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Report of the 2014 Mammal Research Institute Whale Unit Southern Right Whale Survey, Natures Valley to Muizenberg, South Africa

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INTERNATIONAL
WHALING COMMISSION

**REPORT OF THE 2014 MAMMAL RESEARCH INSTITUTE WHALE UNIT
SOUTHERN RIGHT WHALE SURVEY, NATURE'S VALLEY TO MUIZENBERG,
SOUTH AFRICA**

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ABSTRACT

The 2014 Mammal Research Institute Whale Unit southern right whale survey was flown by helicopter over the period 30 September to 14 October and coastwise between Nature's Valley and Muizenberg, South Africa. The weather encountered over the survey period ranged from excellent to poor with some 6½ days of potential survey time lost to inclement weather conditions. A total of 47 hours and 56 minutes of flight operations was required to complete the survey, including 38 hours and 12 minutes of search effort over a distance of 727 km (including photography) and 9 hours and 44 minutes in transit to and from the survey start and end points. Totals of 461 cow and calf pairs of southern right whales (922 animals), 87 unaccompanied adult southern right whales, 18 humpback whales (four cow and calf pairs and 10 unaccompanied adult animals), one Bryde's whale, six groups of bottlenose dolphins and five groups of humpback dolphins were sighted during the survey. These totals include duplicate sightings of individual southern right whales as a general westwards movement of whales along the coast during the two week survey period means that individuals have some probability of being encountered more than once on a survey. Such duplicate whales will be accounted for once photographic matching of these individuals has been carried out. Cow and calf pair sightings appeared generally clumped in San Sebastian Bay, along the de Hoop coastline, in Brandfontein Bay, between Die Dam and Pearly Beach and in Walker Bay. Lesser concentrations were found between Skipskop (the western portion of the de Hoop coastline) and Cape Agulhas (Struisbaai). Low numbers of unaccompanied adult whales (87 individuals) on this survey were concentrated in Walker Bay and San Sebastian Bay and remain of concern in light of the low relative numbers encountered in recent years. An investigation of a possible westward shift in the distribution of these animals to the west of the survey area is becoming increasingly important and it is recommended that the 2015 survey includes a fixed wing aerial survey component covering the region between Muizenberg and the Namibian border at the Orange River Mouth.

INTRODUCTION

Catches by open-boat whaling in the late 18th and early 19th centuries and thereafter, and modern whaling in the early 20th century reduced the global population of southern right whales (*Eubalaena australis*) from an estimated 70,000 animals in 1770 to approximately 400 animals by 1920 (IWC, 2013). Both the historic catch distributions and contemporary sighting records identify possible nursery and feeding grounds associated with the Southern African region (Richards and du Pasquier, 1989; IWC, 2001), including nursery grounds in the coastal waters of a) Namibia and Southern Angola, b) the southern Cape coast south of 32° S, and c) southern Mozambique; and feeding grounds across a) a broad band of the south-eastern Atlantic Ocean from the Pigeon Grounds, through the Tristan Grounds to the Cape (Townsend, 1935), b) a diffuse area of the Southern Ocean south of the subtropical convergence (Tormosov *et al.*, 1998), and c) a localised near-shore area off the west coast of South Africa (Barendse and Best, 2014). The interrelationship of the animals utilising these grounds remains incompletely known.

Since receiving legal protection in 1935, the species has (despite the illegal Soviet catches of some 3000 individuals in the 1960's) appeared to be making a steady recovery in a number of monitored regions including in nursery grounds in the coastal waters of Argentina, South Africa and Australia (IWC, 2001). By 2009 the global population was estimated at some 13,600 individuals, of which South Africa has the largest breeding stock, comprising some 28% of the total population (IWC, 2013). The population using the southern Cape coast of South Africa as a winter nursery area was estimated by Brandão *et al.* (2011) to number about 4,600 individuals in 2008, reaching 5,062 in 2012 of which 1,321 were parous females (Brandão *et al.* 2013). This population has been subject to intensive studies over the last 45 years (e.g. Best, 1990a; Best *et al.*, 2001; Best, 2011), including a series of annual surveys in mid-October each year since 1969 (which have incorporated photography of natural markings of animals on the surveys each year since 1979 (Best, 1990a)), genetics studies (Best *et al.*, 2003) and more recently satellite telemetry (Mate *et al.*, 2011). The importance of the natural marking photography in the annual surveys stems from the fact that southern right whales are individually recognisable from natural markings (principally the unique pattern of callosities on the head (Payne *et al.* 1983), and from features of lighter pigmentation found on the back of some animals in the population).

That cow and calf pairs have been photographically identified since 1979, and brindle or males similarly identified since 2005 means that individual sighting histories can be generated. Such sighting and associated reproductive histories of identified female whales allow for vital demographic parameters of the population (including calving intervals, female survival rates and age at first parturition) to be modelled from the database of photo-identified individuals (Best *et al.*, 2001; Best *et al.*, 2005). Such modelling has allowed the increase in the annual survey counts to be evaluated in terms of life history parameters, and the model-estimated rate of population increase has been found to be almost identical to that found in the field survey counts (Brandão *et al.*, 2011), showing that immigration is not required to meet the annual instantaneous growth rate of the population of around 7%. This growth rate is close to the maximum biologically possible for the species breeding on a three year calving cycle, and is similar to estimated increase rates from other Southern Hemisphere nursery areas.

Aims and objectives

The 36-year (1979-2014) series of individual photo-identification surveys across the southern Cape right whale nursery grounds represents one of the longest uninterrupted data sets for any marine mammal population. The continuation of this important series of annual surveys of

southern right whales on their southern Cape calving and nursery grounds addresses the following key questions:

1. Are there signs of density-dependent effects influencing the demographic parameters of female right whales?

Whilst Brandão *et al.* (2011) conclude that there have been no signs of any density dependent changes in the vital parameters of the population, Brandão *et al.* (2013) noted that their modelled estimate of the annual population growth rate of 6.6% is a slight (yet statistically insignificant) decrease compared to the 6.8% increase rate model estimated previously (Brandão *et al.*, 2012). Despite the population still being well below the level at which density dependent effects would be expected, Brandão *et al.* (2011) noted that continuity of the survey series and the resultant increasing precision of parameter estimates should allow early detection of such density dependent changes, which is an extremely rare opportunity in large whale population studies.

2. Are there indicators of systematic changes in the coastal distribution of right whales over time?

Right whales encountered on the survey can be categorised as cow and calf pairs (adult females with a calf) or unaccompanied adults (which may occur as singletons, in adult only groups or in groups containing a cow and calf pair). The coastal distribution of both cow and calf pair and unaccompanied adult groups is non-random with different sections being utilised as preferential habitat by these two population components (cow-calf groups between Arniston (020°14'E) and Puntjie (021°00'E) and unaccompanied adults between Mudge Point (019°08'E) and Quoin Point (019°39'E), although in recent years the distribution of both components has tended to move towards the western region of the survey area. The surveys have also shown that (until recently) the winter distribution of right whales round the southern African coast was very different to that identified from historical whaling, in that 90% of cow-calf pairs occur on the south coast of South Africa between Plettenberg Bay and False Bay, and very few if any whales to occur off Namibia / Southern Angola or KwaZulu-Natal / Mozambique.

The marked decline in the number of unaccompanied adults encountered on the more recent surveys compared to the increasing densities of cow and calf pairs (as well as the occurrence of several known individuals from South Africa in Namibian waters since 2003) suggests a marked westward shift in distribution of the unaccompanied adult whales. Reasons for such a distribution shift are unknown and may be of considerable importance to the conservation management of the species. For example, as the southern Cape boat-based whale-watching industry is largely dependent on the unaccompanied component of the population (cow and calf whales may not be approached), any shift in distribution of unaccompanied animals limits the permitted approach opportunities of whale-watch operators, thereby probably increasing the incidence of approaches of cow and calf pairs.

3. Do population models indicate significant temporal variation in right whale calving frequency, and can this variation be linked to environmental changes?

This component of the proposed research will attempt to investigate environmental drivers in the variability of reproductive rates, particularly the incidence of longer-than-normal calving intervals and the periodicity of a higher than average count every three years (termed the "bumper" cohort) identified up until 2009 but generally not thereafter. Given that two-year, four-year and five year intervals occur within the individual calving histories (although there is a strong modal calving interval at three years), and that ages at first parturition range from five to 19 years (with a mean of 8.58 years), the fact that the periodicity of the three year

“bumper” cohort has been maintained for almost thirty years raises the question of whether some environmental parameter may have been driving this three-year signature.

The lack of increase in the population of North Atlantic right whales (*E. glacialis*) have partly been ascribed to a strong variability in reproductive rates; a variability that has been suggested to be linked to particular environmental conditions (Greene *et al.*, 2003). Whilst Leaper *et al.* (2006) showed evidence of a relationship between certain oceanographic indices and inter-annual variability in breeding success of southern right whales at Peninsula Valdez in Argentina (in which “calving success” was correlated to sea surface temperature anomalies at South Georgia some 15-18 months earlier and to Pacific El Nino 4 events six years earlier). Comparable studies in South Africa may be complicated by the uncertainty of the feeding migrations of those animals calving on the southern Cape coast. Furthermore, although the application of an individual-based model (Butterworth *et al.*, 2011) using the three-mature-stages (receptive, calving, resting) model of Cooke *et al.* (2003) to the South African right whale population, has the potential to investigate temporal variations in calving success, the identification of suitable environmental metrics that capture annual variability across the three diverse feeding grounds that South African right whales utilise remains a challenge. Comparison of a direct annual measure of body condition to calving intervals may provide a better understanding of the link between calving success and environmental parameters.

METHODS

The annual survey is carried out as a helicopter-based survey in adequate weather conditions (clear visibility and Sea State of 3 or less) along the southern Cape coast (Nature’s Valley to Muizenberg) in October each year using standardised methodology that has been developed over the previous 35 year survey history. These methods are fully described in Best (1990), Best *et al.* (2001), and Best (2011) In order to ensure consistency, the methods have been maintained as far as possible over the survey series, although improvements in technology such as in digital photography and Global Positioning Systems have obviously been incorporated. All encountered groups of whales and dolphins are recorded and right whales are categorised as cow-calf or unaccompanied adult groups. The photographic surveys have concentrated on photographing cow-calf pairs only (although since 2005 all brindle (grey-morph) individuals have also been photographed).

As in previous years, the 2014 survey was flown coastwise some 500-800 m offshore at an altitude of approximately 330 m and a speed of 100 kts covering the coast between Nature’s Valley and Muizenberg. Apart from region between St Sebastian Bay and Gericke’s Point, the survey was carried out in a westward direction. During the westward survey one observer searched offshore from the forward port seat of the aircraft, while a second searched inshore from the starboard rear open door of the aircraft, whilst during the eastward survey (St Sebastian Bay and Gericke’s Point) the aircraft flew closer inshore allowing the rear starboard observer a view of the near-shore region. All encountered whale groups were recorded, along with their position, group size and the group composition. If a cow and calf pair or a brindle (grey-morph) individual was sighted in the group the helicopter descended to 150 m and the callosity patterns and dorsal pigmentation features were photographed by the rear observer using a Canon 7D EOS and a 100-400 mm lens. Once photography was completed (usually within five minutes) the aircraft returned to 330 m to resume searching or proceeded directly to the next observed group at 150 m. Surveying was terminated when sea surface conditions, wind-speed, visibility or glare precluded the taking of suitable identification pictures.

As in 2013, the Unit’s vehicle was driven as a support vehicle by a third potential observer. This allowed for personal baggage and the aircraft rear starboard door to be transported

between overnight stops, for rotation of observers during the two survey legs flown on each day, and for considerable flexibility in subsistence of survey participants. Also as in 2013, the refuelling of the helicopter was carried out from a fuel bowser (and electric pump) provided by the helicopter charter company, NAC Makana, rather than using cached fuel drums as in earlier years.

RESULTS

The survey was carried out over the period 30 September to 14 October 2014, with 30 September used for the repositioning of the aircraft from Cape Town to Witsand. Flights were fuel limited to about three hours duration or less so that generally only two flights were carried out on each survey day. San Sebastian Bay was surveyed on 1 October, whilst the region to the east of San Sebastian Bay was surveyed on 2 and 3 October. Poor weather conditions resulted in the termination of surveying at Gericke's Point on the San Sebastian Bay to Nature's Valley leg on 2 October, and the survey recommenced at Nature's Valley in a westward direction early on 3 October. Weather precluded surveying on 4 October, and the period 5 to 9 October were utilised to survey the De Hoop coastline (with no surveying possible on 8 October). No surveying could be achieved on 10 or 11 October and the Pearly Beach to Muizenberg coastline was surveyed over the period 12 to 14 October. Table 1 provides an overview of the overall survey progress. A total of 47 hours and 56 minutes of flight operations was required to complete the survey, including 38 hours and 12 minutes of search effort over a distance of 727 km (including photography) and 9 hours and 44 minutes in transit to and from the survey start and end points (including some 2 hours and 56 minutes in pre- and post flight-start up and shut down procedures). Table 2 provides a breakdown of the survey effort times and cetacean groups encountered, while Figure 1 shows the flight path including the distribution of surveyed search effort.

Totals of 461 cow and calf pairs of southern right whales (922 animals), 87 unaccompanied southern right whales, 18 humpback whales (four cow and calf pairs and 10 unaccompanied adult animals), one Bryde's whale, six groups of bottlenose dolphins and five groups of humpback dolphins were sighted during the survey. These totals include duplicate sightings of individual southern right whales as a general westwards movement of whales along the coast during the two week survey period means that individuals have some probability of being encountered more than once on a survey. Such duplicate cow and calf pairs of southern right whales will be accounted for once photographic matching of these individuals has been carried out. Figures 2, 3, 4 and 5 provide the distribution of sightings of cow and calf pairs of southern right whales, unaccompanied adult southern right whales, humpback whales and other sighted species respectively. Cow and calf pair sightings appear generally clumped in San Sebastian Bay, along the de Hoop coastline, in Brandfontein Bay, between Die Dam and Pearly Beach and in Walker Bay. Lesser concentrations were found between Skipskop (the western portion of the de Hoop coastline) and Cape Agulhas (Struisbaai) – Figure 2. The low numbers of unaccompanied adult whales appeared concentrated in Walker Bay and San Sebastian Bay.

Table 1. Summary of flights carried out during the 2014 Mammal Research Institute annual survey, 30 September to 14 October.

Date	Flight Leg	Leg Start	Leg End	Time Start	Time End	Total Time
30 September 2014	1	Waterfront	Witsand	13:28	15:04	01:36
01 October 2014	2	Witsand	Witsand	10:54	11:31	00:37
01 October 2014	3	Witsand	Witsand	11:53	14:29	02:36
01 October 2014	4	Witsand	Witsand	14:58	17:14	02:16
02 October 2014	5	Witsand	George	08:21	11:56	03:35
02 October 2014	6	George	Plett	12:54	14:47	01:53
03 October 2014	7	Plett	George	07:52	09:34	01:42
03 October 2014	8	George	Witsand	10:05	11:06	01:01
04 October 2014	No Flight					
05 October 2014	9	Witsand	De Hoop	08:45	12:09	03:24
06 October 2014	10	De Hoop	De Hoop	10:57	14:07	03:10
06 October 2014	11	De Hoop	De Hoop	14:41	16:05	01:24
07 October 2014	12	De Hoop	De Hoop	07:42	10:51	03:09
07 October 2014	13	De Hoop	De Hoop	11:32	13:58	02:26
08 October 2014	No Flight					
09 October 2014	14	De Hoop	Andrews Field	07:32	10:30	02:58
09 October 2014	15	Andrews Field	Andrews Field	11:01	13:01	02:00
10 October 2014	No Flight					
11 October 2014	No Flight					
12 October 2014	16	Andrews Field	Andrews Field	07:52	09:58	02:06
12 October 2014	17	Andrews Field	Heidehof	10:29	13:16	02:47
12 October 2014	18	Heidehof	Heidehof	13:56	14:12	00:16
13 October 2014	19	Heidehof	Heidehof	07:57	09:45	01:48
14 October 2014	20	Heidehof	Grootbos	09:23	10:57	01:34
14 October 2014	21	Grootbos	Hermanus	11:20	14:45	03:25
14 October 2014	22	Hermanus	Waterfront	15:14	17:27	02:13

Table 2. Summary of search effort and sightings by survey flight during the 2014 Mammal Research Institute annual survey, 30 September to 14 October (CC SRW = southern right whale cow and calf pair; Un Ad SRW = unaccompanied adult southern right whale; HW = humpback whale; B = Bryde's whale, b = bottlenose dolphin group; h = humpback dolphin group)

Flight	Date	SE Locality	TD Locality	Survey Start Time	Survey End Time	Total Survey Time	Survey Dist (km)	Transit Time	CC SRW	Un Ad SRW	HW	Other Species
2	01 October 2014	Puntjie	Beach	11:06	11:25	00:19	9.388	00:18	2			
3	01 October 2014	Beach	Beach	12:02	14:23	02:21	30.282	00:15	32	7		
4	01 October 2014	Beach	Witklippunt	14:58	17:07	02:09	21.715	00:07	29	5		
5	02 October 2014	Puntjie	Glentana	08:32	11:39	03:07	113.37	00:28	15	7	2	2b; 1h
6	02 October 2014	Glentana	Gerickespunt	13:07	14:11	01:04	33.839	00:49	5		3	2h
7	03 October 2014	Natures Valley	Wilderness East	08:09	09:13	01:04	68.582	00:38	4	3	9 (2cc)	1B; 1b; 1h
9	05 October 2014	Witklippunt	Lekkerwater	08:54	11:56	03:02	30.906	00:22	36	10	2 (1cc)	1b;
10	06 October 2014	Lekkerwater	Koppie Alleen	11:13	13:57	02:44	36.751	00:26	51	3		1h
11	06 October 2014	Koppie Alleen	Koppie Alleen	14:51	15:56	01:05	17.446	00:19	21			
12	07 October 2014	Koppie Alleen	Klipkoppie	07:52	10:43	02:51	21.662	00:18	49			
13	07 October 2014	Klipkoppie	Skipskop	11:41	13:47	02:06	27.681	00:20	27	1		
14	09 October 2014	Skipskop	Struispunt	07:43	10:16	02:33	39.201	00:25	30	4		
15	09 October 2014	Struispunt	Andrews Field	11:17	12:56	01:39	20.929	00:21	20	3		
16	12 October 2014	Andrews Field	Brandfontein	07:58	09:45	01:47	34.253	00:19	21	2		2b
17	12 October 2014	Brandfontein	Pearly Beach	10:42	13:09	02:27	38.736	00:20	30	8		
19	13 October 2014	Pearly Beach E	Pearly Beach W	08:09	09:39	01:30	17.467	00:18	22	13		
20	14 October 2014	Pearly Beach W	Die Plaat Corner	09:30	10:50	01:20	36.646	00:14	17	3	2 (1cc)	
21	14 October 2014	Die Plaat Corner	Klein River	11:27	14:39	03:12	39.927	00:13	35	16		
22	14 October 2014	Klein River	Muizenberg	15:21	17:13	01:52	87.813	00:21	8	2		

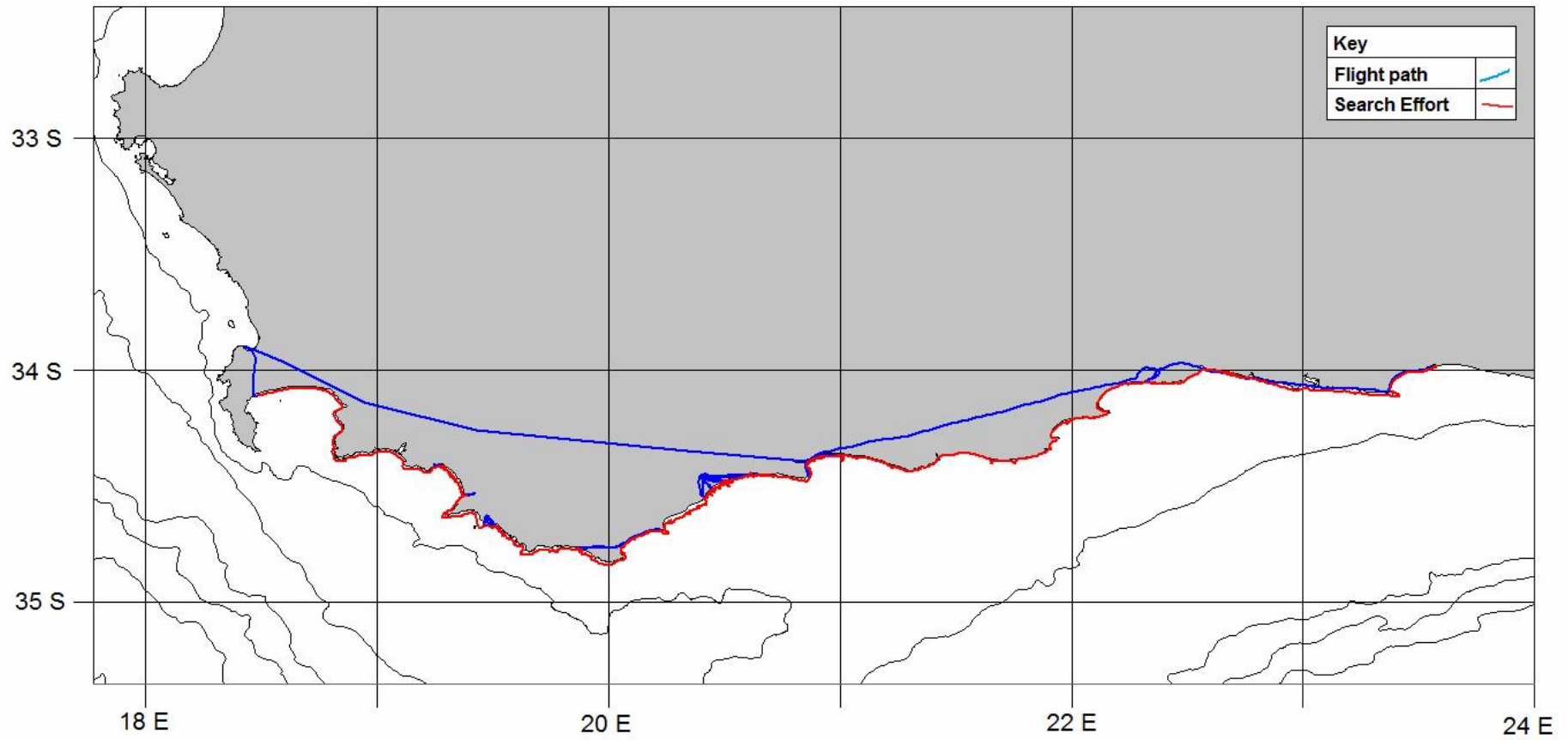


Figure 1. Flight-path flown and effort searched undertaken during the MRI Whale Unit annual southern right whale survey, September - October, 2014.

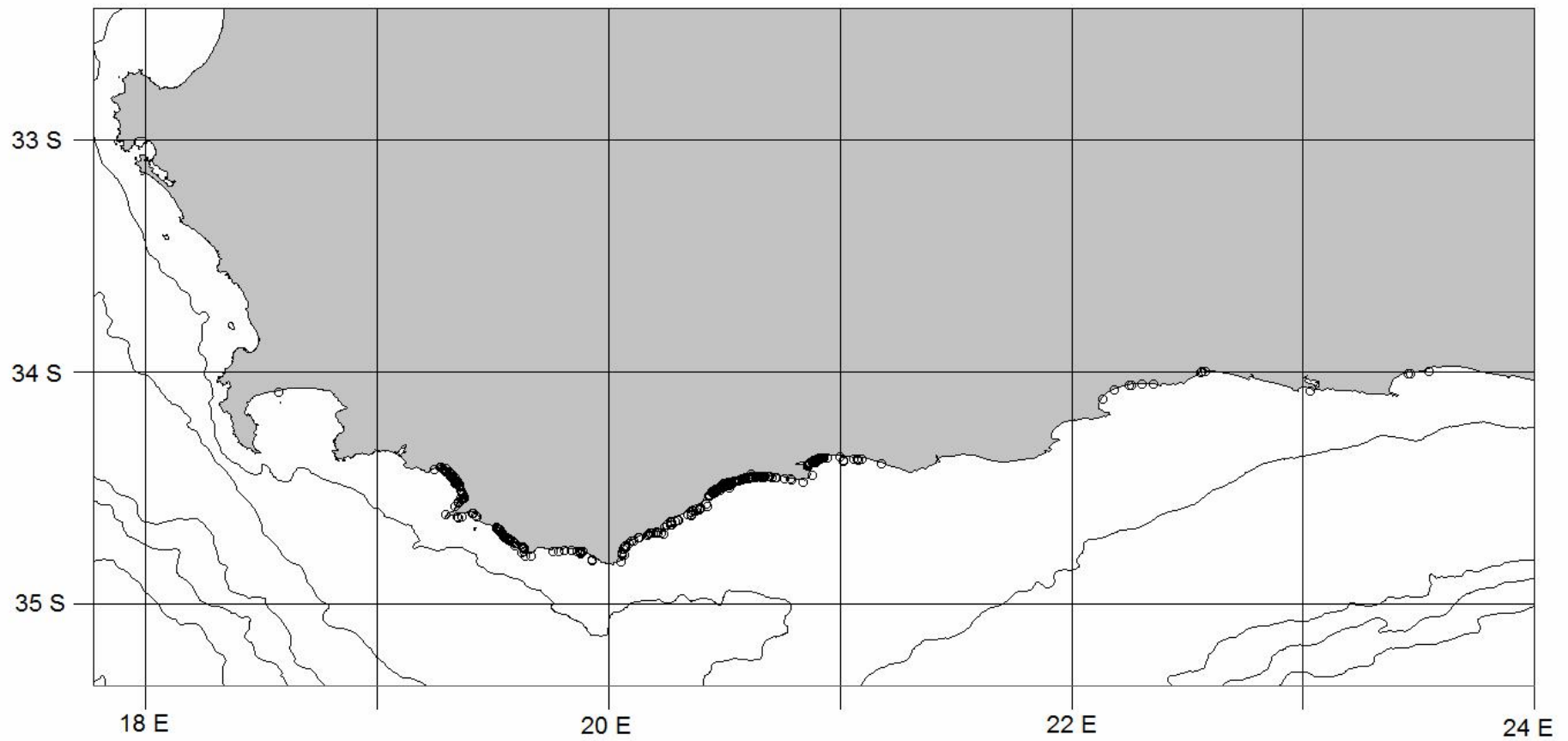


Figure 2. Locations of southern right whale cow and calf pairs sighted during the MRI Whale Unit annual southern right whale survey, September - October, 2014.

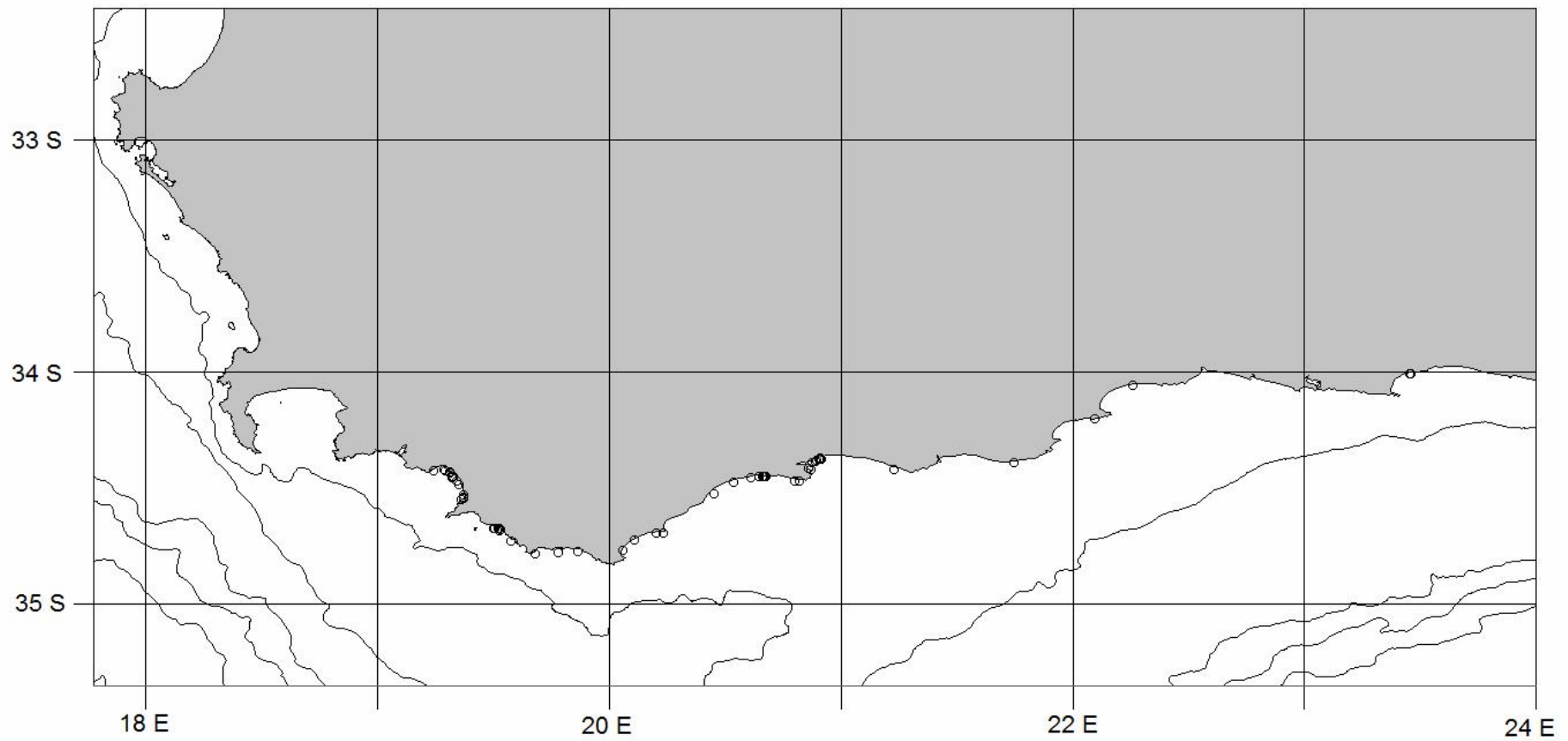


Figure 3. Locations of unaccompanied adult southern right whale groups sighted during the MRI Whale Unit annual southern right whale survey, September - October, 2014.

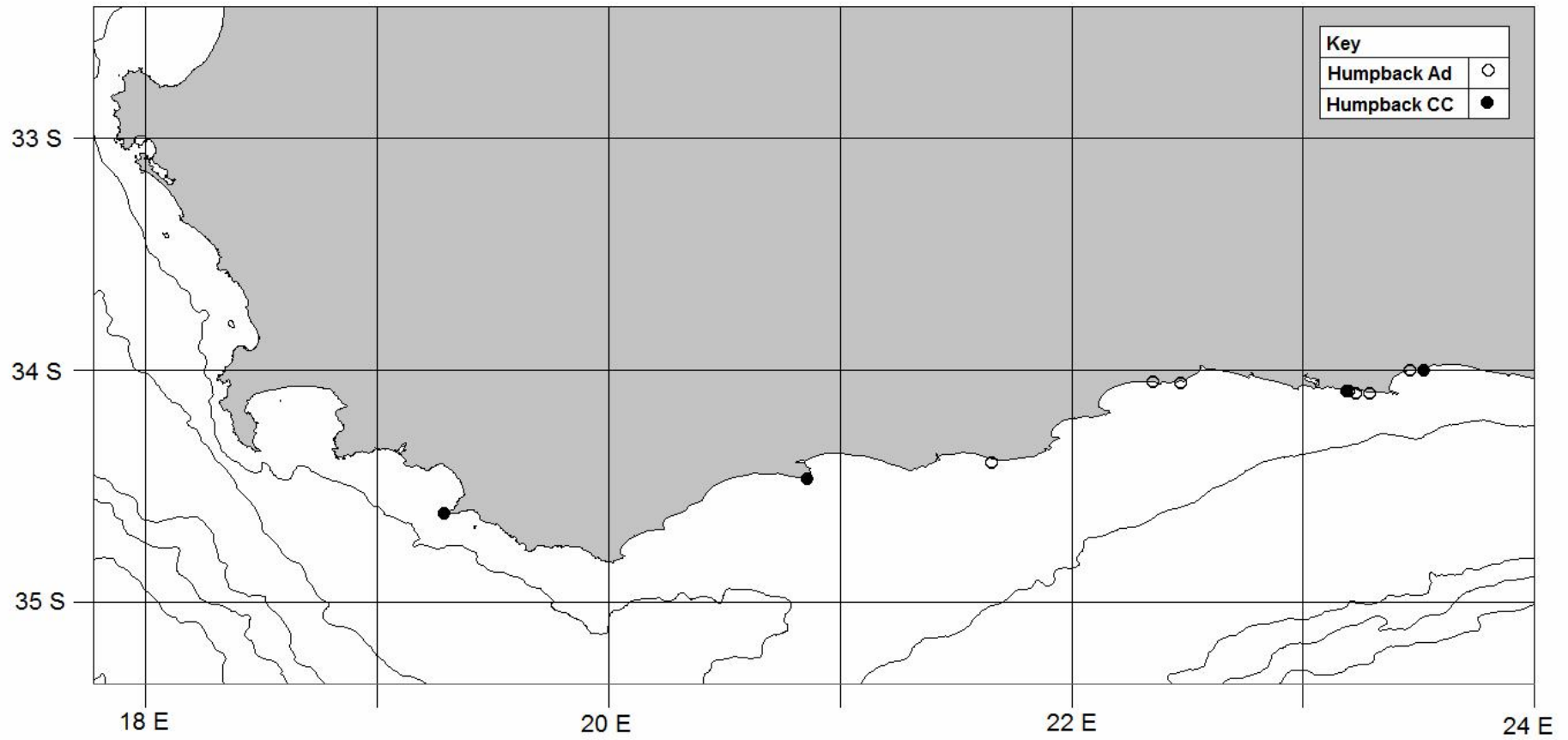


Figure 4. Locations of humpback whale groups sighted during the MRI Whale Unit annual southern right whale survey, September - October, 2014.

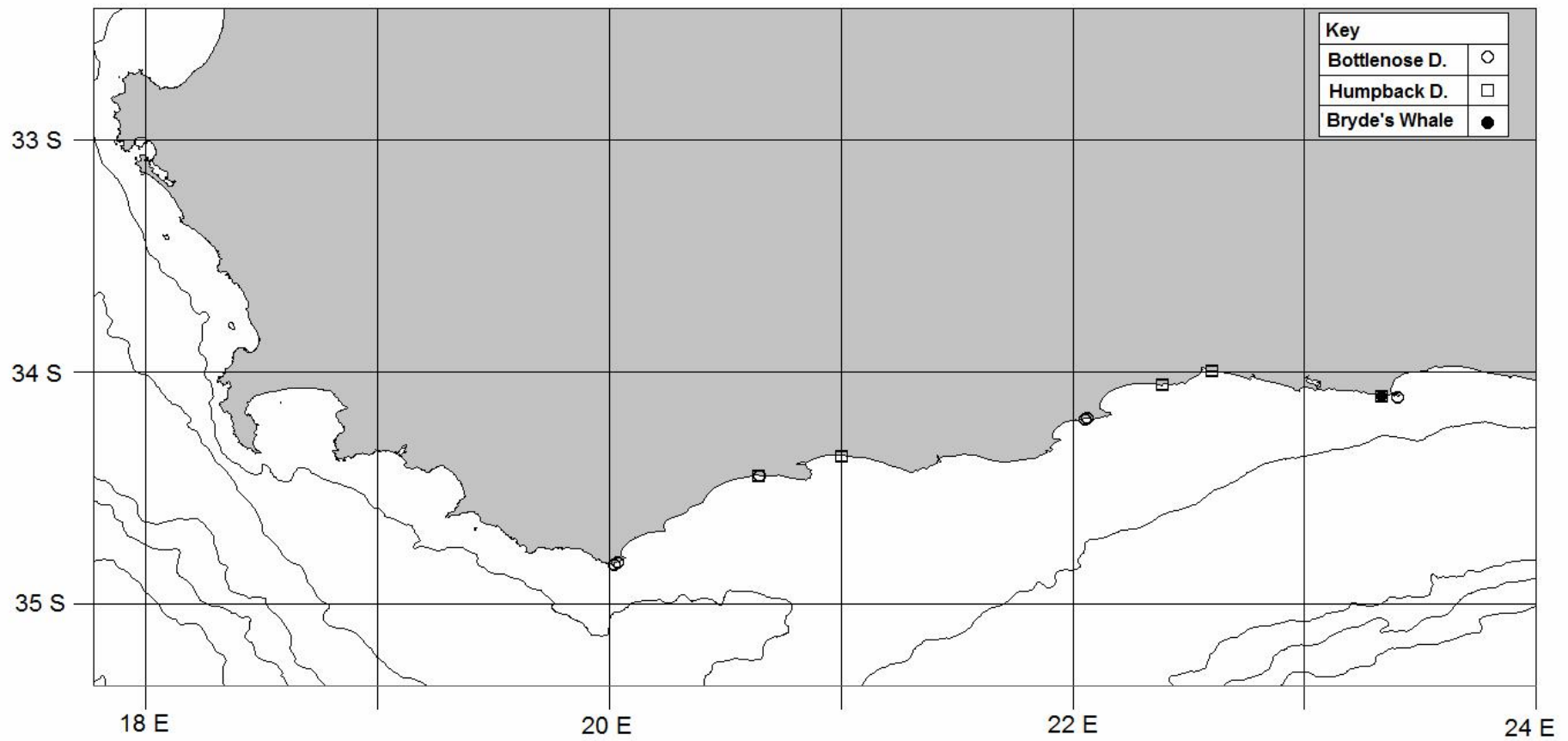


Figure 5. Locations of sightings of bottlenose and humpback dolphins and Bryde's whales encountered during the MRI Whale Unit annual southern right whale survey, September - October, 2014.

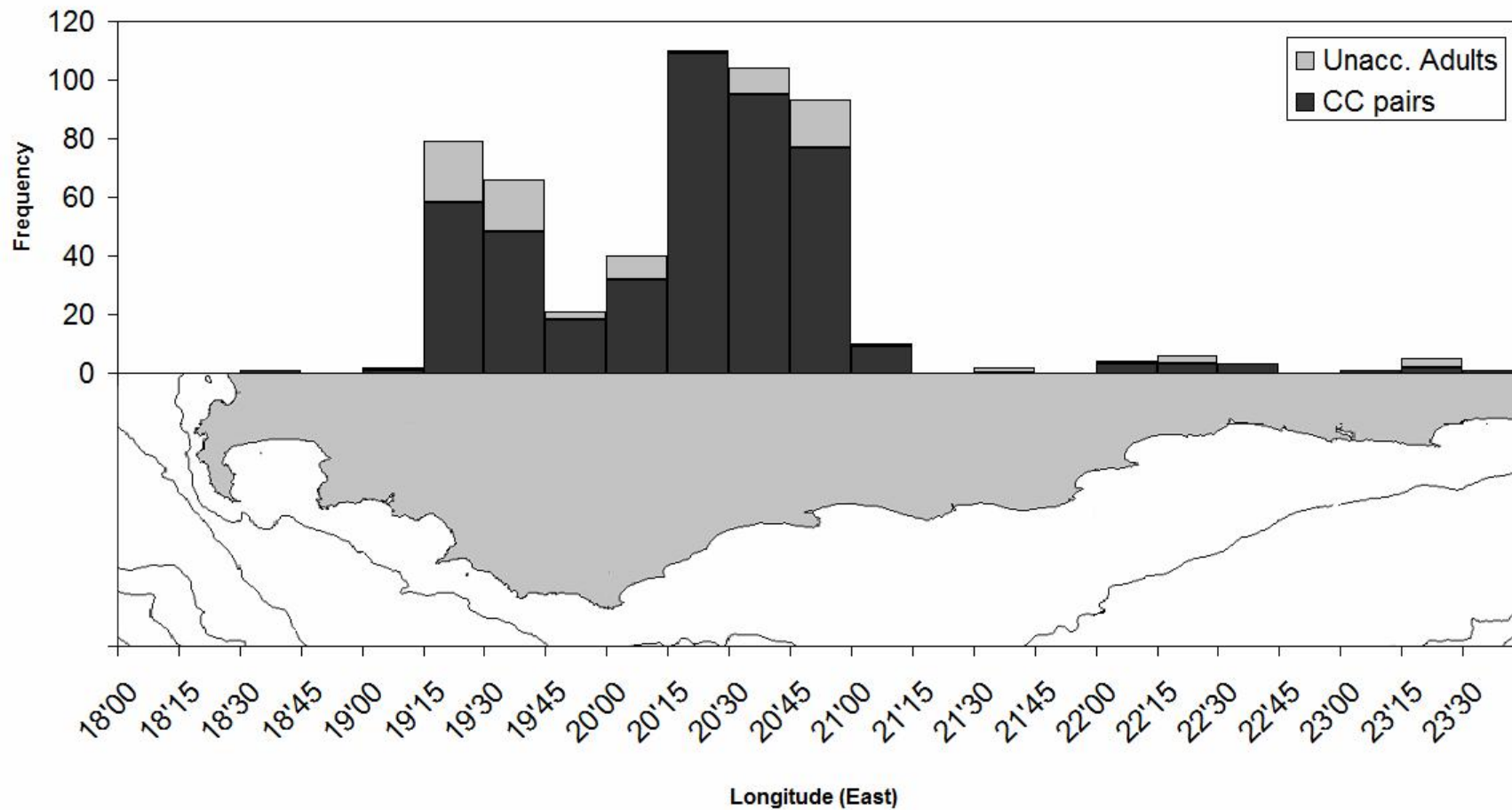


Figure 6. The long-shore distribution of cow and calf pair and unaccompanied adult groups of southern right whales sighted on the 2014 MRI Whale Unit southern right whale survey by longitudinal band.

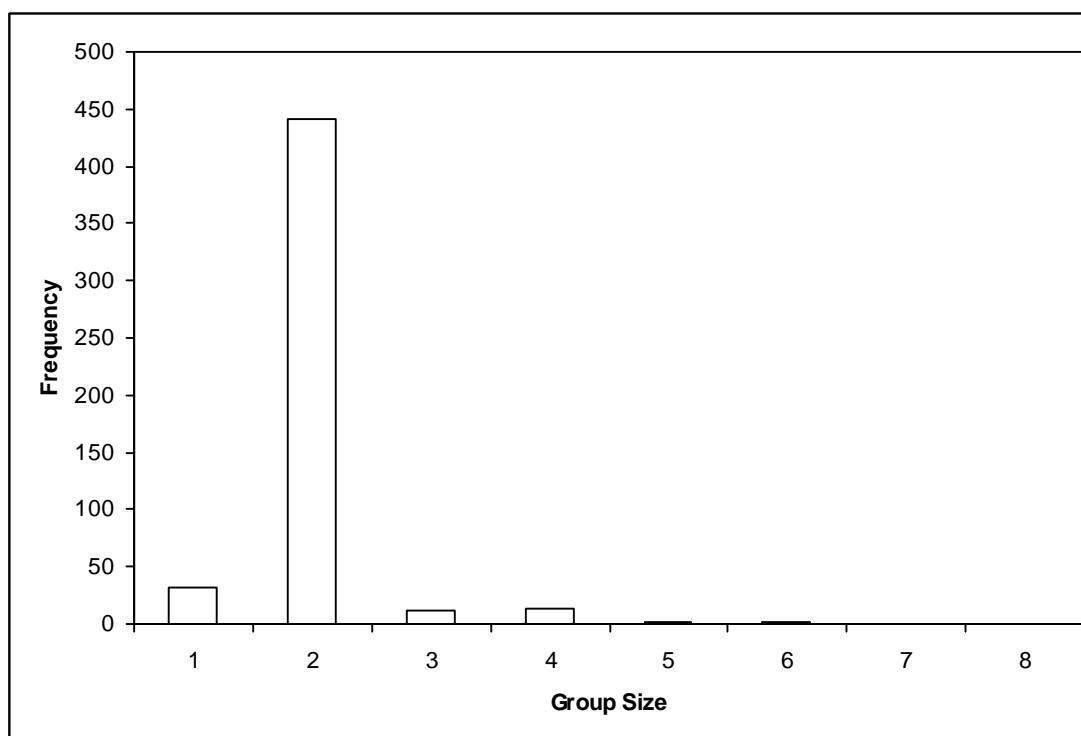


Figure 7. Frequencies of group sizes of groups of southern right whales encountered on the MRI Whale Unit annual southern right whale survey, September - October, 2014.

DISCUSSION & RECOMMENDATIONS

The weather encountered over the survey period ranged from excellent to poor with some 6 ½ days of potential survey time lost to inclement weather conditions during the 14 day survey duration.

Generally the distribution of cow and calf pair groups sighted on the survey was similar to that found in previous years with pairs concentrated on the Cape Agulhas to Puntjie and lesser extent Walker Bay to Cape Agulhas sectors of the coastline. Relatively high numbers (24 cow and calf pairs) were recorded between Puntjie and Nature’s Valley compared to previous years. The 461 cow and calf pairs is the highest total of cow and calf pairs encountered in the 36 year survey series, the previous highest field count having been 354 pairs in 2008. However the relatively poor weather generally experienced on the survey may have resulted in a high proportion of duplicate sightings as animals moved westwards during the 14-day survey period and the total of individual groups excluding duplicates that were encountered will only become apparent once the photographic matching is complete.

The low numbers of unaccompanied adult southern right whales (87 individuals) encountered on the 2014 survey remain of concern. Whilst 1,502 individuals were recorded over the 2005 to 2009 survey period (an average of 300 per annum), only 543 were sighted over the 2010 to 2014 survey period (an average of 109 per annum). An investigation of a possible westward shift in the distribution of these animals to the west of Muizenberg is becoming increasingly important and it is recommended that the 2015 survey includes a fixed wing aerial survey component covering the region between Muizenberg and the Namibian border at the Orange River Mouth. Not only will such a survey provide information on any shifts in distribution of unaccompanied animals, but may provide further information on the interrelationship of the

southern Cape coastal and Namibian “populations”. Roux et al. (2011) reported that 16 of 82 animals photographed in Namibian waters had previously been recorded of the southern Cape coastline.

With whale numbers now having increased to their current levels, it is imperative that all available windows of survey opportunity are utilised maximally. Once again the use of a support vehicle and extra observer greatly facilitated the survey operations and the expedient mobilisation of the aircraft each day. As recommended in 2013, it is recommended that both these and the use of a towed fuel bowser for refuelling of the aircraft be incorporated into the standard survey operating procedures.

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