

Summary of photo-identification information of blue, southern right and humpback whales collected by JARPA/JARPAII

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ABSTRACT

This paper summarizes the information on photo-identification (photo-id) of blue, southern right and humpback whales obtained by JARPA/JARPAII surveys in Antarctic Areas IIIE, IV, V and VIW during the austral summer seasons. There is a total of 3,108 pictures (529 for blue, 914 for southern right and 1,665 for humpback whales, respectively) in the photo-id catalogue administrated by the Institute of Cetacean Research, which were selected from the total obtained in those Areas between 1989/90 and 2010/11. All the pictures were digitized to facilitate archiving.

Species	JARPA	JARPAII	Total
Blue whale	153	376	529
Southern right whale	243	671	914
Humpback whale	464	1,201	1,665
Total	860	2,248	3,108

Pictures of the blue whales from JARPA were already submitted to the IWC secretariat to facilitate comparisons with other catalogues. Pictures of the humpback and southern right whales from JARPA were provided to the IWC's Antarctic Humpback Whale Catalogue and to other international research organizations, respectively, under co-operation studies. Pictures from JARPAII will be provided to the international community in the near future under the same conditions as for the pictures of JARPA. A preliminary examination of pictures within the feeding grounds and between the feeding grounds and lower latitude localities resulted in several matches. The photo-id data collected by JARPA and JARPAII have the potential to contribute to a better understanding of the pattern of movement, distribution and abundance of blue, southern right and humpback whales, and in turn to the assessment and conservation of these three species.

KEYWORDS: BLUE WHALE; SOUTHERN RIGHT WHALE; HUMPBACK WHALE; PHOTO-ID; ANTARCTIC; SCIENTIFIC PERMITS

INTRODUCTION

The IWC Scientific Committee (IWC/SC) has been conducting assessments of Southern Hemisphere blue (*Balaenoptera musculus intermedia*), southern right (*Eubalaena australis*) and humpback (*Megaptera novaeangliae*) and one of the techniques used to investigate distribution, movement and abundance is photo-identification of whales. Photo-id data obtained by JARPA and JARPAII surveys have the potential to contribute to the assessments of those species.

During the JARPA and JARPAII surveys in Areas IIIE, IV, V and VIW, photo-id experiments on blue, southern right and humpback whales have been conducted on an opportunistic basis. Photo-id experiments are conducted in conjunction with biopsy experiment. A summary of the photographs obtained during the JARPA period was summarized during the JARPA review meeting carried out by the IWC/SC in 2006 (IWC, 2008).

The objective of this paper is to summarize the photographs of blue, southern right and humpback whales taken during the JARPA and JARPAII surveys in Antarctic Areas IIIE, IV, V and VIW. Results of a preliminary matching exercise are also presented.

COLLECTION OF PHOTOGRAPHS

Picture of natural marks of blue, humpback and southern right whales were taken along the sighting survey transects of JARPA/JARPAII. Details of the survey procedure for JARPA and JARPAII surveys from 1987/88 to 2010/11 austral summer season can be found in Nishiwaki *et al.* (2006, 2014).

On an opportunistic basis the dedicated sighting vessel (SV) and the sighting and sampling vessels (SSV) approached the whales for conducting experiments on photo ID. When possible the same whale was also sampled for skin biopsy. Researchers onboard the vessels focused on natural marks of the animals such as scars, dorsal fin with particular shape and the mottled pigmentation pattern in the case of the blue whale; scars, lateral marking and ventral fluke coloration in the case of the humpback whale; and scars, head callosities pattern in the case of the southern right whale.

Surveys were conducted in IWC Management Areas III, IV, V and VI during the austral summer seasons (December-March). Between the seasons 1992/93 and 2004/05 photos were taken using 35mm SLR databack cameras equipped with 70-up to 300mm lenses and motor drive. Black and white 400 ASA films (*Ilford HP5*) were used. From the 2005/06 season digital Nikon 70D cameras equipped with 100-300mm lens were used.

After each summer season the best pictures were selected (LAP for the pictures taken between 1989/90 and 2004/05 and KM for the pictures taken from 2005/06), and these pictures were entered into the Institute of Cetacean Research (ICR)'s catalogue. The number of pictures is summarized below.

NUMBER OF PICTURES

Tables 1a, 1b and 1c summarize the results of the photo-ID experiments in JARPA and JARPA II for each species. Table 2 shows the total of pictures in the ICR catalogue. A total of 3,108 photographs (529 for blue, 914 for southern right and 1,665 for humpback whales, respectively) were collected and selected from 1989/90 to 2010/11 seasons (22 seasons). The number of photographs for blue whales was 140, 155, 42 and 39 in Areas III, IV, V and VI, respectively. The numbers of photographs for southern right whales were 653 and 18 in Areas IV and V, respectively. The numbers of photographs for humpback whales were 12, 903, 235 and 51 in Areas III, IV, V and VI, respectively.

PRELIMINARY MATCHING EXERCISE

Within the feeding grounds

Blue whale

A preliminary match exercise resulted in a single match for blue whale (Figures 1a and 1b). Within the 2005/06 season a whale was first sighted in Area III at position 65°49'S, 63°00'E on 12 Jan. 2006. The estimated body length of the whale was 26.8m. The same whale was sighted in Area IV at position 65°44'S, 76°31'E on 1st Feb. 2006. Researchers estimated the body size in 26.1m. The distance between the first and second sightings was 334n.miles. The time between sightings was 20 days and the average distance per day was 17n.miles.

Southern right whale

A whale was first sighted in Area IV on 15 Jan. 1998 (Figure 2a, left picture). The same whale was sighted in Area IV on 15 February 2002 (Figure 2a, right picture). The whale was identified by the callosities pattern of the head. Researchers estimated the body length of this animal in 14.6 meters and the sex was male as determined by DNA analysis of biopsy. This matching was confirmed by microsatellite DNA profiles (Kanda *et al.*, 2014).

In 1999/2000 season a whale was first sighted in Area IV on 10 Feb. 2000 (Figure 2b, left picture). The same whale was sighted in Area IV on 1 March 2008 (Figure 2b, right picture). The whale was identified by the callosities pattern of the head. Researchers estimated the body length of this animal in 15.8 meters and the sex was a female as determined by DNA analysis of biopsy sample. This matching was also confirmed by microsatellite DNA profiles (Kanda *et al.*, 2014).

Humpback whale

In Area VI, one individual was photo-documented twice in similar geographic positions, with a span of six years between sightings (JARPA, 1st January 1997 at 65°33'S, 167°29'W; IWC, 3 January 1991 at 64°56'S, 171°43'W (Rock *et al.*, 2006).

Between low latitude areas and the Antarctic

Southern right whale

The first record of movement of a southern right whale between warm water breeding ground and the Antarctic Ocean, south of 60°S was documented using Australian and JARPA pictures (Bannister, *et al*, 1999). This animal was sighted in Adelaide on 8 September 1987. It was re-sighted by JARPA in Area IV on 26 February 1996 (Figures 2c and 2d). The whale was identified by the callosities pattern of the head and spotted pattern of its back side (Bannister, *et al*, 1999).

Humpback whales

Records of movement of humpback whales between warm water breeding ground and the Antarctic Ocean, south of 60°S was also reported using Australian and JARPA pictures (Rock, *et al*, 2006). These authors reported two cases of individual whales sighted in Area V and in Eastern Australia. These whales were identified by their fluke coloration pattern. Figure 3a shows two different whales sighted in the Antarctic. These were re-sighted along the Eastern Australian coast (Figure 3b) (Rock, *et al*, 2006).

FURTHER RESEARCH

Analyses of photographs collected during the JARPA/JARPAII have the potential to contribute for a better understanding of the pattern of movement and residence of these species in the feeding grounds. It could assist the interpretation of abundance trends and quantitative distribution studies south of 60°S (e.g. Hakamada and Matsuoka, 2014, Matsuoka and Hakamada, 2014, Murase *et al*. 2014).

Further information can be optimized if these photographs are examined in conjunction with photographs from other surveys and regions. For example during the 2008 IWC/SC meeting Olson (2008) summarized the photo-id photographs obtained during 19 IDCR/SOWER surveys in the Antarctic management Areas I-VI. A total of 21,000 photographs were collected in those surveys representing a minimum of 311 individual blue whales. During the discussion of this paper the SC recommended that blue whale photographs collected during JARPA surveys be examined with the purpose to be integrated into the IWC catalogue, once such examination has been completed by Japanese scientists (IWC, 2010). Pictures of blue whales from JARPA were already submitted to the IWC secretariat to facilitate comparison with other catalogues through the OWC SC, under some conditions specified in the paper (Matsuoka and Pastene, 2009). Pictures of the humpback and southern right whales from JARPA were also provided to the IWC's Antarctic Humpback Whale Catalogue and to other research institutions, respectively, under co-operation studies.

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Table 1a. Number of photo-id pictures of blue whales taken during JARPA and JARPAII surveys by IWC Management Areas and austral summer season.

Survey	Season	IWC Areas				Number of photographs
		III E	IV	V	VI W	
JARPA	1987/88	-	-	-	-	0
	1988/89	-	-	-	-	0
	1989/90	-	-	-	-	0
	1990/91	-	-	-	-	0
	1991/92	-	-	-	-	0
	1992/93	-	-	33	-	33
	1993/94	-	9	-	-	9
	1994/95	-	-	16	-	16
	1995/96	7	3	-	-	10
	1996/97	-	-	6	2	8
	1997/98	1	4	-	-	5
	1998/99	-	-	21	0	21
	1999/00	22	6	-	-	28
	2000/01	-	-	0	0	0
	2001/02	0	5	-	-	5
	2002/03	-	-	0	6	6
	2003/04	5	4	-	-	9
	2004/05	-	-	0	3	3
		Sub-total	35	31	76	11
JARPA II	2005/06	59	113	0	-	172
	2006/07	-	-	18	0	18
	2007/08	60	10	0	-	70
	2008/09	-	-	24	39	63
	2009/10	21	32	0	-	53
	2010/11	-	-	0	0	0
		Sub-total	140	155	42	39
	Total	175	186	118	50	529

Table 1b. Number of photo-id pictures of southern right whales taken during JARPA and JARPAII surveys by IWC Management Areas and austral summer season.

Survey	Season	IWC Areas				Number of photographs
		III E	IV	V	VI W	
JARPA	1987/88	-	-	-	-	0
	1988/89	-	-	-	-	0
	1989/90	-	-	-	-	0
	1990/91	-	-	-	-	0
	1991/92	-	39	-	-	39
	1992/93	-	-	24	-	24
	1993/94	-	9	-	-	9
	1994/95	-	-	0	-	0
	1995/96	-	12	-	-	12
	1996/97	-	-	0	-	0
	1997/98	-	94	-	-	94
	1998/99	-	-	0	-	0
	1999/00	-	9	-	-	9
	2000/01	-	-	2	-	2
	2001/02	-	33	-	-	33
	2002/03	-	-	10	-	10
	2003/04	-	6	-	-	6
	2004/05	-	-	5	-	5
	Sub-total	0	202	41	0	243
JARPA II	2005/06	-	495	-	-	495
	2006/07	-	-	0	-	0
	2007/08	-	144	18	-	162
	2008/09	-	-	0	-	0
	2009/10	-	14	-	-	14
	2010/11	-	-	0	-	0
		Sub-total	0	653	18	0
	Total	0	855	59	0	914

Table 1c. Number of photo-id pictures of humpback whales taken during JARPA and JARPA II surveys by IWC Management Areas and austral summer season.

Survey	Season	IWC Areas				Number of photographs
		III E	IV	V	VI W	
JARPA	1987/88	-	-	-	-	0
	1988/89	-	-	-	-	0
	1989/90	-	19	-	-	19
	1990/91	-	-	8	-	8
	1991/92	-	26	-	-	26
	1992/93	-	-	69	-	69
	1993/94	-	51	-	-	51
	1994/95	-	-	43	-	43
	1995/96	3	31	-	-	34
	1996/97	-	-	4	15	19
	1997/98	7	52	-	-	59
	1998/99	-	-	-	-	0
	1999/00	14	37	-	-	51
	2000/01	-	-	13	17	30
	2001/02	3	14	-	-	17
	2002/03	-	-	7	0	7
	2003/04	9	11	-	-	20
	2004/05	-	-	11	-	11
		Sub-total	36	241	155	32
JARPA II	2005/06	0	328	-	-	328
	2006/07	-	-	62	34	96
	2007/08	12	78	-	-	90
	2008/09	-	-	165	17	182
	2009/10	-	497	-	-	497
	2010/11	-	-	8	-	8
		Sub-total	12	903	235	51
	Total	48	1,144	390	83	1,665

Table 2. Summary of the number of photo-id pictures for obtained during JARPA and JARPAII surveys (1987/88-2010/11), by species.

Species	JARPA	JARPAII	Total
Blue whale	153	376	529
Southern right whale	243	671	914
Humpback whale	464	1,201	1,665
Total	860	2,248	3,108



Figure 1a. Blue whale sighted in Area III on 12 January 2006 (left picture) and re-sighted in Area IV on 1 February 2006 (right picture). The whale was identified by the particular shape of the dorsal fin. Both photos are from JARPAII.

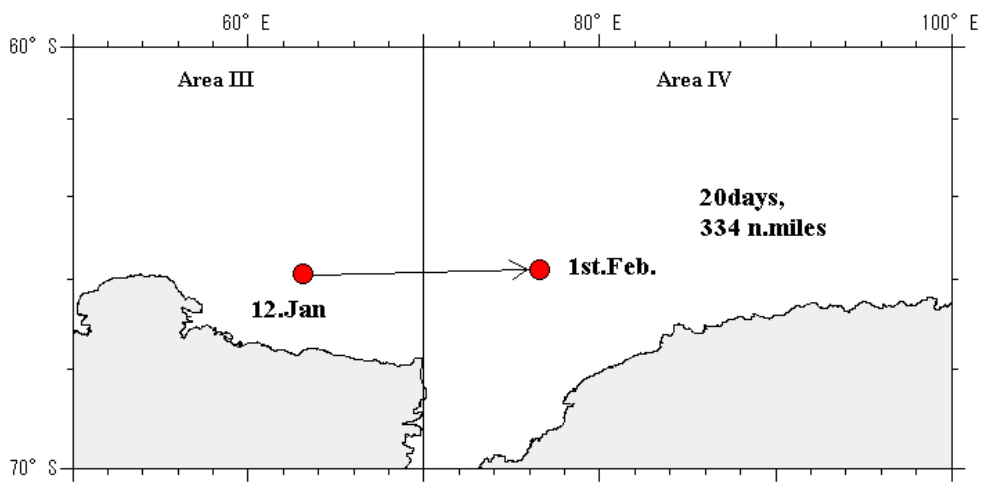


Figure 1b. The movement of a re-sighted blue whale between Area III and Area IV in the austral summer season 2005/2006 using JARPAII data (Matsuoka and Pastene, 2009).



Figure 2a. A southern right whale was sighted in Area IV on 15 January 1998 (left picture) and re-sighted in Area IV on 15 February 2002 (right picture). The whale was identified by the callosities pattern of the head. This matching was independently confirmed by microsatellite DNA analysis (Kanda *et al.*, 2014).



Figure 2b. A southern right whale was sighted in Area IV on 10 February 2000 (left picture) and re-sighted in Area IV on 1 March 2008 (right picture). The whale was identified by the callosities pattern of the head. This matching was independently confirmed by microsatellite DNA analysis (Kanda *et al.*, 2014).

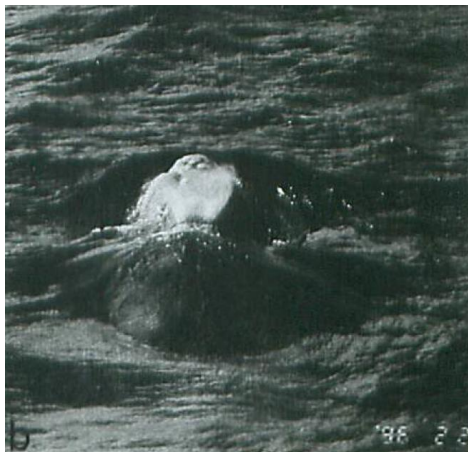


Figure 2c. This whale sighted by JARPA in Area IV on 26 February 1996 had been originally sighted in Adelaide on 8 September 1987. The whale was identified by the callosities pattern of the head and spotted pattern of its back side (see details in Bannister, *et al.*, 1999).

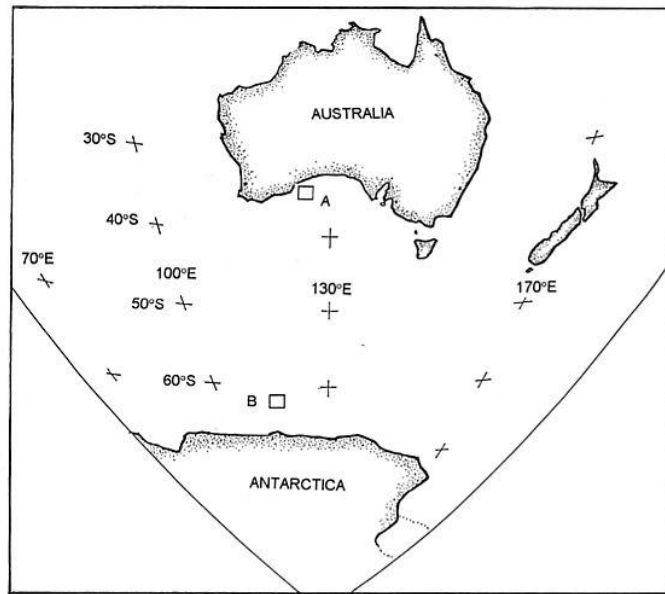


Figure 2d. First record of movement of a southern right whale between warm water breeding ground and the Antarctic ocean, south of 60°S (Bannister *et al.*, 1999).

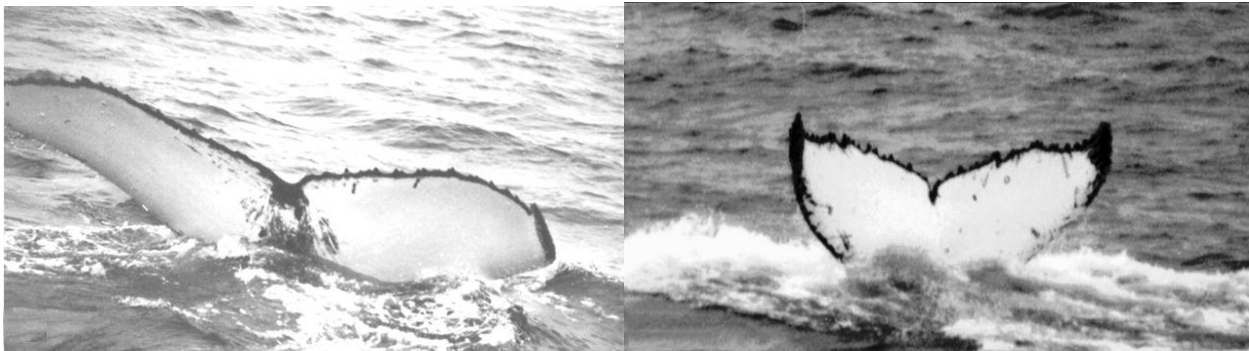


Figure 3a. Two different humpback whales sighted by JARPA in Area V, which were re-sighted along the Eastern Australian coast (see details in Rock *et al.*, 2006).

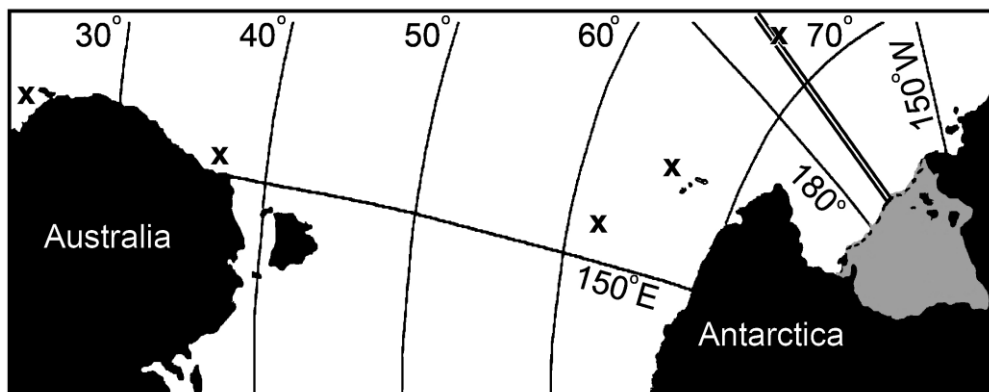


Figure 3b. Documented sightings of humpback whales between Eastern coast of Australia and in Antarctic Area V. Locations of sightings are marked with dark crosses. Latitudinal markings are degrees south; double line indicates the boundary between Area V and Area VI (Rock *et al.*, 2006).