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## Report on the 2016 Mammal Research Institute Whale Unit Southern Right Whale Survey, Natures Valley To Lamberts Bay, South Africa

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### **Report on the 2016 Mammal Research Institute Whale Unit** Southern Right Whale Survey, Nature's Valley To Lambert's Bay, South Africa

Ken Findlay<sup>1,2</sup>, Meredith Thornton<sup>3,4</sup>, Christopher Wilkinson<sup>1</sup>, Els Vermeulen<sup>1,3</sup> and Sandra Hoerbst<sup>4</sup>

<sup>1</sup>Mammal Research Institute Whale Unit, University of Pretoria. [c/o 16 Ebor Rd, Wynberg, Cape Town, South Africa]

<sup>2</sup>Cape Peninsula University of Technology, Zonnebloem, Cape Town South Africa

<sup>3</sup>Mammal Research Institute, University of Pretoria, Pretoria, South Africa

<sup>4</sup>Dyer Island Conservation Trust, Geelbek St, Van Dyks Bay, 7220, South Africa

Findlayk@cput.ac.za

#### ABSTRACT

The South African southern right whale population has been monitored through annual aerial surveys across the Southern Cape coast since the early 1970's, and from 1979 onwards these annual surveys have incorporated identification using photography of natural markings resulting in an uninterrupted 38-year survey series. The planned 2016 survey was flown over the period 28 September 2016 to 5 October 2016 and westwards coastwise between Nature's Valley and Muizenberg. The survey was carried out in an Airbus EC120 helicopter as opposed to the Bell Jet Ranger helicopters used in previous years. A total of 21 hours and 15 minutes of flight operations was required to complete the survey, including 15 hours and 35 minutes of search effort and 3 hours and 33 minutes in transit to and from the survey start and end points. The general progress of the survey was extremely rapid compared to previous years, mainly due to the extremely low encountered abundance of southern right whales. Given such a paucity of encounters the survey was extended to Lambert's Bay on the west coast of South Africa on 10 October. Totals of 54 groups of 55 cow-calf pairs of southern right whales (110 animals) and eight groups of nine unaccompanied adult southern right whales were encountered during the survey. Marked declines of both the cow-calf and unaccompanied adult groups have been recorded in recent years with unaccompanied adult encounters declining since 2009 and cow-calf encounters declining from 2015. Whilst the decline in the unaccompanied adults since 2009 was originally thought to reflect movement of animals to the westward outside of the survey area, particularly to the west coast of South Africa, the paucity of sightings off the west coast this year suggest this is not the case. The fifty-five cow-calf groups encountered this year is the lowest sighting density over the last twenty-five years of survey and approximately thirty percent of the expected total based on surveys up until 2014. The reason for this decline remains speculative, but could reflect one of the two following scenarios.

A temporal inter-annual shift in the 2015 and 2016 calving cohorts. The expected 2016 cohort may have extended their calving interval so that they calve in the 2017 cycle. Such an single year extension would not explain the decline in the 2015 encounters, as this scenario would require a lack of condition of resting females (precluding oestrus) in both 2014 and 2015.

A spatial shift in calving in 2015 and 2016. However, no large concentrations of such animals have been reported from elsewhere on the southern African coast during the 2016 survey period.

There is currently no evidence to suggest any marked decline in the adult population. At this stage, it is impossible to accurately speculate on any long-term changes to the population demographics and it is consequently imperative that the survey series continue so that the temporo-spatial components of the recent observed declines can be monitored and investigated.

KEYWORDS: SOUTHERN RIGHT WHALE, SOUTH AFRICA, 2016 AERIAL SURVEY

#### **INTRODUCTION**

Historic open-boat whaling from the late 18th to the early 20th century and limited modern whaling in the early 20th century decimated southern right whales (Eubalaena australis) across their global range of 16 identified whaling grounds in the Southern Hemisphere. Called right whales as they were a relatively easy target species for whalers (importantly they floated when dead), the global population was reduced from some 70,000 animals in 1770 to approximately 400 animals by 1920 prior to protection in 1935. Despite this protection from 1935, illegal Soviet catches continued until the 1960's. Southern right whales now congregate on three major calving and nursery grounds (in the coastal waters of Argentina, South Africa and Australia) during the late austral winter and spring each year. Whilst the local South African population primarily occupies calving and nursery grounds in the nearshore waters of the Southern Cape coast at this time of year, whaling data identifies that right whales were historically breeding around the Southern African coast from Walvis Bay (Namibia) to Delagoa (Maputo) Bay and Sofala (Mozambique) (Richards and du Pasquier, 1989). Historic catches and contemporary satellite tagging surveys have furthermore identified three loose feeding grounds across i) a band across the south-eastern Atlantic Ocean (Townsend, 1935), ii) a broad diffuse area of the Southern Ocean south of the subtropical convergence (Tormosov et al., 1998), and iii) a near-shore region off the west coast of South Africa (Barendse and Best, 2014), and although satellite tags have identified movements from the southern Cape coast to the west coast and Southern Ocean thereafter, the inter-relationships of the breeding and feeding grounds remain largely unresolved.

Populations in the primary calving and nursery grounds have made strong recoveries since the early 1970's and by 2009 the global population was estimated at some 13,600 individuals (IWC, 2013) with the Cape population of South Africa comprising the largest breeding stock at over 30% of the total (IWC, 2013). This local population has been monitored through annual aerial surveys across the Southern Cape coast since the early 1970's, and from 1979 onwards these annual surveys have incorporated identification using photography of natural markings (Best, 1981, Best, 1990; Best et al., 2001, Best 2011) in early to mid-October each year, as whales are individually recognisable from natural markings (mainly the pattern of cyamid infested callosities on the head but also through skin pigmentation patterns found on the back of some animals in the population (Payne et al. 1983)). All observed nursing females (hereafter cow-calf pairs) are photographed each year for identification purposes and all brindle animals have been similarly identified since 2005. This now 38-year series of individual photo-identification surveys comprises one of the longest continuous data sets of individual sighting histories for any living marine mammal population and provides estimates of a number of demographic parameters (Best et al., 2001) including the trend in population size of cow-calf pairs (at a steady 7% a year from 1979 to 2011 (Brandão et al., 2011)). In addition to the increase observed in the cow-calf pairs across the survey region, the numbers of animals without calves (hereafter "unaccompanied adults") showed similar increases until 2009. However thereafter the abundance of the unaccompanied adults declined markedly, from about 250-430 each year on the 2006-2008 surveys to 15-125 on the 2010-2015 surveys, possibly as a result of a westward shift of animals outside of the survey area.

The database of photo-identified individuals and the sighting histories of female whales allows for vital demographic parameters of the population to be modelled and estimated (including for example, calving intervals, female survival rates and age at first parturition) (Best *et al.*, 2001; Best *et al.*, 2005). Such modelling of life histories has shown that immigration is not required to account for the annual instantaneous growth rate of the population of around 7% (which is close to the maximum biologically possible for the species breeding on a three-year calving cycle. Furthermore, the introduction of an individual-based model (Butterworth *et al.*, 2011) to these data has the potential for the examination of annual variations in calving success in relation to environmental and climate variation.

#### STANDARD SURVEY METHODS AND PROCEDURES

The annual helicopter-based photographic-identification surveys of southern right whales is carried out across the southern Cape coast of South Africa (from Nature's Valley to Muizenberg – for locations see Figure 1) in mid-October. The survey has in recent years generally taken some 40 hours to fly over a two-week period so as to maximise good weather sighting opportunities. These surveys have been carried out each year since 1979, so that the survey series now represents a 38-year series of individual photo-identification surveys across these nursery grounds. Operating procedures have been largely standardized over this survey-series although technological advances have been incorporated where necessary (for example, the introduction of digital photography and hand-held GPS units has greatly facilitated operations). The survey is flown coastwise and generally westwards (apart from the single day leg between Puntjie and Nature's Valley which in some years is flown eastwards from Puntjie) at an altitude of 330 m and a ground speed of 100 kts under adequate sighting

survey and photography conditions. The surveying is generally carried out between 08h00 to 16h00 each day as glare compromises photography earlier and later in the day, and surveying continues the following day from the point reached at the end of the day. In the past, the surveys have been flown in Bell Jet Ranger helicopters some 500-800 m offshore with one observer searching offshore from the port forward seat of the helicopter, while a second searches inshore from the starboard rear of the aircraft (with assistance from the pilot on the starboard forward seat). In previous years, this configuration has meant photographing northwards against the sun resulting in considerable glare especially from midday onwards often resulting in extended hover times or difficult photography towards the rear of the helicopter.

All observed cetacean groups are recorded, including group size and composition, and time and position. If photography of southern right whales is required the helicopter descends to 150 m, and the callosity patterns and pigmentation features of all cow-calf pairs and brindle animals are photographed by the rear observer from the altitude of 150 m using a Canon 7D EOS camera with a 100-400 mm lens. Once photography is complete the aircraft returns to 330 m and resumes survey searching or moves directly to the next group at 150 m. A support vehicle accompanies the aerial survey, allowing for daily provisioning and self-catering of the survey team, transport of equipment and luggage, and, most importantly rotation of observers during each day's survey if needed.

This year the availability of a port-side piloting option in an Airbus EC120 helicopter meant that the photographer could be positioned on the port side of the aircraft behind the pilot and photograph in a southerly and easterly direction when the helicopter hovered, thus limiting glare. In between encounters the photographer could shift over to the starboard side of the helicopter and assist with spotting in a shoreward direction. The use of the Airbus EC120 helicopter also allowed for greater hovering capabilities over the Jet Ranger used in previous years, and therefore limited the circling over the animals. The survey was flown no more than 500m from the shore at a search speed of 60 knots.

#### **RESULTS OF THE 2016 SURVEY**

The planned 2016 survey was flown over the period 28 September 2016 to 5 October 2016 and westwards coastwise between Nature's Valley and Muizenberg. The helicopter and survey team were positioned at Witsand to commence the survey on 29 September but helicopter maintenance required surveying to be delayed until 1 October. Table 1 shows that the general progress of the survey was extremely rapid compared to previous years, mainly due to the extremely low encountered abundance of whales.

The region from Nature's Valley to the west of St Sebastian Bay was surveyed on 1 October. The De Hoop to Rhyspunt coastline was surveyed on 4 October and the remainder standard survey area (the coastal stretch from De Hoop to Muizenberg) was flown on 5 October. Thereafter, given the low flight times and the paucity of encounters, a decision was made to extend the survey to Lambert's Bay. This extension leg was flown on 10 October. Tables 1 and 2 provide an overview of the overall survey progress and Figure 1 shows the flight path including the distribution of surveyed search effort. A total of 21 hours and 15 minutes of flight operations was required to complete the survey, including 15 hours and 35 minutes of search effort and 3 hours and 33 minutes in transit to and from the survey start and end points (Figure 1 and Tables 1 and 2). The extremely low flight times reflect the fact that encounter densities of right whales during the survey were extremely low.

Flight	Date	Flight Start	Flight End	Total Time	Survey start	Survey end	Search Time	Transit Time
1	28 September 2016	Waterfront	Witsand	01:20				
2	01 October 2016	Witsand	George	00:47	Transit (no survey)			
3	01 October 2016	George	George	01:58	Natures Valley	George Coast	01:15	00:43
4	01 October 2016	George	Witsand	03:18	George Coast	Uiterstepunt	03:06	00:12
5	04 October 2016	Witsand	De Hoop	02:15	Uiterstepunt	Rhyspunt	01:54	00:21
6	05 October 2016	De Hoop	Gansbaai	03:14	Rhyspunt	De Kelders	02:52	00:22
7	05 October 2016	Gansbaai	Muizenberg	02:48	De Kelders	Muizenberg	02:30	00:18
				15:40			11:37	01:56

Table 1. The general progress of the survey from Nature's Valley to Muizenberg, 28 September to 5 October.

Table 2. The general progress of the survey from Muizenberg to Lambert's Bay, 10 October.

Flight	Date	Flight Start	Flight End	Total	SE Locality	TD Locality	Search	Transit
				Time			Time	Time
8	10 October 2016	Waterfront	Waterfront	01:11	Muizenberg	Waterfront	00:58	00:13
9	10 October 2016	Waterfront	Saldanha	01:36	Waterfront	Saldanha	01:27	00:09
10	10 October 2016	Saldanha	Lamberts Bay	01:45	Saldanha	Lamberts Bay	01:33	00:12
11	10 October 2016	Lamberts Bay	Waterfront	01:03	Transit		00:00	01:03
				05:35			03:58	01:37



Figure 1. Distribution of search effort (SE - dark blue) and transit flights (TR - light blue) and encounters of bottlenose dolphins (BD), adult humpback whales (HB AD), unaccompanied southern right whales (SRW AD) southern right whale cow and calves (SRW CC), humpback dolphins (HBD) and Bryde's whales (BW) during the 2016 South African southern right whale survey between Nature's Valley and Lambert's Bay.



Figure 2. Distribution of encounters of bottlenose dolphins (BD), adult humpback whales (HB AD), unaccompanied southern right whales (SRW AD) and southern right whale cow and calves (SRW CC) during the 2016 South African southern right whale survey between Nature's Valley and Cape Point. The one sighting of humpback dolphins in Plettenberg Bay is not shown.

![](_page_7_Figure_0.jpeg)

Figure 3. Distribution of encounters of bottlenose dolphins (BD), adult humpback whales (HB AD), unaccompanied southern right whales (SRW AD) and southern right whale cow and calves (SRW CC) during the 2016 South African southern right whale survey between Cape Point and Lambert's Bay.

	Southern Right	Southern Right	Humpback Whales	Humpback Whales	Bryde's Whales	Bottlenose Dolphins	Humpback Dolphins
	Whales	Whales					
	Cow-calf	Unacc.	Cow-calf	Unacc. Adults	Cow-calf		
	pairs	Adults	pairs		pairs		
Groups	54	8	0	5	2	1	1
	110						2
Individuals	(55 pairs)	9	0	210	3	1	

Table 3. Numbers of groups and individual cetaceans encountered during the 2016 South African southern right whale survey between Nature's Valley and Lambert's Bay.

Table 3 shows the cetacean groups encountered in adequate or above adequate sighting conditions across the Nature's Valley to Lamberts Bay survey region. Totals of 54 groups of 55 cow-calf pairs of southern right whales (110 animals) and eight groups of nine unaccompanied adult southern right whales were encountered during the survey (Figures 2, and 3 and Table 3). Some 3196 images were exposed during the survey including between-group spacer images. Five sightings of 210 adult humpback whales (*Megaptera novaeangliae*) were encountered on the Cape Town to Lambert's Bay leg of the survey (Figure 3 and Table 2), one of which was a supergroup estimated at 200 individuals (see Findlay *et al.* 2017). One cow-calf group and one single Bryde's whales (*Balaenoptera brydei/edeni*) were encountered at 34.45°S; 19.32°E and 34.40°S; 18.87°E respectively. One bottlenose dolphin (probably *Tursiops aduncus*) was sighted in False Bay (Figure 3 and Table 2). A single mother-calf group of humpback dolphins (*Sousa plumbea*) was encountered in Plettenberg Bay.

#### DISCUSSION

Marked declines in field encounters of southern right whales have been observed in this survey series over the last five years. These declines are not believed to result from any changes to the standardised survey methodology or differences in sighting conditions over the survey series.

Field counts of cow-calf pairs encountered on the annual South African southern right whale survey since 1990 are shown in Figure 4. Clearly evident within this Figure is the strong increase in the encounters of cow-calf groups each year up until 2014 and unaccompanied adults up until 2009, presumably in response to protection from whaling early in the 20th century. This growth in the population is well documented at approximately 7% per annum (Best, 1990; Best *et al.* 2005; Brandão *et al.* 2011, 2013).

![](_page_9_Figure_0.jpeg)

Figure 4. Numbers of groups of cow-calf pairs and unaccompanied adults encountered on the South African southern right whale survey each year since 1990.

Figure 4 also shows marked declines in encounters of both the cow-calf and unaccompanied adults in recent years with unaccompanied adult encounters declining since 2009 and cow-calf encounters declining in 2015. Whilst the decline in the unaccompanied adults since 2009 was originally thought to reflect movement of animals westwards outside of the survey area, particularly to the west coast of South Africa, the paucity of sightings off the west coast this year suggest this is not the case, and no large concentrations of such animals have been reported from elsewhere on the southern African coast. These extremely low numbers of unaccompanied adults encountered both in 2015 (15) and this year (9) are of further concern as this component of the population forms the basis of the whale watching industry in this region (regulations prohibit approaches to cow-calf pairs). Reduced densities of unaccompanied adults means that whale watch operations in all likelihood have increased their approaches on cow-calf pairs. A large section of the Study Area is closed to boat-based whale watching (the De Hoop coast and St Sebastian Bay) and aggregations in this region may have been expected if whale watch pressure had influenced the distributions of animals.

Of greater concern is the decline in cow-calf pairs over the last two years. The fifty-five cow-calf groups encountered this year is the lowest sighting density over the last twenty-five years of survey and approximately thirty percent of the expected total based on surveys up until 2014. The reason for this decline remains speculative, but could reflect one of the following two scenarios:

A temporal inter-annual shift in the 2015 and 2016 calving cohorts. Southern right whale cows generally exhibit a strong three-year calving interval with a year's gestation, a year's nursing followed by a year's rest. Four and even five-year calving intervals have been recorded (although not at the scale that would be required to account for this decline) presumably reflecting the condition of the cow prior to oestrus. The expected 2016 cohort may have extended their calving interval so that they calve in the 2017 cycle, although such an extension would not explain the decline in the 2015 encounters, as the observed decline would require a lack of condition of resting females in both 2014 and 2015. Furthermore, as South African right whales appear to feed across three major feeding grounds in summer (a band across the south-eastern Atlantic Ocean (Townsend, 1935), a broad diffuse area of the Southern Ocean south of the subtropical convergence (Tormosov *et al.*, 1998), and a near-shore region off the west coast of South Africa (Barendse and Best, 2014)) the very low calving incidence in 2016 would presumably require poor conditioning of

females visiting each of these feeding grounds in early 2015. No increased incidences of poor condition or skinny whales have been recorded recently off the South African coast and no marked increase in incidences of calf strandings have been recorded in recent years (as proxy for nutritional stress of calves resulting from poor adult condition).

A spatial shift in calving in 2015 and 2016. The reports of the 2015 survey speculated that the low encounters of cow-calf numbers at this time reflected a possible distributional shift of the calving females to the west and outside of the primary Nature's Valley to Muizenberg survey area. The extension of the 2016 survey along the west coast of South Africa as far north as Lambert's Bay shows this not to be the case. Furthermore, no marked changes in distribution towards Namibia or Mozambique (to the extent that would be required to explain these declines) have been identified through canvassing of cetacean scientists or whale watch operators in these areas. No aggregation towards the off-limit whale watch region (De Hoop and St Sebastian Bay) has been observed and no other acute anthropogenic stressors (that could cause marked distribution shifts) have been identified.

There is currently no evidence to suggest any marked decline in the adult population, although mortality at the southern open ocean migratory termini would be difficult to determine. At this stage, it is impossible to accurately speculate on any long-term changes to the population demographics and it is consequently imperative that the survey series continue so that the temporo-spatial components of the recent observed declines can be monitored and investigated.

#### RECOMMENDATIONS

Continuation of the survey series is considered imperative so as to monitor and investigate the marked recent changes in the winter migration seasonality and distribution of the South African right whale population off the Cape coast.

The results shown here reflect field counts only. There is an immediate need for a post-doctoral level appointment for continued analyses of the data arising from these surveys and updating of the automated matching system and improved data archiving. The analyses will need training in the Hiby-Lovell automated identification matching system and experience in database management and coding (Hiby and Lovell, 2001). It is recommended that this appointment be carried out with some urgency so that proposals can be developed for continuation of this work within immediate RFP timeframes.

Investigations of the summer distribution of the population through visual surveys would be extremely difficult and costly to undertake, given the wide-ranging feeding grounds and the particularly inclement weather conditions associated with these regions in the Southern Atlantic Ocean and Southern Ocean. It is recommended that further satellite tagging of individuals during their winter migrations be carried out to provide evidence of the summer feeding distributions (see Mate *et al.* 2011), so that a greater understanding of the recent changes in the winter migration seasonality and distribution can be generated.

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