Does disappearance mean extirpation? The case of Namibian right whales

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Abstract

Right whales off Namibia were severely depleted by early nineteenth century whaling, and judging by their infrequency in modern whaling catches in the 1920s must have been very rare by that stage. Aerial surveys from 1993 have revealed increasing numbers of the species, other than cow-calf pairs, in Namibian waters. Aerial surveys on the south coast of South Africa, on the other hand, have shown a major decline in the relative availability of animals without calves since 2009 (although cow-calf pairs continue to increase in numbers). Whales photographed off Namibia/Northern Cape from the air and at sea between 2003 and 2010 (n = 82 individuals) have been compared with the South African catalogue compiled between 1979 and 2012 (n = 1,682), revealing matches between 19 animals. Eight of these were adult females that had calved in South African waters, but only one was also seen with a calf off Namibia: three females however were seen off Namibia in the year in which they conceived or were predicted to conceive. Twelve out of 13 individuals that were albinistic or partially albinistic or that carried a white blaze dorsally had been first seen as calves in the South African south coast nursery areas. A twentieth animal photographed incidentally in the Northern Cape in August had moved to southern Namibia 40 days later. These results are strongly indicative of connectivity between the South African and Namibian/Northern Cape regions. Although the number of mature females using the Namibian coastline as a nursery area is still very small, the presence of adult females from the South African stock in the season in which they are believed to conceive suggests that there is unlikely to be any genetic differentiation between the two areas. It appears more likely that the reappearance of right whales in Namibia is a result of a range expansion from South Africa rather than the survival of a few remnants of the original stock, although the nature of the historic Namibian population (calving, breeding or both) is unclear.

Introduction

During the history of whaling there have been many occasions when a whale population in a region was heavily exploited, to the extent that after a number of years its abundance had been so reduced that it ceased to be of commercial importance: it effectively became "commercially extinct": in some of these cases there were very few subsequent overt signs of recovery, despite decades of official protection, leading to pessimistic assessments of its prospects of survival.

Examples of these include Northeast Atlantic right whales, eastern North Pacific right whales and Spitsbergen bowhead whales: in some of these cases, individual sightings are now being made (Martin and Walker, 1997; Wade et al., 2011; Wiig et al., 2007) leading to the question of whether these represent small remnants, or instead re-colonisation by animals from a currently more robust population (IWC, 2013).

Another such instance involves the "rediscovery" of southern right whales off Namibia (Roux et al., 2001). In this paper we investigate whether this reappearance has involved

individuals originating from the South African population, comparing photo-identification images taken on aerial and boat-based surveys in Namibia from 2003 to 2010 with the South African right whale catalogue that dates from 1979 to 2012.

Materials and methods

The time series of open-boat whaling effort in Namibian waters from 1788 to 1803 published by Richards and du Pasquier (1989) has been extended to 1850, principally using voyage summaries in Starbuck (1878), Jones (1986) and du Pasquier (1982), but also abstracts of logs of French whalers between 1831 and 1836, consulted on microfilm in the International Marine Archives, Nantucket, in 1977. The latter were particularly useful in clarifying the destinations visited by whalers, often expressed in voyage summaries as simply "côte d'Afrique", but actually involving visits to Spencer Bay, Elizabeth Bay, Angra Pequena (Luderitz), Sims Bay, Walvis Bay and Tiger Bay. In extending the time series, therefore, voyages listed as "côte d'Afrique" or "coast of Africa" have been included with those with the destination listed as Walvis Bay, on the assumption that they all referred essentially to the Namibian coast. The abstracts also provided more detail on catches by whaling ground than was available from voyage summaries.

Dedicated aerial surveys of the Namibian (and in some years the Northern Cape) coast have been flown in September or October of 1978, 1998, 1999, 2003, 2004, 2005, 2008, 2009 and 2010. These have covered variable stretches of the coast between the Kunene River mouth and 30^{o}S, so for the purposes of constructing a trend series a stretch of coast reasonably consistent between surveys (Meob Bay, 24^{o} 30'S, to the Orange River, 28^{o} 33'S) has been chosen: this has been termed the "southern Namibian coast". Furthermore, two surveys were carried out in 2003, one from 15 – 19 September and the other from 20-23 October: only the counts from the former (as being closer in time to other surveys) have been used in the trend analysis.

Apart from photographs taken on these dedicated surveys, incidental boat-based and aerial photographs have been taken in the vicinity of Lüderitz by whale watching operators and others from 2007 to 2010.

All aerial (and some boat-based) images taken in Namibian or Northern Cape waters between 2003 and 2010 (n = 82) were compared with the South African aerial catalogue held at MRI, which included surveys from 1979 to 2012 (n = 1,682). Images were not scored for quality or distinctiveness, but those considered unmatchable were rejected before matching. In total, images of 80/82 individuals from Namibia or the Northern Cape were considered of acceptable quality. In addition, another two whales were matched from pigmentation only, as no suitable callosity pictures were available.

Callosity matching was mainly done using the Hiby-Lovell procedure (Hiby and Lovell, 2001), adapted by Mike Harfoot, where image extracts are rated for similarity with those in the catalogue using an overall index of similarity from 1.00 to zero: matching continued until this index had fallen to 0.50 (involving the comparison with 146-545 individuals from the South African catalogue). Two individuals, however, were matched from pigmentation patterns only, as there were no suitable callosity images available. When interpreting the

results, it should be noted that the South African aerial catalogue is based on images of adult females, other albinistic adults and some conspicuously-marked calves, so that the likelihood of matching a male relative to a female, for instance, is much reduced.

The sex of animals was determined from the presence of a calf in attendance (adult female), or from pigmentation patterns, where all partially albinistic individuals are considered to be female and >90% of albinistic individuals male (Schaeff et al., 1999).

Results

Right whaling in Namibian waters

Aside from a brief episode of exploratory voyages to Walvis Bay by the Dutch West India Company from 1726 to 1731 (Dekker and de Jong, 1998), commercial taking of right whales on the Namibian coast may have restarted as early as 1773, when 14 American whaleships returned from the coast of Africa (Starbuck, 1878) - although their exact whaling grounds are unknown. The first French whalers arrived on the west coast of southern Africa in 1787 (du Pasquier, 1990), and were active in Walvis Bay in 1788. This is a more definite date for the beginning of intensified whaling on the Namibian coast (Richards and du Pasquier, 1989). Between 1788 and 1803 a total of 76 American, 39 French and 71 British whalers were identified as being present on the Walvis Bay whaling ground, reaching an annual maximum of 28 in 1796. Because not all vessels on the ground were identified, these are probably minimum numbers: in 1796, for instance, contemporary accounts stated that there were 35 vessels present on the ground, and "near forty" in 1793 (Richards and du Pasquier, 1989).

At an estimated 20 whales taken per vessel voyage, this level of effort would have resulted in the removal of at least 3,700 right whales over the 16-year period – this figure excludes any allowance for whales struck and lost that might have subsequently died. Although these catches were all referred to the "Woolwich Bay" ground, in reality whaling in this era probably took place at a number of localities along the Namibian coast. During a subsequent episode of French whaling from 1831-34, the pattern was for whalers to arrive on the coast at either Angra Pequena (= Lüderitz) or Elizabeth Bay in May/June and remain on the coast until August/September, visiting Sims Bay (= Hottentotsbaai, Du Pasquier pers. comm.), Spencer Bay, Walvis Bay and as far north as Tiger Bay (Baia dos Tigres) at 16° 37'S in southern Angola (Best 1981).

The initial pulse of whaling from 1788-1803 seemed sufficient to deplete the local stocks to the extent that most whale ships shifted to other, more profitable grounds (Richards and Du Pasquier, 1989). The subsequent history of exploitation for right whales on this coast in the nineteenth century is not well documented, although French whalers are known to have visited the Walvis Bay area between 1817 and 1843 (Du Pasquier, 1982), and in four such voyages to the African coast in 1831-34 a total of 40 whales (believed to be right whales from their oil yield) were taken (Best, 1981). The catch per voyage, however, had fallen substantially, and in 16 French voyages between 1831 and 1836 the catch rates while on the Namibian coast ranged from 0 to 18 with an average of 5.6 whales per voyage (Voyage Abstracts, French National Archives).

With the increasing interest paid to humpback whaling from the 1830s, and particularly after 1850 (Best, 1987), whalers continued to visit the west coast of southern Africa in the second half of the nineteenth century in search of humpback whales. Although the history of this fishery is also poorly documented, it seems almost certain that as the seasonality of occurrence inshore of both species is similar, right whales with their greater intrinsic value would continue to be taken incidentally. This could have been sufficient to have prevented any real recovery from taking place.

At the start of modern whaling on the African coast in 1908, right whales must still have been very rare. No right whales were recorded in the 4,063 whales landed in Namibia between 1913 and 1930, and only one in the 14,475 whales landed in Angola between 1909 and 1928 (Best, 1994a), although many of these catches (especially those pre-WWI) were unspecified. Nevertheless, after 1923, when catches were almost completely specified, no right whales were recorded amongst the 2,630 whales landed in Namibia up to 1930, nor amongst the 2,411 whales landed in Angola up to 1928 (the 17 right whales reported in the Bureau of International Whaling Statistics as being taken in 1925 in Angola proved to be a typographical error (Best, 1990): the catch was of Bryde's whales). This contrasts with the situation further south, where 28 right whales were amongst the 21,283 whales landed in the Southwestern Cape between 1909 and 1930, 11 of which were taken between 1923 and 1930 (Best, 1994a). It seems almost certain therefore that by 1930 right whales had effectively disappeared from Namibian inshore waters, although they were still present in small numbers on the South African coast in winter.

Nature of the historical catch

Unlike modern whaling, open-boat whaling kept no official catch records, so determining what they caught depends almost entirely on examining the surviving unofficial records such as the logbooks and journals kept by individual crewmen. The detail in these is extremely variable and so open to interpretation: a lack of a record may simply represent a lack of interest in recording it, for example. These uncertainties have to be borne in mind in the following analysis.

French whaleships bound for Walvis Bay between 1791 and 1803 left port between September and the following May (most (8/12) between January and March), and returned between September and the following March (most (5/7) between November and January (Du Pasquier, 1990). Allowing about three months for the passage each way to and from the whaling grounds (Best, 2006), this would imply the whalers were mainly active on the coast between April/June and August/October. Actual dates of arrival and departure from Walvis Bay are available from nine logbooks between 1788 and 1796 (Richards and du Pasquier, 1989), and range from 31 March to 28 May (mean arrival 3 May) and from 20 May to 14 October (mean departure 26 July) respectively. However at this early stage of the fishery the departure dates were obviously influenced by fishing success, so that once a vessel was full it would depart for home, despite there still being plenty of whales around. An alternative indicator of the extent of the season might be the numbers of vessels on the ground at any one time. Such incidental observations are available on eight occasions during the 1788-1796 seasons (Richards and du Pasquier, 1989), and indicate that there were still large numbers of vessels present until late in August (Fig. 1). Although there are uncertainties surrounding the exact timing of the southern right whale's breeding season,

given the lack of information on the rate of early foetal growth, most conceptions are believed to occur between June and September (Best, 1994b). This implies that the presence of right whales in the Walvis Bay region at least overlapped with their postulated breeding season.

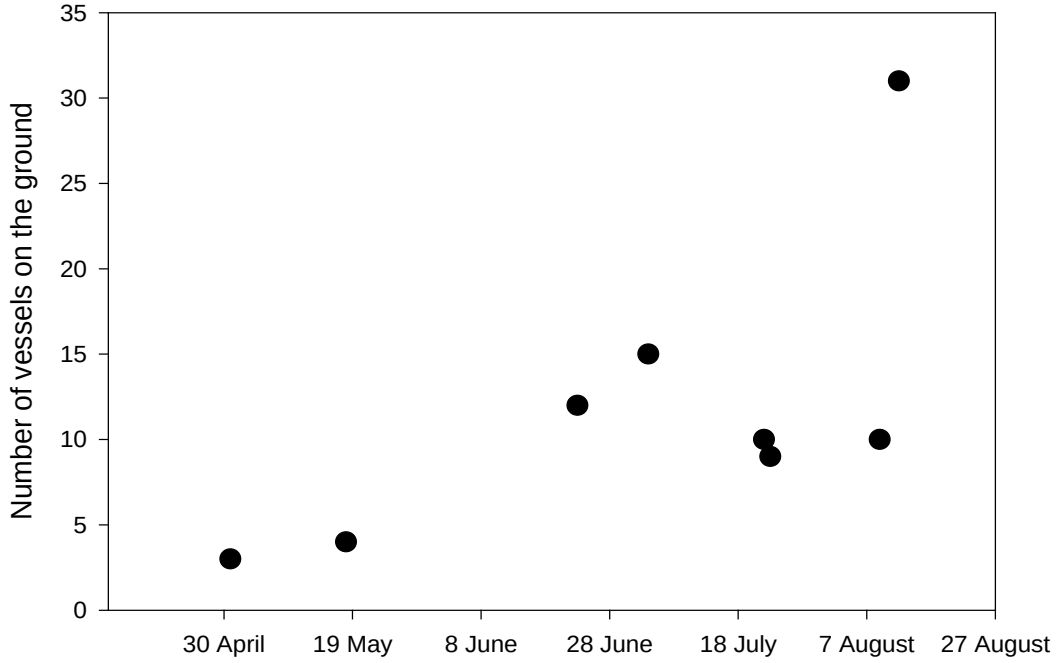

Fig. 1: Numbers of whalers present on any one day on Walvis Bay whaling ground, 1788-1796

The composition of the catch can be assessed from the oil yield of individual whales recorded in contemporary logbooks (n = 16), or from voyage averages for vessels visiting the ground (n = 6). These provide very similar results, with individuals ranging from 50 to 100 (mean 69.6) barrels, and voyage averages ranging from 47.4 to 92.4 (mean 69.6) barrels. With right whales in the South Atlantic said to yield when full grown 40-60 barrels if male and 60-80 barrels if female (Clark, 1887), these values suggest that the catch was composed largely if not exclusively of “adults”, many of which were probably female.

Richards and du Pasquier (1989) commented on the lack of reference to the presence or taking of dependent calves in one informative logbook from the Walvis Bay ground (*Anne* of Dunkirk, 1791-92). The same can be said for the logbook of the *Kingston* of Spitshead, 1800-1801) whaling in Tiger Bay from June to mid-September (PBB pers. obs.). These observations together with the oil yield data would suggest that this was not an area frequented by many cow-calf pairs. However this conclusion should be treated with caution given the unofficial and personal nature of the logbooks themselves, and the possibility that at this stage of the fishery calves, if taken as a lure for the mother, might simply have been discarded without any attempt to process. Du Pasquier (1990), however, believed that the processed catch on the African coast must have included a percentage of young whales, because the overall average oil yield per whale was less than on the coast of Brazil. With

births peaking in August (Best, 1994b), neonates could certainly have been expected to be present at the time whaling took place. The issue of whether or not Namibian waters ever hosted a substantial number of mother-calf pairs needs to be resolved through the examination of additional primary historical records.

Recent sightings of right whales in Namibian waters

Apart from a right whale taken in Gabon in 1951 (Budker and Collignon, 1952), there were no further reports of southern right whales on the west coast of southern Africa north of the Orange River until 1971, when a cow-calf pair was seen on an aerial survey of seal colonies (Best, 1981). The subsequent reappearance of right whales in Namibian waters has been described by Roux et al (2001), including results from the first three aerial surveys. Counts made on all the aerial surveys of the southern Namibian coast are illustrated in Fig. 2. Overall counts have apparently increased in recent years, but inter-annual variability has been too great to provide an accurate estimate of the rate of increase: excluding the 1978 data point because of its separation in time (and hence undue influence on trend analysis) and fitting an exponential regression to the data from 1998 to 2010 produces a slope of 12.5% (95% CI -5%, 30%) p.a., not significantly different from zero (one-tailed p = 0.066). The counts of cow-calf pairs have clearly not increased over the same time period.

Although aerial surveys of northern Namibia have not been undertaken consistently over time, there has only been one sighting on these surveys north of Meob Bay, a cow-calf pair seen at Conception Bay (23° 57.75'S) on 19 September 2003. The present-day distribution of right whales therefore seems to be concentrated largely in southern Namibia, with the historical whaling grounds at Walvis Bay (22° 51'S) and presumably Tiger Bay area (16° 36'S) still to be populated.

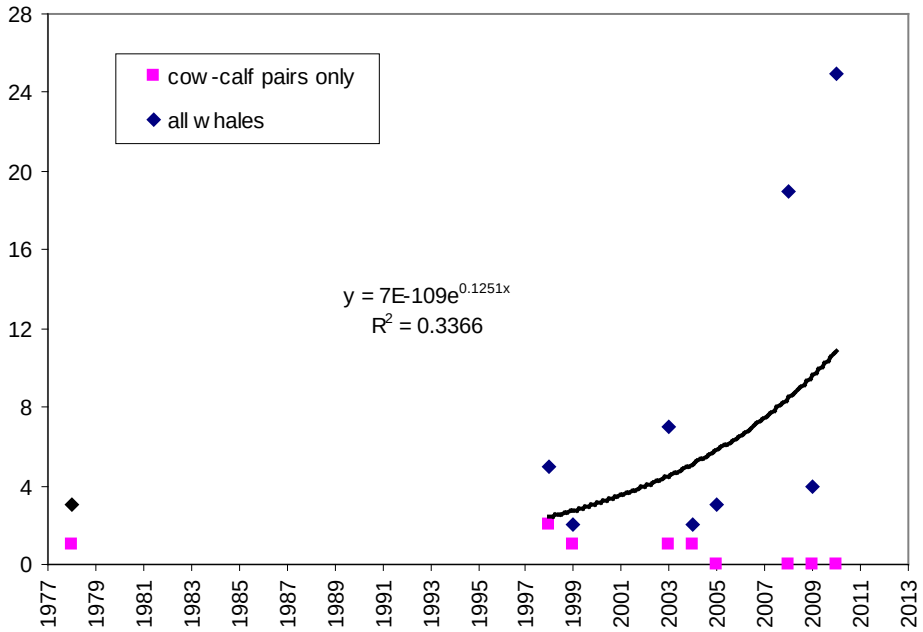

Fig. 2: Total counts and counts of cow-calf pairs on aerial surveys of the southern Namibian coast, 1978 - 2010

Changes in relative abundance of right whales off South Africa

Since aerial surveys for right whales began on the South African coast in 1971, there has been a general overall increase in the numbers of whales seen annually, at least until very recently. Fig. 3 illustrates trends in the numbers of cow-calf pairs and other whales (usually termed "unaccompanied whales") seen on fixed-wing surveys from 1971-1987 and helicopter surveys from 1979-2012.

The areas covered by these surveys were different, with the fixed-wing surveys extending some 250 km further east than the helicopter surveys. This difference in distance searched explains why the counts of unaccompanied whales from fixed-wing surveys were usually higher than those on the helicopter surveys in the same year. The counts of cow-calf pairs, however, were generally in good agreement between the two surveys, despite the difference in distance searched. This was because nearly all the cow-calf pairs were sighted in the western section of the survey area, so that exclusion of the eastern sector on the helicopter surveys made little difference to the total seen.

The data sets are also not strictly comparable, in that the numbers of cow-calf pairs represent individuals recognized from aerial photographs, i.e. with duplicate sightings accounted for, whereas unaccompanied whales were not usually photographed so that the extent of duplication in their sightings is unknown.

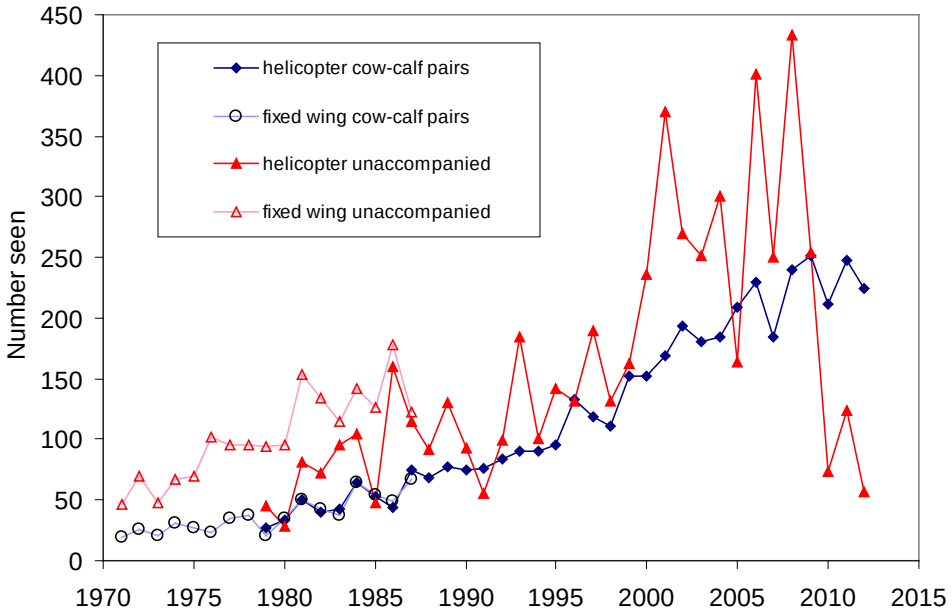

Fig. 3: Trends in the counts of cow-calf pairs and unaccompanied right whale adults in the South African survey area, 1971 – 2012

Using the helicopter surveys since 1979 as being the longest series with the most consistent methodology, the increase rates in cow-calf pairs and unaccompanied adults have been very similar up until 2009, exponential at 6.33% p.a. (r = 0.9232) and 6.25% p.a. (r = 0.8561) respectively. From 2009 onwards, however, the counts of unaccompanied adults have declined sharply, reaching levels only seen 16-20 years earlier. From being higher than the counts of females in 26 of the 31 preceding years, the counts of unaccompanied animals have been as low as 25-50% of the cow-calf counts over the last 3 years.

Movements of right whales between Namibia and South Africa

In total, 19 whales were matched between the Namibian and South African survey catalogues (Table 1, excluding one internal Namibian match between days in the same year). Two of these (L0316A and L0404A) were seen in the waters of the Northern Cape of South Africa, in an extension of the Namibian aerial surveys south of the Namibian/South African border. Three of the 19 whales were believed to be male (because they were albinistic), eight were known to be female (because they were sighted with a calf), four were believed to be female (because they were partially albinistic) and the sex of four was unknown. Given the female bias of the South African catalogue, all that can be said is that both sexes were represented in the inter-catalogue matches. Of the animals that could be accurately aged when first seen in Namibia (having been seen as calves), eight were 4 - 7 years old (and so probably immature), three were 9 - 11 years old (and so probably pubertal), and nine were either known adults (five), 17 years old (one) or of unknown age (three).

Of the eight females seen to have calved on the South African coast a total of 19 times, only one (L0304A) has also been seen in Namibia with a calf. This female was first photographed with a calf near Conception Bay in central Namibia, and three years later with a calf in the nursery area in St Sebastian Bay on the south coast of South Africa, a coastwise geographical separation of some 1,500 km. It has subsequently been seen with two more calves at 3-year intervals, both on the South African south coast, suggesting that the excursion to Namibia was atypical.

Three of the females, however, were present in Namibian waters in the winter preceding that in which they calved (L0713A) or in the winter two years after (L0812A, L1001A) their previous calf – in other words, given a three year calving interval, in the year in which they conceived or were predicted to conceive.

Of the 13 individuals photographed in Namibia/Northern Cape that were either partially albinistic (seven), albinistic (four) or carried white blazes dorsally (two), all but one (an albinistic individual) had been photographed as a calf in South African waters. Given that the probability of photographing an individual on any one survey in South African waters has been estimated as between 0.539 and 0.861 (Brandao *et al*, this meeting), such a high re-sighting rate (0.923) provides powerful support for the hypothesis that essentially all the animals currently being sighted in Namibia have originated from the nursery grounds on the southern coast of South Africa. This conclusion of course assumes that the atypically-pigmented animals were representative of the total population.

A 20th match (L0811A) was not photographed on either survey programme, but during filming of a television documentary series in the Northern Cape in August 2008. Forty days later it was photographed off Luderitz on the Namibian survey, 400 km to the north. Although unsexed, on both occasions it was participating in surface active groups, of 9 animals in August and of 8 animals in October.

A further example of linkage between the two areas is provided by an adult right whale of unknown sex found heavily entangled in rock lobster gear (rope and attached floats) in Table Bay (33 52.83S 18 26.08E) on 16 January 2013. Some of the gear removed was identified as originating from a rock lobster boat registered in Luderitz, Namibia, ca 1,200 km to the north.

Discussion

Right whales off Namibia seem to have been subject to the usual commercial whaling paradigm of discovery, over-exploitation and commercial extinction. After being heavily depleted by late eighteenth-century whaling, they continued to be the targets of opportunistic exploitation for another 100 years before finally being afforded official protection in 1935. For the first 70 years of the twentieth-century, including the first 35 years of official protection, there are no records of the species in Namibian waters, although single specimens were taken further north in Angola (1928) and Gabon (1951). The species had for all intents and purposes disappeared from the region.

The first incidental sightings (four between 1971 and 1984) were followed by an apparent increasing rate of sightings over the next 15 years (four in 1985-1989, nine from 1990-1994 and 20 from 1995 – 1999). Some at least of this resurgence was probably the result of increased public awareness and the development of a coastal diamond mining industry (Roux et al., 2001), but it was sufficient to motivate for the initiation of an aerial survey programme in 1998. This has revealed an overall revival in the numbers of right whales off Namibia, at least in the southern half. This influx of animals has so far not included calving females to any great extent, and has been matched by a marked decline in the relative abundance of animals without calves off the south coast of South Africa from at least 2009. The discovery of 20 matches between these two area, 17 from 2008 onwards, with a best estimate of 92.3% originating from the South African nursery grounds as calves, confirms that the influx into Namibia has probably largely been at the expense of animals from the South African population.

At face value the phenomenon appears to be an example of range expansion as a depleted population recovers. However there are a number of qualifications to this conclusion. The nature of the original “Walvis Bay” whaling ground is uncertain, specifically whether it functioned as a nursery ground or “breeding” ground, or both. Certainly there is evidence that the right whale population off South Africa during the era of modern whaling (1908-1963) and even during open-boat whaling in the nineteenth century was dominated by adult females and their calves (Best and Ross, 1986), and so was very different from what has been observed until recently. Perhaps, therefore, the relocation of unaccompanied animals to Namibia is simply a recapitulation of the historic stock structure on this whaling ground.

The number of animals so far seen off southern Namibia (<30 in any survey) is also far less than the numbers of unaccompanied animals "missing" on recent South African surveys – of the order of 200-300 animals a year. If these individuals have continued to visit coastal waters in winter and spring then they may have relocated to other, unsurveyed areas of both west and east coasts of southern Africa. There is evidence both from the southern extension of the Namibian surveys onto the west coast of Southern Africa (up to ca 30^{o}S) and incidental sightings that right whales are present on the west coast of southern Africa in winter and spring, and that some at least subsequently move into Namibian waters.

The possibility of the reappearance of right whales off Namibia representing the recovery of a few remnant individuals from a separate, original population seems remote, given both the scarcity of early twentieth-century sightings and the evidence of immigration from South Africa. Whether the Walvis Bay whaling ground in fact ever represented a reproductively-isolated population from that off the Cape of Good Hope, rather than a separate population component (Best, 2006), must remain a moot point. But the fact that adult females from the South African stock are to be found there in the season in which they are believed to conceive suggests that there is currently unlikely to be any genetic differentiation between the two areas.

In the meantime, the process described here is consistent with the observation of Richards (2009) that southern right whales in general are extending their distribution northwards and occupying locations where they have not been seen for a century or more.

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Table 1: Details of right whales matched between Namibian/Northern Cape and South African aerial catalogue (?M, ?F where sex determined from pigmentation only)

Namibian/Northern Cape catalogue						*South African aerial catalogue*				Age when first seen in Namibia
Cat. no.	Sex	Colour	Date seen	Location	Grouping	Cat. no.	Date seen	Location	Grouping	
L0304A	F	B	19-Sep-03	235775S	C + calf	R06/65A	13-Oct-06	H	C + calf	Adult
							18-Oct-09	344080S 193096E	C + calf	
							18-Oct-12	344598S 200338E	C + calf	
L0316A	F	PA	21-Oct-03	292770S	Non-SAG	R08/51A	12-Oct-99	343059S 202751E	Calf	4
							10-Oct-08	342454S 205137E	C + calf	
							17-Oct-08	344541S 193649E	C + calf	
							13-Oct-12	342929S 203030E	C + calf	
L0404A	F	B	10-Oct-04	2959S	Non-SAG	R11/06A	05-Oct-11	342189S 213165E	C + calf	Unknown
							11-Oct-11	344188S 201061E	C + calf	
L0701A	?M	A	21-Oct-07	270200S 151300E	Single	R01/80c	11-Oct-01	342942S 202938E	Calf	6
L0703A	U	WB	21-Oct-07	270200S 151300E	Single	R97/03c	17-Oct-97	342235S 205400E	Calf	10
L0708A	?F	PA	22-Oct-07	265700S 151400E	Single	R03/241c	22-Oct-03	343225S 192231E	Calf	4
L0713A	F	PA	22-Oct-07	265700S 151400E	Gp of 2	R99/91A	21-Oct-90	G	Calf	17
							12-Oct-99	343007S 202861E	C + calf	
							11-Oct-02	342835S 205057E	C + calf	
							10-Oct-05	343842S 201739E	C + calf	
							13-Oct-08	342951S 202976E	C + calf	
							15-Oct-10	342520S 205193E	C + calf	
L0811A	U	B	01-0ct-08	263440S	Gp of 8	R08/355A	22-Aug-08	302079S 171661E	SAG	Adult
L0812A	F	B	30-Sep-08	263815S	Gp of 5	R03/163A	21-Oct-03	344292S 200751E	C + calf	Adult
			01-Oct-08	263210S	In pair		13-Oct-06	H	C + calf	
							15-Oct-06	G	C + calf	
L0815A	U	B	01-Oct-08	263440S	Gp of 8	R99/69A	12-Oct-99	342793S 203457E	3 + calf	Unknown
L0820A	?M	A	30-Sep-08	263760S	Gp of 5	R06/308A	12-Oct-03	341741S 215534E	Calf	5
							19-Oct-06	A	SAG	
L0904A	F	B	06-Oct-09	243000S	In pair	R11/45A	06-Oct-11	342328S 205290E	C + calf	Unknown
L1001A	F	B	19-Oct-10	261710S	Single	R05/11A	07-Oct-05	342307S 210687E	C + calf	Adult
							12-Oct-08	342715S 203965E	C + calf	
L1002A	?F	PA	20-Oct-10	270127S	Single	R05/02c	07-Oct-05	342217S 205973E	Calf	5

						09-Oct-05	342387S	205174E	Calf	
L1008A	?F	PA	20-Oct-10	272056S	Gp of 4	R06/123c	15-Oct-06	G	Calf	4
L1012A	U	B	20-Oct-10	274704S	SAG of 9	R09/332A	23-Oct-09	342526S	190976E	Gp of 3	Adult
L1013A	?F	PA	20-Oct-10	274717S	SAG of 9	R01/13c	10-Oct-01	342251S	205435E	Calf	9
L1015A	?M	A	20-Oct-10	274717S	SAG of 9	R94/15c	12-Oct-94	H	Calf	6
L1019A	F	PA	20-Oct-10	274717S	SAG of 9	R05/06A	12-Oct-99	343017S	202834E	Calf	11
							07-Oct-05	342258S	210201E	C + calf	
							14-Oct-09	342839S	205120E	C + calf	
							17-Oct-09	344281S	200994E	C + calf	
							23-Oct-09	341534S	185042E	C + calf	
							13-Oct-12	343051S	202730E	C + calf	
L1020A	U	WB	20-Oct-10	274717S	SAG of 9	R06/247A	21-Oct-03	343699S	192505E	Calf	7
							16-Oct-06	C		Non-SAG	
							18-Oct-08	342808S	192024E	Non-SAG	
							16-Oct-11	342625S	191856E	Single	