



Proposal to establish a marine protected area in the Swatch-of-No-Ground submarine canyon and surrounding coastal waters in the Bay of Bengal

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Photographs: Leaping bottlenose dolphin (top left); Dramatic color change of marine waters at the head of the Swatch-of-No-Ground (top right); Pair of Irrawaddy dolphins (bottom left); Pair of humpback dolphins (bottom right).

Background

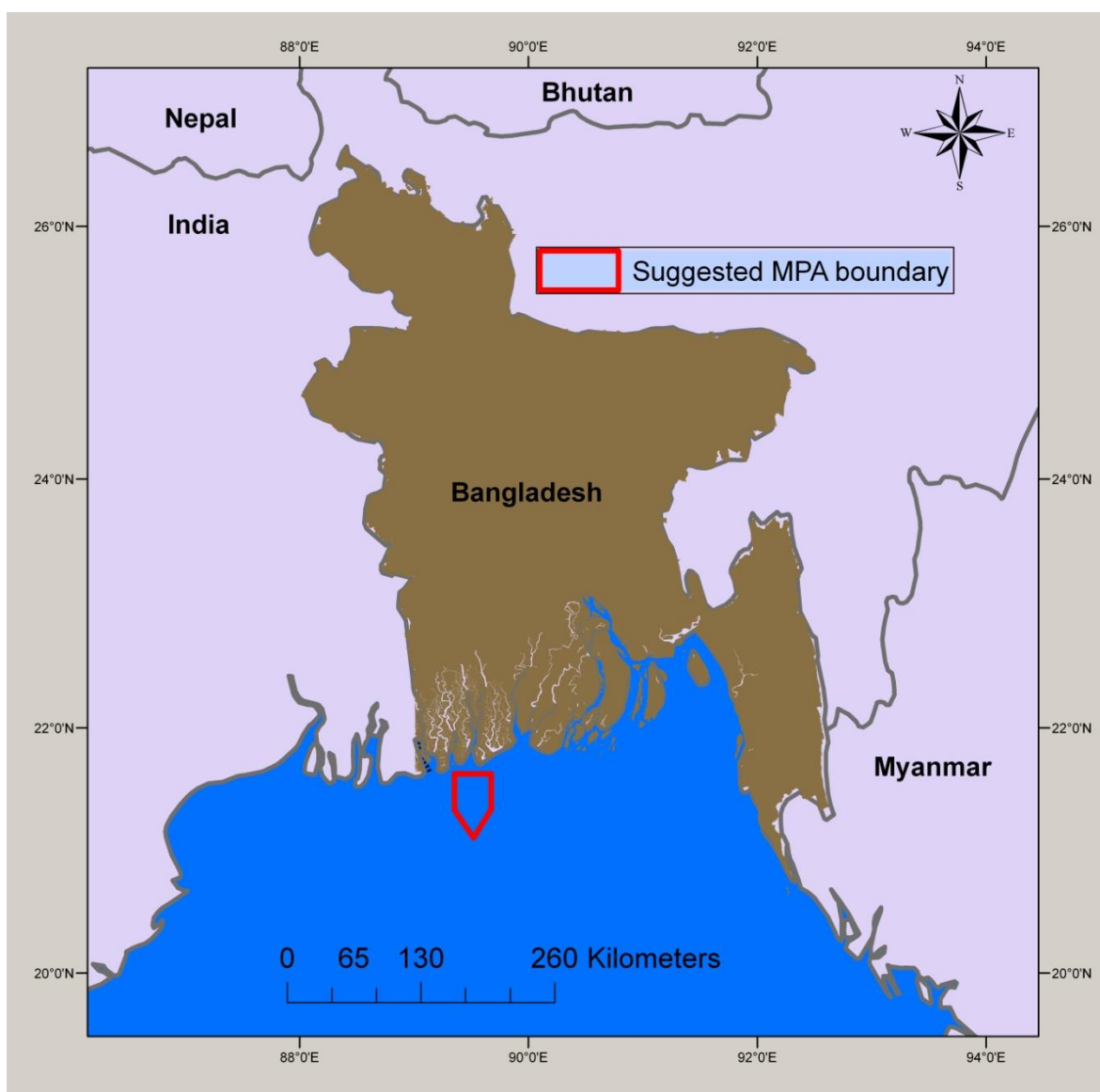
Bangladesh supports an astonishing diversity of cetaceans (the scientific grouping of dolphins, porpoises and whales) including two marine species at immediate risk of extinction. The potential disappearance of cetaceans from the Bay of Bengal would have dramatic impacts on marine ecosystems that support hundreds of thousands of people already living a tenuous existence made even less secure by climate change.

Cetaceans in Bangladesh are threatened by fatal entanglements in fishing gear, depletion of prey from unsustainable fisheries, and ecological changes due to increasing salinity, warming ocean temperatures, and altered currents caused by climate change and upstream freshwater withdrawals. The impacts of climate change are particularly severe in the Bay of Bengal because the Asian continent blocks mobile species, such as cetaceans, from shifting their distribution to cooler waters in response to increasing temperatures. Meanwhile, the behavioral responses of cetaceans to

climate change can inform adaptive management aiming to increase the resilience of fishing communities that depend on the same resources.

Fishermen in Bangladesh regard cetaceans as their brethren at sea and tell stories about friends or relatives who have been saved from drowning by these animals. This makes dolphins, porpoises and whales ideal flagships or icons for marine conservation. Measures taken to conserve cetaceans can also benefit other threatened wildlife, including turtles and seabirds, as well as improve fishing livelihoods and food security.

Establishment of a marine protected area (MPA) in the Swatch-of-No-Ground (SoNG) and surrounding coastal waters responds to Bangladesh's obligations to the Convention on Biodiversity, as well as to the Bangladesh Biodiversity National Assessment and Programme of Action 2020. Establishing this MPA is consistent with the United Nations Framework Convention on Climate Change of which Bangladesh is a signatory. The MPA will also encourage dialogue with India about a potential transboundary protected area, including cetacean habitat on the other side of the border that has not received detailed study but also supports cetaceans threatened by entanglement in fishing gears and environmental change.

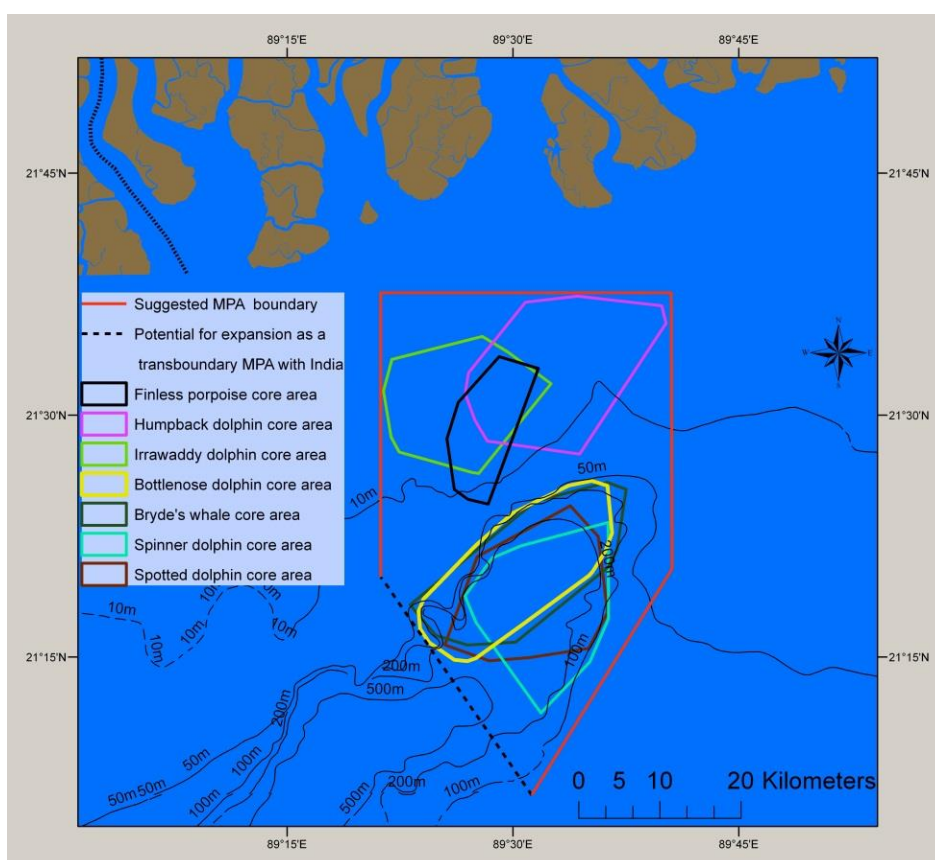


Description of the SoNG and Coastal MPA

Coastal waters in Bangladesh provide critical habitat for the world's largest population of Irrawaddy dolphins, as well as relatively large numbers of Indo-Pacific humpback dolphins and finless porpoises. The numbers and ranges of all three of these species have undergone severe declines in Asia.

The SoNG, a 900+ m deep submarine canyon lying at the end of the geographic “cul-de-sac” of the Bay of Bengal, was formed about 125,000 years ago by erosive flows from the Ganges/Padma river system and underwater currents in the Bay of Bengal. The SoNG supports large numbers of Indo-Pacific bottlenose, pantropical spotted and spinner dolphins, and a likely resident population of Bryde's whales. The canyon carries sediments that sustain the world's largest submarine fan and its cool, upwelled waters may serve as a refuge for cetaceans that cannot adapt to warming ocean temperatures or declines in productivity resulting from climate change.

The proposed MPA covers 1,738 km² of priority habitat for seven cetacean species as well as for whale sharks, marine turtles and seabirds, occurring in the SoNG and surrounding coastal waters. The protected area is configured as a five-sided polygon with the following corner points: Northwest – E 89° 21' 13" N 21° 37' 35"; Northeast – E 89° 40' 30" N 21° 37' 35"; Southwest E 89° 21' 13" N 21° 19' 57"; Southeast – E 89° 40' 30" N 21° 20' 28"; and South E 89° 31' 14" N 21° 06' 25". The dotted line indicates the potential for establishing a larger transboundary MPA with India.

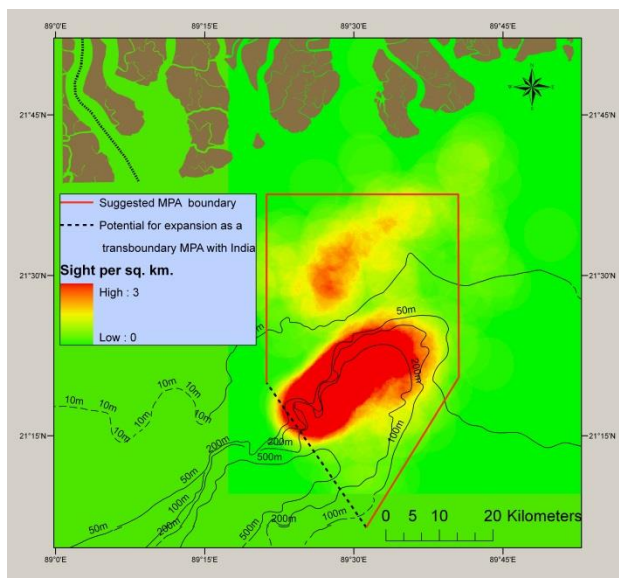


Map showing polygons encompassing priority habitat for all seven cetaceans commonly found in coastal and submarine canyon waters of Bangladesh and a single polygon that covers the total area of priority habitat.

Approaches used for determining boundaries of the proposed MPA

Sightings of Irrawaddy dolphins (114), finless porpoises (43), Indo-Pacific humpback dolphins (104), Indo-Pacific bottlenose dolphins (412), Bryde's whales (128), spinner dolphins (34) and pantropical spotted dolphins (29) were made during field studies conducted in winter seasons between 2004-2012. Local scientists searched for cetaceans along almost 13,000 km of transect lines in a study area located between Katka Island in the east and the Bangladesh/India border in the west, and coastal waters adjacent to the Sundarbans mangrove forest in the north and waters as deep as 500 m deep in the SoNG in the south.

For each species, a nearest neighbor approach was used to test for sighting clusters. A minimum convex polygon was created for each species (see maps in species descriptions) that encompassed all sighting clusters. For bottlenose, spinner and spotted dolphins, and Bryde's whales in the SoNG, the polygons were enlarged, if needed, to ensure that they encompassed 90% of all sightings in the smallest possible space. A similar technique was used for Irrawaddy and humpback dolphins and finless porpoises in coastal waters. However, the sighting clusters were overlaid on a point density map. This map assigns density values to 250 X 250 m cells according to the number of sightings within a 5 km radius. The smallest possible polygon, which encompassed 50% of all sightings overlapping with the highest density areas on the point density map, was used to determine the polygon for that species. The greater percentage of sightings used as the criterion for the SoNG is justified by the much greater density of cetacean sightings recorded in the submarine canyon compared to coastal waters. All seven species polygons were then overlaid. A single polygon designating the MPA boundaries was created around the perimeter (see map above). As a cross check, a point density map using sightings of all species combined (867) was overlaid on the composite polygon for designating the boundaries of the MPA (see map below left).



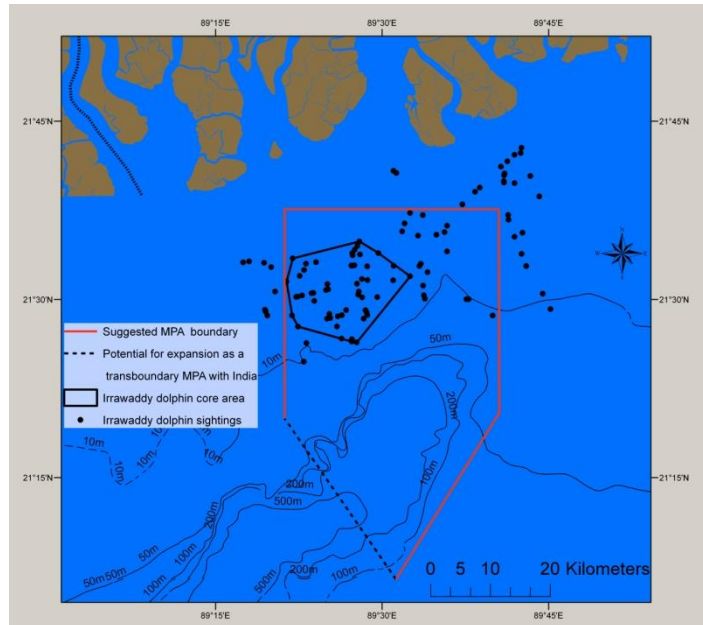
Point density map of all sightings combined overlaid with the boundaries of the proposed MPA.



Satellite imagery showing the diversity of habitat types (shallow, low salinity, and muddy waters to deep, high salinity, and clear waters) covered by the proposed MPA.

DESCRIPTION OF COMMON CETACEANS IN THE PROPOSED MPA

Irrawaddy dolphin (*Orcaella brevirostris*), Bengali name: *Iraboti dolphin*



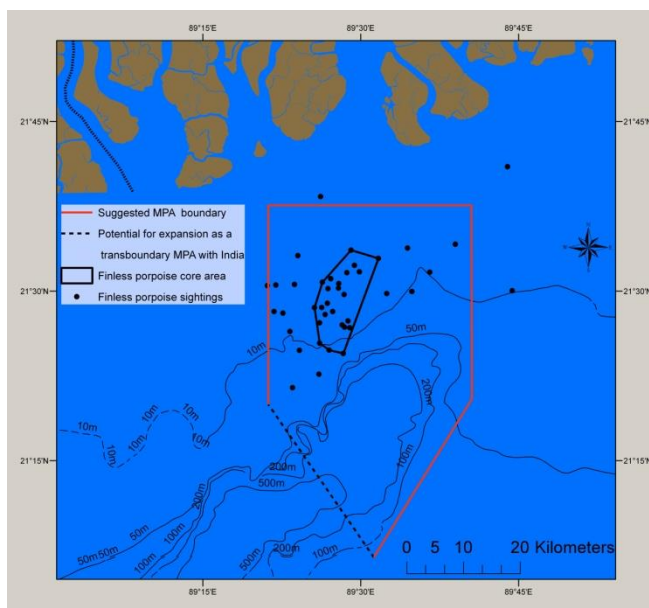
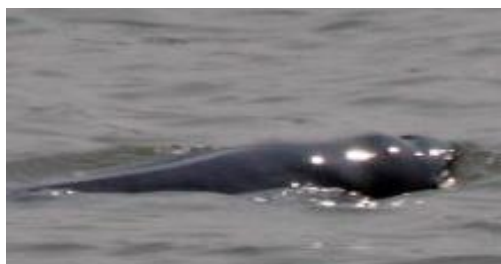
Description of Species: The Irrawaddy dolphin is about 2.0 to 2.5 m long. The dolphin has a rounded head that overhangs the mouth and a crescent-shaped blowhole. It has no visible beak. A neck crease is visible in some individuals. Its dorsal fin is small, triangular, and slightly swept back with a blunt tip. The coloration is all gray but lighter on the belly. Irrawaddy dolphins occur in small groups of generally 1-5 individuals and they are very social animals.

Range and Habitat: Irrawaddy dolphins range in near- and inshore waters of the western Pacific and eastern Indian Ocean in habitat generally associated with river mouths. They also occur far upstream in three large rivers including the Ayeyarwady in Myanmar, Mekong in Cambodia and Laos, and Mahakam in Indonesia.

Conservation Status: Irrawaddy dolphins are considered Vulnerable by the IUCN due to at least a 30 percent reduction in their range-wide population. Five Critically Endangered populations occur in the three large rivers mentioned above and in Chilikha Lagoon, India, and Malampaya Sound, Philippines. Populations generally number in the 10s to low 100s with the single exception of Bangladesh which supports approximately 5,800 dolphins. About 400 of these dolphins occur in waterways of the Sundarbans and 5,400 in the coastal waters offshore of the mangrove forest. Irrawaddy dolphins have been documented accidentally caught in fishing nets in almost all areas where they have been studied. Their habitat is particularly affected by increasing salinity due to climate change and increasing freshwater withdrawals. In Bangladesh, Irrawaddy dolphins are thought to be killed accidentally in large numbers by a drifting gill fishery targeting sharks and rays.

Priority Habitat in the MPA: The proposed protected area will cover 233 km² of priority habitat for Irrawaddy dolphins encompassing 50% of sightings in coastal waters offshore of the Sundarbans mangrove forest.

Finless porpoise (*Neophocaena phocaenoides*); Bengali name: *Pakhnahin porpoise*



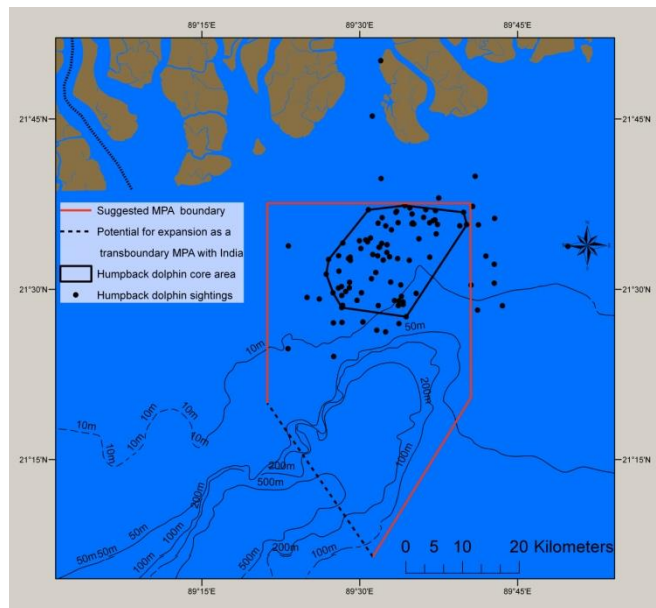
Description of Species: The finless porpoise is slightly smaller than the Irrawaddy dolphin and has no dorsal fin. Adults reach about 1.9 meter length. Their body is dark gray and torpedo shaped with a rounded head and no beak. Finless porpoises are generally found in groups of 1-2, but occasionally up to 20, individuals. They are difficult to observe at sea due to their inconspicuous surfacing behavior and lack of dorsal fin.

Range and Habitat: Finless porpoises occur in tropical to warm temperate shallow waters of the Indo-Pacific. They are normally found in shallow bays and estuaries, although they can also occur far from shore over broad continental shelves. In Bangladesh finless porpoises generally prefer deeper and more saline waters compared to Irrawaddy dolphins.

Conservation Status: Similar to the Irrawaddy dolphin, the finless porpoise is considered Vulnerable by the IUCN due to at least a 30 percent reduction in their range-wide population. Finless porpoises are extremely vulnerable to entanglement in gillnets. About 1,400 finless porpoises occur in the coastal waters of Bangladesh which compares favorably to other areas where the species has been recorded. Finless porpoises have also been sighted in the Sundarbans especially in higher salinity waters of the western side of the mangrove forest.

Priority Habitat in the MPA: The proposed protected area will cover 117 km² of priority habitat for finless porpoises encompassing 56% of sightings in coastal waters offshore of the Sundarbans mangrove forest.

Indo-Pacific humpback dolphin (*Sousa chinensis*); Bengali name: *Golapi dolphin*



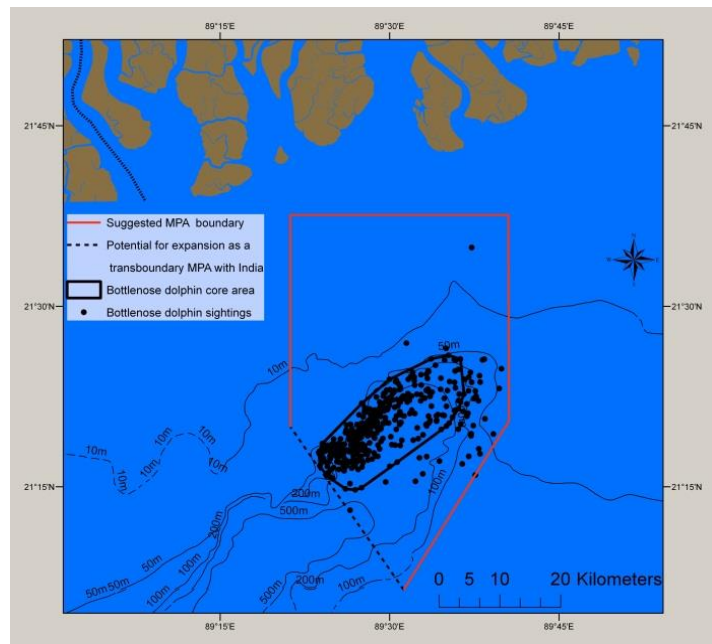
Description of the Species: Indo-Pacific humpback dolphins have a robust body and long beak. They obtain a maximum size of about 2.8 m. Their dorsal fin sits on a hump, which varies in size according to region and is located in the middle of the dolphin's back. Their color pattern differs with age and region but adults are generally bluish gray to light cream-colored with a pinkish hue. Humpback dolphins can most easily be confused with bottlenose dolphins. Differences in coloration and in the dorsal fin and head shape can be used to distinguish them. Humpback dolphins are normally found in groups fewer than 10 individuals, although as many as 100 have been occasionally seen together.

Range and Habitat: Indo-Pacific humpback dolphins occur in shallow, coastal waters of the northern Indian and eastern Pacific oceans generally associated with freshwater inputs. The only waters where they range offshore are over broad continental shelves less than 100 m deep.

Conservation Status: The Indo-Pacific humpback dolphin is considered Near Threatened in the IUCN Red List, but likely Vulnerable, if the *chinensis* type of the species in the central and western Indian Ocean, and the *plumbea* type of the species in the eastern Indian and western Pacific oceans were evaluated separately. Preliminary generic evidence from humpback dolphins in Bangladesh indicates a high degree of divergence from both the *chinensis* and *plumbea* types. This means that the dolphin population could potentially be a separate subspecies or even species. A photo-identification study of humpback dolphin indicates that at least 200 individuals occur in estuarine waters offshore of the Sundarbans. Of the 60 individuals identified by distinctive features in photographs 23.3% exhibited scars, cuts, or grooves that probably resulted from entanglements with fishing gears.

Priority Habitat in the MPA: The proposed protected area will cover 327 km² of priority habitat for humpback dolphins encompassing 73% of sightings in coastal waters offshore of the Sundarbans mangrove forest.

Indo-Pacific bottlenose dolphin (*Tursiops aduncus*); Bengali name: Botolnak dolphin



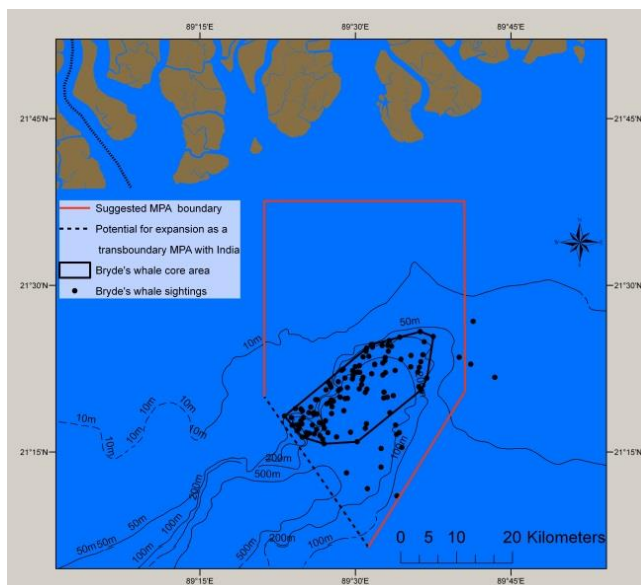
Description of the Species: Indo-Pacific bottlenose dolphins reach a maximum size of about 2.5 m. As their name suggests they have a bottle-like snout. They have relatively large flippers, dorsal fin and flukes and are relatively robust compared to the smaller *Stenella* species (see below). Their color pattern is gray with a slightly darker cape extending below the dorsal fin. Dark bluish spotting occurs on a much lighter belly extending from the belly to the throat and around the mouth in older animals.

Range and Habitat: Indo-Pacific bottlenose dolphins have a clumped distribution in the warm temperate to tropical waters in the Indo-Pacific, from South Africa in the west to the southern half of Japan and southeast Australia in the east. In Bangladesh the species occurs in the head of the Swatch-of-No-Ground submarine canyon where cool, upwelled waters provide biologically productive habitat.

Conservation Status: Although Indo-Pacific bottlenose dolphins are considered as Data Deficient by the IUCN, their near-shore distribution makes them vulnerable to environmental degradation, direct exploitation, and fishery interactions. Incidental catches occur in a number of fisheries throughout their range including in gillnets and purse seines. A photo-identification study of bottlenose dolphins in the SoNG indicated that 1,700 – 2,200 Indo-Pacific bottlenose dolphins live in the Bangladesh portion of the canyon making it among the world's largest populations. The analysis of photo-identified individuals also revealed that these dolphins are part of a larger superpopulation moving throughout a more extensive geographic area including waters in India. Of the 1,144 individual dolphins identified in the study, 28.2% exhibited injuries related to entanglements with fishing gear. This implies a strong potential for fatal interactions that could jeopardize the conservation status of this relatively large population.

Priority Habitat in the MPA: The proposed protected area will cover 282 km² of priority habitat for bottlenose dolphins encompassing 90% of sightings in the SoNG.

Bryde's whales (*Balaenoptera edeni/brydei*); Bengali name: *Bridis timi*



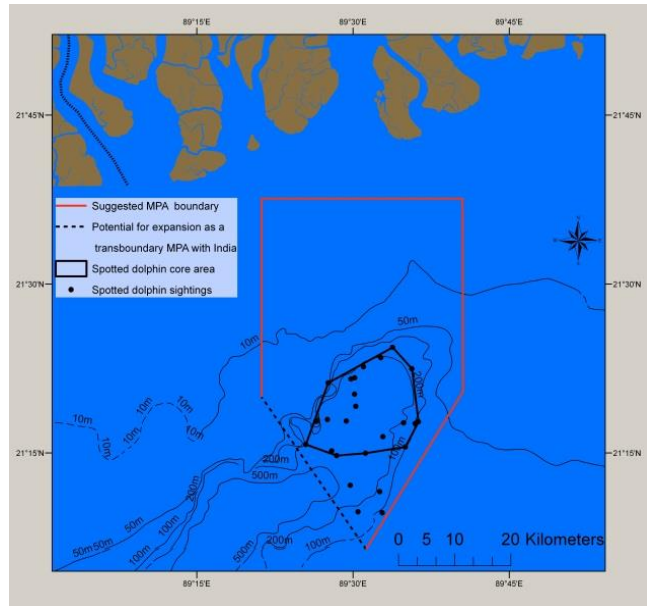
Description of the Species: The Bryde's whale is slim and streamlined. It has three prominent ridges running from the tip of the snout to the blowholes. Bryde's whales have a bluish-gray body with white on the underside. The large-form of Bryde's whale becomes sexually mature at about 11 m in males and 12 m in females, with a maximum length of 15 m in males and 16 m in females. A small form of Bryde's whale attains sexual maturity at about 9.0 m and rarely grows larger than 12 m.

Range and Habitat: The number of species or subspecies of Bryde's whales is uncertain and the different forms are not easily distinguishable. The large form of Bryde's whales occurs in the Pacific, Indian and Atlantic oceans between about 40° N and 40° S. A distinctly smaller form of Bryde's whales is found in nearshore waters of Asia and Australia. Genetic analyses of Bryde's whales from the SoNG revealed that they are from the small form. However, genetic analysis of a single Bryde's whale specimen from Cox's Bazaar found that the large form also occurs in Bangladesh waters.

Conservation Status: In the SoNG 146 sightings of Bryde's whales were made between 2004 and 2012 with an average group size of 2.2 and ranging between 1 and 15, individuals. The species was found in similar habitat as Indo-Pacific bottlenose dolphins at an average depth of 97 m and ranging between 12 and 449 m. Bryde's whales were not subjected to the intensive factory whaling suffered by most of the other baleen whales. However, these whales were hunted extensively along the coast of Japan until 1987. They are presently killed under a special permit allowing a maximum of 50 catches per year. There are artisanal fisheries for the small form of Bryde's whale in the Philippines and Indonesia. Similar to other cetaceans, Bryde's whales are sometimes caught in fishing gear and are occasionally struck by vessels. Due to uncertainty about the number of species, Bryde's whales are considered to be Data Deficient by the IUCN. However, if the large and small forms were evaluated separately, the small form especially might be Near Threatened or even Vulnerable.

Priority Habitat in the MPA: The proposed protected area will cover 290 km² of priority habitat for Bryde's whales encompassing 90% of sightings in the SoNG.

Pantropical spotted dolphin (*Stenella attenuata*); Bengali name: *Chitra dolphin*



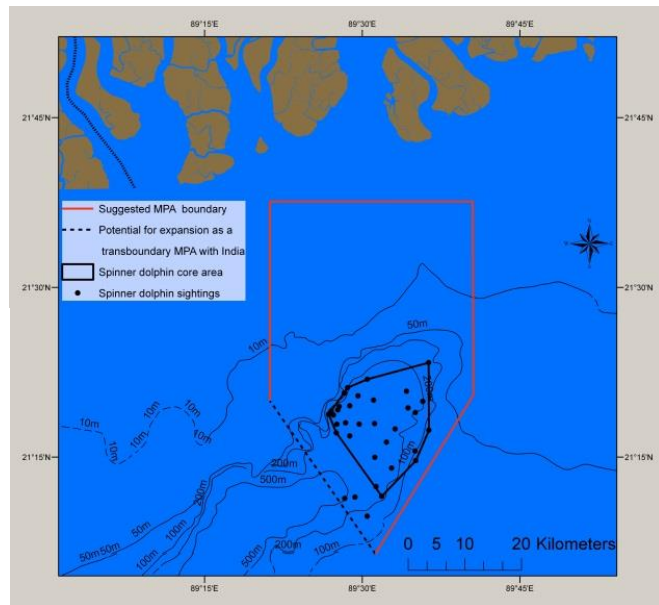
Description of the Species: Pantropical spotted dolphins are slender and streamlined. Adults are 1.6 to 2.6 m long. They have a long narrow beak distinguished from the melon by a sharp crease. The dorsal fin is narrow, falcate and pointed at the tip. Young are born without spots, but most individuals develop spotting on their dark dorsal cape in adulthood. The cape runs narrow on the head and dips down towards the dorsal fin. The belly area is a lighter gray.

Range and Habitat: Pantropical spotted dolphins are found in all oceans between about 40° N and 40° S with the greatest frequency in waters characterized by a sharp thermocline at depths of less than 50 m, surface temperatures greater than 25° C, and salinities less than 34 parts per thousand. Around the world, together with spinner dolphins, pantropical spotted dolphins are among the most dominant species in tropical cetacean communities.

Conservation Status: Pantropical spotted dolphins remain relatively abundant with more than 2.5 million in the Eastern Tropical Pacific (ETP) and Gulf of Mexico. Additional large populations occur in the Atlantic, Indian, and Pacific Oceans that have not been assessed. Japan kills large numbers of spotted dolphins for human consumption and these dolphins die accidentally in local fisheries in Latin American and Asia. In parts of the ETP, spotted dolphin populations were reduced to one-quarter of their historical population size due to massive kills in a purse-seine fishery for yellowfin tuna. However this decline and known mortality in other fisheries was not large enough to cause a global reduction of 30% of their historical population size. This means that the species is considered to be of Least Concern by the IUCN. Little is known about pantropical spotted dolphins in Bangladesh. During a photo-identification study of Indo-Pacific bottlenose dolphins in the SoNG, a total of 29 sightings were made in waters greater than 100 m deep with an average group size of 84 and ranging between 20 and 350 individuals. Pantropical spotted dolphins are not believed to be facing critical threats in Bangladesh. However, little is known about their interactions with fisheries.

Priority Habitat in the MPA: The proposed protected area will cover 263 km² of priority habitat for spotted dolphins encompassing 86% of sightings in the SoNG.

Spinner dolphin (*Stenella longirostris*); Bengali name: *Ghurni dolphin*



Description of the species: Spinner dolphins are slender with an extremely long beak. Adults reach 2.0 m in females and 2.4 m in males. The dorsal fin ranges from triangular to curved slightly backwards. Most spinner dolphins have a three part color pattern that includes a dark dorsal cape, light gray sides, and white belly. Spinner dolphins get their name by their habit of leaping and spinning on their long axis.

Range and Habitat: Similar to pantropical spotted dolphins, spinner dolphins range in tropical and subtropical waters between 40° N and 40° S. Most records of spinner dolphins are associated with islands or steep bottom topography. However in the Eastern Tropical Pacific spinner dolphins occur in large groups of several hundred to thousands in waters with a shallow mixed layer and sharp thermocline. They are often found in close association with spotted dolphins.

Conservation Status: Spinner dolphins die in large numbers in purse-seine, gillnet, and trawl fisheries. Annual mortalities of hundreds to thousands of spinner dolphins have been reported in the few fisheries that have been investigated in India and Sri Lanka. In some cases, consumption of by-caught spinner dolphins has led to directed fisheries. Hunts for spinner dolphins occur in several countries including Sri Lanka, the Philippines and Indonesia. More information is needed before the possibility of a global decline of 30% or more can be eliminated. The species is considered Data Deficient by the IUCN. Little is known about the status of spinner dolphins in Bangladesh. During a photo-identification study of Indo-Pacific bottlenose dolphins, a total of 37 sightings were made of spinner dolphins in the SoNG with an average group size of 97 and ranging from 4-550 individuals. Spinner dolphins are not believed to be facing critical threats in Bangladesh. However, little is known about interactions with fisheries.

Priority Habitat in the MPA: The proposed protected area will cover 263 km² of priority habitat for spinner dolphins encompassing 91% of sightings in the SoNG.

Cetaceans recorded but uncommon in the SoNG

False killer whale (*Pseudorca crassidens*)



Rough toothed dolphins (*Steno bredanensis*)



Sea birds recorded in the SoNG

Greater crested tern (*Sterna bergii*)

Lesser crested tern (*Sterna bengalensis*)

Brown headed gull (*Larus brunnicephalus*)

Black headed gull (*Larus ridibundus*)

Common tern (*Sterna hirundo*)

Whiskered tern (*Chilidonius hybridus*)



Pomerine jaeger (*Stercorarius pomarinus*)

Other marine wildlife recorded the SoNG



Olive Ridley Turtle (*Lepidochelys olivacea*)



Whale shark (*Rhincodon typus*)

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