Live sighting of Blainville's beaked whale *Mesoplodon densirostris* (de Blainville, 1817) in the Indian seawaters

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Two individuals belonging to the species *Mesoplodon densirostris* (de Blainville, 1817) were sighted in the Indian waters during a marine mammal survey conducted on-board the vessel *MFV Yellowfin* associated with the Mormugao Zonal Base of the Fishery Survey of India. This survey was part of the project titled 'Marine mammal stock assessment in India'. Among the sighted individuals, one was a female based on its morphological characters while the sex of the other was unknown. To the best of our knowledge, there are no previous sightings of this rare beaked whale from the Indian Exclusive Economic Zone.

Keywords: Beaked whale, live sighting, marine mammal survey.

MARINE mammals are important components of the marine ecosystem, with 130 valid species in the world oceans[1]. Among them, 26 species belonging to six families have been reported from the Indian waters[2]. During the marine mammal survey undertaken on-board the vessel *MFV Yellowfin* associated with the Mormugao Base of the Fishery Survey of India, two individuals of Blainville's beaked whale *Mesoplodon densirostris* (de Blainville, 1817) (family: Ziphiidae) were sighted from the Indian Exclusive Economic Zone (EEZ) during December 2022.

Movement of these rare, deep-sea whales was sighted while surfacing 66 nautical miles southwest of Mangalore coast, Arabian Sea, India (lat. 11°53′.26N; long. 74°16′.30E). These are popularly known as beaked whales due to their distinct beaks. Blainville's or dense-beaked whale *M. densirostris* (de Blainville, 1817) is the one of the rarest species of the genus *Mesoplodon* (Figure 1). The genus *Mesoplodon* currently has 16 valid species of small-sized whales ranging from 3.9 m long (pgymy-beaked whale *Mesoplodon peruvianus*) to 6.2 m long (strap-toothed whale *Mesoplodon layardii*).

The mesoplodont whales are characterized by a spindle-shaped body, small melon without crease; blends smoothly into the thick rostrum, lack of groove between rostrum and forehead, two throat grooves on the ventral side of the head between the lower jaws, small sub-triangular dorsal fin situated at about two-thirds of the total body length, short and narrow flippers, no deep median notch on flukes; posterior margin straight or slightly cresentic[3,4]. *M. densirostris* has a broad, semi-circular blowhole with the open side oriented anteriorly and dark grey to brown body colour dorsally and lighter ventrally, especially in the vicinity of the genital, umbilical and throat grooves and flippers[4].

M. densirostris is widely distributed in the tropical waters of the world. It has been reported from South Africa,

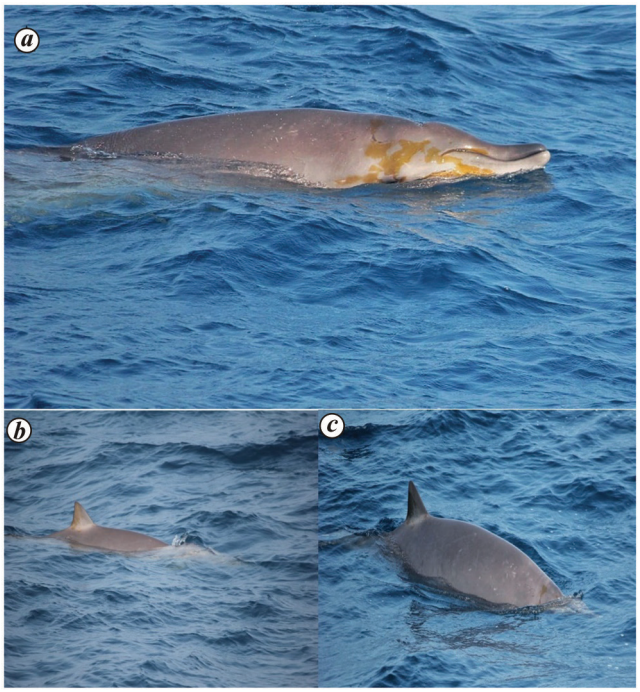

Figure 1. Blainville's beaked whales *Mesoplodon densirostris* (de Blainville, 1817).

Table 1. Live sightings of *Mesoplodon densirostris* in the Indian Ocean

Sighting locality	Month and year
Sri Lanka[6]	April 1986
Coastal waters of Mauritius[11]	Between April 2008 and September 2014
Inner islands of the Seychelles to Saya de Malha[12]	March 2021
Around the islands of Anjouan, Moheli, and Comoros[13]	From 4 August to 4 October 2002
Waters around the Maldives[14]	2–21 April 1998 (20 days)
Mayotte Island[15]	Between July 2004 and June 2006
Around the Comoros archipelago (Mozambique Channel)[16]	Between August and September 2002
Around the islands of Comoros, Mayotte, Glorieuses and Madagascar[17]	–
Seychelles[17]	–
Between Pemba and Unguja Islands off Tanzania[18]	–

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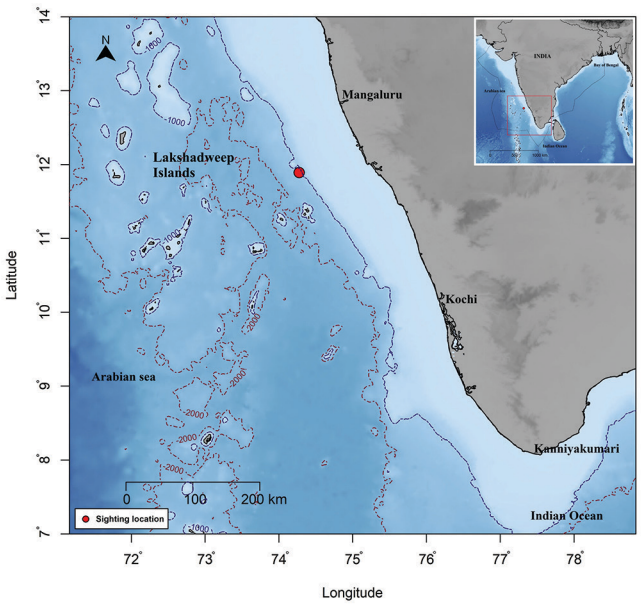

Figure 2. Sighting location of *M. densirostris* in the present study.

Mauritius, Seychelles, Maldives, Sri Lanka, Australia, the Philippines, China, Taiwan and Japan[3] (Table 1). The distribution map of marine mammals published by MacLeod[5] shows the possible presence of three species of mesoplodont whales, namely Ginkgo-toothed beaked whale *Mesoplodon ginkgodens* Nishiwaki and Kamiya, 1985; *M. densorostris*, and Deraniyagala's beaked whale *Mesoplodon hotaula* Deraniyagala, 1963, in the Indian waters. Four species of beaked whales belonging to three genera were documented from Sri Lanka in the oceanic territories[6]. These encompass Cuvier's beaked whale *Ziphius cavirostris* Cuvier, 1823; ginkgo-toothed beaked whale *M. ginkgodens*; Longman's beaked whale *Indopacetus pacificus* (Longman, 1926) and incidentally, *M. densirostris*, which was encountered as an unintended bycatch[6]. However *Mesoplodon* sp. and *I. pacificus* were documented from the EEZ of Pakistan as incidental bycatch[7]. The marine mammal checklist of India[8,9,] listed *M. densirostris* according to the possible distribution given by Jefferson *et al.*[1] and Macleod[5]. The present live sighting of this beaked whale confirms its occurrence in the Indian EEZ.

Blainville's beaked whales were found preferentially in waters of depth between 200 and 1400 m (ref. 1). The maximum size of the Blainville's beaked whale reported was 4.7 m in length and 1033 kg in weight[3]. One pair of teeth (tusks) projects outside the mouth in fully mature males, which are absent in females. Position of tusks may vary between the tip of the lower jaw to halfway, which is used in the discrimination of mesoplodont whale species. *M. densirostris* generally dives up to 1400 m depth and remains there for a long period, up to 1 h; it comes to the surface only for a short while for breathing[5]. Therefore, information on its prey preferences is limited and based on the gut content analysis of stranded animals. *M. densirostris* usually prefers mesopelagic squids belonging to the families Histioteuthidae, Cranchiidae and Gonatidae[3,10]. Other species like *Mesoplodon bidens* (Sowerby, 1804) and *Mesoplodon grayi* von Haast, 1876, prefer fish. Mesoplodont whales do not capture their prey with their teeth; instead, they swallow the prey as a whole by suction[10]. The present study confirms the distribution of *M. densirostris* in the Indian EEZ with authentic records (Figure 2). However, the distribution of other mesoplodont whales in the Indian EEZ needs further confirmation.

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Characterization of radioactive organic matter from Kaimur Group, Vindhyan Supergroup, India

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The Vindhyan sediments overlying the Bundelkhand granite complex have conducive attributes for hosting unconformity-type uranium mineralization. In the Kaimur sandstones of the Vindhyan Supergroup overlying the basement Bundelkhand granites, uranium mineralization hosted by subfeldspathic arenite intercalated with shale has been observed. Uranium minerals are associated with organic matter and pyrite present in arenite. Globular organic matter disseminated in the sediments shows moderate reflectance under reflected light. The average total organic carbon content in organic matter-rich rock samples is 1.1%. It has undergone excessive thermal maturation and high dehydrogenation reflected from a low H/C ratio. Raman spectral analysis indicates that the organic matter contains amorphous carbon.

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Keywords: Amorphous carbon, organic matter, radioactivity, sediments, uranium minerals.

THE Vindhyan Supergroup is one of the largest intracratonic Proterozoic sedimentary sequence in the world comprising unmetamorphosed, mostly horizontal and mildly deformed lithologies[1,2]. The Vindhyan sediments overlying the Bundelkhand granite complex (BGC) have favourable conditions for hosting unconformity-type uranium mineralization and, accordingly, have been targeted for uranium exploration by the Atomic Minerals Directorate for Exploration and Research (AMD), Hyderabad, India. Recently, the Kaimur sandstones of the Vindhyan Supergroup overlying the basement Bundelkhand granites with an unconformity marked by grit/conglomerate were explored. Subsurface drilling revealed uranium mineralization (average grade and thickness: 0.04% eU_3O_8 × 1.39 m) occurring 30–38 m above the unconformity. The uranium mineralization associated with organic matter is hosted by subfeldspathic arenite containing shale intercalations and is confined to a 2–3 m thick zone[3].

The present study deals with the characterization of organic matter that played a vital role in uranium mineralization hosted by the Kaimur sediments at Maharampura and Renhat areas, Gwalior district, Madhya Pradesh, India. The study area is located in the Upper Vindhyan formations belonging to the Kaimur Group of rocks (Figure 1). In the study area, feldspathic sandstone with minor shale (Sumen sandstone formation) is hosting uranium mineralization. The BGC constitutes the basement over which the sedimentary rock formations have been deposited. Petromineralogically, the subfeldspathic arenite comprises primarily quartz followed by feldspar with zircon, apatite and tourmaline as accessories. The framework clasts are subrounded to angular. Feldspar content is about 5–8% and is altered to sericite partially or completely to form pseudomatrix. The rock is moderately well-sorted. Quartz overgrowth, clay (chlorite, sericite), pyrite and calcite are observed as cementing material. Mesoscopically, organic matter is present at the

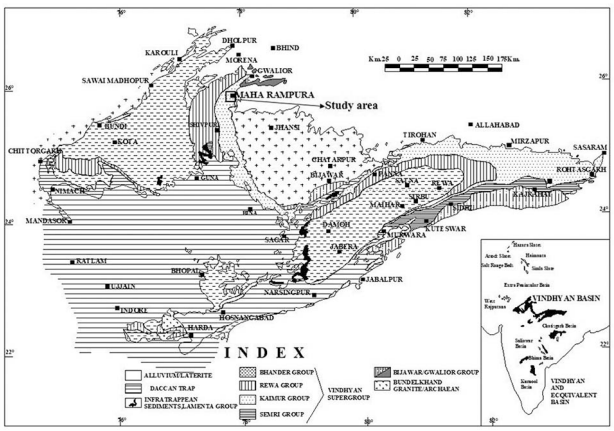

Figure 1. Geological map of the Vindhyan Basin[15,16].