

## **Results of a comparison of humpback whale catalogues from the west coast of South Africa (B2) and the East African Mainland (C1).**

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### **INTRODUCTION**

The degree of exchange by individual humpback whales (*Megaptera novaeangliae*) between inter-oceanic breeding grounds of the southeast Atlantic (Breeding Stock B) and the southwest Indian Ocean (Breeding Stock C) is known only through a single published genetic match between Gabon on the west coast (sub-regional breeding stock B1) and Madagascar on the east coast of Africa (sub-regional Breeding Stock C3) (Pomilla and Rosenbaum, 2005). Furthermore, a number of microsatellite matches have been recorded between B1 and B2 (Carvalho et al. 2009).

Humpback whale tail fluke photographs contained in two separate electronic catalogues from sub-regional Breeding Stocks (BS) B2 and C1, were compared to seek for evidence of exchange between these two regions.

### **METHODS**

#### **West South Africa (Breeding Stock B2)**

This catalogue contained scanned film (1983-2004) and digital images (2004-2008) of tail flukes collected from multiple sources: Two dedicated humpback whale studies conducted at Cape Columbine (1993) and Saldanha Bay (2001-2003); and incidental sightings during other cetacean research work and routine multi-disciplinary scientific cruises (1983-2008). This is described in detail in Barendse *et al.* (2010).

#### **Breeding Stock C1 – Independent catalogue\***

This catalogue contained digital images of tail flukes collected from three data collection localities, and all data were pooled into one catalogue. One site was located on the south coast of South Africa (SC - see Cerchio et al., 2008) during

2005-2008: Knysna/Plettenberg Bay (34°S-23°E) and two sites were located in Southern Mozambique (MS - see Cerchio et al, 2008): Bazaruto Archipelago (21°S-35°E) during 2007 and Ponta Mamoli (26°S-32°E) during 2009. The first site sampled the migration stream (see Best and Ross, 1996), while the northern and southern Mozambique sites sampled the central Mozambique breeding ground, and the southern Mozambique breeding ground / northern migration corridor respectively (Findlay et al. 1994; Findlay and Best, 1996). Images were taken from dedicated small-boat surveys and commercial whale-watching vessels over sampling seasons as shown in Table 1. Whales were mostly photographed using a hand held Canon 350D or 40D with a 70-300 mm lens.

\* This catalogue is independent of a larger 'East African Mainland' catalogue held by Oceans and Coasts (formerly MCM), Department of Environmental Affairs, Cape Town, South Africa.

### **Photographic comparison Procedure**

Largely following the procedure and format described in Minton et al. (2010), images (digital and scanned) from west South Africa were catalogued into a Microsoft *Access* database. Images from the East African mainland were catalogued using Apple Mac *Aperture* image cataloguing software. Both catalogues underwent separate intra-regional, within-year and between-year comparisons, selecting the best quality image for each individual. Each image was assigned a 'Fluke Type' number based on fluke pigmentation patterns, on a 1-5, all-white to all-black scale (as described by Minton et al. (2010)). Each image was also assigned a rating for photographic quality, orientation of subject and individual distinctiveness based on a 5-point scale: Not Useable, Poor, Fair, Good and Excellent,

Images within the west coast of South Africa (B2) catalogue were then compared to the independent C1 catalogue on two computer screens, utilising a screen loupe on each screen to aid the inspection of finer detail within the images. Initially, each image in the first catalogue was compared to all images of the same Fluke Type category in the second catalogue. If no matches were found, it was then compared to all images in adjacent Fluke Type categories (so that a Fluke Type 4 image was compared to Types 4, 3 and 5 in the second catalogue). The number of identified individuals by tail fluke images for each year held in the independent C1 catalogue and west South Africa catalogue is shown in Table 1 and 2 respectively. Images of all photographic qualities were used in the comparison but a filter for photographic quality was applied (Table 1) so that 'Poor' and 'Not Usable' images could be excluded from future mark-recapture analyses. All approaches to whales in South African waters were done under a permit issued to the Centre for Dolphin Studies by Oceans and Coast (formerly Marine and Coastal Management), reference number V1/1/5/1.

### **RESULTS**

A total of 311 tail fluke images (all quality grades) representing 303 individually identified whales from C1 were compared to 510 images (161 individuals) from BS B2. No tail fluke matches were found between the west coast South Africa (B2) and East Africa Mainland (C1).

### **DISCUSSION**

The lack of any tail fluke matches between west South Africa (B2) and the migration stream and breeding ground of the east African mainland (C1) suggests that exchange between the two regions is low. However, before further conclusions are drawn on the rates of exchange between these two inter-oceanic regions, it is recommended that a reconciliation of this C1 catalogue and a larger 'East African Mainland' (C1) catalogue held by Oceans and Coast (formerly Marine and Coastal Management) of the South African Department of Environmental Affairs be carried out; and that this reconciled east African mainland catalogue be compared to the catalogue of west South Africa (B2).

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Table 1. Independent C1 tail fluke catalogue showing the number of individuals identified by tail flukes in each year before and after filtering for photographic quality (excluding poor and not useable images).

<b>East African Mainland</b>	2005	2006	2007	2008	2009
Knysna/Plett (SC)	Nov-Dec	Jul-Dec	Jan-Feb Jun-Dec	Jun-Dec	No obs
all	4	54	27	75	
quality filtered	4	42	24	74	
Bazaruto (MS)	No obs	No obs	Jul-Nov	No obs	No obs
all			109		
quality filtered			104		
Ponta Mamoli (MS)	No obs	No obs	No obs	No obs	Aug-Oct
all					42
quality filtered					40

Table 2 . West South Africa B2 tail fluke catalogue showing the number of individuals identified in each year before and after filtering for photographic quality (excluding poor and not useable images).

B2	Year																	
	83	84	88	89	90	92	93	97	99	00	01	02	03	04	05	06	07	08
All	2	2	3	1	3	2	7	1	3	2	33	37	27	20	15	24	12	1
QF	1	1	2	0	1	1	6	1	0	1	15	17	16	11	12	18	10	1