

Blue whale photo-identification from IWC IDCR/SOWER cruises 1987/1988 to 2008/2009

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ABSTRACT

Photographs of blue whales have been collected during annual IWC IDCR/SOWER cruises since 1987-1988. The archiving and analysis of these photographs has been undertaken to aid in the assessment of Southern Hemisphere blue whales. Over 23,000 photographs were obtained from all six IWC Management Areas during cruises from 1987-1988 to 2008-2009. 16 years of available photographs were examined to identify individuals, yielding 219 whales. Photographs of individual whales were cross-referenced within and between years. Five whales were re-sighted in multiple years, including one whale with a 12-year sighting interval. 21 whales were re-sighted within a season during three years: re-sighting rates within a season for 2005-2006, 2006-2007 and 2008-2009 were 11%, 18% and 22% respectively. These rates suggest that blue whales exhibit some degree of residency within a summer feeding season.

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

INTRODUCTION

In 2006 the Scientific Committee agreed to initiate an in-depth assessment of Southern Hemisphere blue whales, *Balaenoptera musculus* (IWC, 2006). In support of this assessment, the archiving and analysis of blue whale identification photographs collected during IDCR/SOWER cruises was initiated. Identification photographs of blue whales were collected during IDCR/SOWER cruises since 1987-1988 but the photographs had not previously been catalogued or analyzed until the current effort was undertaken (Olson 2007b). The use of photographs to identify and re-sight individual whales has been successful in delineating feeding stocks and determining migration patterns of other populations of large whales (e.g. Dufault and Whitehead, 1993; Bannister *et al.*, 1997; Calambokidis *et al.*, 2001). Identification photographs collected during IDCR/SOWER cruises may yield similar information about blue whales in the Antarctic region. Funding for this work was allocated to the author at the meeting of the Scientific Committee in 2006 and 2009. This report summarizes results to date and updates material presented in Olson (2007a; 2007b; 2008; 2009) and in Olson and Ensor (2007).

MATERIALS and METHODS

Blue whale identification photographs from the IDCR/SOWER cruises have been assembled at the Southwest Fisheries Science Center (SWFSC) in order to archive, catalogue and analyze the photographs as a collection. Photographs were taken during 20 years of cruises, 1987-1988 through 2008-2009. Photographs were obtained from all six IWC Management Areas. No blue whale photographs were collected during the recent 2009/2010 SOWER cruise or during cruises 1988-1989 and 1999-2000. An estimated minimum number of 323 individual whales were photographed during the 20 cruises, based on data given in cruise reports and natural marking records (Table 1).

To date, 23,598 photographs from 16 of the 20 cruises have been compiled at SWFSC (Table 1). In order to facilitate matching and to archive all photographs electronically 1,602 film negatives were digitized.

Blue whale photographs were examined for unique natural markings and identified as individuals following methods outlined in Sears *et al.* (1990). Identification photos were selected for each whale and identification numbers assigned in the process of creating a photo-id catalogue. The photographs were

examined by year, identifying individuals, and then photos of individuals were inter-matched between years.

RESULTS

A total of 219 individual whales were identified from photographs taken during 16 IDCR/SOWER surveys in all six Management Areas. The distribution of individual whales by Area is given in Table 2.

Re-sights between years

Five whales were re-sighted multiple times between years (Table 3). Four of the whales were re-sighted between years within Area III. One whale (#0104) was sighted in Area VI and re-sighted in Area V. While the overall re-sighting rate between seasons is low, the sighting history of two of the whales is especially interesting: whale #0623 was photographed 3 years in a row (2004-2005, 2005-2006, 2006-2007). All the sightings of #0623 occurred in the western part of Area III. Whale #0772 was photographed in 1994-1995 (1 of 5 whales identified that year) and 12 years later in 2006-2007; the sightings of #0772 occurred on opposite sides of Area III.

Re-sights within years

21 whales were re-sighted within season during three research cruises: 2005-2006 (Area III), 2006-2007 (Area III), and 2008-2009 (Area IV). (See Table 4.) The within-season re-sighting rates were 11%, 18% and 22% respectively. Intervals between re-sights within a season ranged from 1 to 15 days; distances ranged from 25 to 250km. The average straight-line distance covered by individual whales between re-sights ranged from 10km/day to 162km/day. 19 of the 21 re-sighted whales moved south-westward.

DISCUSSION

The movement of blue whales within the Antarctic is not well-understood on either a large or fine scale (Branch *et al.*, 2007). Generally it is not known if blue whales show site tenacity for feeding areas and/or if they forage widely and randomly. The scale of within-season movements of the whales observed is similar to blue whales observed on feeding grounds off California, USA by Fiedler *et al.* (1998) and Mate *et al.* (1999). It may be that blue whales in the Antarctic exhibit patterns consisting of smaller scale movements interspersed with longer range movements covering hundreds of miles as described by Fiedler *et al.* (1998), Mate *et al.* (1999) and Croll *et al.* (2005) in the northeastern Pacific. The re-sights during 2005-2006 (11%), 2006-2007 (18%) and 2008-2009 (22%) suggest that blue whales exhibit some degree of residency within a summer season. One of the whales in 2005-2006 remained in or returned to the same general area after 15 days. This is the same whale (#0623) that was seen in Area III in three consecutive years. Likewise, the small number of re-sights between seasons suggests that at least some whales return to the same Area in multiple years. A quantitative analysis of these data will aid in the interpretation of these results. Likewise, the continued analysis of photographs from IWC SOWER cruises will yield more information on these patterns.

Updates from 2009

Last year films from three SOWER cruises - 2001-2002, 2002-2003, 2003-2004 - that previously had been missing were located and forwarded to the author at Southwest Fisheries. The films contained 812 blue whale photographs; all were digitized and added to the collection. The photographs were examined for individual ID's, yielding one whale that matched to a previously seen individual (#0104), and 15 new ID's.

The collection of identified blue whale photographs is now basically complete. Photographs from cruises in the 1980's and 1990's remain missing but date back far enough that they may never be located. The entire collection is presently being re-examined, matches confirmed, and photographs coded for quality. The collection is being prepared for incorporation into the collaborative Southern Hemisphere Blue Whale Catalogue. The associated data are being checked, cleaned, and prepared for potential mark-recapture analysis.

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Table 1. Numbers by year of blue whale photographs collected in the Antarctic during IDCR/SOWER cruises and numbers of identified individual blue whales. Totals are given in the smaller table below. (No blue whales were sighted during the recent 2009-2010 SOWER cruise.)

	1987-1988 Area III	1989-1990 Area I	1990-1991 Area VI	1991-1992 Area V	1992-1993 Area III	1993-1994 Area I	1994-1995 Area III	1995-1996 Area VI	1996-1997 Area II	1997-1998 Area II	1998-1999 Area IV	2000-2001 Areas I & VI	2001-2002 Area V	2002-2003 Area V	2003-2004 Area V	2004-2005 Area III	2005-2006 Area III	2006-2007 Area III	2007-2008 Area IV	2008-2009 Area IV
Number of photos	n/a	n/a	57	26	164	n/a	66	40	268	n/a	117	43	124	184	513	291	3,102	15,572	281	2,285
Estimated no. of whales photographed	3	1	3	2	8	4	8	5	17	8	5	6-8	14	9	27	23	52	114	2	12
No. of whales photo-identified	n/a	n/a	2	1	6	n/a	5	2	10	n/a	3	5	11	4	16	24	45	80	2	9
No. of new whales	n/a	n/a	2	1	6	n/a	5	2	10	n/a	3	5	11	4	15	24	44	76	2	9

n/a Films and/or photographs from these years have not been located

Table 1 continued.

	Totals
Number of photos	23,598
Estimated no. of whales photographed by year	323 - 325
No. of whales photo-identified by year	225
No. of new whales	219

Table 2. Number of individual blue whales identified by Area (whale #0104 seen in Area V and Area VI).

Area	No. of whales identified
I	2
II	10
III	155
IV	14
V	32
VI	7
Total	220

Table 3. Sighting histories of blue whales re-sighted between years.

Whale ID	Date	Area	Latitude	Longitude	Distance between re-sights in different years (km)
#0104	2001 Jan 12	VI	68°06'S	170°42'W	
#0104	2004 Feb 05	V	73°10'S	175°37'E	753
#0622	2006 Jan 29	III	67°49'S	012°06'E	
#0622	2007 Jan 07	III	67°40'S	001°29'E	447
#0623	2005 Feb 04	III	68°32'S	019°16'E	
#0623	2006 Jan 29	III	67°31'S	012°31'E	302 (from 2005 Feb 4)
#0623	2006 Feb 13	III	68°40'S	014°27'E	
#0623	2007 Feb 07	III	69°36'S	005°50'E	355 (from 2006 Feb 13)
#0761	2005 Jan 21	III	69°26'S	005°46'E	
#0761	2007 Feb 06	III	69°22'S	006°14'E	19 (from 2005 Jan 21)
#0761	2007 Feb 07	III	69°24'S	005°29'E	
#0761	2007 Feb 08	III	69°50'S	004°23'E	
#0772	1995 Jan 29	III	65°44'S	058°20'E	
#0772	2007 Feb 08	III	69°49'S	004°47'E	2,222

Table 4. Within season re-sights of blue whales during SOWER surveys.

Year	Area	No. of re-sighted whales	Time between re-sights (days)	Distance between re-sights (km)	Average minimum distance (km/day)
2005-2006	III	5/45 11%	4 - 15	108 - 248	10 - 46
2006-2007	III	14/80 18%	1 - 8	32 - 250	31 - 162
2008-2009	IV	2/9 22%	2 - 4	99 - 176	25 - 88