

A note on recent sightings of southern right whales (*Eubalaena australis*) along the east coast of Madagascar

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ABSTRACT

Southern right whales (*Eubalaena australis*) are distributed throughout the Southern Hemisphere, where they seasonally migrate between high latitude feeding grounds and low latitude breeding grounds. While there are detailed records of historical and recent whaling off the southern, southwestern and southeastern African coasts, historical catches in Madagascar's waters are poorly documented. There have also been no recent, documented sightings of southern right whales off the east coast of Madagascar. Here we report two sightings, one of a single individual in Antongil Bay in northeastern Madagascar and the other of a mother and calf pair near Fort Dauphin on the southeastern coast. DNA obtained from a biopsy sample of the single animal showed it was a male possessing one of the common South Atlantic right whale mitochondrial haplotypes. The available DNA data provide limited suggestive evidence that the individuals documented off Madagascar represent long-distance migrants from the well-documented South African population. However, the possibility that these southern right whales are members of a small or remnant population from the historical whaling grounds of Delagoa Bay, Sofala Bay or the Crozet Island feeding grounds cannot be excluded. Regardless of population assignment for these individuals, it appears that some southern right whales may be using different parts of Madagascar's east coast during the wintering season.

KEYWORDS: SOUTHERN RIGHT WHALE; INDIAN OCEAN; BREEDING GROUNDS; GENETICS

INTRODUCTION

Southern right whales (*Eubalaena australis*) are thought to comprise several populations distributed throughout the Southern Ocean (IWC, 2001). Whaling records have shown that right whales formerly occupied ranges that they no longer do today (Wray and Martin, 1983; IWC, 1986a; Richards and du Pasquier, 1989). Commercial whaling operations over the last two centuries brought southern right whales to near extinction. Despite legal protection in 1935, exploitation of right whales in the Southern Hemisphere continued to occur as late as 1971 (Tormosov *et al.*, 1998).

During the austral winter, southern right whales migrate north to the more temperate and tropical waters of the sheltered bays and inlets along the coasts of South America, southern Africa and Australia, where they breed and calve (Brownell *et al.*, 1986; IWC, 2001). In general, one or two months after calving, the cows begin their migration to higher latitudes for the remainder of the year (Townsend, 1935; IWC, 2001). Recent evidence suggests the gestation period may be one year or more (Best, 1994; Burnell and Bryden, 1997). This seasonal migration is so predictable that whalers stationed along these coasts were consistently able to catch right whales (Richards and du Pasquier, 1989).

Records of whaling off southern Africa (1785-1805 and 1792-1912) identify the historical presence of large stocks of right whales around the Cape of Good Hope (34°S), as well as at lower latitudes (*ca* 23°S) such as Walvis Bay, Namibia (Townsend, 1935; Best and Ross, 1986). These records also show right whale concentrations and movements of individual animals further north into the Mozambique Channel, Maputo Bay (25°S, historically known as Delagoa Bay) and the Bay of Tigris in Angola, West Africa (17°S) (Townsend, 1935; Richards and du Pasquier, 1989). While

the historical estimate of stock size is likely to be inaccurate, Richards and du Pasquier (1989) speculate that the stock size of right whales around the southern coasts of Africa before 1785 would have numbered approximately 20,000. In the 120 years (1792-1912) of shore-based open boat whaling only, Best and Ross (1986) estimate that the catch of right whales was 1,580 individuals. For the entire Indian Ocean between 1830-1909, Best (1987) estimated a total Indian Ocean catch of about 12,500 right whales, with total catches for all stocks estimated between 70,325-74,693.

There was comparatively little whaling (or at least analysed records) for right whales in the waters around Madagascar (Wray and Martin, 1983; IWC, 1986b). Records show that shore-based whaling began in the 1750s, but no other details are known (IWC, 1986b). Some records point to the presence of right whales between Delagoa Bay and Madagascar (presumably the west coast) in the months of May-September (Richards and du Pasquier, 1989). However, while sightings of right whales around Madagascar are mentioned in the literature, no published accounts of historical right whale catches from the east coast of Madagascar have been identified. Furthermore, there are no documented recent sightings of right whales along the eastern coast of Madagascar. The sheltered bays and inlets along this coast were possibly once a migratory destination for right whales from a smaller whaling ground in the Crozet Islands (46°S, 50°E) in the southern Indian Ocean.

Antongil Bay (16°00'S, 49°55'E) in the Masoala Peninsula region of northeastern Madagascar has recently been documented as a major calving area for humpback whales, *Megaptera novaeangliae* (Rosenbaum *et al.*, 1997b). The bay itself is large, occupying 2,800km², and is nearly 80km in length from the mouth to the northern end. Historically, the area attracted considerable attention from American whalers looking for humpback whales (Nordhoff,

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1856), with more recent hunting during the 20th century (Angot, 1951; Best *et al.*, 1998). The areas in the southern region of Madagascar are passed by humpback whales on both their southern and northern migrations. This note reports on two confirmed southern right whale sightings from Madagascar, one of a single individual in Antongil Bay in the northeast, and the other of two individuals near Fort Dauphin on the southeast coast.

METHODS

Daily field surveys were conducted for humpback whales and other marine mammals from two 6m fibreglass boats between July and September 1996-1999. Randomised transects were conducted by each boat in equally divided eastern and western portions of Antongil Bay to minimise sampling bias and to examine possible trends associated with spatial and temporal distribution. When whales were encountered, the initial and terminal positions of a group were recorded using a *Trimble GeoExplorer II*. Photographic identification and video recording typically occurred with each group sighting. Boat surveys were carried out using a single vessel in a similar manner to that described above for the southeast coast between October and December 1999.

Skin tissue samples were collected by biopsy darting whenever possible and these were stored in 95% Ethanol. Methods for DNA extraction, PCR amplification and mitochondrial DNA control region sequencing are detailed in Rosenbaum *et al.* (1997a). The obtained sequence was aligned and compared to other available sequences from southern right whales (Baker *et al.*, 1999; Portway *et al.*, Submitted). Sex was determined using molecular methods (Palsbøll *et al.*, 1992).

RESULTS

On 29 July 1997 at 11:32hrs, a southern right whale was encountered in the northern portion of Antongil Bay (15°31'S, 49°56'E) (Fig. 1). The individual alternated between flippering and lobtailing behaviour. Upon cessation of the lobtailing, three humpback whales approached the right whale to within 800m at the surface. On the following surfacing, the right whale and humpback groups were clearly separated. The right whale maintained consistent 15-17 minute dive times, with 2-3 minute surfacing intervals, for approximately four hours.

From the tissue biopsy sample, the individual was determined to be a male with one of the most common maternal lineages found among right whales in the South Atlantic (Portway *et al.*, Submitted). This lineage is the same as one of two mitochondrial haplotypes found in all three sampled populations from South Africa, South Georgia and Argentina in that study.

The second sighting occurred on 20 November 1999 (25°12'S, 46°38'E), approximately 40km southwest of Fort Dauphin (Fig. 1). During surveys for humpback whales, a mother and calf right whale pair was encountered at 07:45hrs. The calf was observed to repeatedly breach. Deteriorating weather conditions (Beaufort Sea State >4) prohibited additional work with this group, and the surveys were terminated at 08:30hrs with the last position of the right whale recorded as 25°12'S, 46°40'E.

DISCUSSION

While sightings records or historical data offer no link between right whales sighted off Madagascar and the closest locations where concentrations of this species have been

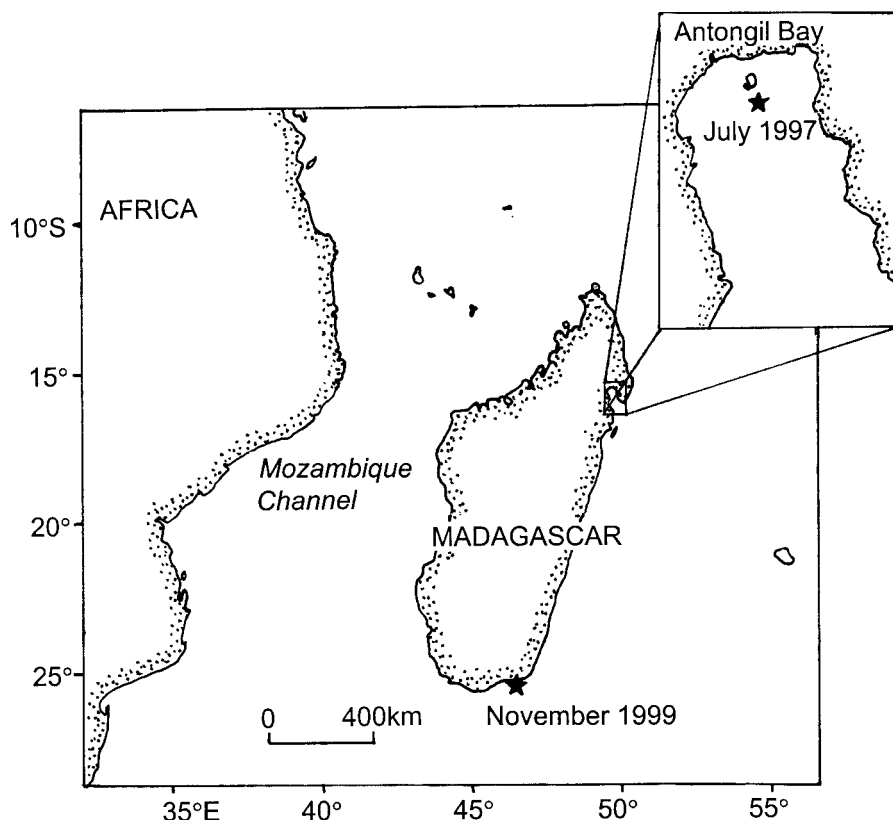


Fig. 1. Dates and locations of sightings of southern right whales (★) off Madagascar, western Indian Ocean. Inset shows Antongil Bay.

well-documented, such as the southern coast of South Africa or the Crozet Islands, it is interesting to consider the possibilities for population affinity. One possible explanation for the sighting of right whales in Madagascar's waters is that the individuals are migrants from the population off southern South Africa at the extremes of their range. As reported by Best *et al.* (1993), animals identified in southern South Africa have shown long-range movements. The most compelling evidence for the animals' South African origin exists from the one individual whose maternal lineage haplotype matched one of the two most common haplotypes found only in the South Atlantic Ocean. However, an analysis of differences or similarities in haplotype composition or frequency alone is unlikely to uncover significant population affinity within an ocean basin. Additional analytical approaches with finer resolution, such as multiple-locus genotyping, and more exhaustive sampling from other locations would be necessary for assigning population affinity for these whales. If these right whales are in fact animals from the South African population, the minimum distances travelled to southeastern Madagascar and Antongil Bay would be 2,782 and 3,995km respectively. Those distances are within the range of distances reported for long-range movements of southern right whales from the South African population and consistent with movements within the South Atlantic (Best *et al.*, 1993).

Alternatively, the right whales seen off Madagascar's coast may be individuals from a remnant or slowly recovering population from the historical whaling grounds of Delagoa Bay, Sofala Bay or the Crozet Islands. The mother and calf pair sighted off southern Madagascar were approximately at the same latitude as Delagoa Bay. Richards and du Pasquier (1989) state that two ships took 29 right whales while cruising off Madagascar (most likely the west coast, but no indication is provided) and at anchor in Delagoa Bay, although no indication is given as to how many whales were taken at each site. To our knowledge, there are no other historical records showing calving of right whales in bays along the coast of Madagascar, as there have been for Delagoa or Sofala Bays. Furthermore, no historical whaling records suggest northern calving areas for animals found in the austral summer on the Crozet whaling grounds. The Crozet grounds (40-52°E) lie nearly 2,300km directly south of southern Madagascar and 3,400km south of Antongil Bay, and may serve or have once served as wintering grounds for this population.

In the western Indian Ocean, the majority of historical whaling catch data show concentrated hunting from Delagoa Bay to Sofala Bay along the African coast or on the Crozet grounds (Wray and Martin, 1983). Another possibility is that the population that once used Delagoa and Sofala Bay as calving grounds is now using Madagascar's coast, following extirpation or reduction in numbers due to intense periods of whaling. Based on historical records, Richards and du Pasquier (1989) suggest that there appeared to be several different migrations by potentially different stocks for the calving seasons from late May to early September. However, these data were mostly concentrated on the coasts of continental Africa. The timing of the migratory cycle from historical records was consistent with the northernmost sighting of the right whale in Antongil Bay reported here. The sighting of right whales in southern Madagascar in late November might be explained by different groups of animals that travelled to more northerly latitudes (around 23-25°S) than others which calved at more southern latitudes. Such an occurrence was thought to cause an extension of the whaling

season off South Africa because of the greater distances (and time required) by right whales travelling further north to other calving grounds (Richards and du Pasquier, 1989).

The only detailed historical dataset from the western Indian Ocean other than the pelagic or coastal African whaling records comes from the offshore Crozet grounds. During two different periods of exploitation, large takes of right whales occurred: at least 1,000 in 1841-45 (Richards, 1990) and about 300 in 1962-1968 during the illegal Soviet expeditions (Tormosov *et al.*, 1998). Whales from the Crozet grounds were so intensely exploited that the population was considered depleted or scarce by the 1870s (Wray and Martin, 1983). Intensive exploitation in the Crozets prior to the 1850s may have reduced the numbers of right whales to the point that whaling ships subsequently operating along the east and west coasts of Madagascar would not encounter right whales with great frequency during the late 19th century. The more recent Soviet exploitation would have had a similar effect. In the austral summers of 1962 and 1963 alone, Soviet pelagic whalers took 115 females from the Crozet Islands, possibly impacting the number of pregnant females observed following that first reported year of hunting (Tormosov *et al.*, 1998). Such periods of intense exploitation, coupled with a general lack of dedicated survey effort along Madagascar's coastline, could have contributed to the scarcity of right whale sightings off Madagascar. The current status of the Crozet Island population of right whales remains largely unknown.

For the western Indian Ocean, there are few reports of right whales as far north as 16°S. A newspaper article reports a sighting of a right whale in the waters of Mauritius at 20°S, 57°E (Best, pers. comm.). With the documented takes of right whales at Delagoa Bay and the current sighting of a mother and calf at 25°S, the sighting of a southern right whale in Antongil Bay may be the northernmost sighting in the western Indian Ocean. In the eastern Indian Ocean, Maury's charts show right whales off the western Australia coast at 15-20°S, though the most recent northern record has occurred at approximately 22°S (Bannister, 1986; IWC, 2001). Richards and du Pasquier (1989) note that some right whales may have calved during July and August at latitudes as high as 17°S in the South Atlantic, with the occasional whale being found in equatorial waters. The latter is supported by recent observations of a right whale, presumed to be a southern right whale, sighted off Gabon at 1°S of the Equator (Darling, pers. comm.). Interestingly, a rare North Pacific right whale sighting in Hawaiian waters occurred at 20°N in 1979 (Rowntree *et al.*, 1980). This lone right whale was observed amidst a group of humpback whales for nearly three hours. Similar interactions between humpback and right whales have occurred where right whale sightings are more common (M. Engel, pers. comm.). However, for the right whale sighting at Antongil Bay, any interaction with humpback whales did not last long, although there were a number of humpbacks in the general vicinity.

The overall population affinity of right whales in Madagascar remains uncertain. Because the sampled individual was of the maternal lineage most common among whales from the South Atlantic, the genetic results at this level of resolution are inconclusive. It is difficult to determine whether this individual was from a remnant local population or maybe a migrant from a well-documented population (Best, 1990). Additional information on the lineage types and frequencies from other historical populations would be necessary to differentiate between the two hypotheses. Despite over 650 hours of boat-based surveys in Antongil Bay and 2,500km of aerial surveys in the

northeast region, no additional right whales have been sighted. The sightings reported here provide some evidence that members of a remnant/small population, or possibly individuals with exceedingly long-distance movements, are now frequenting the coast of eastern Madagascar.

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