

Commentary

Exploring anthropogenic activities that threaten endangered blue whales (*Balaenoptera musculus*) off Sri Lanka

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Abstract

The waters off Sri Lanka, an island in the northern Indian Ocean, are an important habitat for blue whales, a species listed as Endangered in the IUCN Red List of Threatened Species. The subspecies status, genetic affinities and movement patterns of this northern Indian Ocean population of blue whales is not yet clearly understood but off Sri Lanka they can be found throughout the year. Sri Lanka also lies on a busy international shipping lane. Since 2009 a boat-based commercial whale-watching industry targeting the blue whale, has been developing off the south coast, with annual growth in numbers of boats and visitors. This industry however remains unregulated in any formal or informal manner due to the absence of regulatory mechanisms in this small, developing, island nation. Consequently unethical practices are leading to harassment resulting in direct and indirect impacts on the targeted whales. Sighting and stranding data from before and after the inception of whale watching activities indicate a spatial shift in the area of occurrence and concentration of whales and a corresponding increase in fatal vessel collisions along the southwest coastline of the island. There are clear indications of displacement from preferred near-shore feeding areas to the vicinity of the adjacent shipping lane, causing an increase in collision risk. Although these findings are based on limited data, it is recommended that a precautionary principal is followed and anthropogenic activities are quickly regulated to mitigate adverse impacts on these endangered blue whales. [JMATE. 2012;5(1):3-7]

Keywords: *Blue whale status, whale-watching impacts, displacement, vessel collisions*

Introduction

Sri Lanka is a 65,000 km² island in the northern Indian Ocean (N 5° 55' - 9° 50'; E 79° 42' - 81° 53') (Figure 1). The blue whale (*Balaenoptera musculus*) is a common species of large mysticete in the waters around the island (12, 13, 18) and sighting rates are high in comparison to other low-latitude regions of the world (5). Being an island, Sri Lanka's continental shelf is relatively narrow, submarine canyons occur around the coastline and primary productivity is driven by monsoon-related upwellings (29, 30). Taking advantage of feeding opportunities, blue whales are predictably found in coastal waters throughout the year (17).

The IUCN Red List of Threatened Species lists the blue whale as Endangered due to drastic reduction in numbers during the whaling era and slow recovery since being protected. The subspecies status, population affinities, demographic parameters and movement patterns of blue whales in the northern Indian Ocean are however not yet clearly understood (17). Since the 1980's it has been suggested that there is a resident population of blue whales in the northern Indian Ocean (2, 12, 13, 17, 18) including the waters around Sri Lanka. It has also been noted that the geographical distribution of these blue whales does not overlap with other Indian Ocean populations (5, 21) and that their breeding cycle is out of phase with those of the southern Indian Ocean (21). While the indications are that this population may not interbreed with other populations, genetic isolation and the possibility of a separate northern Indian Ocean subspecies (*Balaenoptera musculus indica*) has recently been raised based on observations around Sri Lanka (17). In addition to occurrence throughout the year in Sri Lankan waters, the presence of mother-calf pairs off the east coast (1) and south coast (14, 15, 17) and breeding activity off the south coast (17) have been observed. Sri Lankan waters are also considered an important feeding area for these whales with feeding activity observed off the east (1) south and west coasts (14, 15, 17). Certain unusual morphological traits and behavioural characteristics have also been noted which make these blue whales differ from the two currently recognized subspecies (*B. m. brevicauda* and *B. m. intermedia*) in the Indian Ocean and Southern Ocean (17).

Though small in size and still a developing nation, tourism is a fast growing sector in Sri Lanka and being richly endowed with natural attractions, nature-based tourism is becoming increasingly important in this tropical island. Whale-watching is one of the fastest growing sectors of nature tourism throughout the world (11). However, the impact of high



levels of boat-based tourism and related disturbance on target cetacean populations have now become a cause for concern (3, 4, 6, 7, 23, 26), particularly in developing countries where regulations are nonexistent or not strictly enforced (27). Since 2009 a boat-based commercial whale-watching industry is developing off the fisheries port of Mirissa on the south coast of Sri Lanka (Figure 1). The primary target of marketing campaigns for this industry is the impressively large blue whale, despite these waters having high cetacean species richness (16). The number of whale-watch boats and tourists engaged in this activity are increasing annually but this rapidly expanding industry remains unregulated in any formal (rules and regulations) or informal (voluntary codes of conduct, best practice guidelines) manner because no such mechanisms exist in the

country. While there were only two dedicated whale-watching vessels in 2009 the number has increased to seventeen by 2012. Competition among whale-watch operators and a lack of knowledge regarding whale biology and behavioural ecology is leading to unethical practices and harassment of animals (Figure 2).

Sri Lanka is centrally located on the main East-West trade route across the Indian Ocean with a busy international shipping lane lying just off the southern coast (Figure 1). Colombo, the island's capital city and primary port, is located on the west coast and is developing as a trans-shipment hub in the region. Within the last decade, with increasing shipping traffic, an increase in vessel collision related mortality of whales has been recorded (13). Seismic surveys for oil exploration in the Gulf of Mannar off the northwest coast of the island have also recently been initiated, further adding to anthropogenic disturbances.

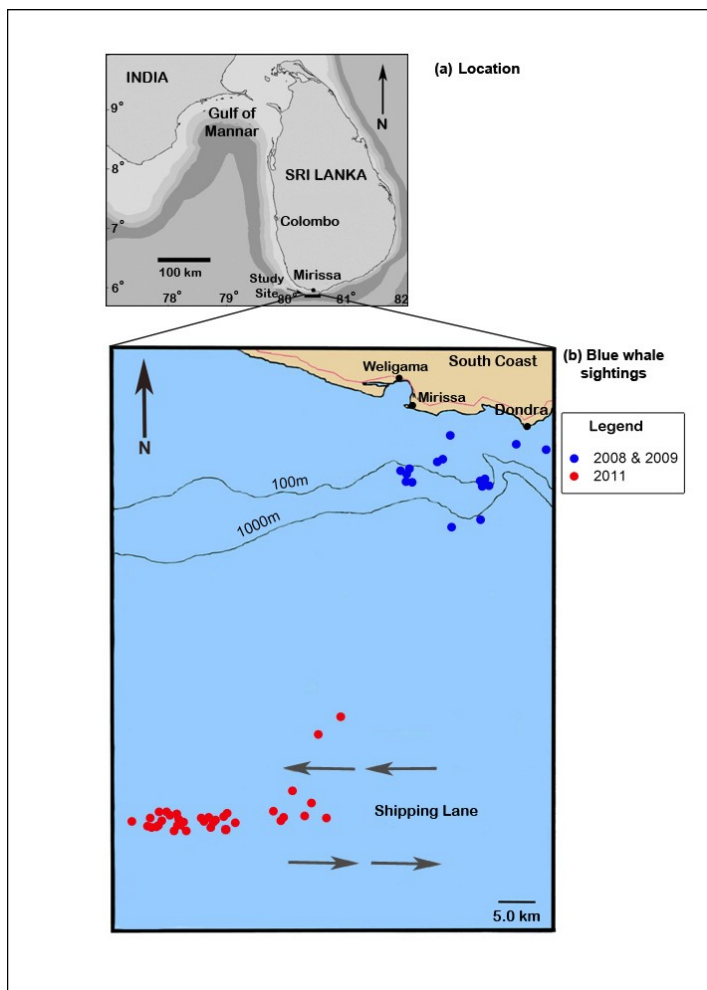


Figure 1: An overall coastal map and specific locations of observations (a) Geographic location of Sri Lanka; (b) Blue whale sightings off the southern coast recorded in 2008-09 shown in blue dots and 2011 in red dots.



Figure 2: Examples of unethical whale-watching practices off southern Sri Lanka.

Discussion

Blue whale sightings data from cetacean surveys off the south coast in 2008/2009 (14, 15) and 2011 (Ilangakoon unpublished data) indicate a spatial shift, albeit small in extent, in the concentration of blue whales off the south coast of the island between these two periods (Figure.1). While whales were concentrated along the nearshore continental shelf edge for feeding during surveys in 2008/2009, by 2011 the

area of concentration had shifted further offshore and to the southwest with most sightings within the international shipping lane (Figure 1). These whales and the shipping lane have coexisted in the area for a very long time and the only new activity to be developed in the interim period is the commercial whale-watching industry. Therefore there could be a distinct possibility that unregulated whale-watching activities are adversely affecting these whales. This could be through a two-pronged impact: (a) displacement from favoured, traditional feeding areas, and (b) inadvertently being pushed into the adjacent shipping lane with increased risk of vessel collisions (Figure 3).



Figure 3: Blue whales in the shipping lane off southern Sri Lanka, showing 2 examples of close proximity of large cargo vessels to them.

Published whale stranding records are available in Sri Lanka for over a century, with the first blue whale stranding recorded from the south-west coastal belt in 1894 (12, 13). Examination of these records clearly indicates a sudden increase in strandings of this species since 2010. A total of twenty-two blue whale strandings were recorded for the south and west coast from 1894 to the present. Of these thirteen (59%) occurred in the 115-year period before 2010, while 9 (41%) occurred in the short period between January 2010 and April 2012. Of the more recent strandings that were not in an advanced state of decomposition when beached, several showed signs of blunt force trauma and propeller lesions. One

was carried into the Colombo harbour stuck below the bow of a container vessel (20 March 2012) and one was observed freshly deceased and floating in the shipping lane off the south coast with clear propeller lesions in the vicinity of its tail stock (2 April 2012).

Elsewhere in the world, similar displacement of cetaceans targeted by whale watching activities have previously been reported in studies on other species such as humpback whales (25) and killer whales (19). Off southern Sri Lanka the displacement of blue whales from favoured feeding grounds could mean that they are being forced to feed in deeper suboptimal waters leading to decreased foraging efficiency and increased energetic costs. If whale-watching is affecting these blue whales in a manner that reduces the time spent on physiologically important activities like foraging and resting that are essential for them to remain healthy (22), significant long-term impacts in the form of compromised health and reproductive success could occur as reported for other cetacean populations (6, 10, 25).

Blue whales are also known to be prone to vessel collisions in other parts of the world, where their habitat overlaps shipping routes, such as off the west coast of the United States (9). Likewise, displacement by whale-watching activities from relatively safe coastal waters in southern Sri Lanka, directly into the shipping lane makes them more vulnerable and at increased risk of accidental collisions that are likely to be lethal given the large vessels constantly plying this route. While observations of whales foraging in the shipping lane are increasingly evident after the inception of whale-watching, the simultaneous increase in strandings clearly indicates a connection between these anthropogenic activities and increased whale mortality. Meanwhile the number of collisions is likely to be greater than the recorded strandings as carcasses may get washed out to sea or sink after a collision depending on seasonal current patterns and thus never be recorded.

The frequent presence of mother-calf pairs and breeding related activity off Sri Lanka indicates that these waters are important to northern Indian Ocean blue whales for breeding and calving purposes. In such an area these whales would need to be in frequent communication with each other. Blue whales are a species that use low-frequency sound for communication and it has been suggested that shipping noise is possibly

one reason for a long-term decrease in the fundamental frequency in their songs in the Eastern North Pacific (20). Increased shipping traffic within their habitat off southern Sri Lanka where breeding related activities take place could therefore have potentially adverse effects on their vocal behaviour and communication. If such impacts are already occurring or to what extent the whales are affected remains unknown. Likewise blue whales elsewhere are known to have increased their discrete audible calls during a seismic survey as a compensatory behavioural mechanism in high noise conditions (8). Seismic surveys in the Gulf of Mannar may therefore be another anthropogenic activity that could adversely impact blue whales off Sri Lanka. Although the biological impact of increasing background noise on *mysticete* whales is not clearly understood there is evidence to suggest that it could adversely affect survival and reproductive success (24, 28).

In conclusion it should be noted that while the waters off Sri Lanka are obviously an important habitat for Endangered northern Indian Ocean blue whales, anthropogenic impacts that can have adverse effects on them are increasing. While these impacts could be cumulative and have long-term population wide effects it is advisable that they should be extensively studied without further delay in order to direct and support future management actions. This is particularly important because the genetic affinities and subspecies status of this population and their ranging patterns are not yet clearly understood. Therefore it is recommended that a precautionary principle should be followed and regulating impacts from anthropogenic activities that can easily be controlled like those arising from commercial whale-watching should be considered a national priority and addressed immediately without further delay.

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References

1. Alling A, Dorsey EM, Gordon JCD. Blue whales (*Balaenoptera musculus*) off the Northeast coast of Sri Lanka: distribution, feeding and individual identification. In: *Marine Mammal Technical Report, No. 3*, edited by Leatherwood S, Donovan GP: UNEP, 1991.
2. Ballance LT, Pitman RL. Cetaceans of the western tropical Indian Ocean: distribution, relative abundance and comparisons with cetacean communities of two other tropical ecosystems. *Marine Mammal Science* 14:429-459. 1998.
3. Bejder L, Samuels A, Whitehead H, Gales N. Interpreting short term behavioural responses to disturbance within a longitudinal perspective. *Animal Behavior* 72(5):1149-1158. 2006.
4. Bejder L, Samuels A, Whitehead H, Gales N, Mann J, Connor R, *et al.* Decline in relative abundance of bottlenose dolphins exposed to long-term disturbance. *Conservation Biology* 20(6):1791-1798. 2006.
5. Branch,TA, Stafford KM, Palacios DM, Allison C, Bannister JL, Burton CLK, *et al.* Past and present distribution, densities and movements of blue whales *Balaenoptera musculus* in the Southern Hemisphere and northern Indian Ocean. *Mammal Review* 37:116-175. 2007.
6. Constantine R. Increased avoidance of swimmers by wild bottlenose dolphins (*Tursiops truncatus*) due to long-term exposure to swim-with-dolphin tourism. *Marine Mammal Science* 17(4): 689-702. 2001.
7. Constantine R, Brunton DH, Dennis T. Dolphin-watching tour boats change bottlenose dolphin (*Tursiops truncatus*) behaviour. *Biological Conservation* 17:299-307. 2004.
8. Di Iorio, L, Clark, CW. Exposure to seismic survey alters blue whale acoustic communication. *Biological Letters* 6: 51-54. 2009.
9. Douglas AB, Calambokidis J, Raverty S, Jeffries S J, Lambourn DM, Norman SA. Incidence of ship strikes of large whales in Washington State. *Journal of the Marine Biological Association UK*. 88(6):1121-1132. 2008.
10. Gregory PR, Rowden AA. Behaviour patterns of

- bottlenose dolphins (*Tursiops truncatus*) relative to tidal state, time-of-day and boat traffic in Cardigan Bay, west Wales. *Aquatic Mammals* 27:105-113. 2001.
11. Hoyt E. *Whale watching 2001: Worldwide tourism numbers expenditures and expanding socioeconomic benefits*: Massachusetts: IFAW, 2001.
 12. Ilangakoon A. *Whales and Dolphins Sri Lanka*. Colombo: WHT, 2002.
 13. Ilangakoon AD. Preliminary analysis of large whale strandings in Sri Lanka 1889-2004. *Pakistan Journal of Oceanography* 2:61-68. 2006.
 14. Ilangakoon, AD. *Cetacean survey off southern Sri Lanka to assess the potential for conservation through cetacean based tourism - Project Completion Report*. Colombo: WDCS, 2009.
 15. Ilangakoon AD, Perera LD. *Cetacean and Sea Bird Survey off South-West Sri Lanka - Project Completion Report*. Hong Kong: OPCF, 2009.
 16. Ilangakoon AD. Cetacean diversity and mixed-species associations off Southern Sri Lanka. In: Proceedings of the 7th International Symposium on SEASTAR 2000 and Asian Biologging Science, edited by Arai, N: SEASTAR, 2012.
 17. Ilangakoon AD, Sathasivam K. The need for taxonomic investigations on Northern Indian Ocean blue whales (*Balaenoptera musculus*) based on year-round occurrence off Sri Lanka and India. *Journal of Cetacean Research and Management* 12(2):195-202. 2012.
 18. Leatherwood S, Reeves RR. Marine mammal research and conservation in Sri Lanka 1985-1986. *Marine Mammal Technical Report No. 1*. UNEP, 1989. p. 67-107.
 19. Lusseau D, Bain D, Williams R., Smith JC. Vessel traffic disrupts the foraging behaviour of southern resident killer whales *Orcinus orca*. *Endangered Species Research* 6(3):211-221. 2009.
 20. McDonald MA, Hilderbrand JA, Mesnik S. Worldwide decline in tonal frequencies of blue whale songs. *Endangered Species Research* 9(1): 13-21. 2009.
 21. Mikhalev YA. Whaling in the Arabian Sea by the whaling fleets Slava and Sovetskaya Ukraina. In: *Soviet Whaling Data (1949-1979)*, edited by Yablokov AV, Zemsky VA. Moscow: CREP, 2000. p. 141-181.
 22. Parsons ECM, Scarparci C. Recent advances in whale watching research: 2009-2010. *Tourism in Marine Environments* 7(1):43-53. 2010.
 23. Schaffar A, Garrigue C. Exposure of humpback whales to unregulated tourism activities in their main reproductive area in New Calidonia. IWC, SC60/WW8. 2008.
 24. Sousa-Lima RS, Morete ME, Fortes RC, Freitas AC, Engel MH. Impact of boats on the vocal behaviour of humpback whales off Brazil. *Journal of the Acoustic Society of America* 112(5): 2430-2431. 2002.
 25. Sousa-Lima RS, Clark CW. Whale sound recording technology as a tool for assessing the effects of boat noise in a Brazilian marine park. *Park Science* 26(1):59-63. 2009.
 26. Steckenreuter A, Moller L, Harcourt, R. How does Australia's largest dolphin watching industry affect the behaviour of a small resident population of Indo-Pacific bottlenose dolphins. *Journal of Environmental Management* 97:14-21. 2012.
 27. Stensland E, Berggren P. Behavioural changes in female Indo-Pacific bottlenose dolphins in response to boat-based tourism. *Marine Ecology Progress Series* 332:225-234. 2007.
 28. Tyack PL, Clark CW. Communication and acoustic behaviour in dolphins and whales. In: *Hearing by Whales and Dolphins*, edited by Au WLL, Popper AN, Fay RR. New York: Springer-Verlag, 2000.
 29. Vinayachandran PN, Mathew S. Phytoplankton bloom in the Bay of Bengal during the northeast monsoon and its intensification by cyclones. *Geophysical Research Letters* 30(11):1572. 2003.
 30. Vinayachandran PN, Chauhan P, Mohan M, Nayak S. Biological response of the sea around Sri Lanka to summer monsoon. *Geophysical Research Letters* 31: L01302. 2004.