FINAL RESEARCH REPORT FOR SOUTH AFRICAN RIGHT WHALE AERIAL SURVEY, 2012

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Objectives

Ultimately this project seeks to establish whether variations in apparent reproductive success in southern right whales off South Africa can be correlated with indices of oceanographic variability, and whether these coincide with independent measures of body condition in adult females with calves.

The more immediate objectives however were to ensure continuity of the series of aerial photo-identification surveys run annually since 1979, and to initiate a study of the respiratory behaviour of cow-calf pairs as an index of condition.

Methods

The aerial survey was carried out between 10 October and 4 November, 2012, using a Bell Jet Ranger helicopter chartered from NAC Makana, and as planned covered the entire coastline between Nature's Valley in the east and Muizenberg in the west (Table 1). Unfortunately the survey's progress was badly affected by two major interruptions due to cold fronts (19 -24 October, 28 October - 3 November), during which time the helicopter relocated to Cape Town. This extended the overall duration of the survey to 26 days, far beyond the norm (6-12 days since 2000), and resulted in a closing date eight days later than any previously. If this extension resulted in more whales than usual departing the coast before the survey was completed, it could have compromised the comparability with the results of previous surveys.

All photography was carried out from the open door of the helicopter at an altitude of about 150 m, using a Canon EOS with 100-400 mm lens. All cow-calf pairs (and any albinistic individuals) encountered were photographed, and standard views of the head and back taken of every individual. Frames for each encounter were bracketed with spacer shots. Altitude and GPS position were recorded automatically every 30 seconds.

Table 1: Flight details and right whale sightings on aerial survey of south coast of South Africa, 2012

Date	Search area	Flight time (h:min)	Cow-calf pairs	Other
10 October	(transit Cape Town – Witsand) St Sebastian Bay	03:39	13	4
11 October	Witsand – Natures Valley (transit to Witsand)	07:30	13	
12 October	Witsand - De Hoop	01:44	14	4
13 October	De Hoop area	06:03	88	8
14 October	De Hoop - Agulhas	01:43	12	
18 October	Agulhas – Pearly Bay (transit to Cape Town)	09:47	84	13
25 October	(transit from Cape Town) Pearly Bay – Danger Point	04:20	41	9
26 October	Danger Point - Gansbaai	00:31	1	
27 October	Gansbaai – Gansbaai (transit to Cape Town)	01:38	7	1
4 November	(transit from Cape Town) Gansbaai – Cape Town	07:43	67	20
Total		44:38	340	59

Matching followed the normal protocol. Images from each group encounter were examined and frames that were non-informatory (blurred, too sub-surface, covered with breaking waves or were inter-group blanks) were deleted, and the remainder placed in a folder labeled with the field encounter number. At the same time, small ID sketches of the head of any non-calves were made and the most appropriate frames for matching the adult and calf were selected. The sketches were used to identify any same-day duplicates, the frames of which were then amalgamated under the field number of the individual that was seen first. After all images had been placed under appropriate field numbers, the frames chosen for each individual were rotated and cropped so that (for callosity matching) the head was vertical on the screen with the bonnet at the top and both eye-brow callosities near the bottom, with each image comprising 640 x 480 pixels. The image was then processed through the Hiby-Lovell matching system (Hiby and Lovell, 2001), as adapted by Mike Harfoot, in which a digital extract of the callosity pattern is compared with all other extracts in the catalogue library and accorded a rating according to its similarity (from 1.00 to 0.00). Matching of candidates on a 1:1 basis with the unknown whale was undertaken until

this index fell to 0.50. Confirmation of a match was made by eye, and used other features not included in the original extract, such as mandibular and post-blowhole callosities, or dorsal pigmentation. Adults seen for the first time that were dorsally pigmented (albinistic, partially albinistic or with white blazes) were then compared with calves with similar markings that had not previously been matched to an adult: this matching was done manually.

Because of the unexpected protraction of the aerial survey, the planned video-recording of respiratory behaviour did not take place.

Results

In total, 340 cow-calf pairs and 59 additional adults or juveniles were seen on the survey (for a total of 739 whales), and all cow-calf pairs and 18 adults/juveniles were photographed: the latter were included either incidentally because they were accompanying a cow-calf pair, or were erroneously thought to be accompanied by a calf, or deliberately because they were albinistic.

After matching, the total number of individuals was reduced to 224 cow-calf pairs and 16 adults/juveniles, implying that the number of same- or between-day duplicate sightings was 116/340 or 34.1% for cows and 2/18 or 11.1% for adults/juveniles. The protracted nature of the survey allowed greater coastal whale movement to take place during non-survey periods: as we believe there is a tendency for cow-calf pairs to move westward with time (Mate et al., 2011), and the survey was executed in a westward direction, these delays would be expected to produce more duplicates. The incidence of duplicates in the surveys over time (Fig. 1) shows that although 2012 was the highest percentage recorded, it seems to be simply following a temporal tendency: as the number of whales has increased, so has the necessity to spend more flying days on the survey and therefore the opportunity for duplication has increased.

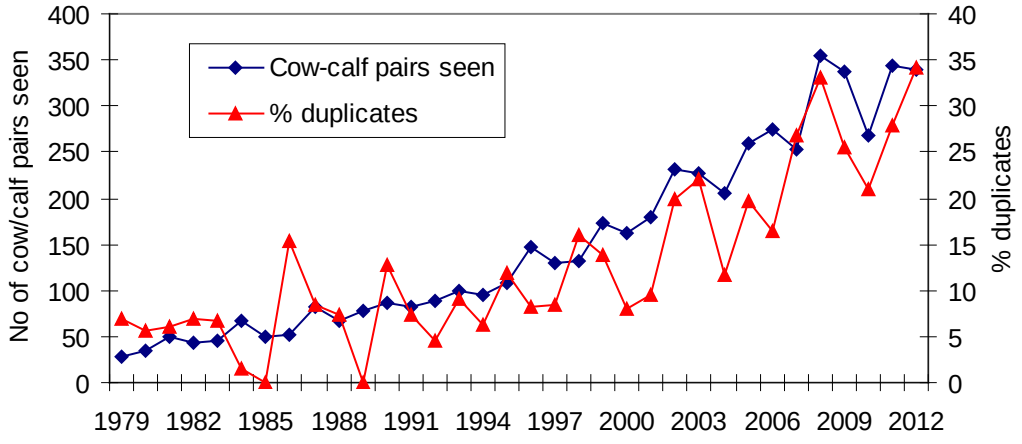

Fig. 1: Extent of duplication in sightings of cow-calf pairs on South African aerial surveys for right whales, 1979 - 2012

The number of unaccompanied whales was the lowest recorded since 1991, and follows a trend exhibited since 2008 (and possibly as early as 2001), from which latter date their numbers relative to the numbers of cow-calf pairs have declined from 2.0 to 0.16, or by about an order of magnitude (Fig. 2). The 2012 value could be affected to some extent because of the protracted nature of the survey, if unaccompanied whales should depart the coast earlier than cow-calf pairs (ref), but qualitatively this effect is unlikely to be big enough to have changed the overall trend seen over the last decade.

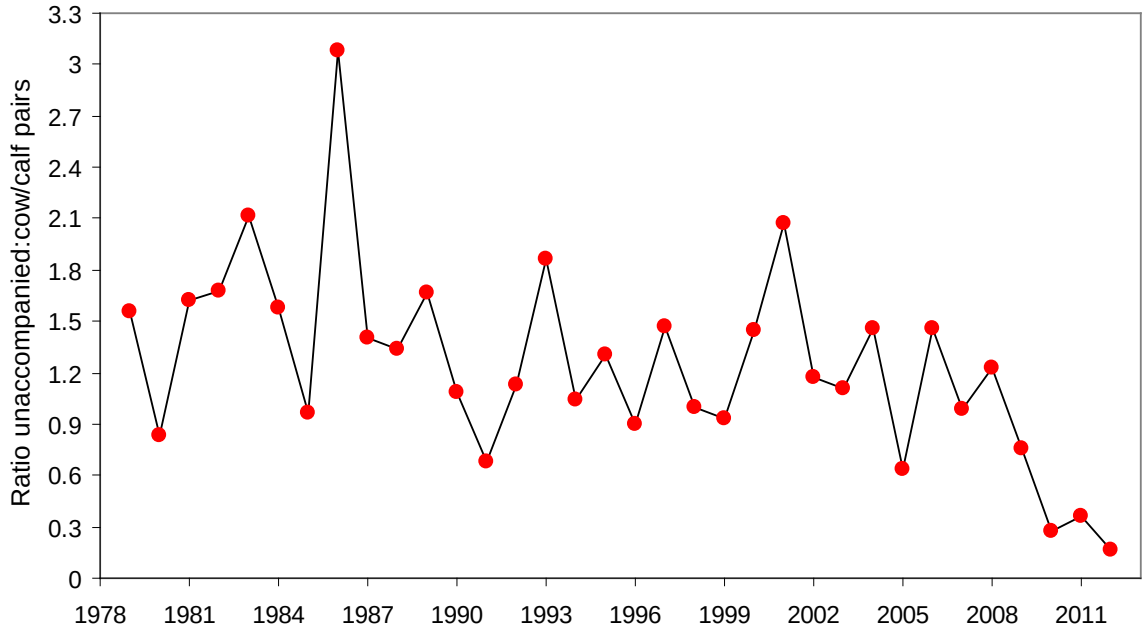

Fig. 2: Ratio of number of unaccompanied adults/juveniles to cow-calf pairs seen on South African right whale surveys, 1979 - 2012

Reasons for this trend are outside the scope of this report, but include the strong possibility that the unaccompanied animals have relocated themselves to other parts of the southern African coast.

The number of identified cow-calf pairs was the fifth highest since surveys began in 1979 (Fig. 3), and an exponential fitted to the data over the 34-year period provides a significant rate of increase (0.0625 ± 0.0035 SE per annum). However the last three data points fall below the trend line, and if it was not for the atypical nature of the 2012 survey, one might be tempted to conclude that the increase rate is beginning to slow down. Nevertheless, the input data are only counts and make no allowance for variation in the efficiency of detection, so that it is premature to reach conclusions on the population's trajectory before the data have been entered in an appropriate population model that estimates the annual detection efficiency.

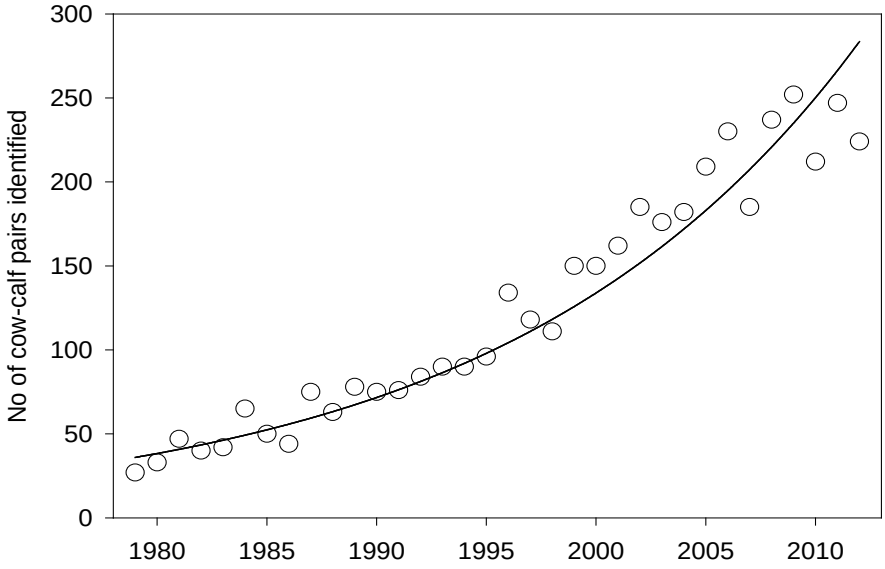

Fig. 3: Exponential fitted to the number of cow-calf pairs identified annually on South African right whale aerial surveys, 1979 - 2012.

The proportion of cows not previously seen on any one survey has been low in the last three surveys (24.1 – 26.9%), values as low only being recorded six times previously (Fig. 4). This index reflects both the efficiency of the survey (in terms of the proportion of the calving population photographed each year) and the demographics of the population itself (notably, the recruitment rate of individuals to the calving population), so in the absence of any independent information or (as yet) analysis based upon a population model, the interpretation of any trend in the index is difficult.

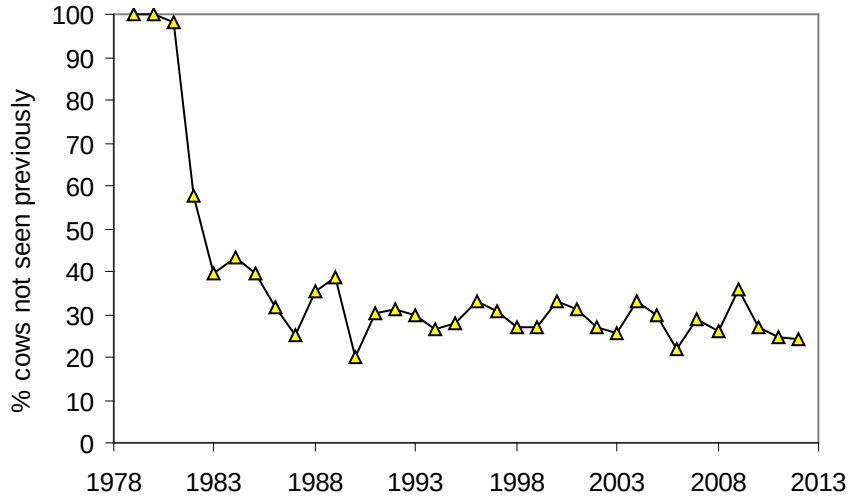

Fig. 4: Proportion of “new” cows seen on South African right whale aerial surveys, 1979 - 2012

Among the “new” individuals photographed there were seven partially albinistic, four white-blazed and one albinistic animal. Only one individual from each of these groups was successfully matched to a calf previously photographed, being an11-yr-old partially albinistic, a 25-yr-old white-blazed and a 1-yr-old albinistic animal: only the first was seen with a calf. In addition, one female first seen in 2000 but previously unrecognized as partially albinistic was discovered, and traced back to a calf born in 1995. This was only the second female recorded as having a calf at an age as young as 5 yr.

One female satellite-tagged in 2001 was resighted with a calf, her fourth since being tagged. The tag site exhibited the slight indentation (but no surrounding swelling) seen in other animals at large for periods in excess of five years after tagging (Best et al., in prep.).

Conclusions

The survey was successfully completed, despite unusually protracted delays owing to inclement weather. The continuity of the survey series is paramount if the dynamics of this population is to continue to be monitored, and the support of the IWC in ensuring that this took place is gratefully acknowledged.

Acknowledgements

The participation of Ken Findlay and Meredith Thornton in the aerial survey is much appreciated. Special thanks are due to the pilot (Guy Douglas) for skilful piloting, and the manager of NAC Makana (Gary Wilson) in providing excellent logistical support – the fuel bowser was a great boon. Wilfred Chivell (Dyer Island Cruises) very kindly provided accommodation and logistical support in the Walker Bay area.

REFERENCES

Best, P.B., Mate, B.R., and Lagerquist, B. In prep. Does satellite-tagging affect reproductive performance in large whales? Evidence from southern right whales. Abstract for 20th Biennial Conference on the Biology of Marine Mammals, Dunedin, NZ.

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EXPENDITURE

Flying costs, 44.33 h @ R6,200	R	274,876.00		
Positioning of fuel dumps	R	5,000.00		
Total flying costs			R	279,876.00
Food and accommodation	R	10,601.27		
TOTAL	R	290,477.27		