

Status of blue whale photo-identification from IWC IDCR/SOWER cruises 1987-1988 to 2007-2008

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ABSTRACT

Over 21,000 identification photographs of blue whales were collected during 19 IWC IDCR/SOWER Antarctic cruises conducted from 1987-1988 to 2007-2008. Archiving and analysis of these photographs has been undertaken at SWFSC to aid in the assessment of Southern Hemisphere blue whales. Photographs were obtained from all six IWC Management Areas and represent a minimum of 311 individuals. Film images from earlier cruises have been digitized to facilitate archiving, analysis and the creation of a photo-ID catalogue. 95% of the currently available photographs have been examined, yielding 203 individuals. Photographs from five cruises in Area III have been cross-referenced to identify re-sighted individuals, locations and re-sighting rates for that region. Four whales were re-sighted in Area III in multiple years, including one whale with a 12-year sighting interval. The within season re-sighting rates for 2005-2006 and 2006-2007 were 11% and 17%, respectively. Two whales were photo-identified in 2007-2008 in Area IV, but did not match to the three other whales identified from Area IV during a previous cruise.

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 has been initiated. Identification photographs of blue whales have been collected during IDCR/SOWER cruises since 1987-1988 but have not previously been catalogued or analyzed. 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. This report summarizes results to date and updates material presented in Olson (2007a; 2007b) 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 19 years of cruises, 1987-1988 through 2007-2008 (no blue whale photographs were collected during cruises in 1988-1989 and 1999-2000). Photographs were obtained from all six IWC Management Areas. An estimated minimum number of 311 individual whales were photographed during the 19 cruises, based on data given in cruise reports and natural marking records (Table 1).

To date, 20,492 photographs from 14 of the 19 cruises have been compiled at SWFSC (Table 1). Photographs from seven years remain outstanding, notably film from the years 2001-2002, 2002-2003 and 2003-2004. In order to facilitate matching and to archive all photographs electronically, photographs in

film format were digitized. The digitizing of all 781 film negatives currently available has now been completed.

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. 95% of the available photographs have been examined by year, identifying 203 individual whales. 80% of the photographs have been intermatched between years, including all of the photographs from Area III and Area IV. The analysis of the remaining photographs is underway.

Area III

Area III has the largest number of photographs of the six Management Areas. 19,195 photographs of blue whales in Area III were collected during five IDCR/SOWER cruises: 1992-1993, 1994-1995, 2004-2005, 2005-2006, and 2006-2007. Photographs of identified whales from each season were compared within and between seasons.

Cruise tracks during the 2005-2006 and 2006-2007 seasons followed the ice edge from a starting point at 000° longitude, eastward to 20°E and then back west to the starting position during January and February (Ensor *et al.* 2006; Ensor *et al.* 2007). All blue whales encountered during these seasons were photographed. This provided the opportunity to examine the residency of blue whales in the research area within each season. (Cruise tracks during other years generally proceeded in a one-way longitudinal direction and did not include a re-survey over the same area.) Photographs of individual whales were compared between days to determine the number of re-sightings over space and time during each cruise.

Area IV

398 photographs were obtained during two cruises in Area IV: 281 photographs in 2007-2008 and 117 photographs during 1998-1999. Identified whales from both seasons were compared to one another.

RESULTS and DISCUSSION

Area III

A total of 161 individual whales were identified from photographs taken during five IDCR/SOWER cruises in Area III:

1992-1993	6 whales identified
1994-1995	5 whales identified
2004-2005	24 whales identified
2005-2006	45 whales identified
2006-2007	81 whales identified

Four whales were re-sighted multiple times between seasons (Table 2) and 19 whales were re-sighted within seasons (Table 3). 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 three years in a row (2004-2005, 2005-2006, 2006-2007) and whale #0772 was photographed in 1994-1995 (one of five whales identified that year) and twelve years later in 2006-2007. All the sightings of #0623 occurred in the western part of Area III; the sightings of #0772 were on opposite sides of Area III. Accounting for re-sights, a total of 157 individual whales were identified in Area III.

The within-season re-sighting rates for 2005-2006 and 2006-2007 were 11% (5 of 45 whales) and 17% (14 of 81 whales), respectively (Table 3). Intervals between re-sights within a season ranged from 1 to 15 days; distances ranged from 32 to 250km. The average minimum distance covered by individual whales ranged from 10km/day to 162km/day. In 2005/2006 re-sighted whales moved in varying directions following their initial sighting, but in 2006/2007 all re-sighted whales moved south-westward. The scale of within-season movements of the whales observed during 2005-2006 and 2006-2007 seasons was 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 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. Re-sights during 2005-2006 and 2006-2007 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 IDCR/SOWER cruises will yield more information on these patterns.

Area IV

Five whales have been photo-identified from Area IV: 2 in 2007-2008 and 3 in 1998-1999. No whales were re-sighted within or between the seasons. These are the only two IDCR/SOWER cruises with photographs from Area IV.

Other Areas

Photographs from other Areas are being analyzed as they became available after digitizing or otherwise added to the collection. So far five whales from three years in Area V (1991-1992: 1 whale; 2002-2003: 2 whales and 2003-2004: 2 out of 29 whales) and five whales from Areas I and VI (2000-2001) were compared with one another, but no intermatches were found. Presently there are 830 available photographs from four years and three Areas remaining to be examined and this is currently underway.

Table 1 shows seven years of “missing” photographs. These are cruises for which there is a record or mention in the cruise report that photographs of blue whales were obtained. The cruises in 1987-1988 and 1989-1990 date back so far that these photos might never be located. Natural marking records from 1993-1994 indicate that many blue whale photographs were taken on personal film and the researcher on board that year has been contacted. Photographs from 1997-1998 are otherwise missing from the collection received at SWFSC from the IWC office. Perhaps most important of the outstanding photographs is the film taken during three recent cruises in Area V: 2001-2002, 2002-2003, and 2003-2004. Up to 52 whales were estimated as photographed during those cruises. This number of individuals would add substantially to the catalogue of Antarctic blue whales, and three sequential seasons of photographs from Area V would provide the opportunity to examine re-sighting rates for that Area.

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Table 1. Numbers by season of available photographs of blue whales collected in the Antarctic during IDCR/SOWER cruises; individual blue whales photographed as listed in IDCR/SOWER cruise reports; and individuals identified after examining photographs. Prior to 2004-2005 all photos were collected on film and have been digitized.

	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	TOTAL
Number of photos	n/a	n/a	57	26	164	n/a	66	40	268	n/a	117	43	n/a	40*	425*	291	3,102	15,572	281	20,492
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	311-313
No. of whales photo-identified	n/a	n/a	+	1	6	n/a	5	+	+	n/a	3	5	n/a	2*	29*	24	45	81	2	203

n/a Photographs from these years have not been received/located.

* Film has not yet been received; the 40 and 425 images were collected on personal digital cameras.

+ Analysis still in progress.

Table 2. Sighting histories of blue whales re-sighted between seasons in Area III.

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

Table 3. Within season re-sights of blue whales in Area III 2005-2006 and 2006-2007.

Year	No. of re-sighted whales	Time between re-sights (days)	Distance between re-sights (km)	Average minimum distance (km/day)
2005-2006	5/45 11%	4 - 15	108 - 248	10 - 46
2006-2007	14/81 17%	1 - 8	32 - 250	31 - 162

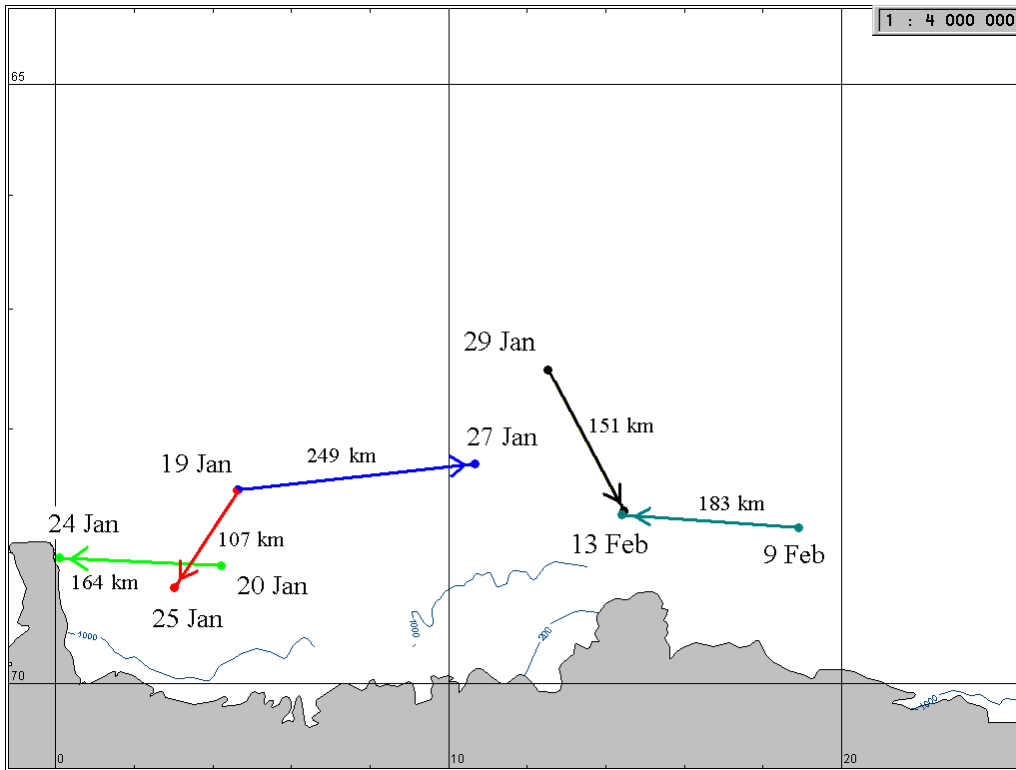


Figure 1. The movements of 5 whales re-sighted in Area III in 2005-2006.

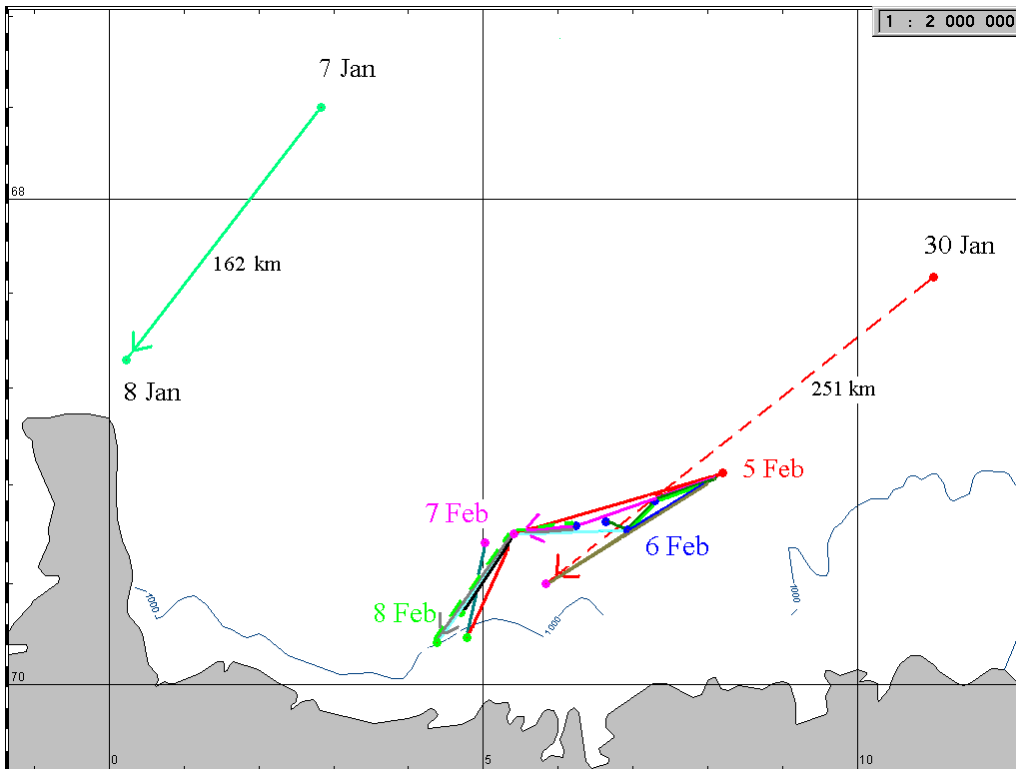


Figure 2. The movements of 14 whales re-sighted in Area III in 2006-2007.