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DUGONG, DOLPHIN AND WHALE IN THAI WATERS

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ABSTRACT

Dugongs are rarely seen, although they have distributed along coastlines both in the Andaman Sea and the Gulf of Thailand. The most abundant area of dugong is at Talibong-Muk Islands, Trang Province. Recently, aerial surveys of dugong population along the Andaman Sea coast have been conducted. Fifty and 38 dugongs were observed in 1997 and 1999, respectively. Age determination had been made on 12 dugongs so far and shown that they were 1-43 years old. Dugongs were occasionally entangled in fishing gears. Among various types of gears, gill net was the main cause of the death of dugongs. One of the practical methods to conserve the dugong is to act of limiting or reducing some activities, which do harm dugong lives, such as the types of fishing gear, illegal fishing, speed boat, and tourism activity in seagrass beds and dugong habitats.

The studies on dolphin and whale in Thailand have been focussed since 1993. All information was obtained from stranded and by-catch specimens, available skeletons, and interview. Twenty-one species of dolphin and whale, representing from 6 families of Cetacea, were currently reported in Thai waters. The Delphinidae is the largest family represented by 14 species. The other families include Balaenopteridae and Kogiidae, that each represented by 2 species, and Phyteridae, Ziphiidae and Phocoenidae, that each represented by a single species. Among the total species recorded, there are 17 species in the Andaman Sea and 14 in the Gulf of Thailand. Putting more emphasis on extensive investigation, more new records of dolphin and whale are expected to be found in Thai waters.

INTRODUCTION

The coastline of about 2,300 km of Thailand are rich in fauna and flora. However, the primary researches have involved the investigation and analysis of economic importance species such as fishes, crustaceans and molluscs. Hence, few studies have been conducted on marine mammals in Thailand since the past. Dugong, the only living member of family Dugongidae (order Sirenia), used to be commonly found along both coastlines of the Andaman Sea and the Gulf of Thailand, until recently, they are rare and only restricted in some areas (Nateekanjanalarp and Sudara, 1992; Chantrapornsyl and Adulyanukosol, 1994; Adulyanukosol, 1995, 1998; Adulyanukosol et al., 1997, 1998, 1999a).

Also within Thailand, various names have been called, i.e. "Payoon", "Moonum", "Moodud", "Nguag", and "Duyong". Moonum and Moodud mean water pig or sea pig. Nguag means mermaid and Duyong, derived from Malayan language and normally used in the southern Thailand, means sea pig. The names "Moodud", "Payoon", and "Duyong" are named for certain villages and districts; the former word is used in the east coast of the Gulf particularly in Chantaburi Province and the later two words are used in Pattalung and Pattani Provinces, southern Thailand (Adulyanukosol, 1998).

Dolphin and whale, belonging to order Cetacea, are composed of 13 families and 78 known species (Jefferson et al., 1993). Concerning on the cetacean recorded in Thailand, Suvatti (1950) and Menaveta (1980) had earlier listed 3 species of cetacean in Thai waters, while Pilleri and Gahr (1974) recorded 7 species of cetaceans. Lekagul and McNeely (1977) reported 12 species. Subsequently, Yenbutra (1988) corrected the name of the "Malayan dolphin" from *Stenella malayana* to *Stenella attenuata* (the pantropical spotted dolphin).

AIMS OF DUGONG, DOLPHIN AND WHALE RESEARCHES

The primary purpose of the study on dugong, dolphin and whale is to support the biological knowledge on marine mammals needed for the conservation and management plan of these animals in Thailand. The specific aims of researches are as follows:

1. To Study the distribution of dugong, dolphin and whale together with estimating their population using the data of interview, ship survey, aerial survey and available skeleton and stranded specimens.
2. To studying the biology of external and internal characteristics of stranded animals. This knowledge is needed to fill up the basic biological data, which is necessary for marine mammal conservation plan in Thailand.
3. To study on skeletons, the allometry of skulls and the age from their hard tissues in order to know the allometric variation, sexual dimorphism, age and geographical variation between the specimens from Thailand and other areas.
4. To analyze the stomach contents in order to identify their selective preference food and feeding areas.
5. To compare marine mammals in Thailand to those from other countries by mean of the application of molecular makers (e.g. mt-DNA) in order to reveal possible divergence of each species.
6. To promote certain fishing methods in the seagrass beds, which are not harmful to dugong such as small traps (fish, squid and crab) and hand lines.
7. To promote the specific areas as dugong sanctuaries of Thailand.
8. To provide education and to increase public awareness on marine mammal conservation.

DUGONG IN THAILAND

Distribution of dugong

Andaman Sea

Aueng et al. (1993) firstly conducted the aerial survey of dugong in Thailand. The surveys were made in Trang Province during 1991-1992 and 61 dugongs were observed. Subsequently, Adulyanukosol (1995) gathered the general information of dugong by making interviews to local villagers, from 200 families, inhabiting along the Andaman Sea coast. She found that the number of dugongs was rapidly declined over period of the least 20-30 years and recommended the areas critically needed for an aerial survey of dugong.

Since then, the attempts to survey the number of dugongs and to study their behavior were initiated by Phuket Marine Biological Center (PMBC), Department of

Fisheries, in 1997. Adulyanukosol et al. (1997) conducted the aerial surveys at 8 seagrass areas within 4 provinces, i.e., Phangnga, Krabi, Trang and Satun, using the "Polaris Flying Boat" (inflatable boat with wings and 64 HP engine) in 1997 and found a total of 48 dugongs including 5 calves. With the incorporation from the Royal Thai Navy, the other aerial surveys had also been conducted in 1997 and 1999 (Adulyanukosol et al., 1999a), using either helicopter (Bell and S-76B) or Dornier-228 (fixed-wing aircraft with capacity of 8 passengers). Twenty and 38 dugongs were observed in 1997 and 1999, respectively. The large assemblage of dugongs was found at Talibong-Muk Islands, Trang Province. The results from overall surveys made in 1997 revealed an actual number of 50 dugongs being seen.

The Gulf of Thailand

In the Gulf of Thailand, there are few researches conducted on dugong. Nateekanjanalarp and Sudara (1992) reported that dugongs used to be found at Kung Krabaen, Chantaburi Province, and Makhampom Bay, Rayong Province, on the east coast of the Gulf of Thailand. They also reported on the evidence of two dead dugongs: one from Laem Singh, Chantaburi Province and the other from Makhampom Bay.

Nevertheless, dugongs were occasionally found at Makhampom Bay and Prasea River Mouth, Rayong Province. Local people in Chantaburi informed that dugongs are often seen during feeding on seagrass at Kung Krabaen Bay every year around December-January. About one dugong is dead each year by trawler or other fishing gears in Rayong Province. In Trat Province, one dead dugong was found at Chang Island in 1996 and another 5 dead dugongs were found at Laem Klat in 1997. Recently, a dead calf, of about 30 kg in weight, was found at Chong Samae San, Chonburi Province in April 1999 (Adulyanukosol, unpublished data and Saengratanachai, pers. comm.).

On the west coast of the Gulf of Thailand, a dugong was reported to die causing by trawler at Khanom District, Nakhon Si Thammarat Province in 1996. During 1997-1998, 3 dugongs died from trawlers at Samui Island, Surat Thani Province. A rotten male dugong was found floating in the sea off Lamae District, Chumporn Province in February 1998 and, in the same year, another freshly dead female was stranded in the same district (Adulyanukosol, unpublished data).

The living dugongs have never evidently been observed so far: this might be because of their rarity in nature or inadequate survey program. However, on the evidence of dead individuals from several localities in the Gulf of Thailand, as pointed out above, it is believed that a viable population might be established either along the east coast or the west coast of the Gulf of Thailand.

Dugong in captivity

Phuket Marine Biological Center (PMBC) is probably the first institute in Thailand, that had involved in marine mammal work since 1979. Boonprakob et al. (1983) reported that four dugongs had been brought to PMBC during 1979-1982 and 3 of them survived in captivities for 77-153 days. They also reported that *Halophila ovalis* was the preference-food species for dugong among several other offering seagrass species. PMBC has occasionally received the entangled dugong since then.

Boonyanate (1994) tried to rare two unweaned calves in captivities; one was released to the sea after 15 days and another smallest one with 97 cm in body length

and 14 kg in weight, died after 41 days of rearing. He had also showed the feeding apparatus and various food formulas for unweaned dugongs and manatee calves. Subsequently, Adulyanukosol and Patiyasevi (1994) reported that a male calf (119 cm and 20 kg) could survive in captivity with a capacity of about 100 tons of sea water for 200 days. This was the longest survival-keeping period for the dugongs in captivity at PMBC. Over the period, the dugong consumed mainly *H. ovalis* for 6.7 kg/day in average. It gained 15.5 kg in weight and 2 cm in length during keeping time. Furthermore, Adulyanukosol (1997) had observed the breathing pattern of this captive dugong and shown that the average breathing interval was 102.5 sec/time and the maximum diving time was 480 sec. The major problems in concern with keeping dugong in captivity were; foods, size and type of enclosures, injuries inflicted during catching and transportation and susceptibility to diseases and medical treatments (Boonprakob et al.,1983; Adulyanukosol and Patiyasevi,1994).

Table 1. The types of fishing gears which cause dead to dugongs and localities of specimens collected from June 1979 to January 1999 (Source: Chantrapornsyil and Adulyanukosol, 1994; Adulyanukosol, 1995; unpublished data).

Abbreviations: a = gill nets, b = gill net for crab, c = gill net for stingray, d = seine, e = trawler, f = hook and line for stingray, g = stationary trap (stake trap), h = hit by boat, i = caught by hands, and j = unidentified fishing gears.

Location (Province)	a	b	c	d	e	f	g	h	i	j
1. Rayong	/	-	/	-	/	/	/	-	-	-
2. Chantaburi	-	-	-	-	-	-	-	-	-	/
3. Chumporn	/	-	-	-	-	-	-	-	-	-
4. Surat Thani	-	-	-	-	/	/	-	-	-	-
5. Nakhorn Si Thammarat	-	-	-	-	/	-	-	-	-	-
6. Ranong	-	-	-	-	-	-	/	-	/	/
7. Phang-nga	/	-	/	-	-	-	/	-	-	-
8. Phuket	/	/	-	-	-	-	-	/	-	-
9. Krabi	/	-	-	-	/	-	/	-	-	/
10. Trang	/	-	-	/	/	/	-	-	-	/
11. Satun	/	-	-	-	-	-	/	-	/	-
Dead (inds)	21	1	3	1	7	2	4	1	-	55
Alive (inds)	4	-	-	-	-	-	2	-	2	-
Total (inds)	25	1	3	1	7	2	6	1	2	55

Behavior

The aerial surveys showed that the diurnal inshore feeding is normal for dugongs living in the Andaman Sea coast. During feeding activities, they ascended to surface for breathing every few minutes. The relationships between mothers and calves were closely observed during the flights using the Polaris Flying Boat, particularly at Cham, Pu and Sriboya Islands in Krabi Province and at Muk-Talibong Islands in Trang Province. Calves stayed closely beside their mothers. The cow-calf pairs were seen together feeding on seagrass, swimming and surface breathing.

During surface breathing, calves stayed beside their mothers or on the dorsal of mothers (Adulyanukosol et al., 1997). In observation during low tide, the dugongs appeared at the distance of about 4-6 km from shore (Adulyanukosol et al., 1999a).

Cause of death

Since 60 years ago, local people in Rayong Province had killed dugongs and consumed their meat as for protein source. The fishermen had to chase the dugongs into shallow water or river mouth and hit them or pierced them with harpoons until they died. In the southern part of the Andaman Sea coast, fishermen used to chase the dugongs into the shallow water together with an operation of enclosing net (Adulyanukosol, 1998; Secondary School Group of Rayong Province, Group 2, 1999).

At present, dugongs are no more killed for food, however, they are occasionally caught in fishing gears. Table 1 shows that dugongs are mostly found dead in gill nets (24 %). While being entangled in fishing gear, particularly in various types of nets, dugongs generally tried to be free and finally drowned. For the case of being trapped inside a stake trap, they tried to leave, but always got hurt by bamboo and net of the trap and then finally died.

DOLPHIN AND WHALE IN THAILAND

Distribution of dolphin and whale

Since 1993, researches on dolphin and whale have been conducted in Thailand such as interview, dolphin survey, and biological investigation of the stranded animals and skeleton. The institution which carried out these works are Department of Fisheries (i. e., PMBC, Eastern Marine Development Center and Southern Marine Development Center) and certain universities (i. e., Chulalongkorn University and Burapha University).

Anderson and Kinze (1994, 1995) had examined 31 records of baleen whales, which were kept in museums, scientific institutions and temples, and found that 24 of these were certainly identified to *Balaenoptera edeni*. They also reported that there were 18 species of cetaceans in Thailand. At present, 21 species of cetaceans are recognized in Thailand (Table 2).

Andaman Sea

A stranded dwarf sperm whale, *Kogia simus*, was firstly reported from Phuket Island by Chantrapornsyl et al. (1991). Kiatkarnjanakul (1994) had taken a photograph of a school of false killer whale, *Pseudorca crassidens*, at Similan Island, Phang-nga Province. Until recently, a pygmy killer whale, *Feresa attenuata*, from Trang Province was recorded for the first time for Thailand (Chantrapornsyl, 1996). Adulyanukosol et al. (1999b) preliminarily surveyed the dolphins by boat around Phuket Island and its adjacent waters in March 1998. Ten bottlenose dolphins, *Tursiops aduncus* were observed at Mai Thon Island, south of Phuket, and another 17 individuals including one calf were observed at Khai Nok Island, northeast of Phuket. These two groups of bottlenose dolphin (Mai Thon and Kai Nok islands) are

Table 2. Record of 21 species of dolphins and whales found in Thailand.

Remarks: Most available data herein are derived from Chantrapornsyl et al. (1996,1999) and Chantrapornsyl, unpublished data. F=Fossil; S=Stranded; L= Living (by sighting); Reference is indicated as superscript: ^a Pilleri and Gühr (1974); ^b Aduyanukosol, et al. (1999b); ^c Anderson and Kinze (1995); ^d Sirimontraporn and Sritakon (1995); ^e Nuyok (1994); ^f Mahakunlayanakul (1996); ^g Kiatkarnjanakul (1994) and ^h Miyazaki (1986).

Common name, Scientific name	Andaman Sea (Province; (no))	Gulf of Thailand(Province; (no))
Balaenopteridae		
Fin whale, <i>Balaenoptera physalus</i>	-	Chachoengsao(F-1)
Bryde's whale, <i>Balaenoptera edeni</i>	Phang-nga(S-2), Phuket(S-4), Krabi(S-1), Trang(S-1)	Rayong(S-1), Chachoengsao(S-1), Petchburi(S-1), Prachaup Kiri Khan (S-2), Nakhon Si Thammarat(S-3), Pattani(S-1)
Physeteridae		
Sperm whale, <i>Physeter macrocephalus</i>	Phang-nga(S-2), Phuket(S- 2),Satun(S-1)	-
Kogiidae		
Pygmy sperm whale, <i>Kogia breviceps</i>	Phang-nga(S-1), Phuket(S-1)	Rayong(S-1)
Dwarf sperm whale, <i>Kogia simus</i>	Phuket(S-1), Satun(S-2)	-
Ziphiidae		
Ginkgo-toothed whale, <i>Mesoplodon ginkgodens</i>	Phuket(S-1)	-
Delphinidae		
Killer whale, <i>Orcinus orca</i>	Phang-nga(L-30), Phuket(L-14)	Surat Thani(L-1)
False killer whale, <i>Pseudorca crassidens</i>	Phang-nga(S-2, L-50 ^g), Phuket(S-2), Krabi(S-1)	Rayong(S-1), Trat(S-1), Prachaup Kiri Khan(S-1), Surat Thani(S-2)
Pygmy killer whale, <i>Feresa attenuata</i>	Trang(S-2)	-
Short-finned pilot whale, <i>Globicephala macrorhynchus</i>	-	Narathiwat(L-1)
Melon-headed whale, <i>Peponocephala electra</i>	-	Songkhla(S-1 ^h)
Hump-backed dolphin, <i>Sousa chinensis</i>	Krabi(S-1)	Chonburi(S-1, S-1 ^f), Chantaburi(L- 5), Prachaup Kiri Khan(S-1), Chumporn(S-1), Surat Thani(S-1)
Bottlenose dolphin, <i>Tursiops aduncus</i>	Phang-nga(S-1, L-19, L-27 ^b), Phuket(S-2, L-15), Trang(S-1)	Rayong(S-2), Chantaburi(S-1), Nakhon Si Thammarat(L-1)
Rough-toothed dolphin, <i>Steno bredanensis</i>	Phuket(S-1), Satun(S-1)	Nakhon Si Thammarat(S-1)
Long-beaked common dolphin, <i>Delphinus capensis</i>	-	Surat Thani(L-50 ^e)
Spinner dolphin, <i>Stenella longirostris</i>	Ranong(S-1)Phang-nga(S-1), Phuket(S-2, L-1, L-5 ^b), Trang(S-11)	Chonburi(S-1), (S-10 ^b)
Striped dolphin, <i>Stenella coeruleoalba</i>	Phuket(S-2), Krabi(S-1)	-
Spotted dolphin, <i>Stenella attenuata</i>	Phang-nga(S-2), Phuket(S-1), Krabi(S-4)	-
Irrawaddy dolphin, <i>Orcaella brevirostris</i>	Satun (L-6)	Samut Prakarn(S-1 ^f), Samuthsongklam(S-1), Surat Thani(S- 1), Pattalung(S-1, S-4 ^d ,L-10 ^e)
Fraser's dolphin, <i>Lagenodelphis hosei</i>	Trang(S-1)	-

Table 2. cont.

Common name, Scientific name	Andaman Sea (Province; (no))	Gulf of Thailand(Province; (no))
Phocoenidae		
Finless porpoise, <i>Neophocaena phocaenoides</i>	Ranong(S-1), Trang(S-2)	Chonburi(S-1, S-4 ^f), Samuth Prakarn(S-1 ^f), Petchburi(S-1 ^f), Prachaup Kiri Khan(S-2), Nakhon Si Thammarat(S-2), Pattalung(S-3)

resident species. Five spinner dolphins, *Stenella longirostris*, were found near Racha Noi Island, south of Phuket. Among the total species recorded in Thailand (Table 2), 17 were found in the Andaman Sea excluding the following 4 species; *Balaenoptera physalus*, *Globicephala macrorhynchus*, *Peponocephala electra* and *Delphinus capensis*.

Gulf of Thailand

Miyazaki (1986) listed the specimens of marine mammals from Thailand, which were kept in the National Science Museum (NSM), Japan. Later, Perrin et al. (1989) had investigated the Thai specimen of the NSM and found that 10 spinner dolphins, *S. longirostris* (M2481, M24971-79) from the Gulf of Thailand were different from other specimens collected elsewhere regarding the body size and shape, skull size and shape, number of teeth, and number of thoracic and lumbar vertebrae. They pointed that these animals should be the dwarf forms or dwarf spinner dolphins.

In 1993, Ten *Orcaella brevirostris* were sighted in the inner part of Songkhla Lake, Songkhla Province (Nuyok, 1994). Soon afterward, Sirimontraporn and Sritakon (1995) examined a carcass of the male *O. brevirostris* from Songkla Lake and found the cyprinid fish (*Puntius leiacanthus*) as its food items.

Mahakunlayanakul (1996) reported 4 species of porpoise and dolphins in the inner part of the Gulf of Thailand; *Neophocaena phocaenoides*, *O. brevirostris*, *T. truncatus (aduncus)*, *Sousa chinensis*. *O. brevirostris* lived only in shallow and brackish water while *N. phocaenoides* prefer estuary. Both of them were commonly found along the coast of the inner Gulf, except Pattaya, Chonburi Province, and the lower part of the east coast. *S. chinensis* distributed in estuaries although they were occasionally seen offshore. *T. truncatus (aduncus)* were found offshore and around islands and sometimes along the coastal line. He also reported, data back to 1967, that *O. brevirostris* was found at Ko Kret, Nontha Buri Province, beyond up to 85 km from the river mouth and up to 60 km from Bang Prakong river mouth in Chachoengsao Province, while *T. truncatus (aduncus)* were found only at 30 km up-river. He also examined the stomach contents of *N. phocaenoides* which contained cephalopods, crustaceans and fishes.

Among 21 species of cetaceans in Thailand, 14 species were found in the Gulf of Thailand. In this study, dolphin and whale which have not been recorded in the Gulf of Thailand are; *Physeter macrocephalus*, *K. simus*, *F. attenuata*, *S. longirostris*, *Stenella coeruleoalba* and *Stenella attenuata*.

Age determination of dugong, dolphin and whale

Adulyanukosl et al. (1998) firstly examined the age of 12 specimens of dugongs in Thailand and found that they were 1-43 years old. The oldest, 43 years old

dugong was a female, with 2.71 m in body length and 293 kg in weight, from Ranong Province (Field no: Du-048).

The teeth from 22 specimens of dolphins and whales (12 species) were also examined to reveal their ages. The maximum age was 27 years for a female *F. attenuata* (Field no: End-056; 201 cm and 70 kg) from Trang Province. Mother of a new born calf, *K. simus* (End-073; 230 cm and 135 kg) which was stranded at Satun Province on 28 February 1997 was estimated to be 8 years old and the teeth of the calf (End-074) had very clear fetal lines (Adulyanukosol, unpublished data).

DISCUSSION AND CONCLUSION

Dugongs are rare and confined to some areas of both coastlines of Thailand. In the Andaman Sea, they have been found along the coast from Ranong to Satun Provinces. In the Gulf of Thailand, they have been found in several coastal provinces, namely, Chonburi, Rayong, Chantaburi, Trat, Chumporn, Surat Thani and Nakorn Si Thammarat. Although, the systematic and comprehensive aerial survey on dugong population in Thai waters has not been conducted yet, they are believed to present more in the Andaman Sea than in the Gulf of Thailand.

Dugongs are still found at a substantially high number at Talibong-Muk Islands, Trang Province. This seems likely be the last place in Thai waters where the large viable population of dugongs exist. Thus, it is critically needed to conserve and manage the area. In particular, the fishing practices that might cause violation to dugongs should be either regulated or prohibited in the dugong habitats. Dugongs will soon vanish from Thai waters if conservation strategies of dugong are not succeeded. In the present report, the recommended area to be established as the Dugong Sanctuary of Thailand is the area around Talibong -Muk Islands.

Twenty-one species of dolphin and whale are currently found in Thai waters; 17 species in the Andaman Sea and 14 in the Gulf of Thailand. Some species of cetaceans found in Thailand are smaller than those found elsewhere, such as Bryde's whale (*B. edeni*), bottlenose dolphin (*T. aduncus*, tropical form) and spinner dolphin (*S. longirostris*, dwarf form). The 7 species (*P. macrocephalus*, *K. simus*, *M. ginkgodens*, *F. attenuata*, *S. coeruleoalba*, *S. attenuata* and *Lagenodelphis hosei*) which were not found in the Gulf of Thailand, are primarily oceanic species. The Gulf of Thailand is a shallow and semi-closed sea with a maximum depth of ca. 85 km, so that a few oceanic species are found. Although, the Andaman Sea is an open sea, still there are many shallow water areas or river mouths. Hence, several of either coastal or more oceanic species, which are still not recorded in the Andaman Sea, are expected to be found in future.

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