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Historical and new records of the Irrawaddy Dolphins, *Orcaella brevirostris* (Owen in Gray, 1866) (Cetacea, Delphinidae) from the east coast of South Sumatra, Indonesia

Fauziyah[1*], Fitri Agustriani[1], Rozirwan[1], Apon Z. Mustopa[2], Irianes C. Gozali[3], Muhammad Iqbal[4], Ellis N. Ningsih[1]

1 Marine Science Department, Faculty of Mathematics and Natural Sciences, Universitas Sriwijaya, Palembang, Indonesia • F: siti_fauziyah@yahoo.com https://orcid.org/0000-0003-3624-7956 • FA: fitri_agustriani@yahoo.com https://orcid.org/0000-0003-2198-7687 • R: rozirwan@gmail.com https://orcid.org/0000-0001-8415-3343 • ENN: ellis_nurjuliasti@unsri.ac.id https://orcid.org/0000-0002-1985-8977

2 Research Center for Biotechnology, Lembaga Ilmu Pengetahuan Indonesia, Jakarta, Indonesia • AZM: azmustopa@yahoo.com https://orcid.org/0000-0001-6614-5518

3 Mobula Project Indonesia, Affiliate Program of the Manta Trust, Banyuwangi, Indonesia • ICG: irianescg@gmail.com

4 Biology Department, Faculty of Mathematics and Natural Sciences, Universitas Sriwijaya, Palembang, Indonesia • MI: kpbsos26@yahoo.com https://orcid.org/0000-0002-6657-0183

* Corresponding author

Abstract

Irrawaddy Dolphin, *Orcaella brevirostris* (Owen in Gray, 1866), has been reported in the waters of Berbak Sembilang National Park, Indonesia, since 1990. We used interview techniques, direct observations, and secondary data from the literature to show that this dolphin occurs on the east coast of South Sumatra from October to February. An Irrawaddy Dolphin bycatch was recorded on 26 January 2021 in a gillnet. There have been historical sightings of fewer than six individuals of Irrawaddy Dolphins between 1990 and 2013 in the estuaries of Bogem, Bungin, Ngirawan, Terusan Dalam, Betet Island, Banyuasin, Lalan, and Tanjung Carat to Makarti Jaya. We map the geographic distribution of Irrawaddy Dolphin in South Sumatra.

Keywords

Berbak Sembilang National Park, bycatch, geographic distribution, sightings

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Introduction

The Irrawaddy Dolphin, *Orcaella brevirostris* (Owen in Gray, 1866) (Cetacea, Delphinidae) is a marine mammal found in varied habitats such as estuaries, freshwater rivers, and coastal waters in the Indo-West Pacific (Minton et al. 2017; Postrado et al. 2019; Chowdhury et al. 2020). In estuarine and coastal waters, these dolphin populations are known to occur in Borneo and Banten Bay of Indonesia, Palawan of Philippines, Bengal Bay of India,

and the Gulf of Thailand (Minton et al. 2017). In freshwater rivers, their populations have been found in three large rivers, the Ayeyarwady River in Myanmar, the Mahakam River in Indonesia, and the Mekong River in Cambodia (Khalifa et al. 2014; Minton et al. 2017). Globally, the IUCN Red List classifies the Irrawaddy Dolphin as Endangered, and its mortality from gillnets in small-scale fisheries is an important threat causing populations to decline (Minton et al. 2017). The Irrawaddy Dolphin is a protected species under the Indonesian Government Regulation No. 106/2018 on the preservation of plant and animal species.

Information about Irrawaddy Dolphins in Indonesia has been recorded from subpopulations in the Mahakam River of East Kalimantan (Dharmadi et al. 2009), Kubu Raya and Kayong Utara Waters of West Kalimantan (Anggawangsa et al. 2014), Tanjung Puting National Park of Central Kalimantan (Rahayu et al. 2020), Banten Bay (Khalifa et al. 2014; Kreb et al. 2020), Segara Anakan on the southern coast of Jawa, Seribu Island, Surabaya coast of East Java, and eastern parts of Sumatera and Biak Coastal of Papua (Rudolph et al. 1997; Khalifa et al. 2014). In the waters of South Sumatra, sightings have been recorded in coastal waters around the Berbak Sembilang National Park (BSNP) in 1990, 2002, 2003, and 2004 (Iqbal 2003a, 2003b, 2003c, 2004), and there is a record in the Ramsar Wetland Information Sheet from Sembilang National Park (2009–2012 version).

Over the last two decades, local fishermen have reported that no sightings of Irrawaddy Dolphins from BSNP. The latest published reports of populations in Banyuasin waters were given by the Wetlands International - Indonesia Programme in 2004 (Iqbal 2004). However, the limited availability of research on this species encourages continuous monitoring of its populations to find out its geographic range, habitat requirements, and other information required for the conservation of the remaining, scattered populations. Therefore, we aim to report the historical and recent records of Irrawaddy Dolphins from the east coast of South Sumatra, Indonesia.

Methods

Study area. This study was carried out on the east coast of South Sumatra, Indonesia. The locations of observation stations are shown in Figure 1. These estuarine waters are characterized by diurnal tides and are highly influenced by the Musi River inflows (Fauziyah et al. 2019a).

Data collection. Our data collection was conducted in three stages. First, a literature study was made of all published reports of the Irrawaddy Dolphin from the east coast of South Sumatra to compile historical records. Next, we conducted interviews and made direct observations. Interviews were conducted in 2018 in the villages

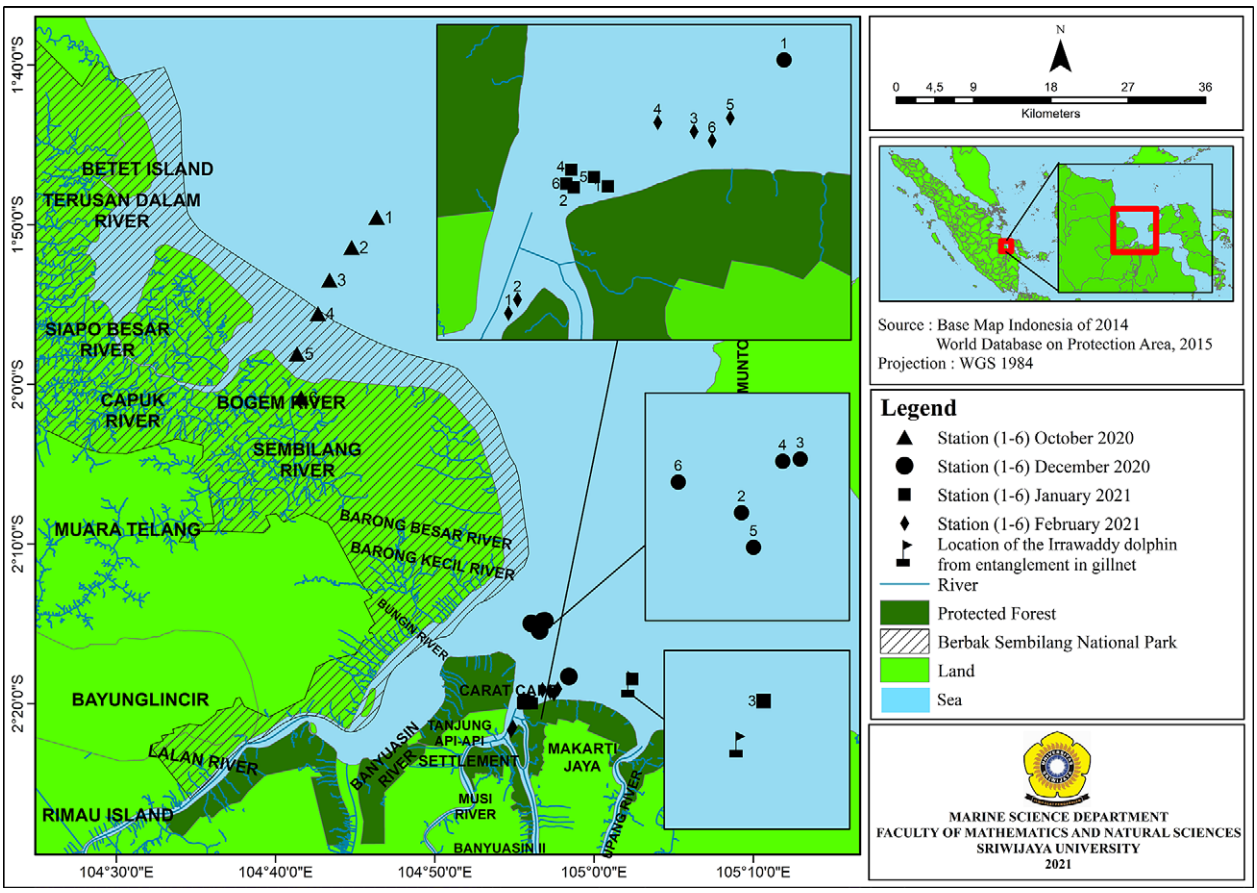

Figure 1. Observation stations for Irrawaddy Dolphin on the east coast of South Sumatra, Indonesia, in October 2020, December 2020, and January–February 2021.

of Marga Sungsang, Sungsang 1, Sungsang 2, Sungsang 3, and Sungsang 4 in Banyuasin II district, which is a settlement area. The Harry King method nomogram with a 90 percent confidence was used to determine the sample size (King 1978). Based on an interview with the village head, we determined that the total population of fishermen in selected villages was 1251 in 2018, and, hence, a minimum number of 64 respondents were required in our survey. A visual observation survey was carried out along the east coast of South Sumatra in October 2020, December 2020, and January to February 2021 (Fig. 1). We observed the fishing operations of local fishers who using drift gillnets (200 m long × 1.5 m high, 4-inch mesh size). Observations were made each month on six one-day trips.

Identification. The Irrawaddy Dolphin was identified by its small dorsal fin on the back, triangular pectoral fin, very short beak, and bulging forehead (Chowdhury et al. 2020). The vital morphological features for this species identification included (1) a pronounced and rounded forehead, (2) no distinct beak, (3) a flexible neck-unusual among dolphin species, results in a slight depression behind the head in some animals, (4) bluish or brownish-grey upper side, (5) long broad paddle-like flippers, (6) a low blunt dorsal fin, which can vary a great deal in shape, (7) narrow tailstock, and (8) a light underside which may appear almost white in muddy water. Photographs of dolphins were taken for purposes of identification. The length and body weight measurements of specimen were recorded.

Results

Historical records. One dolphin has been reported to have entangled in a "tuguk" fishing gear (filtering device) around BSNP, especially around the Siapo Besar River (Iqbal 2003a). Some fishermen claimed that the Irrawaddy dolphin sightings were found in waters around BSNP of Banyuasin in the year 1990–2004, especially in Bogem, Bungin, Ngirawan, and Terusan Dalam estuary, as well as Betet Island (Iqbal 2003a, 2003b, 2003c, 2004). According to local fishers, this sighting was seen in waters around Banyuasin in 2009. Irrawaddy Dolphins were not observed by Suman et al. (2009), but 1–6 individuals of the Indo-Pacific Humpback Dolphin, *Sousa chinensis* (Osbeck, 1765), were found in the Banyuasin River in 2009. These records prove that Irrawady Dolphins were also in waters around Banyuasin, South Sumatra. Historical records (Fig. 5) show sightings of Irrawaddy Dolphins in the waters of the east coast of South Sumatra from 1990 to 2021.

Interviews. The east coast of South Sumatra is the main area for fisheries in South Sumatra. Within in this area, the BSNP is a conservation area, while Banyuasin I, Banyuasin II, Tanjung Api-Api, and Makarti Jaya are protected forest areas. During the interviews with fishers in 2018 (Table 1), we found that six of the 132 respondents (4.5%) stated that they had seen Irrawaddy Dolphins in 2011–2013. However, all respondents stated that they had not seen dolphin sightings since that time. The species was seen in the Banyuasin River, Lalan River, and Tanjung Carat to Makarti Jaya district between October and February.

We found that four of six respondents (67%) stated that they accidentally entangled Irrawaddy Dolphins in their gillnets (Table 1). Effort was made to bring the dolphins ashore to be sold because they had died in the nets. However, one respondent claimed that he released a dolphin from his net, as the live animal was not wholly entangled; this respondent reported seeing a group of dolphins swimming not far from the one caught. Fishers already have knowledge that these animals are protected, so they will release them if caught alive. Two other respondents (33%) revealed that they had seen Irrawaddy Dolphins in the Lalan River and at the junction of the Banyuasin and Lalan Rivers. They didn't interfere with those Dolphin sightings. Between 1990 and 2009, 60% of the 15 dolphin individuals reported were swimming free but the rest were entangled (Iqbal 2003a, 2003c, 2004).

Direct observations. We attempted observing Irrawaddy Dolphins on the east coast of South Sumatra following the interviews. We focused on two target locations: the Musi Banyuasin estuary in Makati Jaya and Carat Cape; and BSNP, in the Bogem River. However, no dolphins were sighted at our 24 stations (Fig. 1). However, on 26 January 2021 at 06:00 a.m. at station no. 3 (Fig. 2), Irrawaddy Dolphins were found accidentally entangled as bycatch in fishers' gill nets (Fig. 4).

Orcaella brevirostris (Owen in Gray, 1866)

Figures 2–4

New records. INDONESIA – **South Sumatra** • Banyuasin coast; 02°31′03″S, 105°03′07″E; 26.I.2021; Fauziyah leg.; entangled in local fisher's gill nets; 1 ♀.

Identification. This species is recognized by it had

Table 1. Data from interviews in 2018 with 6 respondents from 132 respondents who stated that they had seen Irrawaddy Dolphins.

Respondent	Year	Location	Behavior	Condition	Total	Months	Total length (m)
1	2011	Banyuasin River	Entangled in gillnet	Alive and released	4	October–February	1–2
2	2011	Carat Cape to Makarti Jaya District	Entangled in gillnet	Dead	1	October–December	2
3	2013	Carat Cape to Makarti Jaya District	Entangled in gillnet	Dead	1	January–February	2
4	2012	Lalan River	Entangled in gillnet	Dead	1	October–December	2
5	2011	Lalan River	Traveling	Undisturbed	3	January–February	1–2
6	2013	Junction of Banyuasin and Lalan rivers	Traveling	Undisturbed	1	October	1–2

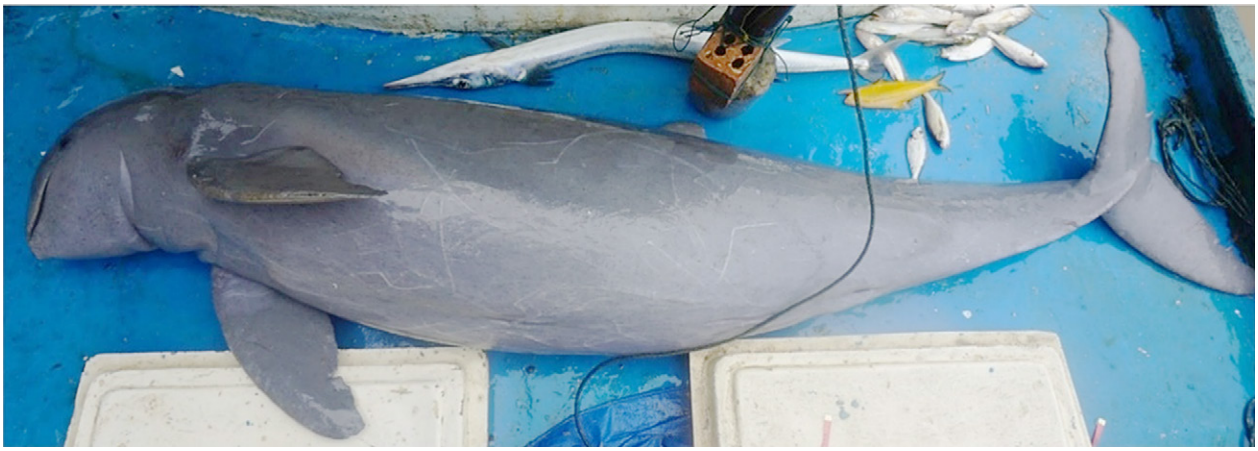

Figure 2. An individual of Irrawaddy Dolphin caught in gillnets on the east coast of South Sumatra (Indonesia) on 26 January 2021. (Photographer: Sri Wulandari).

Figure 3. Morphological characters of an Irrawaddy Dolphin from the east coast of South Sumatra, Indonesia. (Photographer: Agung).

rounded head and blunt, indistinct beak. The dorsal fin is small, triangular, blunt, and located about two-thirds on the back. The pectoral fins are broad, long, and triangular (Figs. 2, 3). Young individuals are usually 1.0 m long and adult females and males 2.3 m and 2.7 m long, respectively (Kumar et al. 2019).

We observed a 2-m long specimen that was 98 kg. As for those seen traveling, we estimate that they were between 1 and 2 m long (Table 1) because only the head and back are visible. At this size, these individuals are adult (1.9–2.75 m long according to Kreb 2004). In Banyuasin and Lalan River, Irrawaddy Dolphins were seen in small groups of only 3 or 4, although Smith (2009) reported groups of 2–6 individuals. The number of Irrawaddy Dolphin individuals seen or entangled (Table 1) and the results of our observations are 12 individuals in total. The number of Irrawaddy Dolphins recorded by researchers from 1990 to 2009 is 15 individuals.

Discussion

Our study compiles historical records and reports a new record of the Irrawaddy Dolphins from the east coast of South Sumatra. This species was found close to

Figure 4. Entanglement of an Irrawaddy Dolphin in January 2021 in a gillnet on the east coast of South Sumatra, Indonesia. (Photographer: Agung)

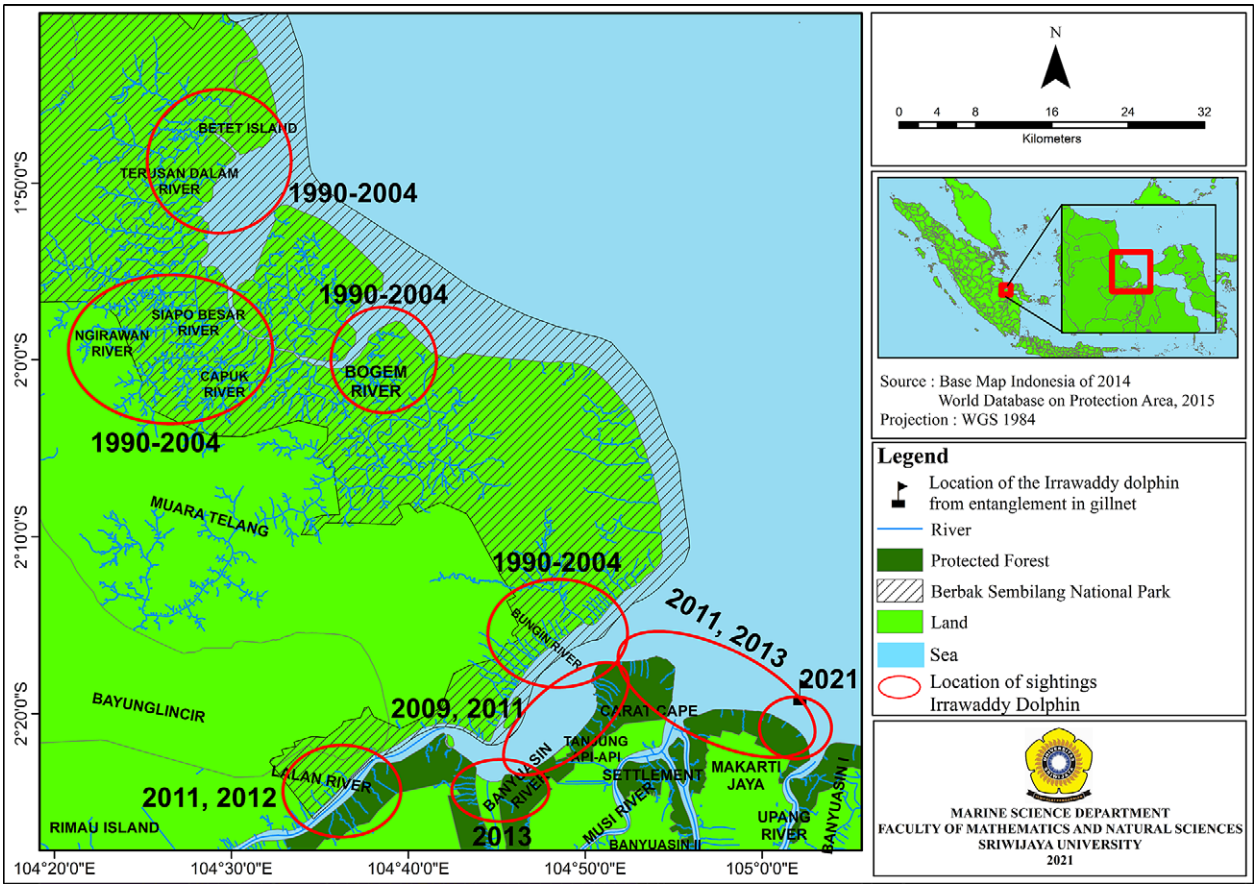

Figure 5. Historical records of Irrawaddy Dolphins on the east coast of South Sumatra, Indonesia between 1990 and 2021.

mangrove ecosystems and tributaries with high turbidity and muddy bottoms, habitat for this species of dolphin (Iqbal 2003a; Minton et al. 2013).

In general, this species has been sighted in the study area during the rainy season. For example, Iqbal (2003a), reported dolphins in February 2002 and January 2003 in BSNP around the Siapo Besar River, South Sumatra. Rahayu et al. (2020) noted the appearance of dolphins in Tanjung Puting National Park, Central Kalimantan, mainly in the rainy season during cloudy conditions.

The number of dolphins that form the population in our study area is undetermined, but there are fewer Irrawaddy Dolphins here than in other areas of Indonesia, especially in Kalimantan and Banten. In February, the total population in the Sungai Banyak Resort SPTN Region II in Tanjung Puting National Park was 55 individuals (Rahayu et al. 2020), while direct and indirect observations of dolphins in Banten Bay was 31–42 individuals (Khalifa et al. 2014). We find it difficult to trace the historical record for the number of dolphins seen or entangled on the east coast of South Sumatra, even though the number of individuals is valuable information for determining habitat conditions and the population size for conservation management (Noor 2016).

The main threat to this Endangered species is entanglement in fishing gear, especially gill nets (Ryan et al. 2011; Whitty 2015; Minton et al. 2017; Jackson-Ricketts et al. 2020). While local fishermen have tried to release entangled dolphins in their gillnets, if the animals are dead, they are not released. In the Mekong River of southern Laos, northeastern Cambodia (Ryan et al. 2011), and India (Kumar et al. 2019), entanglement in gillnets is the most immediate and critical threat to the survival of the species, and a declining the dolphin population has been reported in the Mekong River (Krützen et al. 2018). The sightings and entanglement of dolphins in BSNP and other areas (Banyuasin, Tanjung Carat, and Makati Jaya rivers) are historical records and evidence of the importance of these areas. Specially, BSNP is a habitat for unique and endangered biota. These areas are also provide habitat for other species protected by the Indonesian government, namely *Carcinoscorpius rotundicauda* (Latreille, 1802) and *Tachypleus gigas* (Müller, 1785) (Fauziyah et al. 2019b).

The government has established the port of Tanjung Carat in the Banyuasin estuary as a special economic zone since 2022, which has resulted in increased ship traffic and increasingly dense development. Irrawaddy Dolphins have a high sensitivity to noise pollution from ships' engines and heavy traffic. Dolphins will change direction to avoid noisy areas (Noor et al. 2013) and swim further from ship traffic. Anthropogenic activities are also a threat to the Irrawaddy Dolphin population in Brunei Bay (Mahmud et al. 2018).

If critical threats to the survival of Irrawaddy Dolphins are not reduced or prevented, sightings of dolphins will become increasingly more rare for future generations. Dolphin populations can be saved when compatible conservation measures are implemented. A strong commitment from local and national governments as well as international NGOs is urgently required. Furthermore, a detailed study is needed to clarify the migration of Irrawaddy Dolphins around the east coast of South Sumatra, especially around BSNP. The scarcity of individuals makes it very difficult to collect data. For this reason, an action plan is urgently required, such as (1) continuous monitoring of dolphin abundance and (2) determining mitigation and priority locations of dolphins for the establishment of conservation areas.

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Authors' Contributions

Conceptualization: F, FA, ENN. Data curation: MI. Formal analysis: FA. Investigation: AZM, ICG. Methodology: R. Resources: MI. Writing-original draft: FA. Supervision: R. Writing-review and editing: AZM, ICG.

References

Anggawangsa RF, Dharmadi, Sulistyowati N (2014) Sighting and behaviour of Irrawaddy Dolphins (*Orcaella brevirostris* (Owen in Gray 1866) as critically endangered mammals in Kubu Raya and Kayong Utara Waters, West Kalimantan. Bawal 6 (1): 63–68.

Chowdhury GR, Roy K, Goyal N, Warudkar A, Raza RH, Qureshi Q (2020) On the evidence of the Irrawaddy Dolphin *Orcaella brevirostris* (Owen, 1866) (Mammalia: Cetartiodactyla: Delphinidae) in the Hooghly River, West Bengal, India. Journal of Threatened Taxa 12 (8): 15905–15908. http://doi.org/10.11609/jott.5171.12.8.15905-15908

Dharmadi, Hartoto DI, Nasution SH, Oktaviani D (2009) Distribusi spasial, status pemanfaatan, dan upaya konservasi Pesut Mahakam (*Orcaella brevirostris*) di Kalimantan Timur [Spatial distribution, utilization status, and conservation efforts of the Mahakam dolphin (*Orcaella brevirostris*) in East Kalimantan]. Jurnal Penelitian Perikanan Indonesia 15 (1): 49–58. http://doi.org/10.15578/bawal.1.4.2007.127-132

Fauziyah, Agustriani F, Purwiyanto AIS, Putri WAE, Suteja Y (2019) Influence of environmental parameters on the shrimp catch in Banyuasin coastal Water, South Sumatra, Indonesia. Journal of Physics: Conference Series 1282: 012103. http://doi.org/10.1088/1742-6596/1282/1/012103

Fauziyah, Purwiyanto AIS, Putri WAE, Agustriani F, Mustopa AZ, Fatimah (2019) The first investigation record of threatened horseshoe crabs in the Banyuasin estuarine, South Sumatra, Indonesia. Ecologica Montenegrina 24: 17–22.

Iqbal M (2003a) Melacak keberadaan pesut di TN Sembilang [Tracking occurance of Irrawadi Dolphins in TN Sembilang]. Warta Konservasi Lahan Basah 11 (2): 15.

Iqbal M (2003b) Pemantauan Kawasan Sembilang No. 7, Juli/Agustus 2003 [Monitoring the Sembilang Area No. 7, July/August 2003]. Laporan Teknis No. 74. Proyek Konservasi Terpadu Lahan Basah Pesisir Berbak Sembilang. Wetlands International-Asia Pacific Indonesia Programme, Palembang, Indonesia, 33 pp.

Iqbal M (2003c) Pemantauan Kawasan Sembilang No. 8, Oktober 2003 [Monitoring the Sembilang Area No. 8, October 2003]. Laporan Teknis No. 76 Proyek Konservasi Terpadu Lahan Basah Pesisir Berbak SembilangWetlands International-Asia Pacific Indonesia

Programme, Palembang, Indonesia, 35 pp.

Iqbal M (2004) Pemantauan Kawasan Sembilang No. 10, Juni/Juli 2004 [Monitoring the Sembilang Area No. 10, June/July 2004]. Laporan Teknis No. 86 Proyek Konservasi Terpadu Lahan Basah Pesisir Berbak Sembilang. Wetlands International-Asia Pacific Indonesia Programme, Palembang, Indonesia, 32 pp.

Jackson-Ricketts J, Junchompoo C, Hines EM, Hazen EL, Ponnampalam LS, Ilangakoon A, Monanunsap S (2020) Habitat modeling of Irrawaddy Dolphins (*Orcaella brevirostris*) in the eastern Gulf of Thailand. Ecology and Evolution 10: 2778–2792. http://doi.org/10.1002/ece3.6023

Khalifa MA, Kamal MM, Adiwilaga EM, Sunuddin A (2014) Preliminary study on the distribution of Irrawaddy Dolphin, *Orcaella brevirostris*, in Banten Bay. Open Journal of Marine Science 4: 338–343. http://doi.org/10.4236/ojms.2014.44030

King HA (1978) A nomogram to assist in planning surveys of small (N < 2,000) populations. Research Quarterly American Alliance for Health, Physical Education and Recreation 49 (4): 552–557. http://doi.org/10.1080/10671315.1978.10615570

Kreb D (2004) Abundance of freshwater Irrawaddy Dolphins in the Mahakam River in East Kalimantan, Indonesia, based on mark-recapture analysis of photo-identified individuals. Journal of Cetacean Research and Management 6 (3): 269–277.

Kreb D, Lhota S, Porter L, Redman A, Susanti I, Lazecky M (2020) Long-term population and distribution dynamics of an endangered Irrawaddy Dolphin population in Balikpapan Bay, Indonesia in response to coastal development. Frontiers in Marine Science 7: 533197. http://doi.org/10.3389/fmars.2020.533197

Krützen M, Beasley I, Ackermann CY, Lieckfeldt D, Ludwig A, Ryan GE, Bejder L, Parra GJ, Wolfensberger R, Spencer PBS (2018) Demographic collapse and low genetic diversity of the Irrawaddy Dolphin population inhabiting the Mekong River. PLoS ONE 13 (1): e0189200. http://doi.org/10.1371/journal.pone.0189200

Kumar JSY, Mohapatra A, Balakrishnan S, Venkatraman C (2019) Irrawaddy Dolphin (*Orcaella brevirostris*) washed ashore on Digha Coast, West Bengal, India. Indian Journal of Geo-Marine Sciences 48 (2): 239–242.

Mahmud AI, Jaaman SA, Muda AM, Muhamad HM, Zhang X, Scapini F (2018) Population estimation, distribution, and habitat preference of Irrawaddy Dolphins *Orcaella brevirostris* (Owen in Gray, 1866) in the Brunei Bay, Malaysian waters. Wildlife Biology 2018: wlb.00383. http://doi.org/10.2981/wlb.00383

Minton G, Peter C, Ngeian J, Braulik G, Hammond PS (2013) Population estimates and distribution patterns of Irrawaddy Dolphins (*Orcaella brevirostris*) and Indo-Pacific Finless Porpoises (*Neophocaena phocaenoides*) in the Kuching Bay, Sarawak. The Raffles Bulletin of Zoology 61 (2): 877–888.

Minton G, Smith BD, Braulik GT, Kreb D, Sutaria D, Reeves R (2017) *Orcaella brevirostris* (errata version published in 2018). The IUCN Red List of threatened species 2017 e.T15419A1. http://doi.org/10.2305/iucn.uk.2017-3.rlts.t15419a50367860.en

Noor IY, Basuni S, Kartono AP, Kreb D (2013) Abundance and distribution of Mahakam Irrawaddy Dolphin (*Orcaella brevirostris* Gray, 1866) in Mahakam River, East Kalimantan. Jurnal Penelitian Hutan dan Konservasi Alam 10 (3): 283–296.

Noor IY (2016) Pesut mahakam, profil, peluang kepunahan dan upaya konservasinya [The Irrawady Dolphin of Mahakam, profile, probability of extinction and conservation efforts]. Pusat Pengendalian Pembangunan Ekoregion Kalimantan, Kalimantan, Indonesia, 47 pp.

Postrado JFL, Jover KMAJ, Mabulac HJD, Velasco JSB, Paz MEL de la, Pereda JMR, Ventolero MFH, Santos MD (2019) Identification of fish prey of an Irrawaddy Dolphin (*Orcaella brevirostris*) using mitochondrial cytochrome c oxidase 1 sequence analysis. The Philippine Journal of Fisheries 26 (1): 1–7. http://doi.org/10.31398/tpjf/26.1.2019-0001

Rahayu F, Muflihati M, Anwari S, Suriansyah B (2020) Population estimation of Irrawaddy Dolphin (*Orcaella brevirostris*) at Sungai Perlu Resort on February in Tanjung Puting National Park, Central Kalimantan. Media Konservasi 25 (1): 36–46. http://doi.org/10.29244/medkon.25.1.36-46

Ramsar Sites Information Service. Ramsar Information Sheet (RIS). https://rsis.ramsar.org/ris/1945. Accessed on: 2021-01-15

Rudolph P, Smeenk C, Leatherwood S (1997) Preliminary checklist of Cetacea in the Indonesian archipelago and adjacent waters. Zoologische Verhandelingen 312: 1–48

Ryan GE, Dove V, Trujillo F, Doherty PF (2011) Irrawaddy Dolphin demography in the Mekong River: an application of mark-resight models. Ecosphere 2 (5): art58. http://doi.org/10.1890/es10-00171.1

Suman A, Husnah, Prianto E, Suryati NK, Aprianti S, Arisna D, Ardiansyah V, Junianto RS, Saiyani A, Santiaji, Makmur (2009) Status Sumberdaya Perikanan di Kawasan Pelabuhan Tanjung Api-Api (South Sumatera Eastern Corridor-Secde) [Status of fisheries resources in the Tanjung Api-Api port area South Sumatera Eastern Corridor-Secde)]. Laporan Teknis Kegiatan Riset. Balai Riset Perikanan Perairan Umum, Pelembang, Indonesia, 69 pp.

Whitty TS (2015) Governance potential for cetacean bycatch mitigation in small-scale fisheries: a comparative assessment of four sites in Southeast Asia. Applied Geography 59: 131–141. http://doi.org/10.1016/j.apgeog.2015.01.003