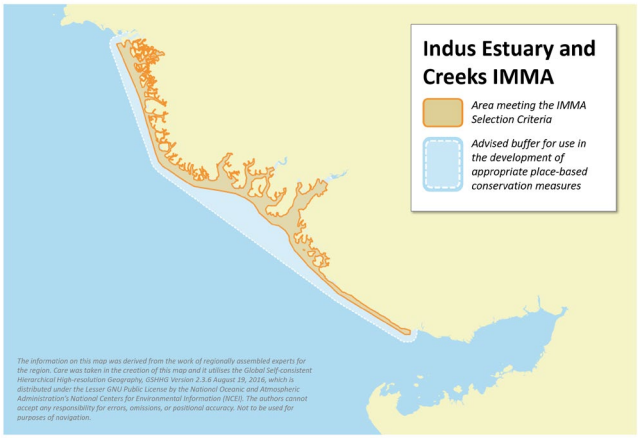

Area Size

2,686 km²

Qualifying Species and Criteria

Indian Ocean humpback dolphin – *Sousa plumbea*
Criteria A, B1

Indo-Pacific finless porpoise –
Neophocaena phocaenoides
Criteria A, B1

Marine Mammal Diversity

Neophocaena phocaenoides, *Sousa plumbea*, *Tursiops aduncus*

Summary

The Indus Estuary and Creeks IMMA comprises an elaborate system of creeks through which the 3,000km-long Indus river disperses and discharges into the Arabian Sea. The lower reaches of these creeks form mangrove channels that extend beyond Pakistan's border to the Mandvi harbour on the Indian coast. The area is inhabited by Endangered Indian Ocean humpback dolphins (*Sousa plumbea*) as well as Vulnerable Indo-Pacific finless porpoises (*Neophocaena phocaenoides*). Surveys conducted between 2005 and 2009 indicate that humpback dolphins are found in the upper, middle and lower sections of creeks in Pakistan, as well as along creek mouths extending to Jhakau and Mandvi Harbour, India. There is evidence that humpback dolphins are feeding and calving in the area. Information about finless porpoises in area is limited to opportunistic

Indus Estuary and Creeks IMMA

Summary (continued)

reports or stranding records. Both species are threatened by accidental entanglements in fishing gear, risk of vessel strikes, habitat degradation, and ambient underwater noise and pollution.

Description

The Indus River is the largest river that discharges into the Arabian Sea. The Indus River Delta covers an area of about 41,440 km² and is one of the most globally important coastal environments in Pakistan (Ahmad, 1998). It was declared a Ramsar site on 5 November 2002, due to its biological diversity and for being the largest stand of mangroves along the Pakistan coast (Ahmad, 1998; Siddiqui *et al.*, 2008). The estuarine creeks and mangrove forests form major nursery grounds for many species of fish and shrimps (Shah et al., 2007). The delta is rich in micro-invertebrates, shrimps, fin-fishes, reptiles, birds and mammals. This area has unique ecological and biological significance because of its variety of habitats and ecosystems including mudflats, shallow to deep creeks, freshwater bodies and sandbars facing open seas. The lower reaches of the Indus River estuary have mangroves consisting of one species, *Avicennia marina*, and is considered the largest arid area mangrove forest in the world. A similar habitat extends beyond the Pakistan border to Mandvi harbor along Indian coast. There are small mangrove patches and associated creeks between Sir Creek and Jakhau whereas between Jakhau and Mandvi harbour the area is mainly sandy shores interspersed with mangrove creeks. The area is known to be inhabited by two cetaceans — the Indian Ocean humpback dolphin (*Sousa plumbea*) and finless porpoise (*Neophocaena phocaenoides*). Both of these species are legally protected in both India and Pakistan; furthermore, the humpback dolphin is Endangered (EN) and finless porpoise is Vulnerable (VU) on the Red List. *Sousa plumbea* is mainly found in coastal waters and in the creeks, but *Neophocaena phocaenoides* is found mainly at the

entrance of the creek system and seldom ventures upstream (Gore *et al.*, 2012; Kiani, 2014 ; Kiani and van Waerebeek, 2015; Pilleri and Pilleri, 1979; Ross et al., 1994). Between November 2005 and May 2009, a total of 46 small-boat survey day trips were carried out in various major creeks and smaller interconnecting channels of the Indus Delta. Most of the effort was concentrated during the northeast monsoon (November–February) and the spring inter-monsoonal period (March–May), due to favorable sea conditions. Humpback dolphins and finless porpoise were found in the upper, middle and lower sections of creeks, as well as in nearshore waters contiguous to the creek mouths, extending to Jhakau and further south to Mandvi Harbour (Sutaria et al. 2015, Kukadia et al. 2016, Sule et al. 2017; Marine Mammal Conservation and Research Network of India; Fig. 1).

Besides *S. plumbea*, and *N. phocaenoides*, Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) are also found in inshore waters, yet have never been observed inside the Indus Delta creeks (Ahmad, 1998; Shah et al., 2007; Siddiqui et al., 2008).

Criterion A: Species or Population Vulnerability

The Indian Ocean humpback dolphin (*Sousa plumbea*) is endangered (EN) and the Indo-Pacific finless porpoise (*Neophocaena phocaenoides*) is vulnerable (VU) on the IUCN Red List. Both are obligate nearshore cetaceans, ecologically constrained to a narrow coastal strip, and therefore these species are facing severe threats to their conservation in the Indus estuary and creeks, due to negative impacts from accelerated coastal development and associated human pressure. Known and suspected threats include accidental entanglements in fishing gear, habitat degradation, pollution, probable competition for food due to widespread use of non-selective fishing gears (such as gillnets) and increasing vessel traffic with associated noise pollution and risk of boat strikes (Iqbal, 2014; Kiani, 2014). Coastal areas in close proximity to industries, port installations (e.g. Port Qasim, Mandvi harbour) and major human settlements are of highest concern. Both species, however, are legally protected in both India and Pakistan. Along the entire Indus estuary, creeks to Mandvi harbour, entanglement in fishing nets appears to be the principal threat to the two species of cetaceans. The impact is most severe during the peak fishing season, i.e., the northeast monsoon (from November to February). Fisheries in the area are generally open access, which resulted in overcapacity of the fishing fleet. Use of gillnets of different types is very common in coastal, as well as offshore waters, with high risk for cetacean entanglements. Industrial and domestic sewage pollution in coastal waters and tidal creeks is a major concern specifically around the populous and rapidly expanding industrial city of Karachi, on the northwestern-most part of the delta, as well as industrial activities in Jahku and Mandvi Harbour area. In the south-eastern region, major pollution sources include pesticides like organochlorines and domestic water flushed into the Indus River from inland areas and from other population centres (Kiani and van Waerebeek, 2015). Loss of habitat (mangrove forest) due to land reclamation for development projects, deforestation and camel grazing are considered important threats to both cetacean species. Mangrove deforestation results in the destruction of vital nursery grounds for small fish, and perhaps other neritic species, that are prey to both cetaceans occurring in the area (Kiani, 2014).

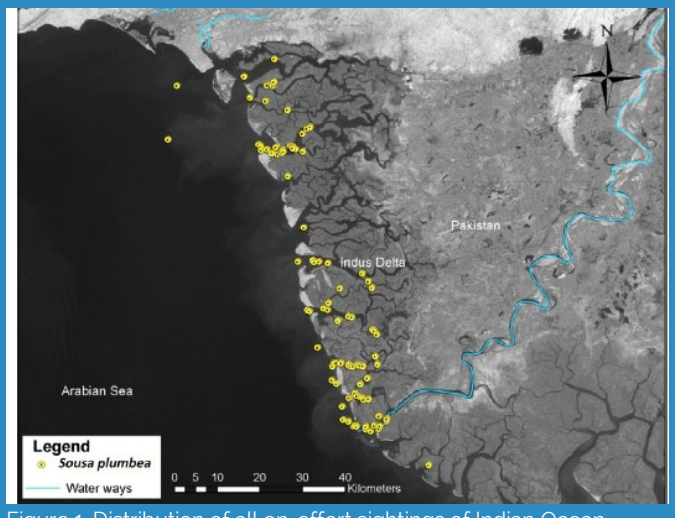

Figure 1. Distribution of all on-effort sightings of Indian Ocean humpback dolphins, *Sousa* plumbea, in the Indus Delta creek system, southeast Pakistan, from November 2005 to May 2009. The Indus River is outlined (long blue line). From Kiani and Van Waerebeek, 2015.

Criterion B: Distribution and Abundance Sub-criterion B1: Small and Resident Populations

Humpback dolphins and finless porpoises are regularly observed in the Indus estuarine area and associated creeks; large-scale anthropomorphic activity has the potential to significantly alter the long-term survival of both species. In the Indus River Delta, group sizes varied considerably from 1 to 35 animals (Kiani, 2014) whereas 27.6% typically consisted of large solitary animals, probably mostly adult males. Overall, groups of 1–10 animals made up 91% of total sightings. Generally, in the bigger groups, some subgroups stayed close to each other and merged occasionally while chasing prey and feeding. Group composition of Indo-Pacific finless porpoise in the Indus estuary and creeks was highly variable, consisting of only adults, only juveniles, mixed adults and juveniles, mother and calf pairs, and undetermined.

Figure 2: The dorsal fin of an Indian Ocean humpback dolphin (*Sousa plumbea*) breaking the surface. Photo: Moazzam Khan

Supporting Information

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