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PRELIMINARY REPORT ON THE CRANIAL MEASUREMENTS OF A BRYDE'S WHALE STRANDED IN FAILAKA ISLAND, KUWAIT IN 2014

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Abstract

On 28 February 2014, a dead baleen whale was stranded and found by residents on the east coast of Failaka Island, Kuwait. The specimen was a female with a total length of 14 m. After muscle and internal organ removal and sample collection, the remains of this animal were buried *in situ*. The Japanese authors of this paper visited Failaka Island to check the condition of the skeleton after about nine months since the stranding event. A total of 44 measurements, including condylobasal length, were made from the dorsal side of the skull. Skull length was 3.222 m, which represented 26.85% of the body length. The skull of the specimen possesses diagnostic characteristics of Bryde's whale, such as the outer edge of the rostrum being rounded and flattened in dorsal and lateral views, respectively. The number of ribs were 13 on the left, and 12 on the right side. The skeleton was reburied to allow natural decomposition of the remaining soft tissue. As of 2022 we have not been able to excavate this skeleton, but we hope to do so in the near future and hope the specimen will be properly catalogued and permanently stored at some museum or institution in Kuwait.

Key words: Skeletal measurement, Balaenopteridae, Bryde's whale, *Balaenoptera edeni* morphometric, large whale.

The Bryde's whale *Balaenoptera edeni* Anderson, 1879, is a medium-sized balaenopterid with a total length of about 13 to 15 meters. While most baleen whales have a clear seasonal migration and antitropical distribution, the Bryde's whale inhabits tropical and warm temperate waters of the Indian, Pacific, and Atlantic Oceans of 40°N to 40°S with a circannual water temperature of 16.3°C or warmer (Kato and Perrin, 2018).

Two genetically and morphologically distinct populations exist within this species, namely *B. edeni brydei* (Olsen, 1913) and *B. edeni edeni* (Committee on Taxonomy, 2022). *Balaenoptera e. brydei* is larger and inhabits offshore waters, whereas *B. e. edeni* is smaller and found closer to shore (Wada *et al.*, 2003; Sasaki *et al.*, 2006; Kanda *et al.*, 2007; Kato and Perrin, 2018; Committee on Taxonomy, 2022). In recent years, some scientists have suggested that these two populations should be separated at the species level and named as *B. brydei* and *B. edeni*, but no agreement has been reached yet (Rosel *et al.*, 2021). In 2021 Bryde's-like whales from the northern Gulf of Mexico were described as a new species, *B. ricei* (Rosel *et al.*, 2021).

Morphological information, such as external and skeletal characteristics, is one of the essential taxonomical traits along with genetics to determine cetacean species. However, for large whales such as

Bryde's whales, the number of available skeletal specimens is small and makes a significant challenge for taxonomic studies. Although several sightings and strandings of Bryde's whale have been reported from the Arabian Sea and adjacent waters, the number of skeletal specimens of this species is limited. Only five skeletal remains of Bryde's whale have been reported from the Iranian coast of the Arabian (Persian) Gulf and the Gulf of Oman since 1971 (Braulik *et al.*, 2010). Some of the other Bryde's whales strandings from the Arabian (Persian) Gulf include the following: (1) a 12.5 m male stranded at Qasr, Iraq on 5 February 1967 (Al-Robaae, 1967, Mahdi, 1967), (2) a 14.5 m individual stranded near the ARAMCO causeway at Abu Ali Island, Saudi Arabia in March 1995 (Robineau and Fiquet, 1996), and (3) a dead specimen stranded in May 1995 at the Saudi Arabia-Bahrain causeway (Robineau and Fiquet, 1996).

Stranding events are the only way of obtaining skeletal specimens of large whales in areas where whaling is not conducted. However, especially in the case of large whales, they are not always collected from all stranded animals due to the high cost of cleaning, preparing and maintaining such skeletal specimens and the problem of securing storage space. Therefore, the number of scientifically valuable skeletal specimens available for academic research is limited.

In early 2014, a baleen whale was stranded on Failaka Island in Kuwait. This animal was buried after being examined by local scientists. About nine months later, following the request of a Kuwait scientific institute to make a skeletal specimen, the whale carcass was temporarily dug out to verify its conditions and to conduct preliminary research on skeletal measurements by Japanese researchers. As of 2022, the skeleton has not yet been excavated for various reasons. However, the data obtained from our brief examination are valuable to further understand the ecology of the Bryde's whale. Therefore, they are provided in this preliminary report.

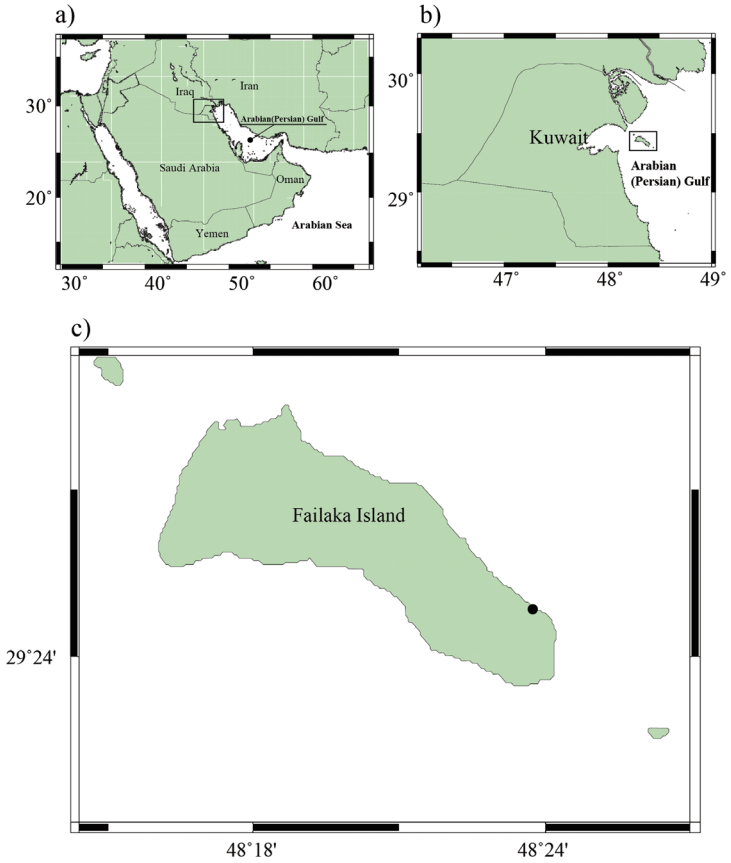

Fig. 1. Location of the Bryde's whale that stranded in 28th February, 2014. a) Wider area map, around the Arabian (Persian) Gulf. b) Map showing the position of Kuwait and Failaka Island. c) Failaka Island map. The black circle indicates the Bryde's whale stranding location.

Fig. 2. December 2014 excavation of the Bryde's whale to check the skeletal conditions and to conduct scientific observations.

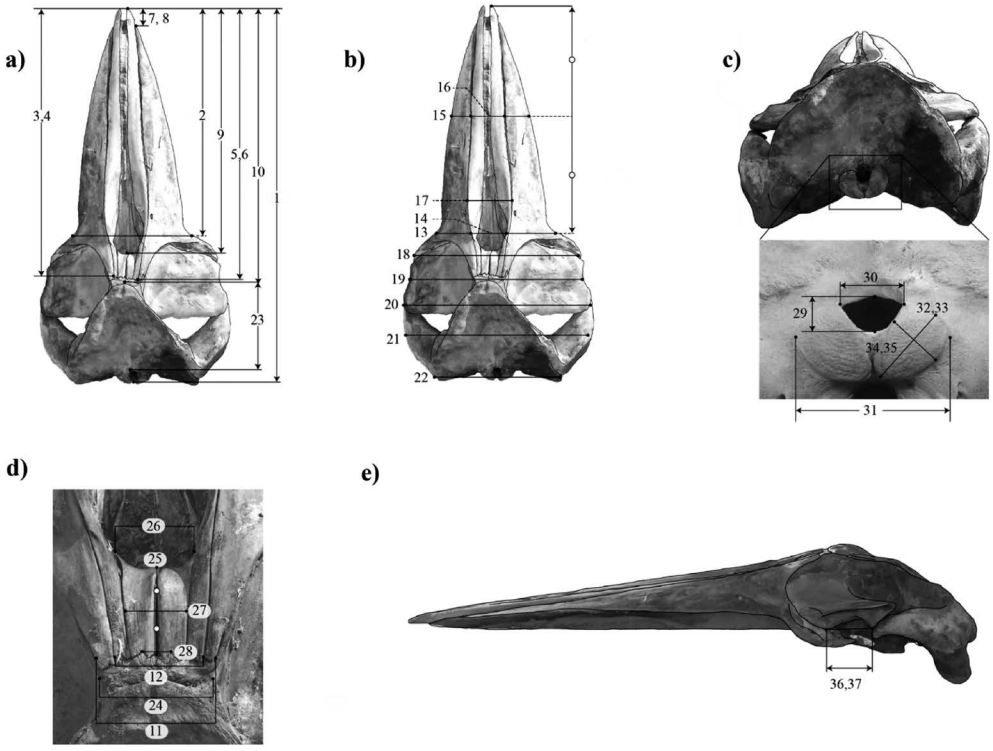

Fig. 3. Cranial measurement points and values of the Bryde's whale stranded in Failaka Island, Kuwait, in February 2014. a) and b) dorsal view, c) caudal view, d) dorsal view of the vertex, and e) lateral view of the skull. For measurement point explanation and values, see Table 1.

On 28 February 2014, a dead baleen whale was found stranded by residents on the east coast of Failaka Island (29°24′50.9″N, 48°23′44.86″E), Kuwait. This island is located about 20 km off the coast of Kuwait City, in the northern part of the Arabian (Persian) Gulf (Fig. 1). In response to the stranding report, on 1 March 2014 Kuwaiti researchers visited the site to examine the carcass and to make an assessment on the possible causes of the whale's death. After their conducting external measurements followed by autopsy and examination of the internal organs, this animal was initially identified as a fin whale having a body length of 14 m (Khalaf, 2014). After sample collection and removal of muscles

Table 1. Cranium measurements of the Bryde's whale stranded in Failaka Island, Kuwait, in 2014.

No.	Measurement points	cm
1.	Condylobasal length	322.2
2.	Length of rostrum	209.1
3.	Length of premaxillary (L)	245.7
4.	Length of premaxillary (R)	246.7
5.	Length of maxillary (L)	227.5
6.	Length of maxillary (R)	227.5
7.	Tip of premaxillary to tip of maxillary (L)	20.0
8.	Tip of premaxillary to tip of maxillary (R)	19.7
9.	Tip of premaxillary to nares, anterior	224.2
10.	Tip of premaxillary to vertex	248.7
11.	Breadth of maxillary, posterior edge	23.6
12.	Breadth of premaxillary, posterior edge	17.4
13.	Breadth of rostrum at base	90.5
14.	Breadth of premaxillary at base	29.3
15.	Breadth of rostrum at middle	63.3
16.	Breadth of premaxillary at middle	28.8
17.	Greatest breadth of premaxillary	34.2
18.	Breadth of cranium, maxillary	135.6
19.	Breadth of cranium, middle of orbital foramen	134.8
20.	Breadth of cranium, anterior edge of zygomatic process	146.6
21.	Breadth of cranium, middle of zygomatic process	145.6
22.	Breadth of occipital bone	97.0
23.	Length from upper ridge of foramen magnum to superior part of occipital bone	71.4
24.	Minimum breadth of parietal bone	23.4
25.	Length of nasals	22.2
26.	Breadth of nasals, anterior	17.6
27.	Breadth of nasals at middle	13.1
28.	Breadth of nasals, posterior	5.8
29.	Height of foramen magnum	10.0
30.	Breadth of foramen magnum	7.3
31.	Breadth across occipital condyles	25.6
32.	Breadth of occipital condyle (L)	11.3
33.	Breadth of occipital condyle (R)	11.4
34.	Height of occipital condyle (L)	17.4
35.	Height of occipital condyle (R)	18.2
36.	Breadth of orbit (L)	24.0
37.	Breadth of orbit (R)	23.3

and internal organs, the remaining parts of the animal were placed in a pit four to six meters deep and buried in the sand.

From 20 to 22 December 2014, the authors of this paper visited Failaka Island to unbury and check the skeleton's condition and to obtain photographic and measurement records (Fig. 2). The left flipper was first excavated. The orientation of finger bones was photographed and traced with a clear plastic sheet. The soft tissue was almost decomposed and liquefied but still remained within the finger bones. As regards the rest of the skeleton, the residual muscle and fatty tissue had not completely decomposed and were still remaining, especially at the underside of the bones. Ribs, cervical, and dorsal ver-

Fig. 4. Dorsal (a) and lateral (b) view of the skull. Note that ventral part of the skull is filled with sand. The scale bar indicates 1 meter.

tebral bones were assigned numbers and labeled with plastic tags. The remnant bones (right flipper's, vertebrae, ribs, and chevrons) were also collected. Measurements and photographic records were taken of the skull for the purpose of academic use before burying them again. Except for the pelvic bones and some (maybe three to five) tips of the right finger bones and the left tympanic bulla, all skeletal parts have been collected. About 17 neural spines of the dorsal and lumbar vertebras were broken. This would probably have been caused by the following reasons: first, that the spines were also decaying within the flesh, which was not removed completely. And a second reason may be the neural spines' position, which stayed level and under pressure from the above sand.

A total of 44 measurements, including skull length, were taken from the dorsal side of the cranium. The skull length (condylobasal length) was 3.222 m, which represented 26.85% of the specimen's body length (Fig. 3, Table 1). Omura (1959) compared the osteological characteristics of Bryde's and sei (*B. borealis*) whales. The skull shape of the animal possesses diagnostic characteristics of Bryde's whale, such as the outer edge of the rostrum being rounded and flattened in dorsal and lateral view, respectively, which was reported by Omura (1959) (Fig. 4). Numbers of ribs were 13 and 12 in left and right, respectively. The 13th left rib was separated into two pieces (not broken). The vertebral formula was as follows:

$$C7 + D13 + L13 + Ca17 + \alpha.$$

After measuring and photographing the skull, the skeletal pieces were transported from Failaka Island to a protected area on mainland Kuwait and buried again. This will allow the remaining soft tissues still attached to the bones to decompose so that a skeletal specimen of this animal may be prepared later on. We hope to do so in the near future so that this scientifically valuable specimen may be permanently stored in a museum or another appropriate institution in Kuwait.

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