Report of the South African southern right whale aerial surveys

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Content

Abstract

Since 1969, the South African southern right whale (*Eubalaena australis*) population has been monitored through aerial surveys to document recovery from overexploitation. Photo-identification was added in 1979 with a consistent annual coverage of the area between Nature's Valley and Muizenberg, creating a 46-year dataset showing steady population growth. From this long-term dataset, concerning trends emerged from 2010, with decreased sightings of solitary adult whales and extended reproductive cycles from 3 to 4-5 years. Since 2015, significant fluctuations in cow-calf pairs along the South African coast indicate continued monitoring is needed to track demographic and behavioural trends.

In this report, we detail the 2025 annual photo-identification aerial survey. This survey was conducted from 30 September to 02 October covering the area from Nature's Valley to Muizenberg using an Airbus AS350 BA helicopter chartered from Silvercross Helicopters. Total flight time was 11 hours and 53 minutes, of which 10 hours and 1 minute were search effort. A total of 128 cow-calf pairs of southern right whales were counted and photographed, as well as 11 unaccompanied adult right whales. The photo-identification analysis is in progress.

For the 9th year in a row, a supplementary aerial count survey was conducted prior to the helicopter-based annual survey to count cow-calf pairs in the primary nursery grounds from Hermanus New Harbour to Witsand. On 6 September 2025, a total of 154 cow-calf pairs was counted within this region. A correlation analysis showed a strong relationship between cow-calf pairs counted on the annual aerial survey and this count survey, indicating these surveys provide a robust proxy for estimating the number of cow-calf pairs across the extended region from Nature's Valley to Muizenberg.

These ongoing surveys and resulting long-term dataset provide invaluable insightsinto the dynamics of this southern right whale population, , emphasising the need for continued research and observation efforts.

Introduction

The southern right whale (*Eubalaena australis*) population that calves off the coast of South Africa has been the focus of intensive scientific monitoring since 1969. Initiated following the cessation of commercial whaling, this long-term research program employs annual aerial surveys to assess demographic trends. In 1979, the methodology was enhanced through the integration of photo-identification techniques, and other technologies as time progressed, described in Best (1981; 1990; 2011), Best et al. (2001) and Vermeulen et al. (2025). This advancement enabled researchers to distinguish individual whales based on their unique callosity patterns and skin pigmentation features, including brindle coloration, grey blazes, and white patches (Payne et al., 1983). The surveys prioritise the identification of nursing females with calves (cow-calf pairs) and individuals exhibiting distinctive physical traits.

Spanning over 46 years, this comprehensive dataset has become a critical resource for modelling and estimating key demographic parameters of the southern right whale population (Best et al., 2001; 2005; Brandao et al., 2023). Over the past decade, survey results have indicated a decline in reproductive performance, evidenced by lengthening calving intervals and decreasing calving rates (Vermeulen et al., 2025). This trend has been particularly pronounced since 2010, coinciding with a marked reduction in the number of unaccompanied adults observed during annual aerial counts (Vermeulen et al., 2025).

Collectively, these findings underscore the irreplaceable value of long-term studies that track identifiable individuals, as such datasets are essential for quantifying the relationship between reproductive performance and ecological variables over meaningful temporal scales (Vermeulen et al., 2025). The continued monitoring effort is not only critical to provide insights into the current status of the population, but also serves as a foundational tool for understanding broader ecological dynamics affecting population recovery, and guiding conservation strategies.

This report provides the results of the 2025 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 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 westward along the coastat 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 one observer searching from the starboard forward and rear seats, 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, 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 fuel, equipment, and luggage, and, most importantly, rotation of observers and pilots during each day's survey if needed.

All observed cetacean groups are recorded, including group size and composition, as well as time and position. When photography of southern right whales is to be taken, the helicopter descends to an altitude of 150 m. The callosity patterns and pigmentation features of all cow-calf pairs and animals with distinct colouration patterns are photographed by the rear observer using a Canon 7D Mark II EOS camera with a 100-400 mm lens. Once photography is complete the aircraft returns to an altitude of 330 m to resume searching or moves directly to the next sighted group at an altitude of 150 m. For details of each year's survey effort and setup, see Vermeulen et al. (2025; Supplementary Materials)

Figure 1. Picture of the Airbus AS350 BA helicopter during the 2025 aerial survey.

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 using a light-weight autogyro (or gyrocopter; Figure 2). This survey area covers two of the main nursery grounds of the southern Cape coast, i.e., De Hoop Nature Reserve and Walker Bay (Elwen and Best, 2004). 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.

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, reducing the likelihood of duplicate counts.

Results

Annual photo-identification aerial survey

The 2025 annual photo-identification aerial survey took place between 29 September and 2 October. The survey team relocated to Witsand on 29 September and the region between Nature's Valley and Skipskop was surveyed on 30 September. On 1 October, the survey continued from Skipskop to Arniston Point after which the team was down for weather. On 2 October, the survey covered the area between Arniston Point and Muizenberg.

A total of 11 hours and 53 minutes of flight operations were required to complete the survey, of which 10 hours and 1 minute were flown as search effort, and 1 hour and 52 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 2025 annual southern right whale aerial survey flown between Nature's Valley and Muizenberg, including the number of observed cow-calf (CC SRW) pairs and unaccompanied adults (Un Ad SRW) per stretch of coastline surveyed.

Flight	Date	Flight Start	Flight End	Total Time	Survey start	Survey end	Search Time	Transit Time	CC SRW	Un Ad SRW
1	30/09/2025	George Airport	Mosselbay	01:59	Nature's Valley	Mosselbay	01:18	00:41	3	0
2	30/09/2025	Mosselbay	Witsand	01:06	Mosselbay	Witsand	00:59	00:07	3	2
3	30/09/2025	Witsand	De Hoop	02:17	Witsand	Skipskop	02:10	00:07	46	0
4	01/10/2025	De Hoop	De Hoop	00:06				00:06		
5	01/10/2025	De Hoop	De Hoop	00:42	Skipskop	Arniston point	00:24	00:18	4	0
6	02/10/2025	De Hoop	Grootbos	03:05	Arniston point	Kleinbaai harbour	02:50	00:15	42	3
7	02/10/2025	Grootbos	Hermanus Cape Nature	01:43	Kleinbaai harbour	Hermanus New Harbour	01:34	00:09	30	6
8	02/10/2025	Hermanus Cape Nature	Cape Town International	00:55	Hermanus New Harbour	Muizenberg	00:46	00:09	0	0
TOTAL				**11:53:00**			**10:01:00**	**1:52:00**	**128**	**11**

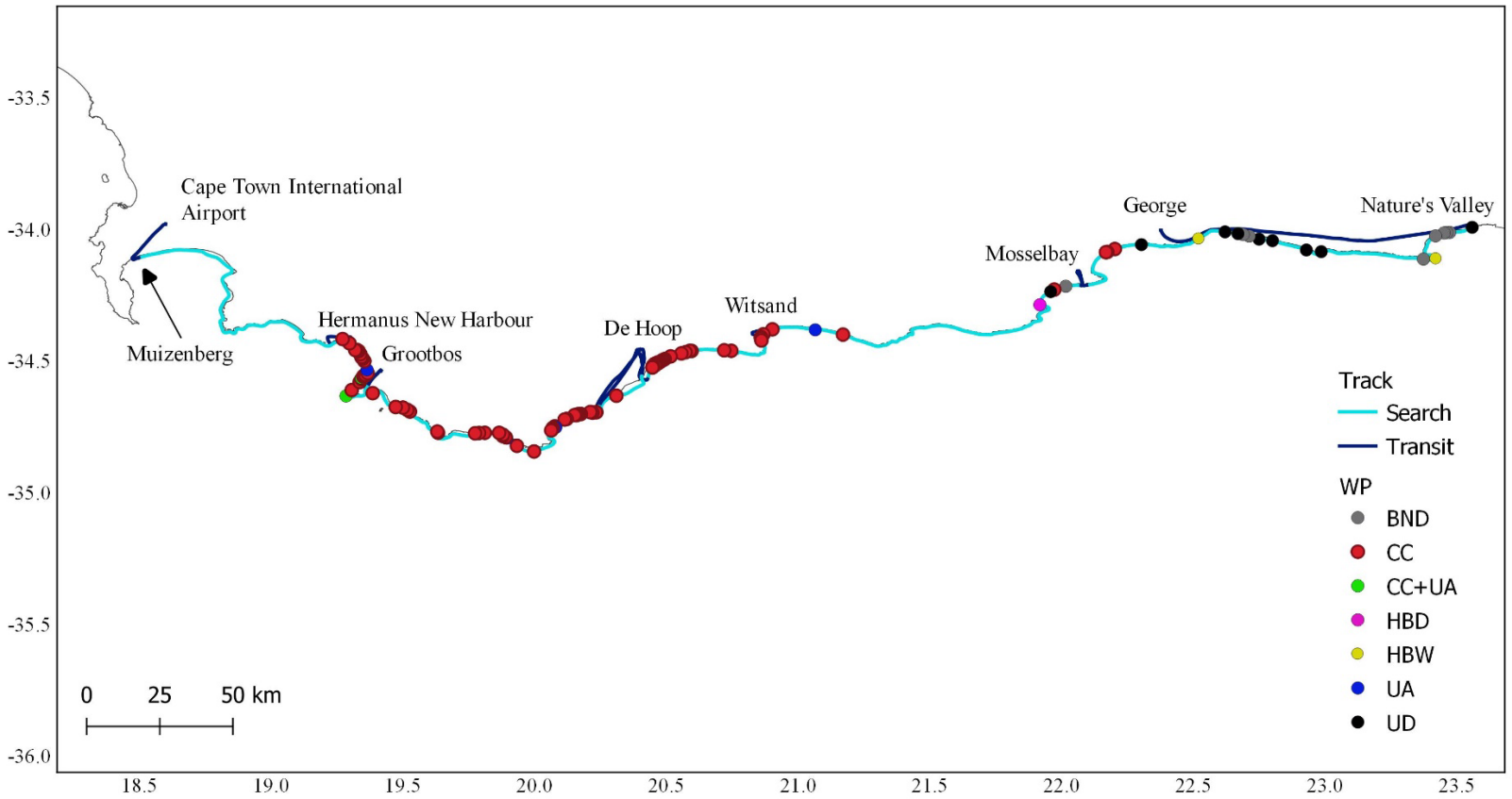

Figure 3. Flight path with search effort (light blue line) and transit (dark blue line), as well as encounters of Indo-Pacific bottlenose dolphins (BND), southern right whale cow and calves (CC), groups including southern right whale cows, calves and unaccompanied adults (CC + UA), Indian Ocean humpback dolphins (HBD), humpback whales (HBW), southern right whale unaccompanied adults (UA) and unidentified dolphins (UD) during the 2025 South African southern right whale survey between Nature's Valley and Muizenberg.

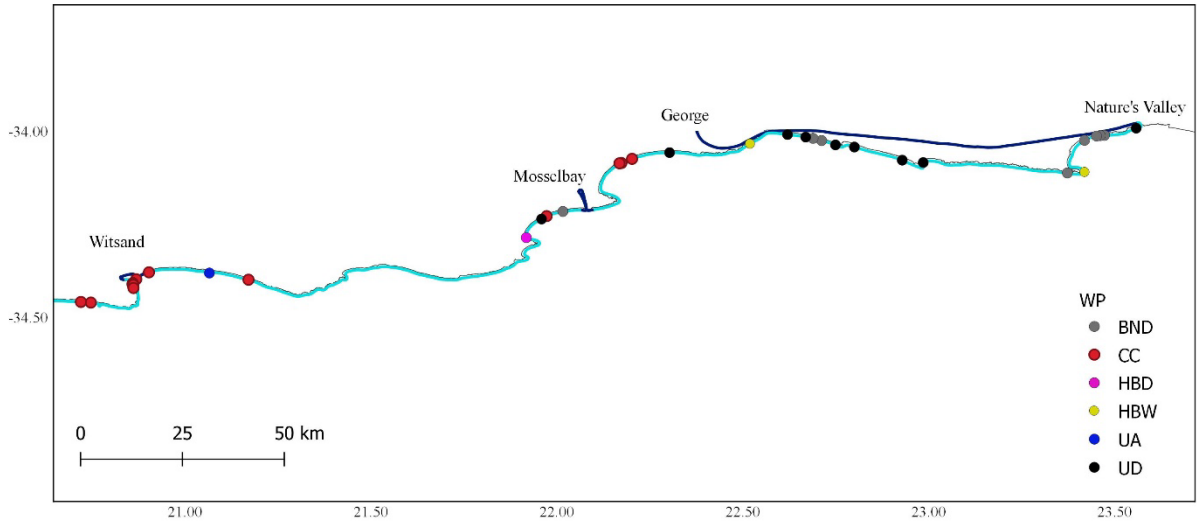

Figure 4. Flight path with search effort (light blue line) and transit (dark blue line), as well as encounters of Indo-Pacific bottlenose dolphins (BND), southern right whale cow and calves (CC), Indian Ocean humpback dolphins (HBD), humpback whales (HBW), unaccompanied southern right whales (UA) and unidentified dolphins (UD) during the 2025 South African southern right whale survey between Nature's Valley and Witsand.

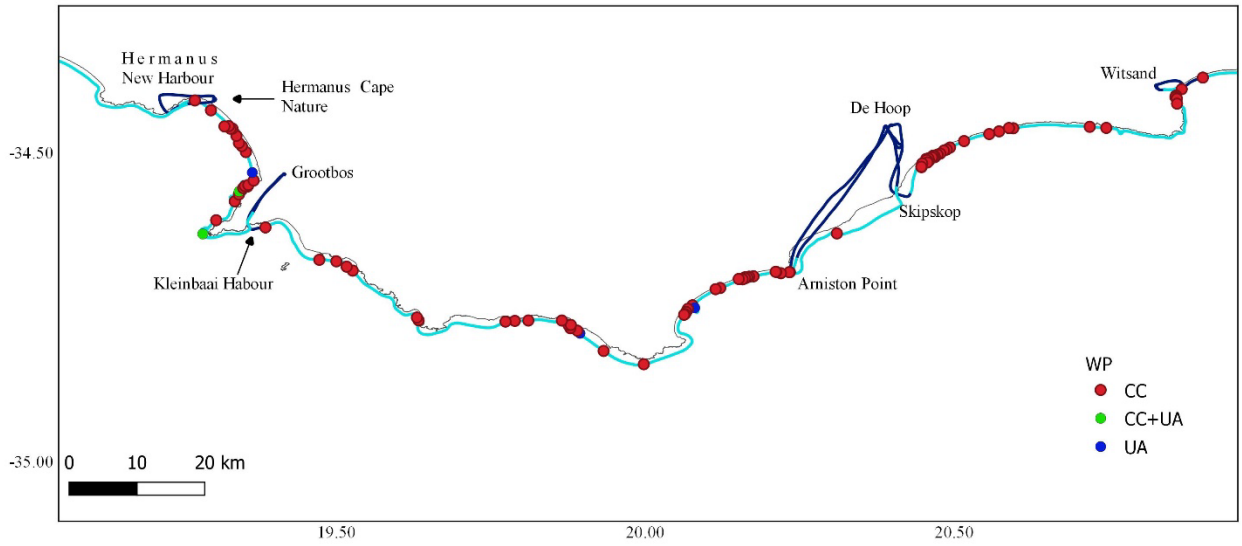

Figure 5. Flight path with search effort (light blue line) and transit (dark blue line), as well as encounters of southern right whale cow and calves (CC), groups including southern right whale cows, calves and unaccompanied adults (CC + UA) and unaccompanied southern right whales (UA), during the 2025 South African southern right whale survey between Witsand Hermanus New Harbour.

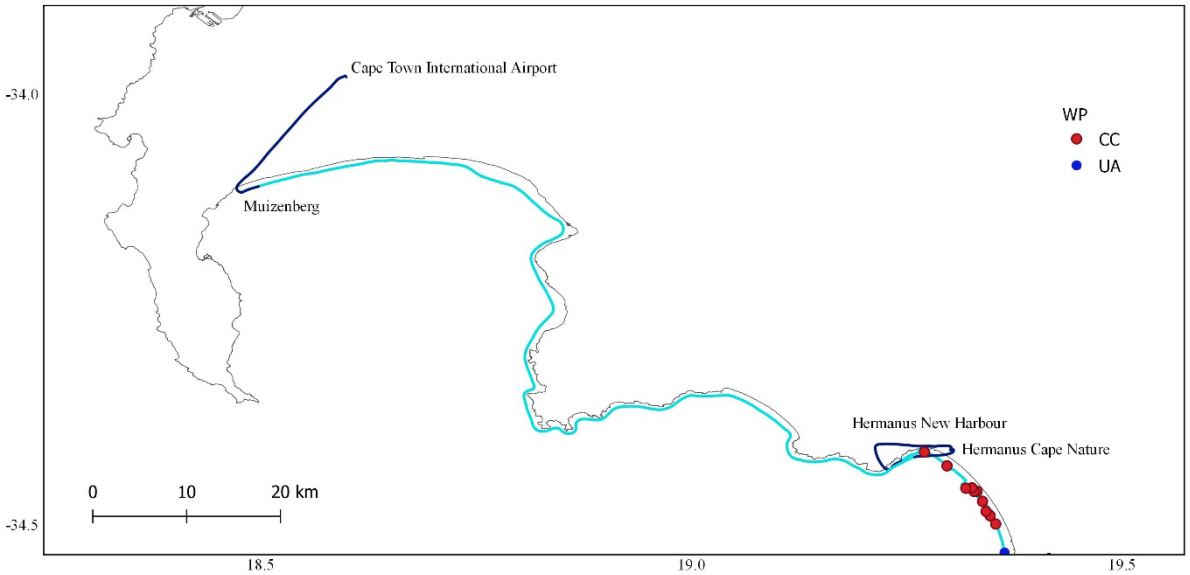

Figure 6. Flight path with search effort (light blue line) and transit (dark blue line), as well as encounters of southern right whale cow and calves (CC) and unaccompanied adults (UA), during the 2025 South African southern right whale survey between Hermanus and Muizenberg.

Table 2 shows the cetacean groups encountered in adequate sighting conditions across the entire survey region (Nature's Valley to Muizenberg). In total, 128 cow and calf pairs of southern right whales (256 animals) in 93 groups, as well as 6 groups comprising 11 unaccompanied adult southern right whales, were encountered during the survey. Over 6,000 photographs of southern right whales were taken during the survey, including between-group spacer images. Furthermore, 2 humpback whales (*Megaptera novaeangliae)* as well as a humpback whale cow-calf pair were encountered. This year, many groups of dolphins were spotted at the beginning of the survey, including 9 groups of approximately 175 unidentified dolphins, 8 groups totalling > 525 Indo-Pacific bottlenose dolphins (*Tursiops aduncus*), and 1 group of 2 Indian Ocean humpback dolphins (*Sousa plumbea)* (Figure 3, 4, 5, 6 and Table 2).

Table 2. Numbers of groups and individual cetaceans encountered during the 2025 South African southern right whale survey between Nature's Valley and Muizenberg.

Species	**Southern right whales**		**Humpback whales**	**Humpback whales**	**Unidentified dolphins**	**Bottlenose dolphins**	**Humpback dolphins**
Group composition	**Cow-calf pairs**	**Unacc. Ad**	**Cow-calf pairs**	**Unacc. Ad**			
Groups	93	6	1	2	9	8	1
Individuals	128	11	1	2	175	525	2

Field counts of cow-calf pairs and unaccompanied adult southern right whales encountered on the 2025 annual aerial survey are shown in Figure 7 in relation to the field counts since 1979.

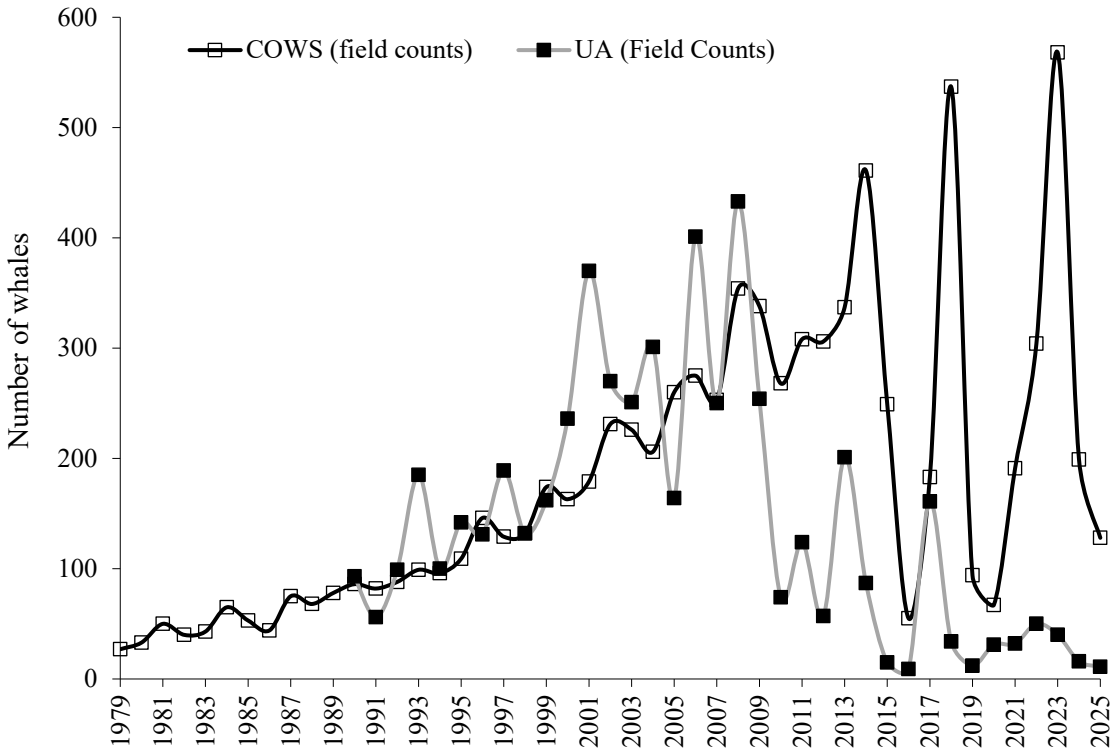

Figure 7. Numbers of southern right whale cow and calf pairs (CC) and unaccompanied adults (UA) counted on the South African southern right whale survey each year between 1979 and 2025.

Aerial count survey

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 6 September 2025 with a total of 2 hours and 20 minutes of search effort, during which 154 cow-calf pairs were counted. As can be seen in Figure 8, the largest concentration of cow-calf pairs was observed in Koppie Alleen, within the De Hoop Nature Reserve, followed by Struisbaai.

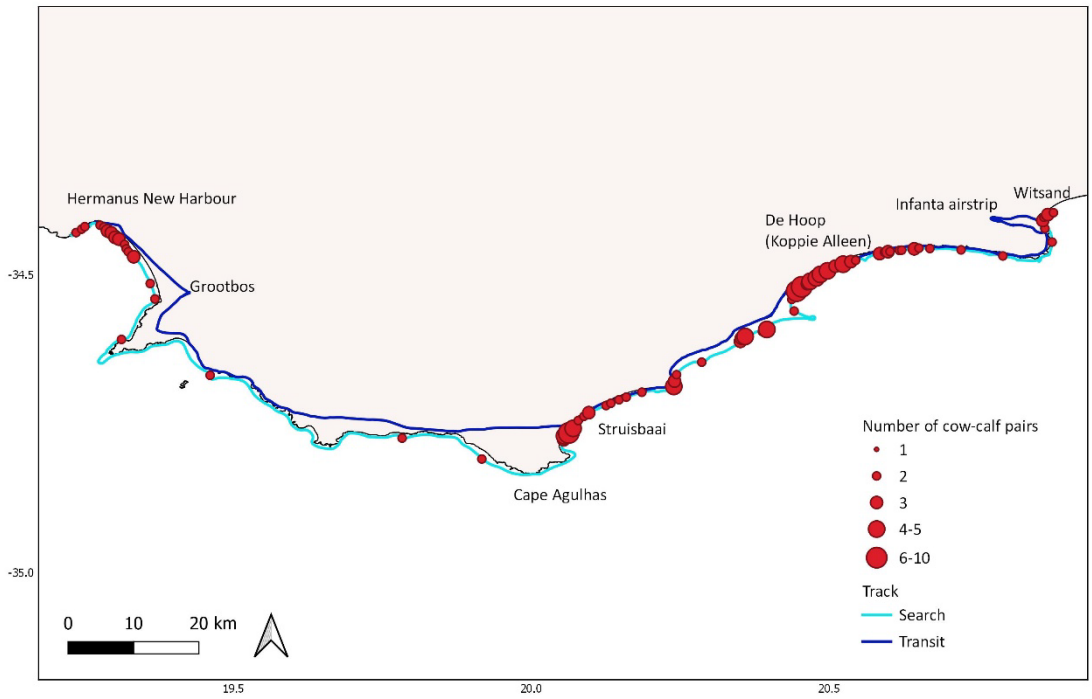

Figure 8. Map indicating the encounters of southern right whale cow-calf pairs along the stretch of coastline between Hermanus New Harbour and Witsand on 6 September 2025. Light blue track shows the search effort whereas the dark blue track shows transit.

The number of cow-calf pairs counted in this survey was similar to the number of cow-calf pairs counted in August 2021 (Figure 9) and clearly continues to provide an indication of the number of cow-calf pairs likely to be observedon the annual helicopter-based aerial survey flown between Nature's Valley and Muizenberg.

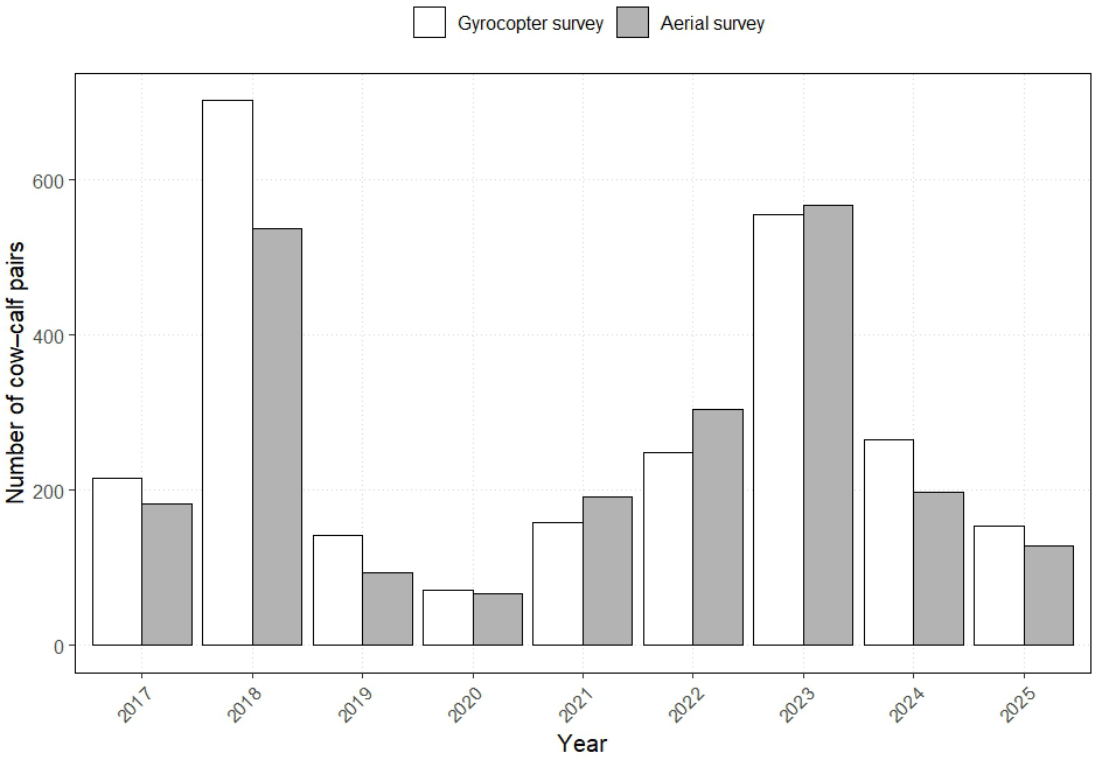

Figure 9. Number of southern right whale cow-calf pairs on the August gyrocopter survey (Hermanus – Witsand) compared to the October helicopter survey (Nature's Valley – Muizenberg).

To assess the relationship between whale counts across survey regions and methodologies, a correlation analysis compared data from the Gyrocopter survey (Hermanus–Witsand) and October aerial survey (Nature's Valley–Muizenberg) over 2017–2025. The analysis showed a strong positive correlation between datasets (Pearson's $r = 0.95$, $p < 0.001$), indicating that interannual fluctuations in whale abundance within the smaller area are closely mirrored by trends along the broader South African coastline. Linear regression analysis demonstrated that whale counts from helicopter surveys can be reliably predicted from gyrocopter flights ($R^2 = 0.91$, $F(1,7) = 71.6$, $p < 0.001$; Figure 10). Despite methodological limitations of the gyrocopter surveys, these data show that the count surveys provide a robust proxy for estimating overall cow–calf pairs across the extended region from Nature's Valley to Muizenberg.

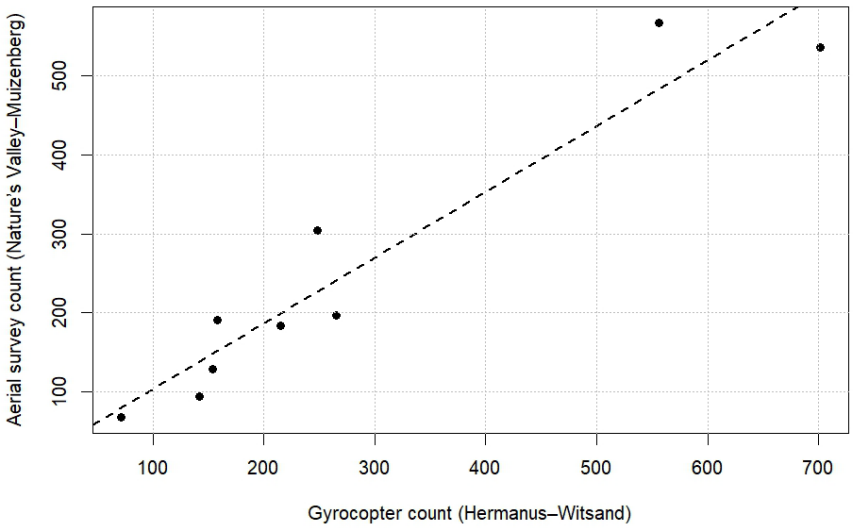

Figure 10. Scatterplot showing the linear relationship between counts from the annual gyrocopter surveys and counts from the annual helicopter-based surveys (n = 10). The red line indicates the fitted linear regression ($R^2 = 0.91$, $F(1,7) = 71.6$, $p < 0.001$).

Discussion

The 2025 annual aerial survey continues to support the cyclical trend in coastal prevalence of southern right whale cow–calf pairs observed along the South African coast since 2015. The total number of pairs recorded may, however, include duplicates, as photo-identification analyses are still underway, delaying confirmation of absolute numbers and constraining assessments of individual females' calving intervals at this stage. Despite this limitation, the observed pattern appears to follow an approximately five-year cycle, possibly reflecting the previously documented increase in five-year calving intervals within this population. Further clarity on this pattern will emerge from the ongoing processing of photo-identification data.

The persistently low presence of unaccompanied adults (males and non-calving females) suggests that migration patterns for this group have not returned to pre-2009 levels. Recent studies, including those by van den Berg et al. (2021), Brandão et al. (2023), and Vermeulen et al. (2023a, 2023b, 2025), continue to highlight the population's sensitivity to ecological changes within its Southern Ocean foraging grounds. In particular, Germishuizen et al. (2024) demonstrated a southward contraction and significant decline in sea ice concentration since 2008, reducing the availability of suitable conditions for Antarctic krill (*Euphausia superba*) recruitment. These altered oceanographic conditions likely underpin the reduced foraging success and declining maternal body condition reported in this population (Vermeulen et al., 2023b), which in turn appear to influence both reproductive success (Vermeulen et al., 2025) and migratory behaviour (Vermeulen et al., 2023a). These findings align with broader climate-driven changes in the Southern Ocean, known to trigger cascading effects across Antarctic marine ecosystems (Rogers et al. 2020).

The continued scarcity of unaccompanied adult whales also has socio-economic implications, particularly for the boat-based whale-watching industry. Given that current regulations prohibit approaches within 300 m of cow–calf pairs, the low abundance of non-calving individuals limits viable whale-watching opportunities. It is therefore recommended that the South African permitting authority and the South African Boat-based Whale-Watching Association collaborate closely with

researchers to adapt management and permitting frameworks, ensuring that activities involving this natural heritage are conducted sustainably and with due regard for the likely energetic constraints of nursing females.

Continued long-term monitoring through annual photo-identification aerial surveys, complemented by count surveys and integrated ecological studies, remains essential. These efforts provide the foundation for tracking demographic and behavioural trends in the South African southern right whale population and for understanding the links between foraging ecology, body condition, reproduction, and migration. Only through sustained monitoring can we detect and interpret these changes within the broader context of a rapidly changing Southern Ocean ecosystem.

Acknowledgements

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All surveys were carried out under the permit Res2025-32 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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