Preliminary Investigation of Irrawaddy Dolphin *(Orcaella brevirostris)* in the Bangpakong Estuary, Inner Gulf of Thailand

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Abstract

Approximately 20 to 25 individuals of the Irrawaddy dolphin *(Orcaella brevirostris)* were found in one school in the Bang Pakong estuary, Thailand. The estuary covers an area of 135 km^2. The habitat characteristics of the Irrawaddy are waters which are rather turbid and with a depth of 2-5 metres. Within the school, it was found that individuals tended to group in numbers of between 2 and 6. The mean group size was 2.5 ± 3.0 individuals. Eleven dorsal fin shape characteristics of Irrawaddy were identified from photo identification. The technique was used to monitor the dolphin population.

Key words: Irrawaddy dolphin/ *Orcaella brevirostris*/ conservation/ Bangpakong estuary

1. Introduction

Loma Huabath is the name by which Thai people know the Irrawaddy dolphin, *Orcaella brevirostris*, first described by Owen in Gray (1866). Irrawaddy dolphins are widespread throughout the Indo-Pacific region from northeastern Australia to eastern India (Stacey and Leatherwood, 1997; Stacey and Arnold, 1999) and the northern Philippines (Dolar et al., 2002) where they occur along the coast in shallow water. They are also found in large river systems including Irrawaddy River in Myanmar, Mahakam River in Indonesia, and Mekong River that flows through Laos, Cambodia, Vietnam and northern Thailand (Smith and Hobbs, 2002). Irrawaddy dolphins are also found in lagoons and lakes. In Thailand, they have been reported in Songkla Lake, adjacent to Phatthalung and Songkhla provinces, in the southern Gulf of Thailand (Pilleri and Gihr, 1974; Chantrapornsyl et al., 1996).

Currently, Irrawaddy dolphins are considered a critically endangered species by IUCN (2011) and in dire need of conservation including habitat restoration. Irrawaddy dolphins occur also in the Bangpakong River and its estuary in the Upper Gulf of Thailand. Its decline in this region has been associated, directly and indirectly, with heavy fishing activities that include the use of gill nets. In this investigation individual morphological irregularities were employed to identify individual Irrawaddy dolphins within the Bangpakong River and its estuary.

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2. Methodology

2.1 Study area

The study was conducted within the estuary and lower regions of the Bangpakong River, adjacent to Chachoengsao and Chonburi provinces. The Bangpakong River begins at the confluence of Nakhonnayok and Prachinburi rivers that originate within the Bantad mountain range, flows southward, ultimately discharging into the upper Gulf of Thailand and has a watershed of 18,758 km^2. Bangpakong estuary contains a high diversity of invertebrate and vertebrate animals that represent an important regional ecosystem (Sawangarreruks et al., 2005).

Agriculture areas line both sides of Bangpakong River, major crops being rubber, oil palm, sugar cane, pineapple, cassava and rice. Animal husbandry is also intensive and includes the non indigenous Nile tilapia, *Oreochromis niloticus* and giant tiger prawn, *Penaeus monodon*, in addition to pig and chicken farms (Braaten and Flaherty, 2000). Urban and industrial development is increasingly competing with agriculture for land within the Bangpakong basin (Cheevaporn et al., 1994).

2.2 Distribution

Irrawaddy dolphin were observed in Bangpakong estuary from January 2009 to December 2010 (Figure 1). Observations were made from a boat on each of 4±3 days monthly for approximately 10±2 hrs/day between 07.00 am and 06.00 pm, We began observations at Klong Tha Kham, and moved downriver in a zigzag pattern. Each boat line was 0.5 km and the boat speed was approximately 8 knot/ km.

The investigation was divided into two stages, with the first consisting of interviews with local fishermen and villagers living in the Bangpakong coastal area to gather information on the presence and locations of Irrawaddy dolphins within the study area. Interviews also sought opinions regarding a conservation policy that would lead to sustainability of dolphins in this area. The second stage consisted of a survey on the river. Dolphins were observed on the river's surface with binoculars (7x50 mm), photographed and identified by unique morphological irregularities. Observations were recorded with Nikon cameras, digital models D100 and D80s and F90x film model, equipped with Tele and wide lenses of 70-300, 80-400 and 28-105 mm, respectively. Film images tended to provide sharper detail than digital images.

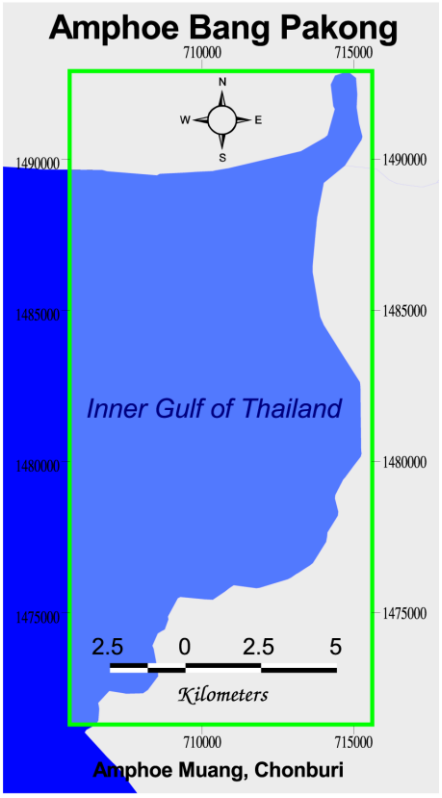


Figure 1 Areas of investigation for Irrawaddy dolphin population.

3. Results

3.1 Interviews of local fishermen and villagers

Interviews with local fishermen and villagers indicate that while they favor conservation of Irrawaddy dolphins they both compete for the same fish. Gill nets set by fishers appear to be a major factor in premature deaths of dolphins in the Bangpakong estuary. Fish captured in nets attract dolphins as they represent an important dietary item. Sometimes dolphins become tangled inescapably in the nets and may suffocate. Often, feeding schedules of Irrawaddy dolphin coincide with times when fishers are examining their nets. Normally, fishers attempt to drive dolphins from the areas where they set nets by creating a disturbance. Any dolphins captured in nets and alive are customarily released unharmed.

3.2 Distribution

Bangpakong estuary is habitat for only one marine cetacean, *Orcaella brevirostris*, and, currently, the species is represented by what appears to be a single pod or population of 20 to 25 individuals based on morphological irregularities (Figure 4). Mean group size is 2.5±3.0 individuals (N=70) with a range of 2 to 6 individuals (Figure 2). Dolphins were observed 30 km upriver from the estuary.

Within the turbid water of the estuary dolphins were always within approximately 2 to 4 km from the coastal margin where water depth is 2 to 5 m. Total estuarial habitat of the Irrawaddy dolphins was estimated as approximately 10 km^2.

Figure 2. Group size of Irrawaddy dolphin which usually ranged from 2 to 6 individuals in Bagpakong estuary.

3.3 Dorsal Fin Characteristics of Individual Dolphins from Photographs

Identification of individuals was based on dorsal fin irregularities and body scars (Figure 3). Dorsal fins irregularities were grouped into 11 patterns in Bangpakong estuary (Figure 4). There were BKS 1, BKS 2, BKS 3, BKS 4, BKS 5, BKS 6, BKS 7, BKS 8, BKS 9 and BKS 10. The scar found clearly in one individual of all was coded in BKS 11.

Figure 3 Dorsal fin irregularities among Irrawaddy dolphins.

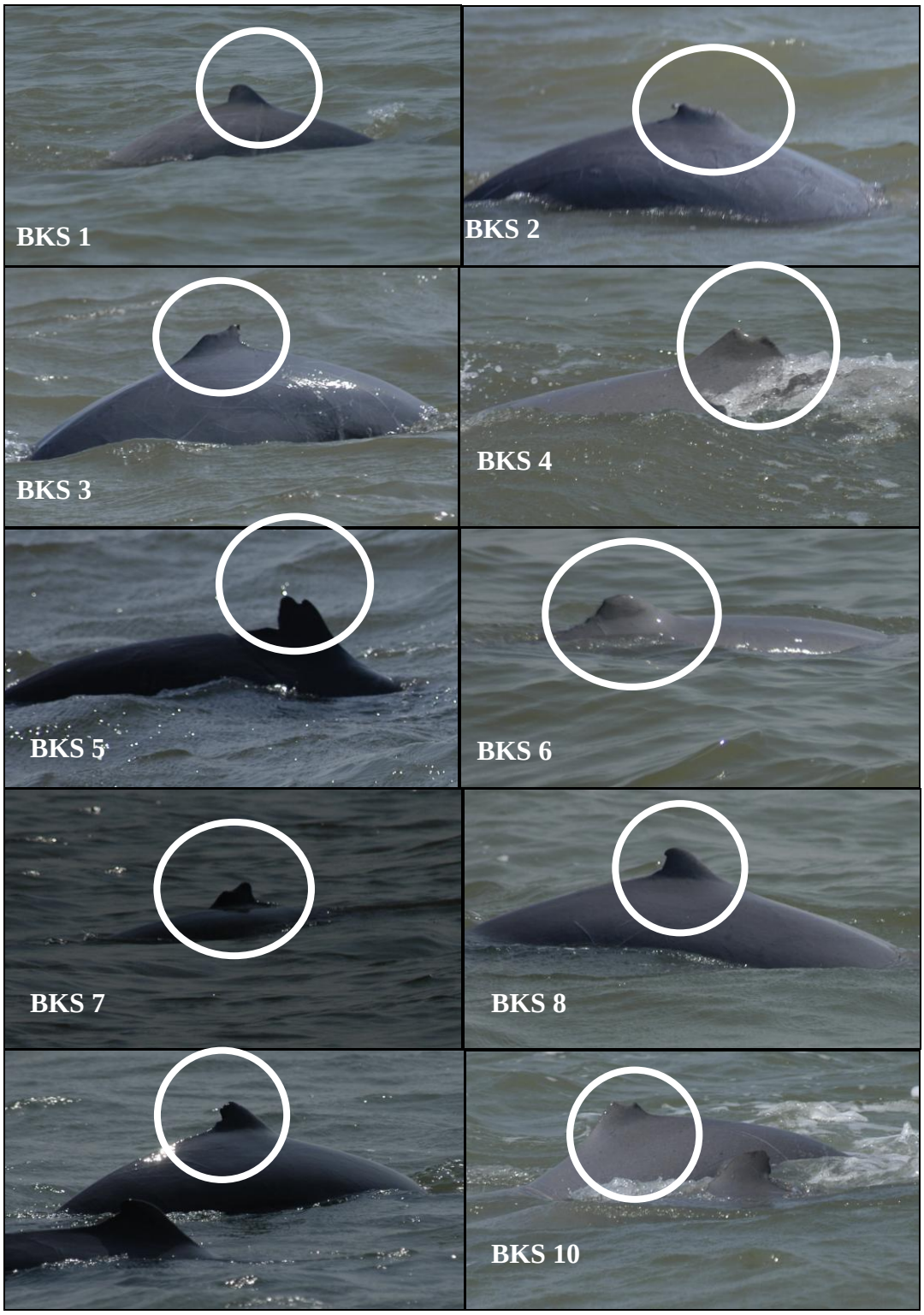
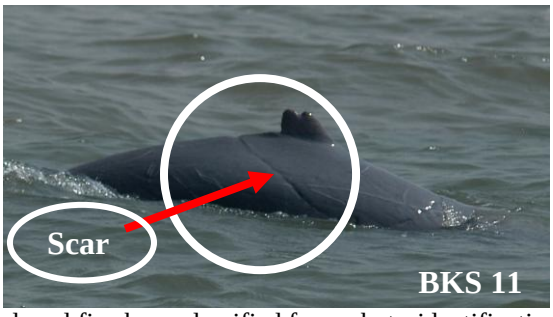


Figure 4 Characteristics of dorsal fin shape classified from photo-identification technique. Eleven dorsal fins of Irrawaddy dolphin in Bangpakong estuary were coded as BKS 1, BKS 2, BKS 3, BKS 4, BKS 5, BKS 6, BKS 7, BKS 8, BKS 9 and BKS 10, respectively. The scar found in one individual was coded in BKS 11.



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3.4 Irrawaddy Dolphin and Fishery Interactions in Bangpakong River and Estuary

Many fishery related activities occur on the Bangpakong River that, directly or indirectly, diminish the dolphin's habitat. Transportation boats are numerous, active and noisy. Irrawaddy dolphin are subject also to activities by fishers and fish culturists (Figure 5). Aquaculture farms, called Krachang Pla by Thai people, are abundant in this area and, while measurements were not made in the present study, are known to contribute organic material in the form of uneaten food and fecal matter that enhance the water's biochemical oxygen demand (BOD) and reduce its habitat suitability for oxygen-sensitive fishes. Surface gill nets set to capture pelagic fish can be harmful directly by capturing dolphins leading to death by suffocation (Figure 6) and indirectly by reducing the availability of fish on which dolphins feed.

Figure 5 Gill nets being installed by fishermen in a circle of about 100 m in diameter while a Irrawaddy dolphin was swimming near the gill nets.

Figure 6 Sea bass, *Lates calcarifer* farms located in Bangpakong estuary.

4. Discussion

Population numbers of Irrawaddy dolphin appear not to have changed appreciably in recent years. The estimate of 20 to 25 individuals made in the present study is comparable to the 15 to 25 individuals reported for the same region in 2005 and 2006 (Thongsukdee et al., 2007). However, these estimates are well below the 90 individuals reportedly present in the river about 50 years ago (Mahakunlayanakul, 1996). Furthermore, dolphin habitat appears to have decreased considerably with individuals just a few years ago found as far as 60 km upriver (Mahakunlayanakul, 1996; Thongsukdee et al., 2007) compared to only 30 km in the present study.

Irrawaddy dolphins are always found in shallow water and near the coast. Their habitat in the Bangpakong estuary is adjacent to mangroves where the water is relatively turbid, a consequence of coastal erosion, tides, and upwelling. The diverse food web and high biological diversity in these areas sustain an ample supply of foods favored in dolphin diets including fish, squid, and larger crustacean (Sawangarreruks et al., 2005). Bangpakong estuary might best provide dolphins with a place in which to feed and to reproduce while the river may better provide for other activities including rest and social interactions.

Photos allowed for individual recognition among the dolphins based on dorsal fin irregularities and body scars. Conceivably scars can be expected to heal partially or fully over time. However, in the course of the present study scars persisted well enough that individual recognition was not impaired. Unfortunately it was not possible to assign age or sex to any of the dolphins. To do so would require sampling individuals as well as a technique by which to assign age, both being well beyond the scope of this study.

Habitat degradation in Bangpakong estuary has occurred and likely has indirectly and directly affected the health of Irrawaddy dolphins. The human population has increased in size and diversified in their range of activities as has agriculture, and industry and in the process has contributed large quantities of organic and inorganic substances throughout the coastal areas of the Gulf of Thailand (Cheevaporn and Menasveta, 2003). Little is known on how this complex of chemicals has affected

ecosystems or even individual species within ecosystems in the Gulf. Water and particulate sediments in this area can have heavy burdens of heavy metals that have been found to accumulate in marine mammals (Harino et al., 2007) and, in some instances to impact on their health (Kakuschke and Prange, 2007). Certainly based on available information it is likely the carnivorous Irrawaddy dolphin in the Bangpakong estuary region accumulate various potentially harmful substances including heavy metals. It is also likely that these accumulations may impose stress on affected individuals and even cause liver disease (Bowles, 1999) and possibly disease to other organs. However, their full effect, if any, will remain unknown until conclusive studies are undertaken. .

The greatest threat to the Irrawaddy dolphin in the Bangpakong region may be from fishing related activities (Lloze, 1973; Stacey, 1996) such as entanglement in gill nets, vessel strikes, animals deliberately killed, and electrocution (Smith et al. 1997; Smith and Jefferson, 2002). During our study, we did not find any dead dolphins. However, the gill nets are a common fishing gear in this area and have been reported to cause death to Irrawaddy and other cetaceans (Smith and Beasley, 2007). Indeed, Krebs (2000) found ten Irrawaddy dolphins killed by entanglement in gill nets, three others probably from vessel strikes and three deliberately killed in Mahakam River, Indonesia. Baird and Mounsouphom (1994) found at least 23 dolphins accidentally killed in the Mekong River near the Laos and Cambodia border while 12 individuals died from entanglement in gill nets and other dolphins were killed by blast fishing. Beasley et al. (2003) also reported dolphins dead from gill net entanglement. Earlier, Beasley et al. (2002) listed 28 records of Irrawaddy dolphins that died from strandings in Songhkla Lake between 1990 and 2001.

5. Conclusion

Irrawaddy dolphin, O. *brevirostris*, in Bangpakong eonstuary occurs mostly near the coastal in shallow, turbid water. Individuals were photo-identified from diagnostic irregularities to their dorsal fin and body scares. This information will be fruitful in support of conservation of this endangered species. The health and abundance of Irrawaddy dolphin is suggested to be directly correlated with overall marine productivity.

6. Acknowledgements

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