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Report of the South African southern right whale aerial surveys 2023

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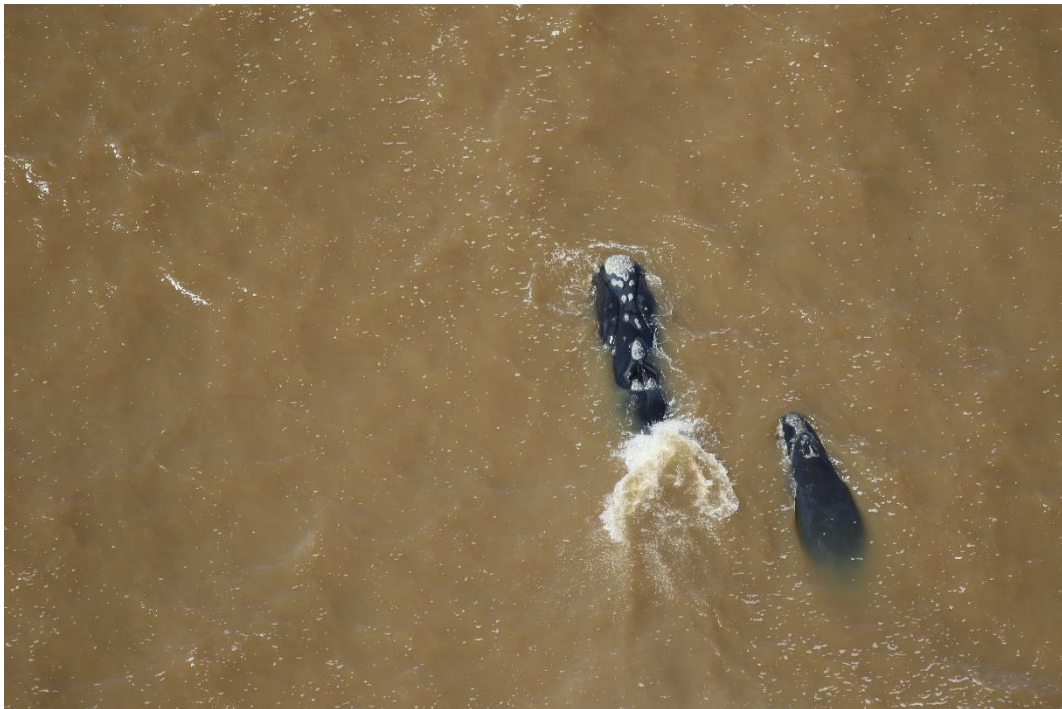
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Report of the South African southern right whale aerial surveys

-
2023



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Abstract

Monitoring the recovery of the South African southern right whale (*Eubalaena australis*) population has been ongoing since 1969 with yearly aerial surveys. These surveys have included a photo-identification element since 1979, providing a continuous dataset spanning 44 years. Over this period, there has been a consistent increase in population size following the cessation of commercial whaling. However, since 2010 there has been a notable decrease in unaccompanied adult sightings, an extension of the typical 3-year reproductive cycle to 4 or 5 years since the same year, and a considerable variation in the number of cow-calf pairs along the South African coastline since 2015.

The 2023 annual photo-identification aerial survey, covering the area between Nature's Valley to Muizenberg, was flown between 27th September and 3rd October 2023 in a westward direction, with the aim to count all southern right whales and photograph all nursing females as well as individuals with a brindle or grey blaze colouration. A total of 38 hours and 12 minutes were flown in an Airbus AS350 BA helicopter, chartered by Silvercross Helicopters, to complete the survey. Of these, 31 hours and 39 minutes were flown as search effort, and 6 hours and 23 minutes were flown in transit to and from the survey start and endpoints.

The results of the survey revealed a total of 568 cow-calf pairs of southern right whales, totalling 1,136 individuals, marking a historic high in observed cow-calf pairs along the South African coastline. Additionally, 40 unaccompanied adult whales were sighted, indicating a persistent trend of low numbers in this category. Photo-identification analyses of the obtained photographs is still ongoing.

Before the annual helicopter survey, one aerial count survey was conducted, with the sole purpose of counting cow-calf pairs. This survey was flown in an eastward direction on 28 August 2023 using an autogyro. Results of this survey indicated the presence of 556 cow-calf pairs and 24 unaccompanied adults in the coastal area between Hermanus New Harbour and Witsand (covering the main nursery grounds).

The continued enormous fluctuations in the coastal prevalence of cow-calf pairs and the continued low presence of unaccompanied adults reiterate the extreme value of this long-term dataset.

Introduction

Since 1969, the South African population of southern right whales (*Eubalaena australis*) has been subject to systematic monitoring via annual aerial surveys aimed at evaluating their demographic trends subsequent to the cessation of commercial whaling activities. Commencing in 1979, these yearly aerial surveys have integrated the technique of photo-identification, as documented by Best (1981; 1990), and Best et al. (2001; 2011), whereby individual whales are distinguished by their unique callosity patterns on the head and/or distinctive skin pigmentation patterns such as brindle colouration, grey blaze, and white patches (Payne et al. 1983). Throughout these surveys, particular emphasis is placed on identifying all nursing females and their accompanying calves (referred to as cow-calf pairs), alongside individuals exhibiting distinctive features like brindle, white blaze, or partial grey colouration.

This continuous dataset, spanning 44 years, comprising individual sighting histories, serves as a foundational resource for the modelling and estimation of vital demographic parameters within the southern right whale population, as outlined by Best et al. (2001; 2005).

Over the past decade, observations derived from this extensive longitudinal dataset reveal notable shifts within the southern right whale population, encompassing: (a) a marked reduction in sightings of unaccompanied adult whales along the South African coastline since 2009, (b) pronounced fluctuations in the abundance of cow-calf pairs since 2015 as documented by Findlay et al. (2017), (c) a discernible elongation of calving intervals, transitioning from the traditional 3-year cycle to 4- and 5-year intervals as reported by Vermeulen et al. (2018) and Brandão et al. (2018), (d) an apparent alteration in the timing of peak cow-calf pair presence in South African breeding areas, shifting from early October to late August or early September according to Vermeulen et al. (2018), and (e) a marginal decline in the population growth rate, decreasing from 7.1% annually in 2001 as documented by Best et al. (2001), to 6.8% in 2011, 6.6% in 2012, and further to 6.5% per annum as indicated by Brandão et al. (2023).

Collectively, these findings underscore the necessity for comprehensive and detailed analyses, highlighting the critical importance of sustaining long-term monitoring efforts of southern right whales within the calving habitats of the southern Cape region.

This report provides the results of the 2023 southern right whale aerial surveys.

Methods and Procedures

Annual photo-identification aerial survey

The annual helicopter-based photo-identification survey of southern right whales is conducted along the southern Cape coast of South Africa from Nature's Valley to Muizenberg (for locations see Figure 3) at the end of September - early October, a time when it is believed most calves are present along the coast (i.e. most calves have been born and have not yet left on their annual migration south). Operating procedures have been largely standardised over this 40+ -year survey-series (although technological advances have been incorporated where necessary). The survey is flown coastwise and westwards at an altitude of 330 m and a ground speed of 80-100 kts under adequate sighting and photographic conditions. The survey is generally conducted between 08h00 to 16h00 each day as glare compromises photography earlier and later in the day. The survey continues the following day from the point reached at the end of the previous day. In the past years, the surveys have been flown with an Airbus AS350 BA helicopter (see figure 1) some 800 m offshore, with two observers searching from the starboard forward and rear seat, while a second observer searches offshore from the rear port seat (with assistance from the pilot on the port forward seat). Should glare interfere with sighting conditions, then the flight path would shift temporarily over the shore, with the pilot and rear observer searching seawards to increase sightability (see Figure 1). A support vehicle accompanies the aerial survey, allowing for daily provisioning of the survey team, transport of equipment and luggage, and, most importantly, rotation of observers during each day's survey if needed.



Figure 1. Picture of the Airbus AS350 BA helicopter in Cape Town International Airport (picture courtesy of Silvercross Helicopters).

All observed cetacean groups are recorded, including group size and composition, as well as time and position. If photography of southern right whales is required, the helicopter descends to an altitude of 150 m. The callosity patterns and pigmentation features of all cow and calf pairs and animals with distinct colouration patterns are photographed by the rear observer using a Canon 7DII EOS camera with a 100-400 mm lens. Once photography is complete the aircraft returns to an altitude of 330 m and resumes searching or moves directly to the next sighted group at an altitude of 150 m.

Aerial count survey

To examine the general increase of cow-calf pairs along the southern Cape coast during whale season (June to December), an additional aerial survey was carried out between Hermanus New Harbour and Witsand (for locations see Figure 3) using a light-weight autogyro (or gyrocopter; Figure 2). Due to the configuration of an autogyro, the sole purpose of this survey was to count southern right whale females associated with calves as accurately as possible.



Figure 2. Image of the autogyro used for the count survey

As in previous years, the coastline between Hermanus New Harbour and Witsand was surveyed to cover two of the main nursery grounds of the southern Cape coast, i.e., De Hoop Nature Reserve and Walker Bay (Elwen and Best, 2004).

The survey is flown in an eastward direction between 08h00 and 14h00 at an altitude of approximately 300 m, a speed of approximately 60 kts and 500 m offshore. During the survey, the pilot would mainly search ahead and coastwise, while the observer in the back would search offshore. Intercom communication between the pilot and the observer allows for the observer to make notes of the cow-calf pairs counted both inshore and offshore. When whales were too far offshore to determine group composition, they would be approached after which the aircraft would return to approximately 500 m offshore. If the presence of a calf could not be determined with certainty, the observed whale would be recorded as unaccompanied, and the survey would continue. Each survey would take no longer than approximately 3 hours in a continuous flight, limiting the likelihood of duplicates within the count.

Results

Annual photo-identification aerial survey

The 2023 annual photo-identification aerial survey was flown along the coast between 27th September and the 3rd October in a westward direction between Nature's Valley and Muizenberg. The helicopter and survey team were positioned at Witsand on the 28th of September. The region between Nature's Valley and Blombosstrand was surveyed on 27th September. Blombosstrand to Infanta point was surveyed on 28th September, Infanta Point to Sipskop on 29th September, Sipskop to Agulhas on 1st October, Agulhas to Danger Point on 2 October and Danger point to Muizenberg on 3rd October.

A total of 38 hours and 12 minutes of flight operations were required to complete the survey, of which 31 hours and 39 minutes were flown as search effort, and 6 hours and 23 minutes were flown in transit to and from the survey start and endpoints. Table 1 shows the general progress of the survey. Figure 3 shows the flight path including the distribution of the different sightings. Figures 4, 5 and 6 provide additional detail to the sightings.

Table 1: Flight schedule of the 2023 annual southern right whale aerial survey flown between Nature's Valley and Muizenberg.

Flight	Date	Flight Start	Flight End	Total Time	Survey start	Survey end	Search Time	Transit Time	CC SRW	Un Ad SRW
1	26/09/2023	CT Int	Hermanus	00:30				00:30		
2	26/09/2023	Hermanus	Witsand	00:47				00:47		
3	27/09/2023	Witsand	Mosselbay	00:46				00:46		
4	27/09/2023	Mosselbay	George	02:29	Natures Valley	George coast	01:34	00:55	10	2
5	27/09/2023	George	Witsand	02:53	George coast	Blombosstrand	02:39	00:14	27	9
6	28/09/2023	Witsand	Witsand	02:40	Blombosstrand	Duiwenhoks	02:24	00:16	36	0
7	28/09/2023	Witsand	Witsand	01:23	Duiwenhoks	Infanta point	01:15	00:08	10	0
8	29/09/2023	Witsand	De Hoop	02:17	Infanta point	Koppie Alleen	02:07	00:10	42	0
9	29/09/2023	De Hoop	De Hoop	02:54	Koppie Alleen	De Hoop coast	02:46	00:08	58	3
10	29/09/2023	De Hoop	De Hoop	01:32	De Hoop coast	Skipskop	01:23	00:09	29	2
11	01/10/2023	De Hoop	De Hoop	01:41	Skipskop	Arniston	01:27	00:14	23	
12	01/10/2023	De Hoop	De Hoop	02:50	Arniston	Struisbaai coast	02:23	00:27	43	4
13	01/10/2023	De Hoop	De Hoop	02:06	Struisbaai coast	Agulhas	01:31	00:35	40	
14	02/10/2023	De Hoop	Strandveld	02:49	Agulhas	Aasfontein	02:29	00:20	43	0
15	02/10/2023	Strandveld	Pearly beach	02:31	Aasfontein	Pearly beach	02:23	00:08	55	4
16	02/10/2023	Pearly beach	Grootbos	01:14	Pearly beach	Danger Point	01:04	00:10	22	0
17	03/10/2023	Grootbos	Grootbos	01:31	Danger Point	De Kelders	01:21	00:10	28	1
18	03/10/2023	Grootbos	Hermanus	03:00	De Kelders	Klein river mouth	02:53	00:07	80	7
19	03/10/2023	Hermanus	Kleinmond	01:27	Klein river mouth	Kleinmond	01:20	00:07	22	6
20	03/10/2023	Kleinmond	Kleinmond	00:02				00:02		
21	03/10/2023	Kleinmond	CT Int	00:50	Kleinmond	Muizenberg	00:40	00:10	0	2
TOTAL				38:12:00			31:39:00	6:23:00	568	40

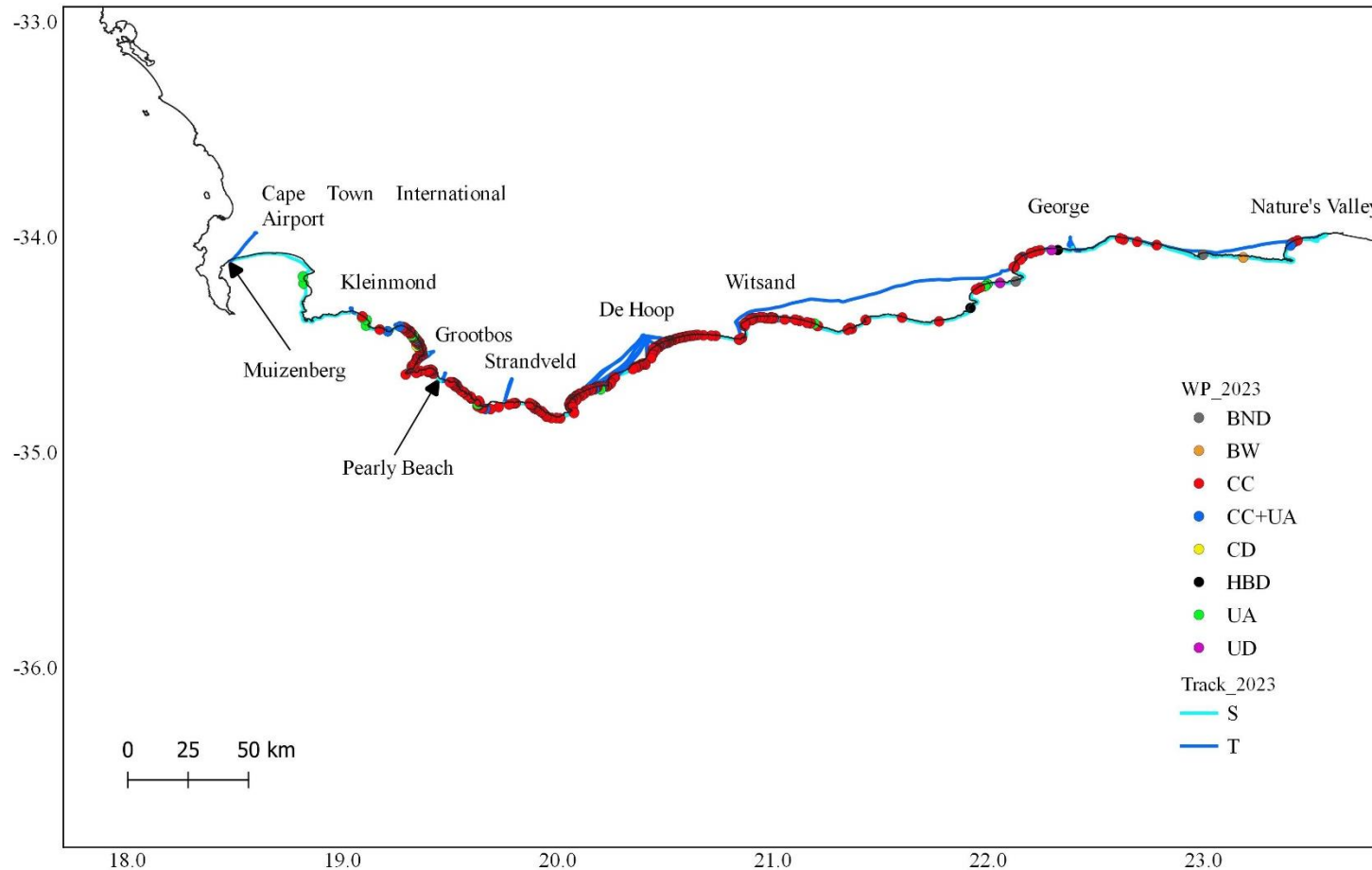


Figure 3. Flight path with search effort (light blue line) and transit (dark blue line), as well as encounters of bottlenose dolphins (BND), Bryde’s whales (BW), southern right whale cow and calves (CC), groups including southern right whale cows, calves and unaccompanied adults (CC + UA), common dolphins (CD), Indian Ocean humpback dolphins (HBD), southern right whale unaccompanied adults (UA) and unidentified dolphins (UD) during the 2023 South African southern right whale survey between Nature’s Valley and Muizenberg.

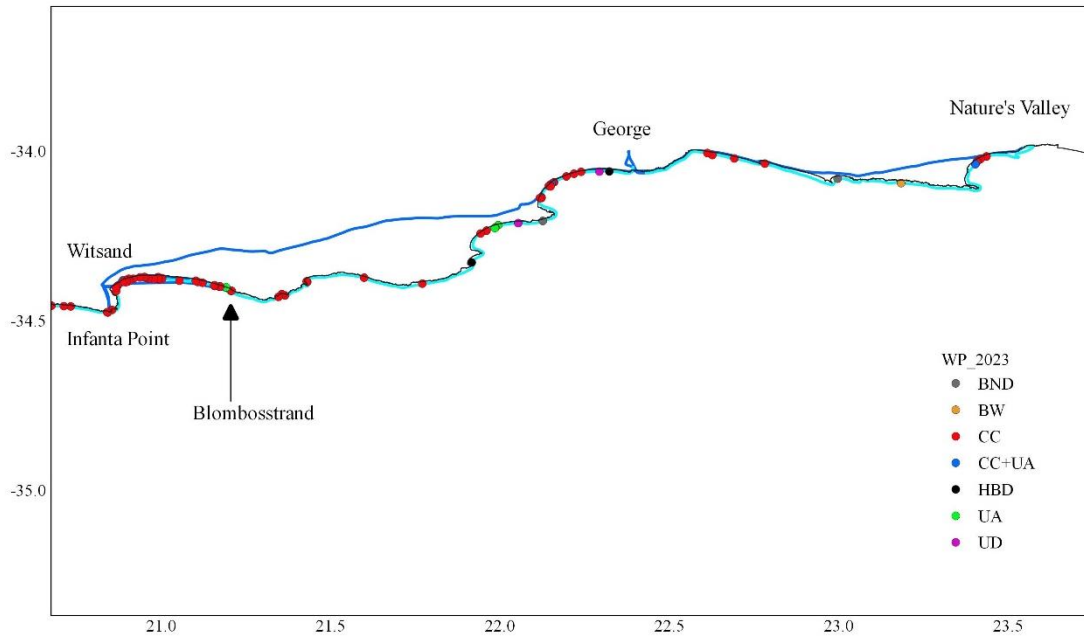


Figure 4. Flight path with search effort (light blue line) and transit (dark blue line), as well as encounters of bottlenose dolphins (BND), Bryde’s whales (BW), southern right whale cow and calves (CC), groups including southern right whale cows, calves and unaccompanied adults (CC + UA), humpback dolphins (HBD), unaccompanied southern right whales (UA) and unidentified dolphins (UD) during the 2023 South African southern right whale survey between Nature’s Valley and Witsand.

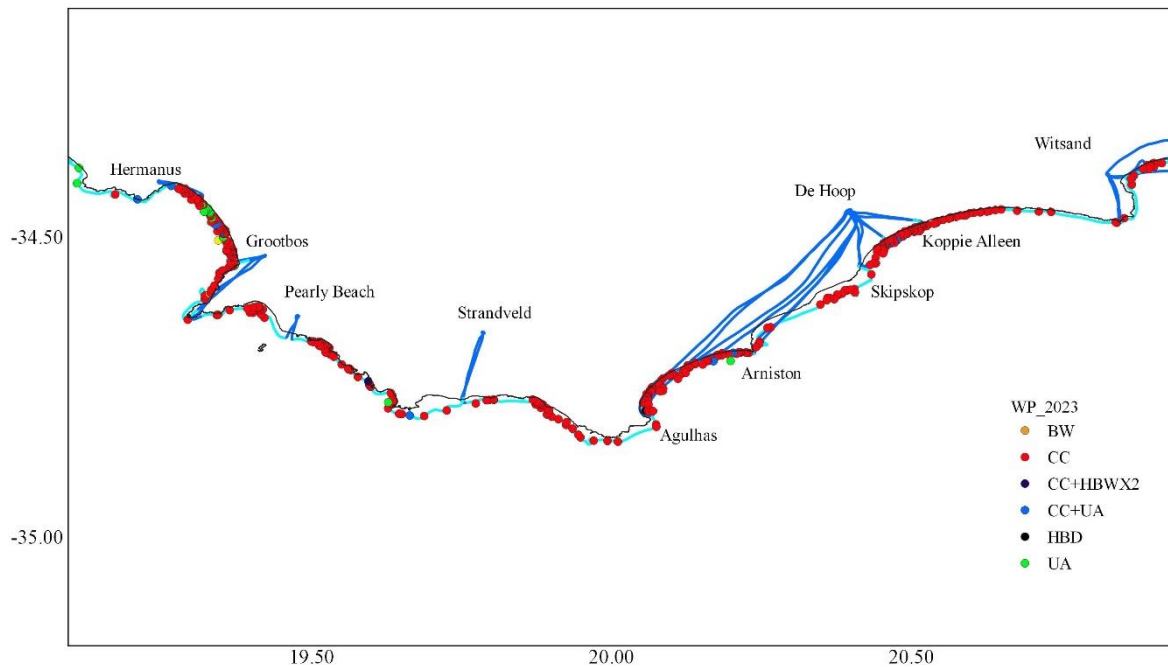


Figure 5. Flight path with search effort (light blue line) and transit (dark blue line), as well as encounters of southern right whale cow and calves (CC), groups including southern right whale cows, calves and humpback whales (CC + HBWX2), groups including southern right whale cows, calves and unaccompanied adults (CC + UA), humpback dolphins (HBD) and

unaccompanied southern right whales (UA), during the 2023 South African southern right whale survey between Witsand and Hermanus New Harbour.

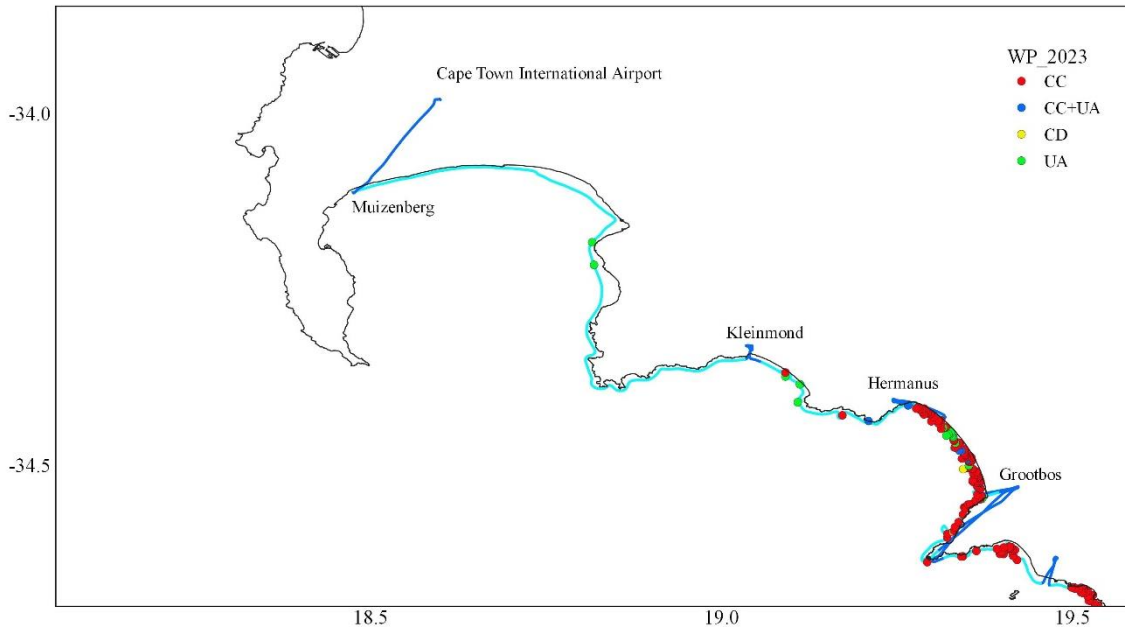


Figure 6. Flight path with search effort (light blue line) and transit (dark blue line), as well as encounters of southern right whale cow and calves (CC), groups including southern right whale cows, calves and unaccompanied adults (CC + UA), common dolphins (CD) and unaccompanied adults (UA), during the 2023 South African southern right whale survey between Hermanus New Harbour and Muizenberg.

Table 2 shows the cetacean groups encountered in adequate sighting conditions across the entire survey region (Nature’s Valley to Muizenberg). In total 568 cow and calf pairs of southern right whales (1,136 animals) in 462 groups, as well as 33 groups equalling 40 unaccompanied adult southern right whales, were encountered during the survey. Over 10,000 photographs of southern right whales were taken during the survey including between-group spacer images. Furthermore, 2 humpback whales (*Megaptera novaeangliae*) were encountered, as well as 2 groups Bryde’s whales (*Balaenoptera edeni brydei*), 4 groups of 15 Indian Ocean humpback dolphins (*Sousa plumbea*), 2 groups of some 200 bottlenose dolphins (probably *Tursiops aduncus*) and 2 groups totalling some 500 common dolphins (*Delphinus delphis*) and up to 13 unidentified dolphins were encountered (Figure 3, 4, 5, 6 and Table 2).

Table 2. Numbers of groups and individual cetaceans encountered during the 2023 South African southern right whale survey between Nature’s Valley and Muizenberg.

	Southern right whales	Southern right whales	Humpback whales	Bryde’s whales	Indian Ocean humpback dolphins	Bottlenose dolphins	Unidentified dolphins	Common dolphin
	Cow-calf pairs	Unacc. Adults						
Groups	462	33	1	2	4	2	2	2
Individuals	568	40	2	2	15	200	13	500

Field counts of cow-calf pairs and unaccompanied adult southern right whales encountered on the 2022 annual aerial survey are shown in figure 7 in relation to the field counts since 1979.

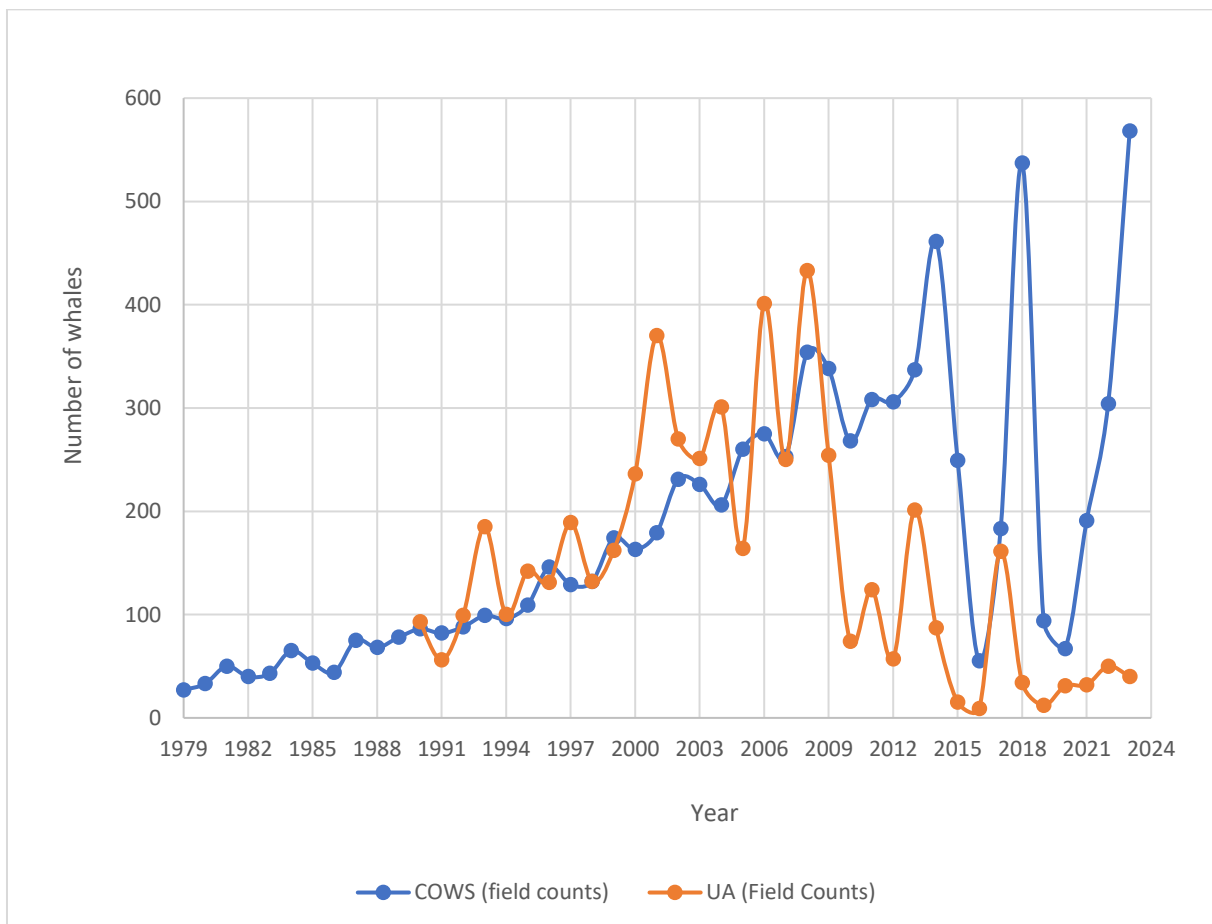


Figure 7. Numbers of southern right whale cow and calf pairs and unaccompanied adults counted on the South African southern right whale survey each year since 1979.

Aerial count survey

Due to financial limitations, one aerial count survey was conducted between the Hermanus New Harbour and Witsand in addition to the annual photo-identification aerial survey, for the sole purpose of counting cow-calf pairs. This survey was flown on 28th August 2023, during which 556 cow-calf pairs and 24 unaccompanied adults were counted. As can be seen in Figure 8, the largest concentration of cow-calf pairs was observed in the De Hoop Nature Reserve.

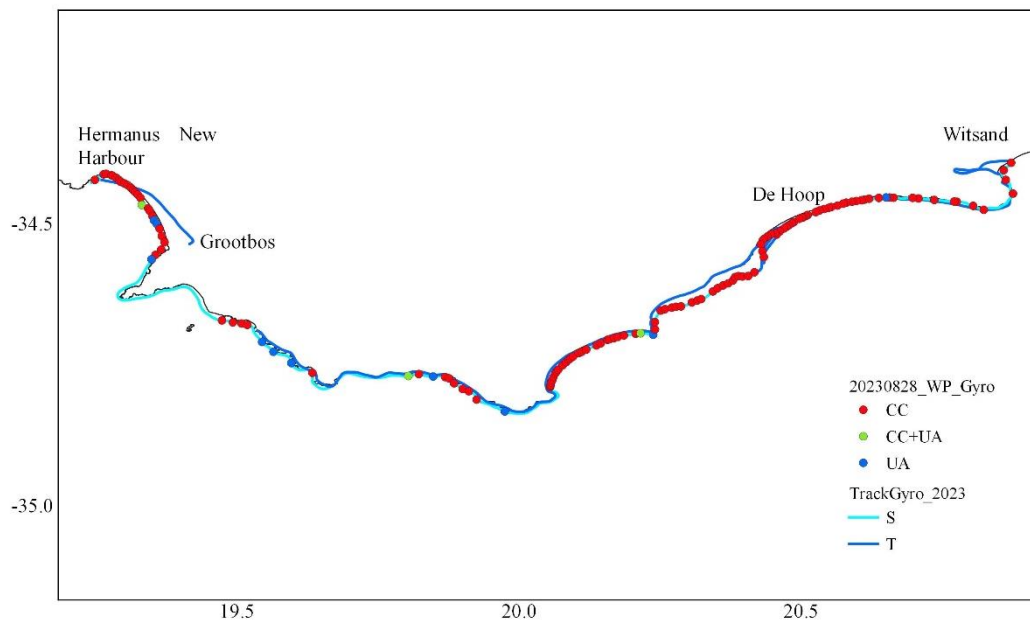


Figure 8. Map indicating the encounters of southern right whale cow-calf pairs along the stretch of coastline between Hermanus New Harbour and Witsand on 28 August 2023, as well as encounters of southern right whale cow-calf pairs (CC), groups including unaccompanied adults and cow-calf pairs (CC+UA) and unaccompanied adult southern right whales (UA).

Discussion

The 2023 annual aerial survey revealed a record-breaking number of cow-calf pairs, nearing the count of 537 pairs documented in 2018. However, this number might still include duplicates since photo-identification data hasn't been processed yet, delaying the comparison of absolute numbers. It's important to highlight that the 2023 survey faced exceptionally tough conditions, with heavy rainfall and subsequent floods leading to poor water clarity and visibility near river mouths. These adverse conditions slowed down search speeds, reducing them to 60 knots compared to the usual 80-100 knots in those areas. Regardless, this high count of cow-calf pairs comes 5 years after the previous high count (2018) and may reflect 5-year calving cycles in the reproductive females. Photo-identification analyses may or may not confirm such a notion. The continued extremely low presence of unaccompanied adults (males and non-calving females) indicates migration patterns of this class of individuals have not returned to levels seen before 2009.

Previously documented findings from annual aerial surveys and related research, including studies by van den Berg et al. (2021), Brandão et al. (2023), and Vermeulen et al. (2023a, 2023b), persistently highlight the susceptibility of the South African southern right whale population to broader-scale ecological shifts within their foraging habitats. These alterations evidently impinge upon the whales' energy acquisition mechanisms crucial for facilitating successful migration and reproductive processes. This is unsurprising, given the effects of climate change on the physical characteristics of the Southern Ocean, thereby instigating cascading alterations across various trophic levels within Antarctic marine ecosystems (Rogers et al., 2020).

The continuation of the survey series and an assessment of the resulting demographic parameters remain of crucial importance to monitor and investigate the observed changes in the South African southern right whale population, and its effects on population dynamics. This will entail not only a continuation of the annual photo-identification aerial surveys but also the continuation of the additional count surveys to monitor the timing of peak calving along the South African coast and additional photo-identification effort before the annual aerial survey. A continued in-depth assessment of the foraging ecology, migration, reproductive success, and body condition of this population is furthermore crucial, to gaining a better understanding of the observed changes in the population.

Furthermore, it's re-emphasized that the scarcity of unaccompanied adult southern right whales, which are essential for the South African Whale-Watching industry (where regulations forbid approaching cow-calf pairs within a distance of less than 300 meters), has significant implications for cow-calf pairs. Due to the lack of detailed data and a precautionary stance, it's strongly advised that the South African permitting authority and the South African Boat-based Whale-watching Association collaborate with researchers to effectively regulate activities involving this precious natural resource. This is particularly important given the probable limited energy reserves of the nursing cows.

Acknowledgements

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All surveys were carried out under a permit from the Department of Forestry, Fisheries and the Environment to approach whales and under specific Marine Protected Area permits from the relevant conservation authorities.

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