue (SHBWC)

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INTRODUCTION

Two subspecies of blue whales currently are accepted in the Southern Hemisphere: the pygmy blue whale (*B.m. brevicauda)* in the Subantarctic zone; and the Antarctic or true blue whale (*B. m. intermedia*) that summers in the Antarctic Zone (Rice, 1998). Recently, Branch *et al*. (2007a) proposed that blue whales off Chile belong to a unique population and are likely an unnamed subspecies.

Outside Antarctic waters, aggregation areas used by blue whales in the Southern Hemisphere are poorly known (Branch *et al*., 2007b) but a few specific feeding areas have been documented off Australia and Chile (Gill, 2002; Hucke-Gaete *et al*., 2004; Cabrera *et al.*, 2005; Galletti Vernazzani *et al.*, In Press).

In 2006 the Scientific Committee of the International Whaling Commission (IWC) agreed to initiate an in-depth assessment of Southern Hemisphere blue whales (IWC, 2006) and in 2008, the Committee endorsed a proposal to establish a central web-based catalogue of blue whale identification photographs, known as the Southern Hemisphere Blue Whale Catalogue (SHBWC) (IWC, 2008).

Currently the SHBWC holds photo-identification catalogues of researchers from major areas off Antarctica, Australia, Eastern South Pacific and the Eastern Tropical Pacific (IWC, 2011). Comparisons among catalogues off Chile found one match over ten years (Galletti Vernazzani and Cabrera, 2011).

Here we present preliminary results of 2011-2012 comparisons of photo-identification catalogues of blue whales between the eastern South Pacific Ocean, Eastern Tropical Pacific Ocean (ETP) and Southern Ocean.

METHODS

Individual blue whales are identifiable from unique patterns of mottling on both sides of the body near the dorsal fin (Sears *et al*., 1990) and in some cases, permanent scars can be used to identify or confirm individuals.

The catalogue is a specially designed web-based platform that allows for online simultaneous upload and comparisons of catalogues from different areas (IWC, 2011).

The Southern Ocean sub-catalogue includes photographs of 227 individual blue whales collected during IWC IDCR/SOWER surveys from 1987-1988 to 2008-2009 and covers all six IWC Management Areas (Olson, 2012).

The eastern South Pacific Ocean sub-catalogue includes photographs collected during a 1997/98 survey off Chile (Findlay *et al*., 1998) that have been analyzed, archived and contributed to the SHBWC (Galletti Vernazzani and Cabrera, 2011) as well as the catalogue of Centro de Conservacion Cetacea, consisting of 300 individuals photographed off southern Chile between 2004 and 2009 (Galleti Vernazzani *et al*., 2010).

The ETP sub-catalogue includes photographs of 84 individuals contributed by the SWFSC/NOAA collected during various years from 1992 to 2009. Of these, 11 whales were photographed near the

Galapagos Islands, 23 whales in the oceanographic cold equatorial tongue that extends westward from the Galapagos, 18 whales in Peruvian waters, and 32 whales at the Costa Rica Dome (Gerrodette and Olson, unpublished data; see Fig. 7 Branch *et al*. 2007b).

Not all individuals have been photographed by both sides. Comparisons of individual photographs were examined separately by left and right side.

RESULTS

Contributed catalogues from the ETP, eastern South Pacific Ocean, and Southern Ocean include 822 and 826 individual blue whales photographed by left and right sides respectively (Table 1).

Area – Group	Left PhotoID	Right PhotoID
Chile – IWC SOWER	14	9
Chile - CCC	288	299
Subtotal eastern South Pacific	**302**	**308**
ETP - NOAA	**60**	**53**
Southern Ocean – IWC SOWER	**158**	**157**
Total	**822**	**826**

Table 1 – Summary of photo-identifications

To date, no matches have been found from comparisons between the eastern South Pacific and ETP or from comparisons between ETP and the Southern Ocean. Comparisons are approximately 50% completed; all left side photographs of individual blue whales have been completed and right side comparisons still are underway.

Comparisons between the Southern Ocean and eastern South Pacific are ongoing but to date, no matches have been found.

DISCUSSION

Although no re-sightings have been found between those regions in the SHBWC, there are re-sightings within regions. Galletti Vernazzani *et al*. (In Press) reported high annual return rates at northwestern Isla Grande de Chiloe of about 31% between 2004 and 2010, including 16 whales that have been seen in three or four different years. In addition, despite the small sample size of 1997/98 IWC survey cruise, the first long-term resighting of blue whales off Chile was found (IWC-SOWER, January 1998 and CCC, March 2008) and both sightings occurred in southern Chilean waters approximately 220 km apart (Galletti Vernazzani and Cabrera, 2011). Olson (2012) reported that seven whales from the Southern Ocean were re-sighted in multiple years. Four of the whales were re-sighted within 19 to 753 km of their original location and one whale had a 12-year sighting interval. However, none of the 84 whales photographed off ETP have been re-sighted within or outside of the ETP.

Branch *et al*. (2007a) reported that total length measurements of adult female blue whales taken off Chile are between the total lengths of the two subspecies recognized in the Southern Hemisphere and represent a unique population or even a different subspecies. In addition, LeDuc *et al*. (2007) analysed genetic samples from southwestern Australia, the southeastern Pacific (Chile), and the Antarctic and found that the genetic differentiation between Antarctic blue whales and pygmy blue whales was not markedly greater than between Australian and Chilean blue whales.

These photographic data examined to date are additional support that Southern Ocean and eastern South Pacific blue whales are distinct populations as no Chilean blue whales have been yet discovered in the Southern Ocean.

While it is believed that Southern Hemisphere blue whales feed in high latitudes and breed in low latitudes, like other baleen whales, no breeding ground has been documented for blue whales in the Southern Hemisphere (Gilpatrick and Perryman, 2008) but we would expect that either Southern Ocean or eastern South Pacific blue whales would use the region near the Equator or maybe the ETP for their breeding grounds. In this sense, Antarctic blue whale type calls have been detected in the ETP (Stafford *et al.*, 2004). However, no recaptures have been found from left side photographs between the ETP catalogue and those from the eastern South Pacific and the Southern Ocean. Although the results were considered preliminary because photo comparisons are not yet complete, these data do not provide evidence of exchange between ETP and the eastern South Pacific or the Southern Ocean. This is consistent with the other data (satellite tracking acoustic, and photo-identification) linking the ETP blue whales to blue whales off Baja California, Mexico and California.

Some California blue whales have been satellite tag tracked to the ETP (Mate *et al*., 1999) and aggregate around the Costa Rica Dome which is a known upwelling region (Fiedler, 2002). Individual matches have been found between California and Costa Rica Dome (Gerrodette *et al*., 2008). Acoustic calls (A-B type) from blue whales have been recorded along the west coast of the United States; off Baja California, Mexico; and in the ETP (Stafford *et al*., 1999) and these calls are very different from the calls of blue whale off Chile or in the Southern Ocean (McDonald *et al*., 2006).

AKNOWLEDGEMENT

We would like to thank the IWC, NOAA and CCC for contributing their catalogues to this international effort and especially thanks the captains and crew members of the *Alfaguara*, *LSG Chiloe*, *LSG Puerto Montt*, *Shonan Maru*, *Shonan Maru No. 2* that made possible to collect all these photographs. We would also like to thank the IWC for funding support allocated to the SHWBC and the support and comments provided by Carole Carlson and Robert L. Brownell, Jr. We would also acknowledge all the assistance with photoidentification comparisons provided by Jenny Gomez, Maria Clara Jimenez y Laura Cabrera.

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