



E-ISSN: 2320-7078  
P-ISSN: 2349-6800  
JEZS 2017; 5(2): 507-512  
© 2017 JEZS  
Received: 05-01-2017  
Accepted: 06-02-2017

**Sudhan C**  
PG Research Scholar,  
Department of Fisheries Biology  
and Resource Management,  
Fisheries College and Research  
Institute; Tamil Nadu Fisheries  
University; Thoothukudi,  
Tamil Nadu – 628008, India

**Jawahar P**  
Professor and Head,  
Department of Fisheries Biology  
and Resource Management,  
Fisheries College and Research  
Institute; Tamil Nadu Fisheries  
University; Thoothukudi,  
Tamil Nadu – 628008, India

**Moulitharan N**  
UG Scholar, Fisheries College  
and Research Institute; Tamil  
Nadu Fisheries University;  
Thoothukudi, Tamil Nadu –  
628008, India

**Santhosh Kumar S**  
Assistant Professor,  
Department of Fisheries Biology  
and Resource Management,  
Fisheries College and Research  
Institute; Tamil Nadu Fisheries  
University; Thoothukudi,  
Tamil Nadu – 628008, India

#### Correspondence

**Sudhan C**  
PG Research Scholar,  
Department of Fisheries Biology  
and Resource Management,  
Fisheries College and Research  
Institute; Tamil Nadu Fisheries  
University; Thoothukudi,  
Tamil Nadu – 628008, India

## Short communication on stranded Bryde's whale along Thoothukudi Coast of Tamil Nadu, India

**Sudhan C, Jawahar P, Moulitharan N and Santhosh Kumar S**

#### Abstract

*Balaenoptera edeni* has stranded dead in the bay near Thoothukudi Thermal power plant, Tamil Nadu on 8<sup>th</sup> July 2016. Wrong guidance of the leader whale, attracted towards heat water, malfunction of internal organs, mechanical injuries by coral reefs, breeding purpose, in search of food, predator avoidance and migration were quoted as the reasons for stranding by several fishers and scientific communities. In addition, morphological and meristic characters have been discussed. The attempt has been made to prove certain indigenous thoughts of fishermen and scientists about the stranded whale and to have an overview about the marine mammal evolution, distribution, feeding ecology and reason framed for whale stranding occurred along in Indian coast.

**Keywords:** Morphometrics, meristics characters, thermal power plant and whale stranding

#### 1. Introduction

Marine mammals are not necessarily completely dependent on an aquatic existence. There are several different types of marine mammals. The two most commonly seen and best-known groups of marine mammals are the cetaceans (whales, dolphins and porpoises) and the pinnipeds (seals, sea lions and walrus) [1]. The evolutionary history shows that, there were three major phases of cetacean radiation. The first occurred about 45-53 mya (Eocene) in the shallow, warm, tropical waters of the ancient Tethys Sea which includes appearance of *Ambulocetus*, a 4 meter walking protocetacean seen as a 'missing link' in cetacean evolution [1]. The second major phase resulted in the initial radiation of the odontocetes and mysticetes, about 25-35 mya (Oligocene) that decides the development of important modern adaptations, such as echolocation in the toothed whales and filter feeding in the baleen whales. The final radiation 12-15 mya (Miocene) involves in the appearance of modern cetaceans like delphinoids and balenopterids [1-5].

The identity and number of species in the "Bryde's Whale complex" is still unclear [4-14]. There is an "ordinary" Bryde's Whale, with a worldwide distribution in the Pacific, Indian and Atlantic oceans [4,6,7], which grows to about 14 m in length, and one or more smaller forms which tend to be more coastal in distribution [9&10]. The taxonomic status of the smaller forms is unclear. *Balaenoptera edeni* was originally described by Anderson (1879) from a specimen collected near the Sittang River, Myanmar, which is now held in Calcutta. It was small compared with "ordinary" Bryde's whales, being apparently nearly physically mature at only 11.3 m in length [11, 12 & 13]

#### 2. Materials and Methods

As information obtained about whale stranding, we the post graduation students from Fisheries College and Research Institute, Tamil Nadu Fisheries University, Tamil Nadu, Thoothukudi-628008 went with curiosity to investigate about the type of species stranded and their identification based on classical taxonomy. As per the standard procedure, the key characters were noted in relation with morphometric and meristic characteristics of the species stranded.

The whale could be identified as *Balaenoptera edeni* (Fig. 1) and has stranded dead in the bay near (beside) Thoothukudi Thermal power plant, Tamil Nadu on 8<sup>th</sup> July 2016. Initially, whale was stranded (Fig. 2-7) alive at the same place at 4.00 PM on 6<sup>th</sup> July and it was rescued and reintroduced into the sea by the local fishermen, fisheries department and volunteers. The whale again stranded on 07/07/2016 near old fishing harbor; the fishermen and fisheries department officials with the help of boat, the whale was dragged in live condition to the deep sea up to 20 nautical miles. Despite all the efforts made by the fishermen and the fisheries

department the whale washed ashore dead at noon near the thermal power plant effluent releasing bay on 8<sup>th</sup> July 2016 (Fig. 8). Then the whale was buried after the postmortem examination by the veterinary officials (Fig. 9).

The percentage analysis was made by the structured survey for predicting the reason of stranding. In order to add the value of data collected, the correlation degree between the two variables has been tested using SPSS software (Statistical Package for Social Sciences) by Pearson correlation coefficient method with two tailed as test of significance level.

**3. Results**

The diagrammatic representation of *Balaenoptera edeni* Anderson 1879 was given in Fig 1. As per the standard procedure, the key characters were noted in relation with morphometric and meristic characteristics (Fig. 10) of the species stranded and presented in Table 1.

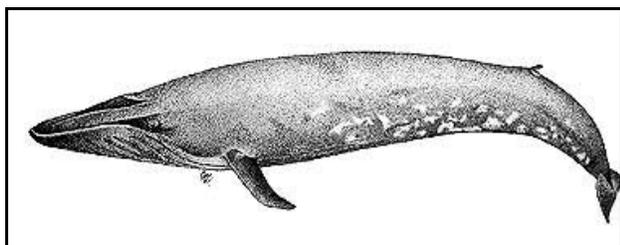
The comprehensive details of Bryde’s whale stranding in India and commercial whaling data was focused in Table 2 and 3. Similarly discussion of certain facts pertaining to *Balaenoptera edeni* Anderson 1879 was made in Table 4. The SPSS result shows that 0.829 degree of correlation by two-tailed test which shows sufficiently high degree of correlation between the test two variables.

**Table 1:** Morphometric and meristic characters of stranded whale

Morphometric Characters	Meristic Characters
Total body length: 6m	No. of ridges on head: 3 No. of baleen plates: 365 No. of ventral plates: 80
Dorsal fin: 0.45m	
Pre anal length: 3.8m	
Post anal length: 2.2m	
Fluke length: 1.2m	
Fluke width: 0.72m	
Blow hole length: 0.21m	
Blow hole width: 0.17m	

**Taxonomical Position**

- Kingdom : Animalia
- Phylum : Chordata
- Sub-phylum : vertebrata
- Class : Mammalia (Mammals)
- Order : Cetaceae (Whales, dolphins and porpoises)
- Suborder : Mysticeti (Baleen whales)
- Family : Balenopteridae (Rorquals)
- Genus : *Balaenoptera* (Bryde’s Whale)
- Species : *B. edeni*.
- Scientific Name : *Balaenoptera edeni* Anderson 1879
- Common Name : Bryde’s Whale



**Fig 1:** Diagrammatic representation of *Balaenoptera edeni* Anderson 1879

**3.1 Key Identification Characters**

The dorsal side of the head (Fig. 5) between the blow hole and tip of the head has three ridges (unique character).Head

makes about 25% of the total body length [1 & 2]. Tall falcate or sickle shaped dorsal fin notched at triangle edge present at two third of its body length. There will be about 250-410 dark grey or black baleen plates on each side of the upper jaw. The body has broad and notched flukes (Fig. 7) with small flippers. Females are generally larger than males. Blow is bushy or columnar with about 3-4m height. Bryde’s whales are dark gray in color with a yellowish white under side. They are the second smallest rorqual within average length of 12 meters, although the female is usually about 1 foot longer than the male. Bryde’s whales have two blowholes located on the top of the head. Bryde’s whale is often confused with the Sei whale; however, the Bryde’s whale has three parallel ridges in the area between the blowholes and the tip of the head. The flippers are small compared body size. The prominent dorsal fin is sickle shaped. Instead of teeth, these whales have two rows of baleen plates. These plates are located on the top jaw and number approximately 300 on each side [9 & 10]. Each baleen plate is short and wide, 50 cm x 19 cm. Populations exist mainly in warmer waters (~20 degrees Celsius). More research needs to be done on this topic pertaining to the identification and other molecular level studies.

**4. Discussion**

**Distribution:** Bryde’s whales (*Balaenoptera edeni*) can be found in the Pacific, Indian and Atlantic oceans [4, 5, 16 & 18], but they are most commonly found and native to tropical and sub-tropical regions.

**Habitat:** Prefers coastal and subtropical waters of temperature greater than 20 °C or coastal waters above the continental shelf or shallow waters during feeding.

**Behavior:** Mostly seen as solitary animal and form groups during feeding. Non migratory and are confined to a particular area of sea. But some are seasonal where they move towards higher altitudes in summer and towards equator during the winter. Rarely shows the flukes (Fig. 7) above the water while swimming [15].

**Sexual maturity and breeding:** Male matures (Fig. 6) at the 8<sup>th</sup> year while the female at 10<sup>th</sup> year of their age. Length at first maturity is 11.2m. Females are larger than males. Gestation period will be up to 12 months. They breed all around the year and give birth to young ones with 4m length and 900kg weight [17, 18].

**Food and feeding:** Opportunistic feeders and feeds mainly on the shoaling preys of pelagic environment zone. They were lunge feeders like baleen Whale where they filter the engulfed water with the baleen. They live in association with the sea birds, seals, sharks and other cetaceans for the feeding (Fig. 11).

**Exploitation:** The Southern hemisphere and pacific region greatly lost its Bryde’s population due to the historical whaling practices. The difficulty in differentiating the Sei whale and Bryde’s whale resulted in the combined catch statistics until 1972. The commercial whaling data until 1981 were tabulated below as follows in Table 2.

**Table 2:** Commercial whaling data

Time Period	Region	No. Of Animals
1900s	Southern hemisphere	< 8000
1946-1983	Western pacific	15,076
1968-1972	Eastern pacific	2304
1973-1981	Eastern pacific	2873
2000(Japan)	North pacific	43
2001(Japan)	North pacific	50

Threats: Illegal fishing and whaling activities; Striking with the boats, trawlers and ships; entangling in the fishing gears and chemical pollution [7-10].

Conservation and Wild life protection act of India: In 1986, International Whaling Commission (IWC) adjourned the commercial whaling activity with the special permit of whaling for the scientific purposes (Fig. 12). Convention on the international trade on the endangered species (CITES) listed Bryde’s whale in appendix I which forbids the illegal and unauthorized trading. The International Union for the Conservation of Nature (IUCN) status was recorded to be data deficient version 3.1. and also protected by and Wild life protection act (1972) of India [11, 12].

Marine mammals were not randomly distributed in the world’s oceans. It has been known, for example, that certain species were found exclusively or primarily in waters of a particular depth, temperature range, or oceanographic regime, and not in areas lacking one or all of these characteristics. Ocean currents and productivity pattern indirectly influence the migratory routes of the concerned animal. The interaction of these currents and sub-surface movements of major water masses moves nutrients around by upwelling and horizontal currents.

The percentage analysis for predicting the reason of stranding in Table 4 and Fig. 13 shows that 35% and 40% on both sides respectively to be the highest score for the variable “Attracted towards heat water”. As the breeding starts at the length of 11

– 12m of size, the stranded whale measured to be 6m scores were not given by the scientific communities. For predator avoidance, migration and malfunction of internal organs were least scored (5%) variables by fishermen arrived from their extracted knowledge. Wrong guidance of the leader whale, malfunction of internal organs and in search of food were least scored (5%) variables by scientific communities.

Hence, the communication brings about the awareness pertaining to the catch of whales among fishers and other communities by the structured survey and also predicts the reason for stranding of whale especially due to the warm water that remains the unhealthiness of the ecosystem. It acts as the baseline data for the conservation and management issues in India and other tropical countries.

**Table 3:** Indian scenario of Bryde’s whale Stranding

S.no.	Stranded area	Date
1	Beypore, Calicut, Kerala.	02.07.1979
2	Dhanushkodi, Tamil Nadu.	20.02.1973
3	Point calimere, Tamil Nadu.	14.01.2000
4	Mandapam, Tamil Nadu.	08.08.2006
5	Edayar, Thiruvananthapuram, Kerala.	02.07.2009
6	Kadmat island, Lakshadweep.	01.11.2010
7	Mandapam, Tamil Nadu.	25.04.2015
8	Juhu beach, Mumbai.	29.01.2016
9	Thoothukudi, Tamil Nadu.	08.07.2016

**Table 4:** Discussion of certain facts pertaining to *Balaenoptera edeni* (Anderson, 1879)

S. no	Biological questions	Answer	References
1.	Where they could be seen?	Native to Indian ocean, Atlantic ocean and Pacific ocean.	Allen <i>et al.</i> , 2011; Alves <i>et al.</i> , 2010 and Tershy, 1992.
2.	Where do they live in ocean?	In tropical marine climate and Pelagic habitat	Kawamura and Satake, 1976; Smultea <i>et al.</i> , 2012; Wiseman, 2011 and Tershy, 1992.
3.	Is there any depth range for that particular species pertaining to habitat?	100 to 300 m	Kawamura and Satake, 1976; Smultea <i>et al.</i> , 2012; Tershy, 1992 and Wiseman, 2011.
4.	Is there any established length weight relationship?	13650 – 15000 kg 12 – 14 m (pertaining to adult)	Kawamura, 1980 and Wade and Gerrodette 1993.
5.	What are the reproductive features found?	Breed once in a year (Average number of offspring: 1)	Kawamura, 1980 and Wade and Gerrodette 1993.
6.	Any parental care was observed?	Precocial and female takes care for about 6 months	Kawamura, 1980, Wiseman, 2011 and Siciliano <i>et al.</i> , 2004.
7.	Are they having typical behaviors?	Motile and Migratory towards warm climate	Kerosky <i>et al.</i> , 2012; Wiseman, 2011; Yamato 2012 and Naganathan, 2007
8.	Are they have negative impacts on human?	No	Deepak Samuel, 2007; Wiseman, 2011 and Oleson <i>et al.</i> , 2003.
9.	What were the feeding preferences and ecosystem role?	Planktivore and helps is nutrient cycling and promotes homeostasis in the ecosystem	Deepak Samuel, 2007; Melkani, 2007 and Murase <i>et al.</i> , 2007
10.	Are they economically valuable?	Yes	Murase, 2007; Reilly, <i>et al.</i> , 2008 and Salvadeo <i>et al.</i> , 2011.



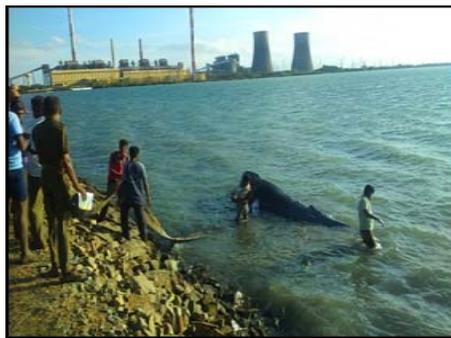
**Fig 2:** Stranded Whale (06/07/2016)



**Fig 3:** Stranded Whale – Dorsal View in sea



**Fig 4:** Stranded whale (Same on 08/07/2016)



**Fig 8:** Location of Stranded whale near thermal power plant



**Fig 5:** Dorsal view – Observed with mechanical injuries and blood streaks



**Fig 9:** Examination by local fishers, state fisheries department officials and veterinarians



**Fig 6:** Male reproductive organ



**Fig 10:** Measuring morphometrics and counting meristics characteristics



**Fig 7:** Fluke



**Fig 11:** View of Baleen plates

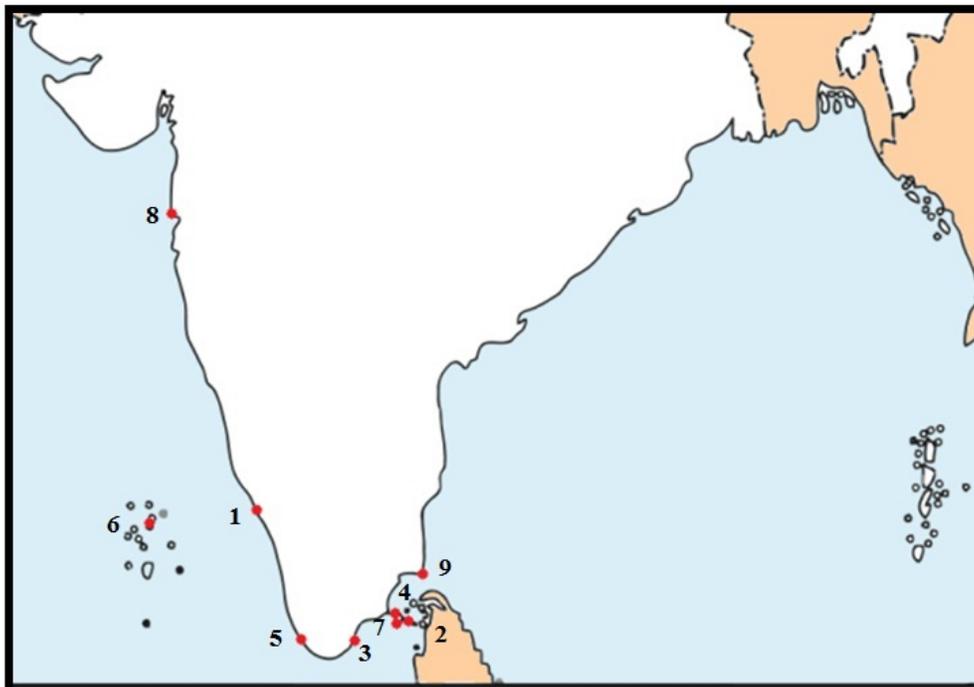


Fig 12: Map showing Indian scenario of Bryde's whale Stranding

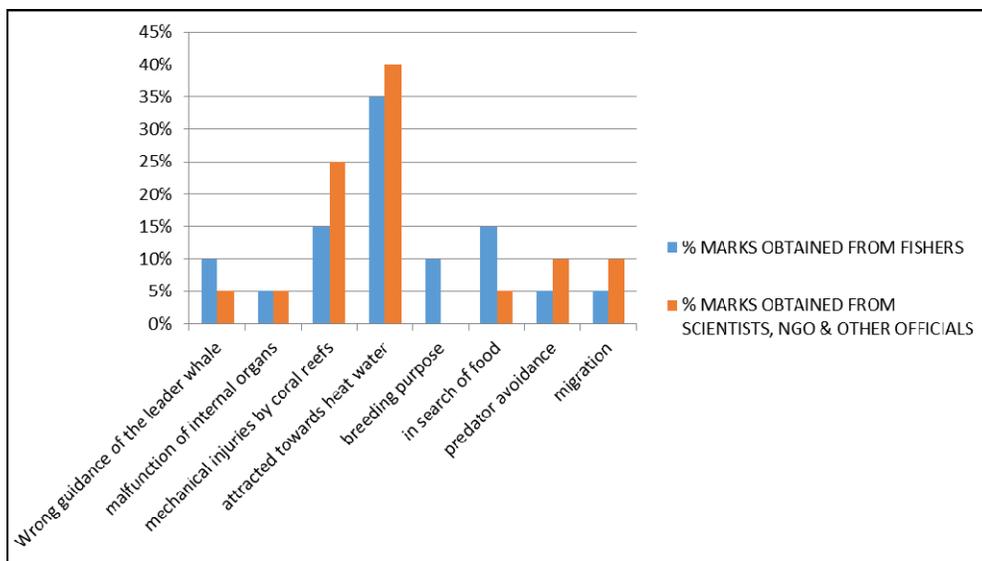


Fig 13: Reasons for stranding

**5. Acknowledgement**

The authors wish to thank beloved Dean Dr. G. Sugumar, Chair Dr. A. Srinivasan, School of Fisheries Resources and Environment Management; Fisheries College and Research Institute; Thoothukudi; Tamil Nadu Fisheries University for the encouragement and support.

**6. References**

- Allen S, Morten son J, Webb S. Field Guide to Marine Mammals of the Pacific Coast. California, US: University of California Press, 2011.
- Alves F, Dinis A, Casca I, Freitas L. Bryde's whale (*Balaenoptera brydei*) stable as sociations and dive profiles: Newinsights into for aging behavior. Marine Mammal Science. 2010; 26(1):202-212.
- Deepak Samuel V. Capacity Building in Identification of

Marine Scheduled Animals. Melkani VK, Patterson Edward JK, Murugan A, Naganathan V. (Ed). Gulf of Mannar Biosphere Reserve Trust, Ramanathapuram, Tamil Nadu, India, 2007, 74-82.

- Kawamura A, Satake Y. Preliminary report on the geographical distribution of the Bryde's Whale in the NorthPacific with special reference to the structure of the filtering apparatus. Scientific Reports of the Whales Research Institute. 1976; 28:135.
- Kawamura A. Food habits of the Bryde's whales taken in the South Pacific and Indian Oceans. Scientific Reports of the Whales Research Institute, 1980b, 32:123.
- Kerosky S, Sirovic A, Roche L, Baumann S, Wiggins S, Hilde brand J. Bryde's whale seasonal range expansion and increasing in the Southern California Bight from 2000 to 2010. Deep-Sea Research I. 2012; 65:125-132.

7. Melkani VK. Capacity Building in Identification of Marine Scheduled Animals. Melkani VK, Patterson Edward JK, Murugan A, Naganathan V. (Ed). Gulf of Mannar Biosphere Reserve Trust, Ramanathapuram, Tamil Nadu, India, 2007, 1-16.
8. Murase H, Tamura T, Kiwada H, Fujise Y, Watanabe H. Prey selection of common minke (*Balaenoptera actorostrata*) and Bryde's (*Balaenoptera edeni*) whales in the western North Pacific in 2000 and 2001. Fisheries Oceanography. 2007; 16(2):186-201.
9. Naganathan V. Capacity Building in Identification of Marine Scheduled Animals. Melkani VK, Patterson Edward JK, Murugan A, Naganathan V. (Ed). Gulf of Mannar Biosphere Reserve Trust, Ramanathapuram, Tamil Nadu, India, 2007, 17-50.
10. Oleson E, Barlow J, Gordon J, Rankin S, Hildebrand J. Low frequency calls of Bryde's whales. Marine Mammal Science. 2003; 19(2):407-419.
11. Reilly SB, Bannister JL, Best PB, Brown M. *Balaenoptera edeni*. The IUCN Red List of Threatened Species 2008: e.T2476A9445502. <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T2476A9445502.en>.
12. Salvadeo C, Ramirez SF, Gallardo GA, MacLeod C. Bryde's whale (*Balaenoptera brydei*) in the south western Gulf of California: Relationship with ENSO variability and prey availability. Ciencias Marinas. 2011; 37(2):215-225.
13. Siciliano S, Santos MCO, Vicente A, Varenga FA. Strandings and feeding records of Bryde's whales (*Balaenoptera edeni*) in south-eastern Brazil. Journal of the Marine Biological Association of the United Kingdom. 2004; 84:857-859.
14. Smultea M, Douglas A, Bacon C, Jefferson T. Bryde's whale (*Balaenoptera brydei/ edeni*) sightings in the Southern California Blight. Aquatic Mammals. 2012; 38(1):92-97.
15. Tershy B. Body size, diet, habitat use, and social behavior of *Balaenoptera* whales in the Gulf of California. Journal of Mammalogy. 1992; 73(3):477-486.
16. Wade P, Gerrodette T. Estimates of cetacean abundance and distribution in the eastern tropical Pacific. Report of the International Whaling Commission. 1993; 43:477493.
17. Wiseman N, Parsons S, Stockin K, Baker S. Seasonal occurrence and distribution of Bryde's whales in the Hauraki Gulf, New Zealand. Marine Mammal Science. 2011; 27(4):253-267.
18. Yamato M, Ketten D, Arruda J, Cramer S, Moore K. The auditory anatomy of the minke whale (*Balaenoptera acutorostrata*): A potential fatty sound reception pathway in a baleen whale. The Anatomical Record, 2012; 295:991-998.