GUIDELINES

for the

PHOTO-IDENTIFICATION

of

ANTARCTIC BLUE WHALES



Antarctic Blue Whale Project

Southern Ocean Research Partnership 2014



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INTRODUCTION

The photo-identification of Antarctic blue whales (*Balaenoptera musculus intermedia*) is a key method of data collection for the Antarctic Blue Whale Project (ABWP), under the auspices of the Southern Ocean Research Partnership (SORP). A primary research objective of the ABWP is to obtain a sufficient number of identification photos of Antarctic blue whales to estimate abundance using mark-recapture methods. Obtaining a current estimate of abundance is considered crucial for the assessment of the status of the Antarctic blue whale population and in monitoring its recovery. Analysis of photo-ID data will be used to address additional research objectives of the ABWP such as improving the understanding of population structure and movement between feeding and breeding grounds. For more information on the ABWP and SORP see Bell (2014).

Newly obtained identification photos of Antarctic blue whales under the ABWP will build upon the collection of 50 identification photos obtained during the ABWP's first Antarctic Blue Whale Voyage in 2013 (Double *et al.*, 2013; Olson *et al.*, 2013). In turn, these photos will be incorporated into the Antarctic Blue Whale Photo-ID Catalogue. Identification photos of Antarctic blue whales collected during IWC IDCR/SOWER surveys formed the basis of the Antarctic Catalogue (Olson, 2012). The Antarctic Catalogue currently contains 274 identified individuals representing 12% of the most recent population estimate of 2,280 (Branch, 2007). Antarctic blue whale photographs from the ABWP will also be uploaded into the regionally collaborative Southern Hemisphere Blue Whale Catalogue (Galletti-Vernazzani and Olson, 2013) for analysis of movement and population structure within the Southern Hemisphere.

Individual blue whales are identifiable from unique patterns of mottled pigment on both sides of the body and from variations in dorsal fin shape (Fig. 1). Photo-identification images of blue whales can be collected from any vessel, from large ships to small inflatable boats (Fig. 2).



Figure 1. Antarctic blue whales are identified as individuals based on unique variation in pigmentation and dorsal fin shape.







Figure 2. Collecting identification photographs of Antarctic blue whales from the bow of a large ship and from an inflatable boat.

This document provides protocols for collecting and archiving identification photographs of Antarctic blue whales and related data so that the photographs and data collected by different research groups will be comparable. The data recording and archiving system suggested here has been set up simply with readily available software (Excel; camera bundled software) so that it's easy to use and facilitates the exchange of data and photographs between multiple researchers and projects.

I - EQUIPMENT

- Camera(s) digital SLR
- Lenses ideally, use image-stabilized lenses when working from moving platforms such as ships and boats. 100-400mm zoom works best for taking photos from a large ship; 100-300mm zoom works best when working from a smaller boat (e.g. an inflatable boat).
- Batteries 2-3 batteries per camera as they discharge power quickly in cold temperatures
- Battery charger
- Media storage cards 2-3 per camera is ideal, then there is no need to clear cards before using them again on a busy day
- Card reader at least 2 readers so that there is a back-up
- Lens cloths & liquid lens cleaner for cleaning lenses; alcohol wipes for cleaning camera exteriors
- Small waterproof notebooks
- Pencils, sharpeners, erasers
- Pelican case or other waterproof case for the camera, lenses, and accessories
- Data forms (see Chapters 2 and 3)
- Binder notebook (to hold forms)



Equipment continued:

- Photo editing software software that allows the photographer to sort and batch rename photos. Usually the software that comes bundled with digital SLR cameras is sufficient.
- External hard drive(s) for storing and backing up images; photos are large files and require a large amount of storage space.
- Whiteboard, markers, eraser for use as a photo board
- GPS
- Computer
- Monitor
- Printer
- Photocopier/scanner

II - FIELD PROTOCOLS

Camera settings

- Set all cameras with date and time synchronized to GPS time. (Clarify in your data notes whether you are using local time or UTC.)
- Set file type for the highest jpg quality.¹
- Set file numbering as continuous. Do not reset numbering until the end of the day.
- Shutter priority with ISO400 and shutter speed 1/1000 sec is a good place to start for the generally overcast days in the Antarctic. Generally, faster shutter speeds and higher ISO settings are needed to capture a moving whale in focus. An automatic sports action mode also works well for photographing moving cetaceans.
- Adjust settings as needed based on the lighting. In very low light, increasing the exposure compensator a few increments will help pick up a blue whale's mottling.
- Check the camera's batteries and be sure there are freshly charged ones available. Battery power deteriorates quickly in freezing temperatures.

¹Highest jpg is recommended because it provides sufficient quality for photo-ID and the relative smaller file size facilitates file storage and does not slow down the camera buffer nearly as much as RAW. If you have a fast camera, a fast computer, and plenty of storage shoot in RAW&jpg format. RAW format creates the best quality photos.



Recording field data

Photo-associated data should be recorded directly when photographing blue whales, either into paper forms (see below), small field notebooks, a voice recorder, or a tablet. These data will be entered (or copied) electronically at the end of the day (see Chapter 3). If using small field notebooks or a voice recorder be sure to have a list available, as a prompt, of what data are necessary to be recorded. Data to record include:

- Date (note whether local time or UTC)
- Time of photography effort start²
- Latitude/longitude of photography effort start
- Encounter number/sighting number per group of whale(s). Use the same number as
 a visual sighting record if photos are being collected on a project that is also
 collecting visual sighting data. Otherwise, number the sightings sequentially for the
 duration of the field project.
- Species
- Group size
- Number of individuals photographed (sometimes this will be an estimate)
- Photographer
- Platform (e.g. ship, small boat)
- If on a project with biopsy effort, record the biopsy sample number with the corresponding photo frame sequence.
- Additional comments or notes
- Time of photography effort end²

Paper forms

Paper forms are not a required step of the data recording process, but they are useful for interpreting the photo identification data. The forms have room for sketches and extended notes that an electronic file does not have and aid in the sorting of multiple whales photographed in the same group. A sample completed paper form is given in Appendix A. A blank form is available in Appendix B. (Appendix B is untitled so that it can be printed for use in the field.) If paper forms are used, the data can be written directly to the form during photo-ID effort, or, transcribed from a small notebook, voice recorder, or tablet.

²By recording the start and stop time of photo-ID effort the time per photo-ID acquisition can be calculated. Useful but not required.



Photography

Good quality identification photographs of blue whales are based on four criteria: distance to the whale, subject, angle, focus, and lighting (Fig. 3). In an ideal photograph:

- 1. the whale is close enough to see the mottling pattern clearly
- 2. the dorsal fin is in the photo
- 3. the whale is directly perpendicular to the photographer
- 4. the whale is in focus
- 5. the whale is not backlit or reflecting glare



Figure 3. Example of a good quality ID photo of an Antarctic blue whale.

Photograph the entire side of the whale, at a directly perpendicular angle, keeping in mind that the most important shot is that of the dorsal fin with the surrounding pigmentation. Photograph any unusual scars regardless of where they occur on the body. Photograph both sides of the whale whenever possible.

Keep the sun behind you. Often whales don't cooperate with this so if the whale is backlit adjust the camera settings (e.g. set exposure compensator +1 stop, or increase the ISO setting and reduce shutter speed). It doesn't matter if the water appears almost completely white in the photograph as the goal is to be able to see the mottled pigmentation on the whale.

Photograph all biopsied whales even if a true perpendicular angle cannot be obtained.

Photograph a spacer (a photo subject inside the boat, an iceberg, etc.) between individual whales if photographing a group with more than one whale. This aids in sorting the photos later.



At the end of an event photographing blue whales, take a final photograph of a photo board with the date and sighting number written on it that identifies the series of photographs (Fig. 4).

Clean cameras and lenses at the end of every day. Salt air is corrosive on the cameras and lenses.



Figure 4. A photo board.

Opportunistic photographs

There are times when it is possible to photograph blue whales even though the ship may not be able to directly approach the whale(s). It is worth collecting these photos, even if the whale may seem too far or not at a true perpendicular angle; sometimes these photos can be used for identification purposes and it is always better to discard photos than not to have obtained them at all.

III - PHOTO ARCHIVING AND DATA STORAGE

The data recording and archiving system suggested here has been set up simply with readily available software (Excel; camera bundled software) so that it's easy to use.

At the end of every day download, rename and archive photos, enter or copy the associated data, and back up all photos and data. Clean cameras and lenses. Charge batteries, clear and reformat media cards, and set up equipment for the next day.

Archiving photos

Downloading and renaming images

Use the Batch Rename function in the photo software that came bundled with the camera, or use Adobe Photoshop, ACDSee, or other image software to rename photos.



Label images to create a unique identifier for each image based on date, the photographer's initials, and a daily sequential number. For example:

20130212 PHE 0001

where yymmdd is the date identifier_ABC is the photographer's initials_0001 is the sequential number (use 4 digits with leading zeros if necessary). For a smooth transition from field notes to electronic archival, assign the same sequential numbers as appear on the media card relative to each image. For example, if the first blue whale image on the media card for a given sighting starts with 0243, then use that as a start number for the first image from that sighting when batch renaming. Do not use folder numbers from the media card (e.g. Canon 100-0243; do not use the '100'). If you reset the numbering at the end of each day, the next day the sequential numbering will begin again at 0001, which helps to keep photo naming running smoothly.

Electronic file structure for photos

Create a folder for each sighting (or group) of blue whales that is photographed. Label the folder by species, date, and sighting (or group) number (e.g. B.musculus_25Feb2013_065). Place all photographs from all photographers of a given sighting in the respective folder.

Electronic data file

Set up an Excel file with the same entry fields as the paper form. Simply enter (or copy) the data into the Excel file. A sample file with data is given in Appendix C.

Backing up photos and data

Back up the electronic file and all the photos every evening. Ensure that there are two sets of photos that are kept for posterity and are not edited in any way (except for renaming). Scan the paper data forms (or the field notebook pages) and back these up as well.

IV - IDENTIFICATION OF INDIVIDUAL BLUE WHALES

Antarctic blue whales are identified as individuals based on variation in dorsal fin shape and mottled pigmentation. Dorsal fin sizes vary from a small rounded hump to a pronounced falcate fin. Mottling pigmentation varies from light to heavy, presenting a darker or lighter appearance. The pigmentation patterns are unique to each whale and do not change over time. Fig. 5 gives an example of an individual whale photographed in different years and locations. An individual whale is recognized as the same whale in multiple photographs by confirming that the mottling pattern and any nicks in the dorsal fin are unmistakably the same.

If possible, with groups of blue whales larger than one, review the photos and field notes to determine which photos are attributable to which individual whale. Assign field ID labels per unique individual as 'A', 'B', 'C', etc. (see Appendix A). This is not a required part of the



process but field notes are best interpreted by the person that collected them so this step improves the thoroughness and quality of the data. Sorting photographs from a group of blue whales and assigning ID's correctly can be tricky. Generally, left side to right side assignments are not made within a group unless the evidence is unequivocal (e.g. unique dorsal fin shape due to large nicks or scars). Fig. 6 gives an example of a whale photographed during the same research voyage on different days.

For reference, the method Gendron and Ugalde de la Cruz (2012) use to sort blue whale photos helps train the eye to recognize individuals.





Figure 5. Antarctic blue whale ID#802, photographed on 10 February 2008 (top) and 13 February 2013 (bottom).







Figure 6. Antarctic blue whale ID#602, photographed 19 January 2006 (top) and 25 January 2006 (bottom).

V – CONCLUSION

Any and all identification photographs of Antarctic blue whales will be a valuable contribution to the photo-ID database, which requires more photographs to reach a sufficient number for estimating abundance. Photo-ID data are also useful in examining movement patterns within the Antarctic region and the wider Southern Hemisphere. In order to submit your photos to the Antarctic Blue Whale Project please contact Elanor Bell, SORP Secretariat (Elanor.Bell@aad.gov.au), or Paula Olson, ABWP Technical Committee for



Individual Identification (Paula.Olson@noaa.gov), or Mike Double, the ABWP lead (Mike.Double@aad.gov.au).

Finally, a reminder that these are guidelines, there is no requirement to adhere strictly to these protocols as long as quality photographs and associated data (date, position, linked biopsy records, etc.) are obtained and recorded accurately.

REFERENCES

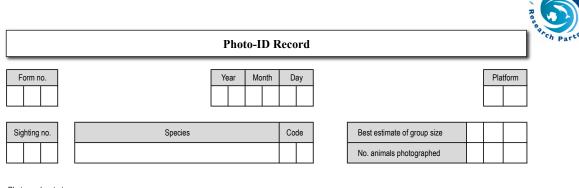
- Bell, E. M. (compiler). 2014. Annual Report of the Southern Ocean Research Partnership (IWC-SORP) 2013/2014. IWC SC/65b/SH12.
- Branch, T.A. 2007. Abundance of Antarctic blue whales south of 60°S from three complete circumpolar sets of surveys. *Journal of Cetacean Research and Management* 9:87–96.
- Double, M.C., Barlow, J., Miller, B.S., Olson, P., Andrews-Goff, V., Leaper, R., Ensor, P., Kelly, N., Wadley, V., Lindsay, M., Peel, D., Calderan, S., Collins, K., Davidson, M., Deacon, C., Donnelly, D., Olavarria, C., Owen, K., Rekdahl, M., Schmitt, N., and Gales, N. 2013. Cruise report of the 2013 Antarctic blue whale voyage of the Southern Ocean Research Partnership. IWC SC/65a/SH21.
- Galletti-Vernazzani, B. and Olson, P. 2013. Progress on the Southern Hemisphere Blue Whale Catalogue. IWC SC/65a/SH23.
- Gendron, D. and Ugalde De La Cruz, A. 2012. A new classification method to simplify blue whale photo-identification technique. *Journal of Cetacean Research and Management* 12(1): 79-84.
- Olson, P.A. 2012. Antarctic blue whale photo-identification catalogue summary. IWC SC/64/SH8.
- Olson, P.A., Ensor, P., Schmitt, N., Olavarria, C., and Double, M.C. 2013. Photo-identification of Antarctic blue whales during the SORP Antarctic Blue Whale Voyage 2013. IWC SC/65a/SH11.

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APPENDIX A



		2013 Antarctic Bl	Blue Whale Voyage - Photo-ID F	Record
	Form no.	1	Year Month Day 1 3 0 2 1 4	Platform S ++
	Sighting no.	Species UE WHALE		estimate of group size CO Z animals photographed CO Z
	Photography start: Latitude Degrees Minutes NS	1.1.11=	EW E	Effort Hour Minutes Start J 9 4 2 Finish Z O 3 O
	Photographer Start		Whale Biopsy field ID Annual Sample number	Notes
	K0W002	9007 2 R	- 4 10013	Back New
	PA0045 PA0048	90482R 30499R	AY Stuck dart AY 13-W13013	no sample Zwhales, hippsied closer whale to camera
	PA0050 PA0050 PA0052	00506R 70521T 20524S	BN - BN -	tail slaps
÷				BIDDSY DUPLICATE WITH BWI3014
	2 ,			
	Subject L=left side; R=right side Comments and Sketches Swept Wark five	I D#13	pple body views; G=group of animals; S=spacer; Platfi triangula	orm: SH=ship; SB=small boat; Attempt: YN ar fin B ID±1327
	5	dark,	13014	<u></u>
	*Sam	e whale as	RONLY	RONLY
		ting #217		



Photography start:																
	L	.atituc	le					Longitude								
Deg	rees		Mi	nutes			N/S	Deg	grees		Minutes					
							S									

Effort	Но	ur	Minutes					
Start								
Finish								

			Frames Sub-											Biopsy	
Pho	tograp	oher	Start			Finish je			ject	field	I ID	Attempt	Sample number	Notes	
										_					
										_					
										_					
										_					

Subject: L=left side; R=right side; H=head; T=tail; V=various or mulitple body views; G=group of animals; S=spacer;

Platform: SH=ship; SB=small boat; Attempt: Y/N Comments and Sketches:

12

APPENDIX C



O								r by bic			as BW1				
۵	COMMENTS		dart stuck	back view	stuck dart	duplicate biopsy as		tail slaps, but NOT by bio			duplicate biopsy as BW1				
0	PLATFORM	SH	SH	SH	SH	SH	SH	SH	SH	SH	SH	SH	SB	SH	SH
z	SUBJECT BIOPSY NO. PHOTOGRAPHER PLATFORM	KOM	KOM	KOM	PAO	PAO	PAO	PAO	PAO	PAO	PAO	PAO	NTS	NTS	PAO
M	BIOPSY NO.	×	×	BW13013	stuck dart	BW13013	×	×	×	×	BW13014	×	×	×	×
٦	SUBJECT	>	>	>	œ	œ	œ	-	S	>	œ	S	>	>	>
×	FRAME END	13BW20130214KOM_0068	13BW20130214KOM_0072	13BW20130214KOM_0080	13BW20130214PAO_0482	13BW20130214PAO_0499	13BW20130214PAO_0506	13BW20130214PAO_0521	13BW20130214PAO_0524	13BW20130214PAO_0572	13BW20130214PAO_0593	13BW20130214PAO_0596	13BW20130215NTS_0188	13BW20130220NTS_0148	13BW20130220PAO_0078
_	FRAME START	13BW20130214KOM_0001	13BW20130214KOM_0069	13BW20130214KOM_0073	13BW20130214PAO_0459	13BW20130214PAO_0483	13BW20130214PAO_0500	13BW20130214PAO_0507	13BW20130214PAO_0522	13BW20130214PAO_0525	13BW20130214PAO_0573	13BW20130214PAO_0594	13BW20130215NTS_0001	13BW20130220NTS_0001	13BW20130220PAO_0001
_	SPECIES	B. musculus	B. musculus	B. musculus	B. musculus	B. musculus	B. musculus	B. musculus	M. novaeangliae	B. musculus	B. musculus				
Ξ	E/W	ш	ш	ш	ш	ш	ш	ш	ш	ш	ш	ш	ш	ш	ш
ی	LONGITUDE	149.25	149.25	149.25	149.25	149.25	149.25	149.25	149.25	146.71	146.71	146.71	150.77	168.13	168.13
ш	N/S	S	s	s	s	S	S	S	s	S	s	s	s	s	S
ш	LATITUDE	62.01	62.01	62.01	62.01	62.01	62.01	62.01	62.01	62.26	62.26	62.26	64.76	64.53	64.53
Q	SIGHT. NO. LATITUDE	215	215	215	215	215	215	215	215	217	217	217	237	288	288
U	DAY	14	14	14	14	14	14	14	14	14	14	14	15	20	20
8	MONTH	02	02	02	05	05	05	02	05	02	02	02	02	02	05
A	YEAR	2013	2013	2013	2013	2013	2013	2013	2013	2013	2013	2013	2013	2013	2013