

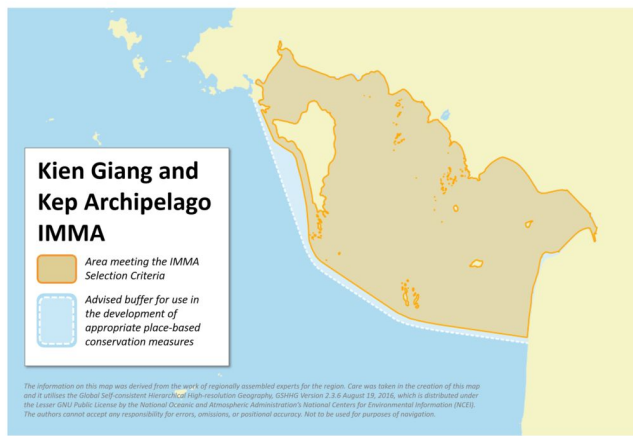
Kien Giang and Kep Archipelago IMMA

Summary, continued.

humpback dolphins (*Sousa chinensis*), Pantropical spotted dolphins (*Stenella attenuata*), False killer whales (*Pseudorca crassidens*) and Bryde's whales (*Balaenoptera edeni*) have also been recorded. The Kien Giang and Kep Archipelago IMMA contains important foraging habitat of at least two threatened species: the Irrawaddy dolphin and the dugong.

Description

The Kien Giang and Kep Archipelago is located the south-eastern portion of the Gulf of Thailand. The area consists of two protected areas: the Kien Giang Biosphere Reserve (KGBR) in Vietnamese territory and the Kep Marine Fisheries Management Area, covering the waters of the Kep Archipelago, in Cambodian waters. The KGBR is a UNESCO designated protected area that encompasses more than 8350 km² of the marine environment. This area is relatively shallow, with a maximum depth of 50 m. There are a variety of marine ecosystems coexisting in this area, namely mangroves, seagrass beds, and coral reefs. From an economical perspective, KGBR is recognized as an important fishing zone of Vietnam due to the exceptionally high productivity of local marine ecosystems. On the Cambodian side, the waters of the Kep Archipelago cover an area of ca. 305 km², and support 46 ha of fringing coral reefs and ca. 2000 ha of seagrass beds. The waters are shallow, ranging from 2 m to 6 m with the exception of a few 9 m pools. The waters are also greatly influenced by freshwater inputs from a variety of rivers and tributaries, in particular, the Preaek Tuek Chhu River from the North-West and the Giang Thanh River from the East. Together, Kep Archipelago and KGBR form a



Area Size

8 889 km²

Qualifying Species and Criteria

Irrawaddy dolphin – *Orcaella brevirostris*

Criterion A; C (2)

Dugong – *Dugong dugon*

Criterion A; C (2)

Marine Mammal Diversity

Neophocaena phocaenoides, *Tursiops aduncus*,
Pseudorca crassidens, *Sousa chinensis*,
Stenella attenuata, *Balaenoptera edeni*

Summary

The Kien Giang and Kep Archipelago IMMA covers the coastal waters of Kien Giang province in Vietnam and Kep province in Cambodia. The IMMA contains important habitats for the survival and recovery of Irrawaddy dolphins (*Orcaella brevirostris*). A combination of mangroves, coral reefs and seagrass beds in the area create exceptionally high productivity that attract marine mammals. The local seagrass beds provide a suitable foraging ground for dugongs (*Dugong dugon*). The Irrawaddy dolphin is the most frequently sighted cetacean in this area. Sightings of Indo-Pacific finless porpoises (*Neophocaena phocaenoides*), Indo-Pacific

transboundary area that has high biological productivity.

Few studies have been done to ascertain the abundance and population status of marine mammals in the Kien Giang and Kep Archipelago area. Smith et al. (1997) conducted an opportunistic boat-based survey around the west side of Phu Quoc island (Vietnam), the biggest island inside the area but recorded no sightings of marine mammals. However, Smith et al. (1997) were able to record the presence of dugongs in this area through interviews and examining several skulls provided by locals. Later interview surveys revealed more evidences of dugong occurrence in this area (Quang et al., 2005; Hines et al., 2008). Unfortunately, no systematic survey has been done since to fill the information gaps on dugong distribution and abundance. Dugong meat can still consistently be found in local markets (Quang et al., 2005; Hines et al., 2008; Vu, 2018, pers obs). Two recent reports of dugong entanglements

in the area (Vu, 2018, pers obs) suggested this species is still present. The exact number of animals that are being removed from the population remains unknown due to the difficulties in acquiring information on entanglement and illegal hunting. The availability of seagrass meadows (Quang et al., 2005; Hines et al., 2008; Supkong and Bourne, 2014) in both the Vietnamese and Cambodian sides of the IMMA, suggest there is a dugong population inhabiting the waters of this area.

Information on the cetaceans in Kien Giang and the Kep Archipelago is accumulating through ongoing study efforts in both Vietnam and Cambodia. On the Vietnamese side, three opportunistic surveys took place to investigate cetacean status in KGBR from 2011 to 2013. A total of four sightings of Irrawaddy dolphins (*Orcaella brevirostris*) were made during a 4 weeks survey period (Vu et al., unpublished data). Following this, a systematic boat-based survey using line-transects and photo-ID was conducted in 2014



Figure 1: Irrawaddy dolphins in Cambodia's Kep Archipelago, within the Kien Giang and Kep Archipelago IMMA.
Photo: 'The Cambodian Marine Mammal Conservation Project'



Figure 2: Irrawaddy dolphins in Cambodia's Kep Archipelago, within the Kien Giang and Kep Archipelago IMMA.
Photo: 'The Cambodian Marine Mammal Conservation Project'

and 2015 to access distribution and abundance of cetaceans in KGBR (Vu et al., 2014, 2015, 2017). Three cetacean species, including the Irrawaddy dolphin, Indo-Pacific finless porpoise (*Neophocaena phocaenoides*) and Indo-Pacific humpback dolphin (*Sousa chinensis*) were recorded. Average encounter rates of *O. brevirostris*, *N. phocaenoides* and *S. chinensis* were 2.56, 0.27 and 0.4 individuals per 100km of on-effort tracklines, respectively. The preliminary Photo ID/Mark-recapture analysis performed on 536 pooled photos of Irrawaddy dolphin dorsal fins acquired in KGBR from 2012 to 2014 estimated 72 individuals (CV=35%) in this area (Vu et al., 2015). Additional to those data, opportunistic sightings of False killer whale (*Pseudorca crassidens*) (n=1) and Bryde's whale (*Balaenoptera edeni*) (n=1), a stranding case of a Pantropical spotted dolphin (*Stenella attenuata*) (n=1) and bycatch of Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) (n=2) were recorded from local media in KGBR (Vu et al. unpublished data). As for the Cambodian side, the Irrawaddy dolphin is the only marine mammal species with confirmed presence in the waters of the Kep Archipelago (Tubbs et al., 2019; 2020).

Research investigating the Archipelago's population of Irrawaddy dolphins started in September 2017, as part of 'The Cambodian Marine Mammal Conservation Project'. Irrawaddy dolphins have been found to inhabit these waters in all seasons, with the highest encounter rates during the summer monsoon (May–September) and post-monsoon (October–November) seasons, and the lowest encounter rates in the pre-monsoon season (March–April; Tubbs et al., 2020). Habitat modelling techniques have shown the species to most commonly occur between depths of 3.0–5.3 m, sea surface temperatures between 27–32°C, and in close proximity to offshore islands (< 7.5 km; Verutes et al., 2021). While the population size of Irrawaddy dolphins is unknown, photo-identification techniques initiated in January 2018 have identified 15 individuals (Tubbs, 2019). Despite efforts, the data gap on abundance and distribution of cetaceans in Kien Giang and Kep Archipelago still persist. Ongoing studies from both countries have been set into motion to address the issue.

Criterion A: Species or Population Vulnerability

The IMMA contains habitat that is important for the survival and recovery of the Irrawaddy dolphin and the dugong. The Irrawaddy dolphin was listed as Endangered by the IUCN Red list as all known populations have been reducing worldwide (Minton et al., 2017). The dugong was recognised as a Vulnerable species by IUCN due to emerging threats on remaining populations (Marsh and Sobotzick, 2015). Despite the data gaps regarding the abundance and distribution of the two species in Kien Giang and Kep Archipelago, dugong and Irrawaddy dolphin are consistently recorded in this area (Vu et al., Forthcoming).

Criterion C: Key Life Cycle Activities Sub-Criterion C2: Feeding Areas

The IMMA area provides an important nutritional base on which both dugong and Irrawaddy dolphins depend. The Kien Giang and Kep Archipelago meets this criterion because of its exceptionally high productivity, high prey abundance and the presence of seagrass beds, which are crucial for dugongs (Quang et al., 2005; Hines et al., 2008). For Irrawaddy

dolphins on the Vietnam side, fifteen percent of observed dolphin activities were feeding behaviours (Vu et al., Forthcoming). On the Cambodian side, there was a statistically significant departure from homogeneity between the four potential behaviour categories observed (Foraging, Travelling, Socialising, Resting), with more foraging and travelling than expected. For the dugong, the presence of suitable seagrass beds, and interview data (acquired from local dugong hunters) suggested that the dugong forage in this area (Hong, 2003; Quang et al., 2005; Hines et al., 2008; Supkong and Bourne, 2014).

Supporting Information

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Figure 3: Irrawaddy dolphins in Cambodia's Kep Archipelago, within the Kien Giang and Kep Archipelago IMMA. Photo: 'The Cambodian Marine Mammal Conservation Project'

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**MARINE MAMMAL
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