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Baleen whale records from India

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BALEEN WHALE RECORDS FROM INDIA

Dipani Sutaria¹, Mihir Sule², Ketki Jog³, Isha Bopardikar⁴, Abhishek Jamalabad⁵, Divya Panicker⁶

¹Adjunct Senior Research Fellow, College of Marine and Environmental Sciences, James Cook University, Townsville, Australia (Dipani.Sutaria@gmail.com).

²Konkan Cetacean Research Team, Bombay, Maharashtra (Mihir.Sule@gmail.com).

³Konkan Cetacean Research Team, Bombay, Maharashtra (Ketki.Jog@gmail.com).

⁴Konkan Cetacean Research Team, Bombay, Maharashtra (Isha.Bopardikar@gmail.com).

⁵Terra marine research institute, Bangalore (Abhishek.Jamalabad@gmail.com)

⁶Department of Oceanography, University of Washington, Seattle 98105, USA (dpanic@uw.edu)

ABSTRACT

The current presence of three baleen whale species, the blue whale (*Balaenoptera musculus*), Bryde's whale (*Balaenoptera edeni*) and the humpback whale (*Megaptera novaeangliae*) was assessed along the Indian coastline via sighting and stranding records. The available literature was reviewed to understand the frequency and distribution of stranding events along the coastline. Fisherfolk were interviewed to obtain information on baleen whale sightings and community perceptions towards whales. We found that blue and Bryde's whales are recorded from both the east and west coasts and humpback whales from the west coast only. During 2015-2016, the majority of strandings were reported from Maharashtra and Karnataka. In March 2017, at least one humpback whale sighting was confirmed from recorded vocalisations off the Goa coast. An investigation of the ongoing fisheries has also revealed a steep decline in commercial fisheries and an 82% decline in the Sardines in 2015-16. With this scenario in mind, we recommend continuation of dedicated baleen whale surveys and collaborative efforts with local regional authorities to carry out in-depth analyses of strandings and document the ecology of whales in Indian waters.

KEYWORDS

INDIA, ARABIAN SEA, INDIAN OCEAN, BAY OF BENGAL, BLUE WHALES, BRYDE'S WHALES, HUMPBAC WHALES, VOCALISATIONS, STRANDINGS, SIGHTINGS, FISHERIES, FEEDING

INTRODUCTION

The Indian coast is approximately 7,516 km long and is divided among nine coastal states, two union territories and two island territories. At least 29-31 marine mammal species have been reported in Indian waters and all marine mammals in Indian waters are protected to the highest level under the Wildlife Protection Act (1972), which includes a blanket ban on hunting, trade or capture. Dedicated research on cetaceans in Indian waters has been extremely limited (Kumarran 2012) and systematic studies only began in the early 2000's. However, these projects have already provided valuable information and identified conservation issues for marine mammals.

Three of the species known to occur in India are baleen whales, specifically the blue whale (*Balaenoptera musculus*), Bryde's whale (*Balaenoptera edeni*) and the humpback whale (*Megaptera novaeangliae*), confirmed through sightings and the assessment of carcasses. Baleen whale sighting records prior to the year 2000 exist, but mis-identifications are common and published records of other baleen whales, specifically fin whales (*B. physalus*), sei whales (*B. borealis*) and minke whales (*B. acutorostrata*) are considered spurious (e.g. James & Lal Mohan. 1987; Kumaran 2002; Kumarran 2002).

This note is in continuation of SC/65b/ (Sutaria et al 2015) and SC/66b/SH/34 (Sutaria et al 2016) submissions. In the previous two documents we reviewed records of baleen whales reported from the west coast of India, and presented details of confirmed sightings and strandings from 2001 to May 2016. In this note we update the same information for the west coast, and also provide a list of reports from the east coast of India. We provide updated information from vessel surveys for Goa, fishing vessel surveys and interviews from Karnataka and interviews from Gujarat; and a Humpback whale report from Goa.

STUDY AREA

The coast of India comprises of nine coastal states (Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Orissa, West Bengal), three Union territories (Daman and Diu, Pondicherry) including one island territory (Lakshadweep archipelago) and the Andaman and Nicobar islands. Our marine mammal research teams are working from five locations off the west coast of India; Gujarat, Maharashtra, Karnataka, Kerala and the Lakshadweep archipelago.

METHODS

Literature review

We assess the details (carcass image, size measurements, number of ventral grooves if available) from stranding records, and provide a summary of the distribution and frequency of these events from India.

Interview surveys

Interview surveys were designed in 2014 to explore knowledge regarding dolphins and whales amongst different stakeholder groups – Cargo vessel crews, Fishing vessel crews and Dive Company staff. Workshops were held with cargo vessel crew in Mandvi and Porbandar in 2015, and with staff from three different Dive Companies in Goa in 2016 (SC/66). Interviews with fishers have been ongoing at different locations along the Gujarat coast from Jakhau in the north till Veraval in the south. These are open-ended interviews and usually take place at the fishing vessel during days when the crew is at land or at tea stalls at the fishing harbour. Identification sheets showing different species of whales and dolphins were used during the interviews once they started describing any observations. We also used a hand drawn map to get an idea of the usual fishing routes used across different seasons, the target fisheries across seasons and the location of a whale sighting in relation to the fishing harbour. Interviews lasted anywhere from 15min to 45mins. Interviews take place one to one, and not in groups. In 2016-17 we continued interview surveys with fishing communities in Gujarat and in Karnataka. The main aim of the interviews was to obtain information on:

1. Frequency of baleen whale sightings
2. Approximate locations of baleen whale sightings
3. Perceptions towards baleen whales

Boat surveys

Vessel based line transect surveys for cetaceans were carried out along the coast of Goa from November 18th to November 22nd 2016. The coast from Terekhol in the north and Palolem in the south (approx 120km) was covered. Survey lines were within 10km from shore. Along the trackline we stopped to carry out hydrophone dips to search for whale vocalisations if any. All surveys were carried out in Beaufort 3 or below. The research team consisted of three primary observers and a data logger. The team followed the standard protocol of searching for animals on the track line and on both sides of the survey vessel till the horizon. At a sighting, we went off effort and collected minimum sighting information – location, species ID, group size, group composition, predominant group behavior and water depth.

Fishing vessel surveys

In Karnataka, Jamalabad surveys for marine mammals by being a marine mammal observer on purse seine and trawl fishing vessels. On encounters with cetaceans, he notes down species ID, pod size, behavior around fishing gear and fish diversity that trip. He has also trained fishers to collect sighting data when out on fishing trips.

RESULTS

The stranding data from 2015 and 2016 have peaks in the number of baleen whales reported from the west coast of India, with Maharashtra and Karnataka having the maximum number of records (Tables 1,3). The numbers of records from the east coast are few and most of these are from Tamil Nadu (east) and Orissa (Tables 2, 4). Orissa, Andhra Pradesh and Tamil Nadu also saw a sudden rise in the number of Sperm whales washed shore in 2015-16. Of the three species of baleen whales reported, blue whales (*Balaenoptera musculus*) and Bryde's whales (*Balaenoptera edeni*) have been reported from the east coast and west coast, while humpback whales (*Megaptera novaeangliae*) have been reported only from the west coast (Gujarat, Goa, Kerala and Tamil Nadu west). Bryde's whales are the most common of the three species on both coasts. We noticed that there was a peak in reports from Maharashtra in the months of April in 2015 and 2016, other than that there was no seasonal differences in the number of reports from the country.

Year	Total Number of records	Mortalities	Sightings
2016	23	20	3
2015	24	16	8
2014	2	1	1
2013	3	2	1
2012	4	4	0
2011	4	4	0
2010	1	0	1
2009	2	2	0
2008	3	3	0
2006	2	2	0
2005	3	2	1 (3)
2004	4	4	0
2003	1	1	0
2001	3	3	0

Table 1. Number of baleen whale records per year from the west coast of India from 2001 onwards

Year	Total number of records
2017	1
2016	3
2015	1
2012	2
2010	1
2009	1 (sighting)
2006	4
2005	1
2003	1
2001	1
2000	3

Table 2. Number of baleen whale records per year from the east coast of India from 2001 onwards

State	Number of records
Goa	3
Gujarat	11
Karnataka	11
Kerala	9
Maharashtra	37
Lakshadweep	1
Tamil Nadu (west)	1

Table 3. Number of records per State on the west coast of India from 2001 onwards

State	Number of records
Tamil Nadu (east)	15
Pondicherry	0

Andhra Pradesh	0
Orissa	4
West Bengal	1

Table 4. Number of records per State on the east coast of India from 2001 onwards

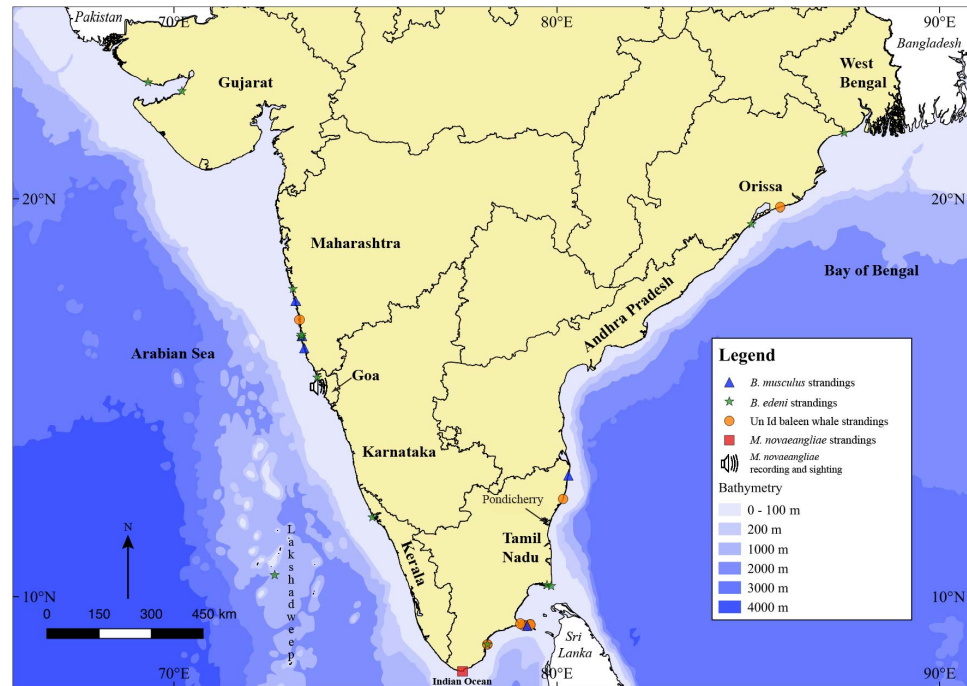


Figure 1. Whales reported on the west coast (May 2015 onwards) and on the east coast (2001 onwards) of India (Listed in Appendix 1 and 2)

Gujarat

In Gujarat, fishers from Jakhau (13 trawlers), Chota Salaya (seven gill-netters), Modhva (three gill netters), Okha (five trawlers) and Veraval (three trawlers) were interviewed. It was usually only the *tandel* (Captain) who was ready to take part in the interviews. Gill-netters from Chota Salaya and Modhva had seen whale sharks but not whales in the recent years. Some of the gill-netters had once worked on the *vaahans* (Dhows) and had seen whales during the trips east. They all knew about *Machchh* (baleen whales) but said that they are found in deeper waters and not in near-shore waters. The trawler captains had all sighted whales during their fishing trips. When asked to show the routes on which they sighted whales, three regions were highlighted – one area in the deeper channels outside Kori creek, the second area in the deeper waters off Okha, and lastly the deeper waters off Veraval. Most of the trawler captains said that they do not approach the whales if sighted; they also said that the sightings are common when they travel north towards Jakhau in August-September (time when they catch squid and cuttlefish). They are also sighted more often from March to May every year. The group size is usually 1-2 individuals. Most of the Jakhau respondents noted seeing two whales in January 2017 off the Kori mouth. Another fisher sighted whales off the coast of Okha; the same person said that in 2013-14, he saw whales often on the route between Porbandar and Jakhau in 35-40m water depth. While some fishers saw whales 2-3 times in 2016, another fisher remembered seeing them in October 2016, again between Jakhau and Kori in 14-18m water depths. All respondents said the first cue to the presence of a whale was a tall spout of water on the surface. One respondent even described lunge feeding behaviour that his crew had witnessed in the late 1980's when he said they saw whales more frequently.

Three Bryde's whales have stranded in Gujarat since May 2015.

Vessel surveys were planned thrice for the Porbandar-Jakhau region of Gujarat but could not be carried out. Given the international security concerns in these waters and current political conflicts in the region we were not granted permission by the Indian Coast Guard for the same. We were also told that to be an observer on fishing vessels requires a fishing licence.

Maharashtra

Seven whales have stranded in Maharashtra since May 2016, of which three were Bryde's, three were Blue whales and one was not identifiable.

Goa

Boat surveys were conducted in November 2016. Finless porpoises (*Neophocaena phocaenoides*) and Indian Ocean Humpback dolphins (*Sousa plumbea*) were sighted during this survey, but no whales were encountered or acoustically recorded.

In March 2017, a baleen whale was heard and recorded by Dive Goa's SCUBA instructor, Ajey Patil around Suzie's wreck, near Grand island (15°20'51.84"N, 73°46'24.14"E). The Instructor of another dive company sighted the whale from about 300m. They noted that the whale stayed in this area for two days and could not be heard anymore after that. An underwater video recordings (by Ajey Patil) had vocalisations from which the whale was identified as a humpback whale and confirmed by Dr. Salvatore Cerchio. The recordings were in a mp4 format which was later converted to the standard WAV format. Spectrograms of the files were viewed on Raven Pro 1.5 (Cornell Lab of Ornithology, Ithaca, NY, USA) (smoothing window: Hann, fast Fourier transform (FFT): 2048, temporal grid spacing: 23.2 ms with FFT overlap: 50%) (by Isha Bopardikar). The recording contained repeating phrases of vocalizations (Figures 2, 3). More data and long-term acoustic monitoring would be needed to establish any geographic connection between these recordings and the other populations found in the Arabian Sea.

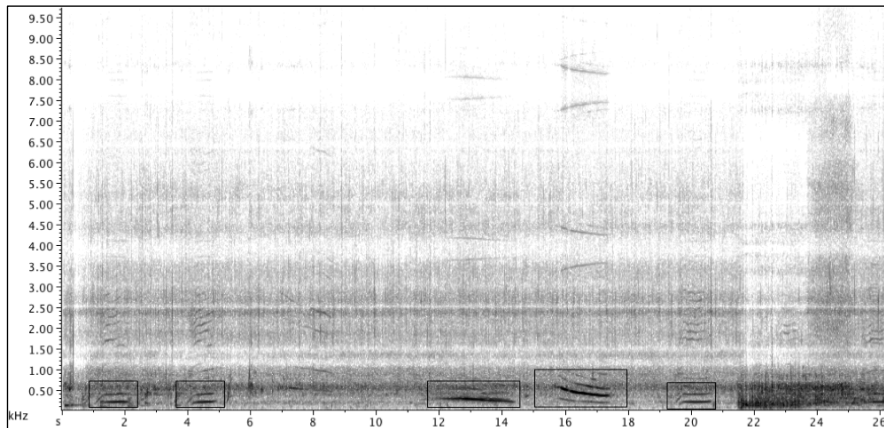


Figure 2: Spectrogram of a humpback whale song recorded off Grand Island, Goa. Marked boxes indicate a repeating phrase.

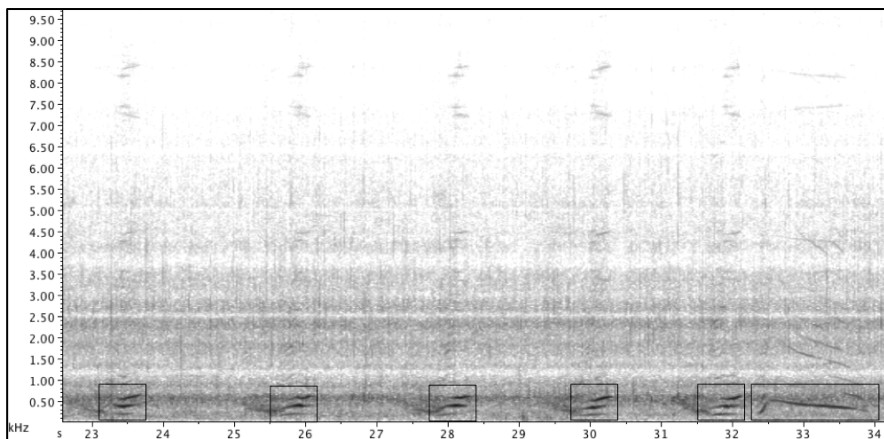


Figure 3: Spectrogram of a humpback whale song recorded off Grand Island, Goa. Marked boxes indicate a repeating phrase.

Karnataka

Older, more experienced fishers state that near-shore sightings of whales have gradually declined over the decades as coastal fisheries have intensified. The species sighted cannot be conclusively identified from their accounts, but based on visual identification charts and size estimations, most interviewees suggest that Bryde's whale is the species most commonly sighted, and only one interviewee so far has suggested that the blue whale has also been sighted. Almost all accounts of whale sightings mention close-knit groups of two or three individuals. Since the commencement of this project in September 2015, fishing crews have reported six baleen whale sightings in coastal waters close to Karwar (the harbour their boats operate from), and ten sightings offshore, three of which were reported in some

detail. One of these is an account of a purse seiner incidentally encircling a group of two or three whales, which reportedly fed on the targeted fish shoal within the net (the species of fish remains unconfirmed) and then ripped their way out of the mesh – a very long mended gash, said to have been made by one of these whales, was visible in the net when this boat returned to dock. Another interviewee reported having occasionally sighted baleen whales staying motionless at the surface with the head exposed, pointing vertically upward with the mouth agape. A third interviewee, who has sighted orcas in the region a few times and produced evidence of the same, claims to have seen orcas hunting young baleen whales (presumed to be Bryde's whales) in offshore waters, by swimming above their prey to drown it. There are several accounts of dead and live orca strandings in the region, most of which are unconfirmed. These include a few very old accounts, brought to light by interviews, of live whales stranded in shallow water being towed out to sea or having swum away on their own. Museums in Karwar are in possession of two unidentified baleen whale skeletons recovered from animals stranded in the region.

On 23rd March 2016, a baleen whale was sighted in shallow coastal waters, 10 m deep, at 14.898445° N, 74.044506° E, a point approximately 1.7 km from a rocky shore. This solitary animal could not be photographed or conclusively identified. It was sighted only once, its presence given away by its blow. Owing to the ongoing fishing activity of the vessel from which this observation was made, it was not possible to follow the whale, and it was not sighted again. Scattered shoals of Indian oil sardine *Sardinella longiceps* were present in the vicinity, and were being foraged upon by Indian humpback dolphins *Sousa plumbea*, but the whale was not seen interacting with, or in close proximity of, either the sardine shoals or the dolphins.

On 29th September 2017 two adult Bryde's whales were sighted at 14.87761 N, 73.97253 E – a point about 8.9km from the nearest shore, at a water depth of 22m. Two surfacing's by the pair (Figure 4) were observed in quick succession, and they appeared to be travelling in an offshore direction. Both animals were photographed. No fish shoals were observed here, and no boats were seen close to the whales.

Date	Location	Depth (m)	Group size
Aug-2015	Unknown	Unknown	1
Oct-2015	14°52', 73°58'	20	1
11-Nov-2015	14°1', 74°01'	15	2
01-Dec-2015	14°53', 73°57'	22	4 (2+2)
Dec-2015	14°40', 73°49'	55	2
Dec-2015	14°51', 74°01'	15	2
20-Dec-2015	14°43', 73°43'	65	3
Late Aug-2016	14°56', 73°56'	16	1
Aug-2016	14°36', 74°00'	40	1
Aug-2016	14°45', 73°55'	40	1
Aug-2016	14°25', 74°05'	40	1
13-Oct-2016	14°48', 74°00'	15	1
15-Oct-2016	14°45', 74°03'	10	1
24-Oct-2016	14°48', 74°00'	16	1
27-Oct-2016	14°45', 73°40'	70	6

Table 5: Fishermen's records for baleen whale sightings at sea off Karwar, Karnataka (Jamalabad, A)



Figure 4: A pair of Bryde's whales sighted off the coast of northern Karnataka (A.Jamalabad 2015)

DISCUSSION AND FUTURE WORK

The west coast had a large number of whales washed ashore in 2015-2017. The majority of carcass reports are from Maharashtra and Karnataka with at least 36 reported in 2015-2016 alone. The stranding of whales is not something that goes unnoticed unless the carcass has landed on a beach that is not frequented. The apparent high numbers reported could of course also be related to the presence of research teams here, yet we do feel that the numbers are higher than is typical. While exploring fish catch data from the west coast, we found that there has been a steep fall not only in the overall catch of commercially important fish, but also an almost 82% drop in Sardines (locally called *Tarli*) since 2014. It was also stated by Central Marine Fisheries Research Institute (CMFRI) that there was a peak in jellyfish during the time (feeds on Sardine roe). Such shifts in prey-predator populations are probably causing cascading effects in the marine food chain. Several of the whales washed ashore in Maharashtra and Karnataka in 2015-16 looked emaciated (Pers Comm Robert Brownell and Tim Collins) and we are concerned that this might be because of low densities of preferred prey. Moreover, based on fisher interviews, whales in 2014-16 also came much closer to shore than normal, following schools of sardine, showing that local movements may also be changing in relation to prey availability. Over-fishing remains the major concern and needs to be mitigated and managed at a local and regional level if we wish to sustain whale populations in the future.

Dedicated baleen whale surveys using visual and acoustic methods would help significantly to fill the large knowledge gaps on baleen whales and cetaceans in offshore waters of India. A serious and concentrated effort with an in-depth analysis of baleen whale carcasses is required to understand the causes and seasonality of mortalities. This requires collaboration between researchers, NGO's, GO's, local administrative authorities along with the forest department and trained veterinarians to carry out necropsies or deal with live stranding events. Moreover an organised database of all records in a shared standard format needs to be used to make the data available to the range countries of these baleen whales.

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REFERENCES

- James, P. S. B. R., & Lal Mohan, R. S. 1987. The marine mammals of India. *Mar. Fish. Infor. Serv., T&E Ser.*, 71, 1-13.
- Kumaran, PL. 2002. Marine mammal research in India – a review and critique of the methods. *Current Science* 83(10): 1210-1220.
- Kumarran, R. P. 2012. Cetaceans and cetacean research in India. *J. Cetacean Res. Manage.* 12(2), 159-172
- Sutaria,D., Sule, M., Jog,K., Bopardikar,I., and Panicker, D.2015. Baleen whale records from the Arabian Sea, India. Working Paper submitted to the International Whaling Commission, San Diego. USA
- Sutaria,D., Sule, M., Jog,K., Bopardikar,I., Panicker, D., and Jamalabad, A. 2016. Baleen whale records from the Arabian Sea, India from June 2015 to May 2016). International Whaling Commission, Bled.Slovenia SC/66b/34/SH

LIST OF PUBLISHED BALEEN WHALE RECORDS FROM INDIA

- Afsal, V.V. and Rajagopalan, M. 2007. Strandings of whales along the Gulf of Mannar and Palk Bay. *Mar. Fish. Infor. Serv., T&E Ser.* 191: 25–26.
- Anoop, A.K., Prathibha, R., Dineshbabu, A.P., Nayak, T.H. and Keparaju, S. 2004b. Record of stranded whales along Karnataka coast. *Mar. Fish. Infor. Serv., T&E Ser.* 182: 16.
- Arghekar, V Udaya (2001) Stranding of a whale (*Balaenoptera* sp.) At Murdeshwar Beach, Uttara Kannad district of Karnataka. *Mar. Fish. Infor. Serv., T&E Ser.*, 169 . p. 13.
- Baby, K G .1996. On a whale stranded at Anchangadi, Trichur district, Kerala. *Mar. Fish. Infor. Serv., T&E Ser.*, 142. p. 17.
- Baby, K J (2009) Occurrence of humpback whale at Thrissur. *Mar. Fish. Infor. Serv., T&E Ser.*, 200. p. 21.
- Baby, K.G. 1996. On the stranding of a blue whale *Balaenoptera musculus* at Valappad Beach, southwest coast of India. *Mar. Fish. Infor. Serv., T&E Ser.* 141: 20.
- Baby, K.G. 1999. On the stranding of a whale at Mannalamkunnu, Trichur district, Kerala. *Mar. Fish. Infor. Serv., T&E Ser.* 159: 19–20.
- Balasubramanian, T.S. 2000. On a sei whale, *Balaenoptera borealis* stranded at Vellapatti along the Gulf of Mannar coast. *Mar. Fish. Infor. Serv., T&E Ser.* 163: 13–14.
- Balasubramanian, T.S. 2001b. Live stranding of sei whale *Balaenoptera borealis* Lesson at Tuticorin. *Mar. Fish. Infor. Serv., T&E Ser.* 167: 14–15.
- Balasubramanian, T.S. and Selvarani, B.J. 2001. Stranding of spinner dolphins and a whale along Tuticorin coast. *Mar. Fish. Infor. Serv., T&E Ser.* 167: 15–16.
- Baruah, A.D. 2000. Whale rescue operation in Kodiakkarai. *Seshaiyana* 8: 1–2.
- Bensam, P., Vincent, S.G. and Pillai, P.K.M. 1972. On a rorqual, *Balaenoptera* sp. caught off

Tuticorin, Gulf of Mannar. *J. Mar. Biol. Assoc. India* 14: 886–87.

Bharamu, S Melinmani (2004) Stranding of a whale, *Balaenoptera* sp. near Vijaydurg landing centre of Maharashtra coast. *Mar. Fish. Infor. Serv., T&E Ser.*, 182 . p. 14.

Bhatkal, Ganesh and Anoop, A K and Rohit, Prathibha and Krishnakumar, P K (2005) Stranding of two baleen whales (*Balaenoptera* spp.) at Murudeswara beach and Padukere, Karnataka coast,. *Mar. Fish. Infor. Serv., T&E Ser.* 186 . 12- .

Bhatkal, Ganesh and Anoop, A K and Rohit, Prathibha and Krishnakumar, P K (2005) Stranding of two baleen whales (*Balaenoptera* spp.) at Murudeswara beach and Padukere, Karnataka coast,. *Mar. Fish. Infor. Serv., T&E Ser.*, 186. 12-.

Bijukumar, S.S. Jijith, U. Suresh Kumar & S. George (2012). DNA barcoding of the Bryde's Whale *Balaenoptera edeni* Anderson Cetacea: Balaenopteridae) washed ashore along Kerala coast, India. *Journal of Threatened Taxa* 4(3): 2436–2443

Blandford, W.T. 1888–91. Order: Cetacea. pp.564–91. In: Blandford, W.T. (eds). The fauna of British India, Ceylon and Burma. 9. Taylor and Francis, London.

Blyth, E. 1859. On the great rorqual of the Indian Ocean, with notices of other cetals, and of the Syrenia or marine pachyderms. *J. Asiatic Soc. Bengal* 28: 481–98.

Burton, R.W. 1941. A visit to Laccadive Islands. *J. Bombay Nat. Hist. Soc.* 41: 489–513.

Chari, V.K. 1951. The great Indian rorqual or fin whale (*Balaenoptera indica* Blyth) off Umargam (Bombay State). *J. Bombay Nat. Hist. Soc.* 50(1): 167.

CMFRI, Kochi (1981) Incidental catch of whale off Vizhinjam. *CMFRI Newsletter* No.12 April-June 1981, 12. p. 6.

CMFRI, Kochi (1987) Baleen whale stranded. *CMFRI Newsletter* No.39 January- March 1988, 39. p. 7.

CMFRI, Kochi (1988) Whale landed. *CMFRI Newsletter* No.41 July- September 1988, 41. p. 6.

CMFRI, Kochi (1988) Whales stranded. *CMFRI Newsletter* No.40 April- June 1988, 40. p. 5.

CMFRI, Kochi (2008) Baleen whale washed ashore at Dona Paula beach, Goa. *CMFRI Newsletter* No.118 April- June 2008, 118. p. 7.

Daniel, J.C. 1963. Stranding of a blue whale *Balaenoptera musculus* (Linn.) near Surat, Gujarat, with notes on earlier literature. *J. Bombay Nat. Hist. Soc.* 60: 252–54.

Devkar, V.L. 1949–50. The stranding of a large blue whale (*Balaenoptera musculus* Linn.) in the River Mahi. *Bulletin of the Baroda Museum and Picture Gallery* 7: 75–82.

Dhawan, R.M. 1970. Stranding of four whales along Goa coast between December 1968 and April 1970. *J. Bombay Nat. Hist. Soc.* 67: 327–28.

Dhawan, R.M. 1972. Strandings of whales along the Goa coast. *J. Mar. Biol. Assoc. India* 14: 410–11.

Gandhi, V. and Kasinathan, C. 2002. On a sei whale *Balaenoptera borealis* washed ashore at Pirappanvalasai (Palk Bay) near Mandapam. *Mar. Fish. Infor. Serv., T&E Ser.* 173: 4.

Grubh, B.R. and Pereira, M.J. 1965. Strandings of finner whales (*Balaenoptera physalus* (Linn.))

near Virar (Thana District) and at Bombay, Maharashtra State. *J. Bombay Nat. Hist. Soc.* 62: 550–51.

Jacob, P.K. and Menon, M.D. 1950. The piscivorous habits of the rorqual or fin whale (*Balaenoptera* sp.). *J. Bombay Nat. Hist. Soc.* 47: 156–58.

James, P S B R and Menon, N G and Pillai, N G K (1993) On a blue whale *Balaenoptera musculus* stranded at Chellanam, Cochin. *Mar. Fish. Infor. Serv., T&E Ser.* 122 . pp. 23-24.

James, P.S.B.R., Menon, N.G. and Pillai, N.G.K. 1993. On a blue whale *Balaenoptera musculus* stranded at Chellanam, Cochin. *Mar. Fish. Infor. Serv. T&E Ser.* 122: 23–24.

Jani, M.M. 2002. New record of a stranded whale, *Balaenoptera indica* (Blyth) at Shivrajpur on Dwaraka coast in Gujarat. *Fishing Chimes* 22: 32–33.

Jani, M.M. and Patel, M.I. 1995. On first record of sei whale *Balaenoptera borealis* (Less) from Gulf of Kutch. *Fishing Chimes* 15: 52–53.

Jayasankar, P and Anoop, B and Afsal, V V and Rajagopalan, M (2006) Species and sex of two baleen whales identified from their skin tissues using molecular approach. *Mar. Fish. Infor. Serv., T&E Ser.* 190. pp. 16-17.

Jayasankar, P and Anoop, B and Peter, Reynold and Afsal, V V and Rajagopalan, M (2007) Species of a whale and an unknown fish sample identified using molecular taxonomy. *Indian J. Fish.* 54 (3). pp. 339-343.

Jayasankar,P, B. Anoop, M. Rajagopalan, K. M. M. Yousuf, P. Reynold, P.K. Krishnakumar, V.V. Afsal And Anoop A. Krishnan 2009. Indian Efforts on the Inventorization of Marine Mammal Species for their Conservation and Management. Central Marine Fisheries research Institute. Kochi.

Joel, J.J., Ebenezer, I.P., Sigamony, P.P. and Prosper, A. 1996. On the stranding of a young fin whale at Kanyakumari, Tamil Nadu. *Mar. Fish. Infor. Serv., T&E Ser.* 141: 19.

Jones, S. 1953. On the stranding of a whale at Jambudwip on the Bengal coast about 19 years ago. *J. Bombay Nat. Hist. Soc.* 51: 499–500

Kakati, V S (1997) Stranding of a baleen whale. *Mar. Fish. Infor. Serv., T&E Ser.* 147. p. 15.

Karbhari, J.P. 1973. Stranded fin whale *Balaenoptera physalus* (Linn.) off Magdalla (Surat). *Indian J. Fish.* 20: 639–40.

Karuppiyah, S., Subramaniam, A.N. and Kumaresan, S. 1998. Observations on marine mammals from Parangipettai, southeast coast of India. *Seshaiyana* 6: 12–13.

Kasim, H.M. and Balasubramanian, T.S. 1989. On the stranding of sei whale *Balaenoptera borealis* along the Gulf of Mannar coast. *Mar. Fish. Infor. Serv., T&E Ser.* 95: 12–14.

Kasinathan, C. 1986. Report on Baleen whale stranded along Mallipatinam Coast, Tanjore District. *Mar. Fish. Infor. Serv., T&E Ser.*, 70. p. 25.

Kasinathan, C. 2002. On a minke whale, *Balaenoptera acutorostrata* caught at Pudupattinam near Thondi along Palk Bay. *Mar. Fish. Infor. Serv., T&E Ser.* 173: 8.

Kewalramani, K.M. 1969. Whale on Gujarat coast. *Sea Food Export Journal* 1–4: 13–15.

Kharbari, J.P., Aravindakshan, M. and Nair, K.P. 1966. On a rorqual *Balaenoptera physalus*

(LINN.) washed ashore on the Bombay coast. *J. Mar. Biol. Assoc. India* 8(1-2): 226-27.

Krishnapillai, S. and Kingston, S.D. 2004 Stranding of a sei whale, *Balaenoptera borealis* Lesson at Kurumpani near Colachal, Kanyakumari, Tamil Nadu. *Seshaiyana* 21: 5-6.

Krishnapillai, S., Jayaprakash, A.A., Kasinathan, C. and Ramamoorthy, N. 1995. On the sei whale *Balaenoptera borealis* Lesson stranded along Palk Bay coast near Pamban lighthouse. *Mar. Fish. Infor. Serv.*, T&E Ser. 139: 11.

Kulkarni, G.M., Zacharia, P.U., Kemparaju, S., Nagaraja, D., Muniyappa, Y. and Naik, R.A. 1989 On a fin whale stranded at Someswara, South Kanara. *Mar. Fish. Infor. Serv.*, T&E Ser. 102: 16-17.

Lal Mohan, R S (1992) Observations on the whales *Balaenoptera edeni*, *B. musculus* and *Megaptera novaeangliae* washed ashore along the Indian Coast with a note on their osteology. *J. Mar. Biol. Assoc. India*, 34 (1&2). pp. 253-255.

Lipton, A.P., Diwan, A.D., Reghunathan, A. and Kasinathan, C. 1995 Frequent strandings of dolphins and whales along the Gulf of Mannar coast. *Mar. Fish. Infor. Serv.*, T&E Ser. 138: 11-14.

Manojkumar, P P (2009) Sighting of a rare whale. *CMFRI Newsletter* No.120 October 2008-March 2009, 120 . pp. 15-16.

Marichamy, R., Rajapandian, M.E. and Srinivasan, A. 1984 The stranding of rorqual whale *Balaenoptera musculus* (Linnaeus) in the Gulf of Mannar. *J. Mar. Biol. Assoc. India* 26: 168-70.

Mathew, A.P. 1948 Stranding of a whale (*Megaptera nodosa*) on the Travancore coast in 1943. *J. Bombay Nat. Hist. Soc.* 47: 732-33.

McCann, C. 1934 The great Indian fin whale (*Balaenoptera indica*) stranded at Bombay. *Current Science* 3: 1.

Mestry, A Y and Thakurdas, 2011 Stranding of baleen whale *Balaenoptera* sp. at Satpati Landing Centre, Thane District, Maharashtra. *Mar. Fish. Infor. Serv.*, T&E Ser. 210. p. 24.

Millard, W.S. 1906. A whale near Bassein (Bombay coast). *J. Bombay Nat. Hist. Soc.* 17: 533-34.

Mohan, R.S.L. 1992. Observations on the whales *Balaenoptera edeni*, *B. musculus* and *Megaptera novaeangliae* washed ashore along the Indian coast with a note on their osteology. *J. Mar. Biol. Assoc. India* 34(1 and 2): 253-55.

Mohanraj, G and Somaraju, M V and Rao, C V Seshagiri 1995 Blue whale *Balaenoptera musculus* landed at Mangamaripeta, north of Visakhapatnam. *Mar. Fish. Infor. Serv.*, T&E Ser. 137. p. 17.

Mohanraj, G., Somaraju, M.V. and Seshagiri Rao, C.V. 1995 A blue whale *Balaenoptera musculus* landed at Mangamaripeta, north of Visahapatnam. *Mar. Fish. Infor. Serv.*, T&E Ser. 137: 17.

Moses, S.T. 1940 Whales in Baroda, with notes on the anatomy of the fin whale *Balaenoptera indica* stranded at Mulvel in March 1939. *J. Bombay Nat. Hist. Soc.* 41(4): 895-97.

Moses, S.T. 1947 Notes on two whales stranded in Baroda State, Orca at Armada in 1934 and Balaena at Gajana in 1944. *Indian Science Congress*, Delhi 3: 188.

Moses, S.T. 1947 Stranding of whales on the coasts of India. *J. Bombay Nat. Hist. Soc.* 47(2): 377-78.

- Muthiah, C. 1995 Baleen whale and a porpoise stranded at Ullal, near Mangalore. *Mar. Fish. Infor. Serv., T&E Ser.* 140: 10.
- Muthiah, C., Mohamed, S., Bhatkal, G. and Melinmani, B. 1988 On the stranding of a humpback whale in the north Kerala coast. *Mar. Fish. Infor. Serv., T&E Ser.* 85: 12.
- Nagabhushanam, A.K. and Dhulkhed, M.H. 1964 On a stranded whale on the South Kanara coast. *J. Mar. Biol. Assoc. India* 6: 323–25.
- Nair, K.V.S. and Jayaprakash, A.A. 1987 On a blue whale *Balaenoptera musculus* stranded at Chappa beach, Narakkal, Cochin, southwest coast of India. *Mar. Fish. Infor. Serv., T&E Ser.* 71: 17–18.
- Nair, K.V.S., Chakraborty, R.D., Bhint, H.M. and Thumber, B.P. 2004 Stranding of sei whale *Balaenoptera borealis* (Lesson) at Jaffarabad coast. *Mar. Fish. Infor. Serv., T&E Ser.* 182: 15.
- Nammalwar, P., Devadoss, P., Srinivasan, A., Chidambaram, L., Rao, T.C. and Rao, A.H. 1989 On the stranding of whales along Tamil Nadu and Andhra coasts. *Mar. Fish. Infor. Serv., T&E Ser.* 102: 13–16.
- Nammalwar, P., Krishnapillai, S. and Sankaralingam, S. 1983 Fin whale washed ashore in Rameswaram Island. *Mar. Fish. Infor. Serv., T&E Ser.* 48: 21.
- Nammalwar, P., Marichamy, R., Raju, A., Jayaprakash, A.A., Kasinathan, C., Ramamoorthy, N. and Sethuraman, V. 1992 On the stranding of sei whale *Balaenoptera borealis* Lesson at Mandapam along the Palk Bay coast. *Mar. Fish. Infor. Serv., T&E Ser.* 117: 18–19.
- Noble, A., Nasser, A.K.V. and Radhakrishnan Nair, P. 1992 On a sei whale, *Balaenoptera borealis* landed at Puthuvypu in Vypeen Island near Cochin. *Mar. Fish. Infor. Serv., T&E Ser.* 116: 18.
- Owen, R. 1866 On some Indian Cetacea collected by Walter Elliot, Esq. *Trans. Zool. Soc. Lond.* 6: 17–47.
- Pernetta, J.C. (Ed). 1993a. Marine Protected Area Needs in the South Asian Seas Region. Volume 2: India. A Marine Conservation and Development Report. International Union for Conservation of Nature, Gland, Switzerland. 7:77 URL: http://data.iucn.org/dbtw-wpd/edocs/MRN-007_2.pdf.
- Pillai, N. G. K., Vivekanandan, E., & Koya, K. P. (2006). Status of fisheries of Lakshadweep. *Mar. Fish. Infor. Serv., T&E Ser.* 187, 1-7.
- Prater, S.H. 1915 Note on a stranded Great Indian fin whale (*Balaenoptera indica*) at Ratnagiri. *J. Bombay Nat. Hist. Soc.* 23: 576–77.
- Purandhara, C. and Naik, C.H.V. 1992 On the stranding of *Balaenoptera physalus* at Kota, Dakshina Kannada. *Mar. Fish. Infor. Serv., T&E Ser.* 115: 18.
- Rao, C.L. 1961 On the capture of a baleen whale at Kakinada on the east coast of India. *J. Mar. Biol. Assoc. India* 3: 273.
- Rao, C.T. 1983 Photograph of whale stranded at Peddaganjampallipalem. *CMFRI NewsLetter* 22:6.
- Rao, C.V.S. 1991 On a minke whale *Balaenoptera acutorostrata* caught off Kakinada coast. *Mar. Fish. Infor. Serv., T&E Ser.* 109: 15–16.
- Rao, P.V., Livingston, P. and Misra, A. 1989 A report on the whales sighted off Mandapam on

- the Palk Bay side on 5th July, 1988. *Mar. Fish. Infor. Serv., T&E Ser.* 95: 10.
- Sathasivam, K. 2000 A catalogue of Indian marine mammal records. *Blackbuck* 16(2 and 3): 23–74.
- Sathasivam, K. 2002 Two whale records from Tamilnadu, Southern India. *J. Bombay Nat. Hist. Soc.* 99: 289–90.
- Shetty, C Prakash and Dinesh, C K and Kakati, V S and Sreeram, Miriam Paul 2009 Baleen whale washed ashore at Dona Paula, Goa. *Mar. Fish. Infor. Serv., T&E Ser.* 201. p. 30.
- Silas, E.G. 1964 . Baleen whales in Gulf of Mannar causes death of two fishermen. *J. Bombay Nat. Hist. Soc.* 61: 683–84.
- Silas, E.G. 1984 . Marine Mammal News. *Mar. Fish. Infor. Serv., T&E Ser.* 55: 14.
- Silas, E.G. 1985 Presidential address. pp.x–xii. In: Silas, E.G. (eds). Proceedings of the Symposium on Endangered Marine Animals and Marine Parks, Cochin, India, 12–16 January 1985. Mar. Biol. Assoc. India, Cochin. 508pp
- Singh, H.S. 2003. Sea mammals in marine protected area in the Gulf of Kachchh, Gujarat State, India. *Indian Journal of Marine Sciences* 32(3): 258–62.
- Sulochanan, Bindu and Lavanya, S and Nataraja, G D .2013. Baleen whale stranding in Sasihitlu beach of Karnataka. *Mar. Fish. Infor. Serv., T&E Ser.* 217. pp. 46-47.
- Telang, K Y .1987. On a Baleen whale landed at Hollengade, Karnataka coast. *Mar. Fish. Infor. Serv., T&E Ser.* 78. p. 17.
- Tiwari, J.K. and Varu, S.N. 2001. Stranded whales on the Gujarat coast. *J. Bombay Nat. Hist. Soc.* 98: 272.
- Townsend, C.H. 1935. The distribution of certain whales as shown by logbook records of American whaleships. *Zoologica* (NY) 19(1–2): 1– 50+6 maps.
- V.V., Yousuf, K.S.S.M., Anoop, B., Anoop, A.K., Kannan, P., Rajagopalan, M. and Vivekanandan, E. 2008. A note on cetacean distribution in the Indian EEZ and contiguous seas during 2003–07. *J. Cetacean Res. Manage.* 10(3): 209–16.
- Venkataraman, G. and Girijavallabhan, K.G. 1966. On a whale washed ashore at Calicut. *J. Mar. Biol. Assoc. India* 8: 373–74.
- Venkataraman, G., Dorairaj, K., Devaraj, M. and Ganapathi, R. 1973 On a new record of sei whale *Balaenoptera borealis* Less from Indian waters. *Indian J. Fish.* 20: 634–38.
- Venkataramanujam, K., Jegatheesan, G. and Srikrishnadhas, B. 1988 On a sei whale *Balaenoptera borealis* stranded at Tuticorin, east coast of India. *Invest. on Cetacea* 21: 247–49.
- Venkataramanujam, K., Paulraj, S. and Ramadhas, V. 1983. Stranding of the blue whale, *Balaenoptera musculus*, in the west coast of India. *Invest. on Cetacea* 16: 76–79.

Appendix 1: All records of whales from the west coast of India May 2016 onwards

Date	Location	Type	Species	Notes	Reference
01-March-2017	Suzie's wreck, Goa	Acoustics and sighting	<i>M. novaeangliae</i>		
Dec-16	Ratnagiri, Maharashtra	Stranding	<i>UI</i>		
02-Dec-2016	Kavaratti, Lakshadweep	Stranding	<i>B. edeni</i>	Photographs	
07-Dec-2016	Tambaldeg, Maharashtra	Stranding	<i>B. musculus</i>	Photographs	Dr Dhekne
Nov-16	Maharashtra	Stranding	<i>B. edeni</i>		
07-Oct- 2016	Guhaghar, Ratnagiri, Maharashtra	Stranding	<i>B. musculus</i>	Photographs	Dr Nandini Deshmukh
10-Sept-2016	Ambolgadh, Ratnagiri, Maharashtra	Stranding	<i>B. edeni</i>	Photographs (calf)	Nagesh Daftardar
10-Sept-2016	Jaitapuri, Ratnagiri, Maharashtra	Stranding	<i>B. musculus</i>	Photographs	Forest dept
15-Sept-2016	Harne, Murud Maharashtra	Stranding	<i>B. edeni</i>	Photographs	Mohan Upadhaya
09-Sept-2016	Anjuna, Goa	Stranding	<i>B. edeni</i>		
13-July-2016	Ezhimala beach, Kerala	Stranding	<i>B. edeni</i>	Photographs	Jameela
01-July-2016	Ballachadi, Gujarat	Stranding	<i>B. edeni</i>	Photographs (calf)	
09-July-2016	Mandvi, Gujarat	Stranding	<i>B. edeni</i>	Photographs	

Appendix 2: All records of whales from the east coast of India from 2000 onwards

Date	Location	Type	Species	Notes	Reference
17/02/17	Puri, Orissa	Stranding	<i>B. edeni/B. musculus</i> (?)		Newspaper
06/02/16	Puri, Orissa	Stranding	<i>UI</i>		Newspaper
08/07/16	Hare island, Tamil Nadu	Stranding	<i>B. edeni</i>	Live stranded on 6/7/16, animal was pushed back to sea. Landed again at Toothukudi thermal plant	Sudhan et al 2017
04/12/16	Puri, Orissa	Stranding	<i>B. edeni/B. musculus</i> (?)		Newspaper (Hindustan Times: 04Dec 2016)
02/01/15	Tamil Nadu	Stranding	<i>B. edeni/B. musculus</i> (?)	Carcass was identified as <i>B. musculus</i> by Sakhtivel (CMFRI)	MMI
30/06/12	Mannavaram swamp, Tamil Nadu	Live stranding	<i>B. edeni</i>		Newspaper (The Hindu)
12/12/12	Digha, West Bengal	Stranding	<i>B. edeni</i>	MMI	Newspaper and YouTube
22/11/10	Chennai Harbour, Tamil Nadu	Stranding	<i>B. musculus</i> (?)	<i>B. musculus</i> (MMI)	Newspaper (Times of India: 23/11/10)
10/04/09	Rushikulya, Orissa	Sighting	<i>B. edeni</i>		Sajan John et al
01/05/06	Mandapam, Tamil Nadu	Stranding	<i>UI</i>		VV Afsal et al (2007)
17/07/06	Kundhukal, Tamil Nadu	Stranding	<i>B. musculus</i>		VV Afsal et al (2007)
04/08/06	Hare island, Tamil Nadu	Stranding	<i>UI</i>		VV Afsal et al (2007)

08/08/06	Kundhukal, Tamil Nadu	Stranding	<i>UI</i>		VV Afsal et al (2007)
27/12/05	Narikuzhi, Tamil Nadu	Stranding	<i>UI</i>		VV Afsal et al (2007)
01/01/03	Narikuzhi, Tamil Nadu	Stranding	<i>UI (B. edeni/ B. musculus)</i>	Misidentified as Sei whale	Kasinathan and Ramamoorthy (2004) Krishnapillai, S. and Kingston, S.D. 2004
27/06/01	Pirappanvalasai, Tamil Nadu	Stranding	<i>UI (B. edeni/ B. musculus)</i>	Misidentified as Sei whale	Gandhi and Kasinathan (2002)
18/01/01	Kanyakumari, Tamil Nadu	Stranding	<i>M. novaeangliae?</i>		Sathasivam (2001)
01/06/00	Hare island, Tamil Nadu	Stranding	<i>UI (B. edeni/ B. musculus)</i>	Misidentified as Sei whale	Balasubramaniam (2001)
23/08/00	Pudupattinam, Tamil Nadu	Stranding	<i>UI (B. edeni/ B. musculus)</i>	Misidentified as a Minke whale	Kasinathan (2002)
14/11/00	Point Calimere, Tamil Nadu	Stranding	<i>B. edeni</i>		Sathasivam (2001)