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CHAPTER

15

Conserving Dolphins in the Mekong River: The Complex Challenge of Competing Interests

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1. INTRODUCTION

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Attempts to conserve the critically endangered population of Irrawaddy dolphins (*Orcaella*

brevisrostris) (Owen in Gray, 1866) inhabiting the lower Mekong River (Fig. 15.1) are an example of the challenge of conserving endangered species in complex economic, political, and social



FIGURE 15.1 Map showing the study area of the lower Mekong River. The area ranged from the Laos/Cambodian border (Muang Khong) south to the Vietnamese Delta (including Tonle Sap Lake). The Kratie to Khone Falls river section is the only area in the river where dolphins were sighted. The southern part of this river stretch is in Kratie Province, the upper part is in Stung Treng Province. Base map produced by Matti Kummu and reproduced with his permission.

situations. This Irrawaddy dolphin population is small, declining, and facing numerous threats to its survival. The subpopulation inhabiting the Mekong River was classified as critically endangered by the World Conservation Union (IUCN) in 2004 (Smith and Beasley, 2004).

The Irrawaddy dolphin was originally described as the short-snouted porpoise from

a specimen found at the mouth of the Vishakhapatnam (Vizagapatam) River, along the east coast of India, in 1852 by the Englishman Sir Richard Owen (Owen, 1866). This small, unusual dolphin reaches a length of 2.75 m, is uniform gray in color with a white belly, has a rounded forehead, small dorsal fin, and disproportionately large paddle-like flippers (Fig. 15.2).



FIGURE 15.2 Irrawaddy dolphin calf from Koh Pidau Pool, Kratie Province, Mekong River. (See Color Plate 23)

The Irrawaddy dolphin is a facultative freshwater cetacean (i.e., it inhabits both fresh and marine waters) and is subject to increasing

human-induced threats as a result of its reliance on riverine and coastal habitats (Stacey and Leatherwood, 1997; Smith and Jefferson, 2002). The known global distribution of Irrawaddy dolphins is shown in Fig. 15.3. However, knowledge of the distribution of this species throughout its coastal range is still incomplete.

There are five freshwater Irrawaddy dolphin populations. Three populations occur in major Asian river systems: (1) the Mahakam population of Kalimantan, Indonesia (estimated population size of 70 individuals; *Kreb, 2004; Kreb, 2005; Kreb et al., 2007*); (2) the Ayeyarwady population of Myanmar (estimated population size 59-72 individuals; *Smith et al., 2007*); and (3) the Mekong population of southern Lao PDR (hereafter referred to as Laos), Cambodia and Viet

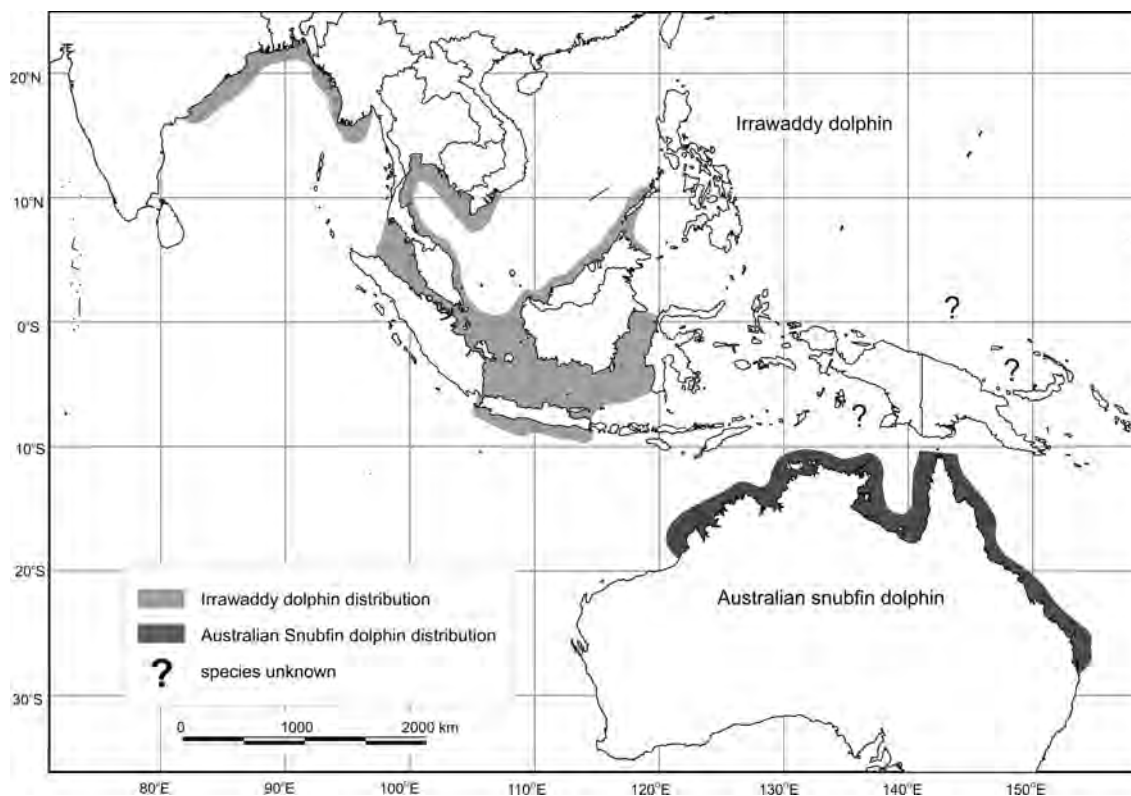


FIGURE 15.3 Distribution map of the Irrawaddy and Australian Snubfin dolphin.

Nam (estimated population size 108-146 individuals; Beasley, 2007; Beasley *et al.*, 2007; see below). Two populations occur in brackish/freshwater lakes: (1) the Songkhla Lake population in Thailand (estimated population size of <20 individuals; Beasley *et al.*, 2002a; Kittiwattanawong *et al.*, 2007); and (2) the Chilka Lake population in India (estimated population size of at least 85 individuals, Pattnaik *et al.*, 2007).

p0185 Irrawaddy dolphins were also believed to occur in the coastal waters of Australia (Stacey and Arnold, 1999; Stacey and Leatherwood, 1997). However, the Asian and Australian stocks of *Orcaella* were designated as a separate species in 2005, on the basis of consistent differences in color, cranial and external morphometrics, postcranial morphology, and genetics. The Australian species is now named the Australian snubfin dolphin (*Orcaella heinsohni*) (Arnold and Heinsohn, 1996; Beasley *et al.*, 2002b, 2005a). The separation of the Asian and Australian stocks of *Orcaella* into two species increases the conservation challenge in both regions.

p0190 Freshwater habitats are subjected to significant human disturbance (Abell, 2002; Dudgeon 2000a,b,c,d; Saunders *et al.*, 2002). Irrawaddy dolphins are highly susceptible to anthropogenic impacts as a result of their occurrence in small, isolated populations, strict habitat preferences, apparent high site fidelity, slow maturation rate (7-9 years), long calving interval (2-3 years), and most importantly, their close proximity to human activities in freshwater ecosystems (Smith *et al.*, 2003). Most freshwater populations of Irrawaddy dolphins are small, declining, and listed as critically endangered by the IUCN. Nonetheless, there has been a notable lack of on-the-ground conservation measures to conserve most of these populations.

p0195 In this chapter, we present the results of recent research and conservation efforts focused on the Irrawaddy dolphin population inhabiting the lower Mekong River of southern Laos,

Cambodia, and Viet Nam. We also discuss the potential for successful future conservation of the dolphins and the Mekong River ecosystem; in an environment in which significant economic, political, and social considerations are influencing management initiatives.

2. HISTORICAL ACCOUNTS OF IRRAWADDY DOLPHINS IN THE MEKONG RIVER

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Irrawaddy dolphins were first reported **p0200** from the Mekong River in the mid-1860s by the Frenchman Henri Mouhout, who ~~rediscovered~~ the Cambodian Ankor ruins (Mouhout, 1966). In early August 1860, Mouhout was traveling on the Tonle Sap River past Phnom Penh and he noted “shortly afterward we entered the Mekon [sic], which was only now beginning to rise . . . here shoals of porpoises sail along with their noses to the wind, frequently bounding out of the water” (Mouhout, 1966, p. 173).

The first dedicated study of dolphins’ inhabiting the Cambodian Mekong River was conducted **p0205** in 1968/69 by a French doctoral student, Renee Lloze, who observed dolphins along the river from the Vietnamese/Cambodian border north to just past Kratie township, including Tonle Sap Great Lake (Lloze, 1973). Lloze’s team captured and necropsied two Irrawaddy dolphins from the northern Cambodian Mekong River for studies on anatomy, feeding, and skeletal morphology. The only known historical reports of dolphins in the Vietnamese Mekong River are from the 1920s. These reports were apparently collected by Frenchmen Gruvel (1925) and Krempf (1924-1925) (cited by Lloze 1973).

These early records suggest that dolphins **p0210** historically occurred throughout the lower Mekong River, from the bottom of Khone Falls (Fig. 15.1), south to the Vietnamese Delta (including Tonle Sap Great Lake), perhaps

numbering at least a few thousand individuals. No historical or contemporary dolphin records are known from the mainstream Mekong River north of the Khone Falls. As a result of political instability, war, and internal conflict, little research had been conducted on the Mekong dolphin population before the early 2000s, as described below.

s0020 **2.1. Country Status**

s0025 **2.1.1. Laos**

p0215 In the early 1990s, field research by Canadian Ian Baird of the Lao Community Fisheries and Dolphin Protection Project (LCFDPP) confirmed the presence of Irrawaddy dolphins in southern Laos, and to a lesser extent in northeast Cambodia. Baird and his Laotian counterparts conducted studies on the dolphins' distribution and feeding and investigated mortality rates and causes at Chiteal Pool (known as "Vern Nyang," or "Boong Pa Gooang" in Laos) on the Laos/Cambodian border from 1991 to 1997 (Baird and Mounsouphom, 1994, 1997). Baird also conducted interviews with local fishers in the Sekong, Srepok, and Sesan rivers (which converge with the Mekong River at Stung Treng, Cambodia, 500 km from the river mouth) in Cambodia and Laos. These interviews confirmed that dolphins historically ascended all three rivers, to approximately 280 km up the Sekong River (to Kaleum District) in southern Laos. A German scientist investigating the use of nontimber products also confirmed through interviews that two dolphins had been shot near Sekong town in the Sekong River of southern Laos in 1990 (Bergmans, 1995).

s0030 **2.1.2. Cambodia**

p0220 Very little research had historically been conducted on dolphins inhabiting the Cambodian Mekong River. A Cambodian national, Touch Seang Tana, conducted the first studies from 1994 to 2000. Tana conducted observations,

interviews, and opportunistically collected carcasses, concluding in a 1996 report that the species was rare in Mekong River waters as a result of human activities, including direct persecution for oil extraction in Tonle Sap Great Lake during the mid-1970s (Perrin *et al.*, 1996). Baird combined boat surveys and interviews to assess the abundance and distribution of dolphins in the upper Cambodian Mekong River in 1996, and estimated that no more than 200 individuals remained in the entire river (Baird and Beasley, 2005). No further studies on the dolphins were conducted in Cambodia, until the Mekong Dolphin Conservation Project (MCDP) began in 2001 (see Section 3).

2.1.3. Viet Nam

There are very few historical dolphin records from Viet Nam, and no previous dedicated studies. There are three recently confirmed reports (with photographs) of Irrawaddy dolphins found dead in fishers' nets from the Vietnamese Mekong River near the Vietnamese/Cambodian border. These carcasses were discovered in 2000, 2002, and 2005 (Beasley *et al.*, 2005b; Chung and Ho, 2002). Irrawaddy dolphin specimens have recently been discovered in various Vietnamese whale temples in Vung Tau and Binh Thang, near the Mekong River Delta (Beasley *et al.*, 2002b; Smith *et al.*, 1997). However, these specimens are probably from coastal populations, as there are local reports of Irrawaddy dolphins occurring along the Vietnamese coast (Beasley *et al.*, 2005b).

2.2. Existing Dolphin-Watching Tourism

In the Mekong River, dolphin-watching tourism is facilitated by the reliable occurrence of dolphins in small deep-water pools throughout the year. There are two locations where tourists can view Irrawaddy dolphins in the Mekong River: (1) Chiteal Pool on the Laos/Cambodian border; and (2) Kampi Pool in Kratie Province, Cambodia.

p0235 Dolphin-watching tourism at Chiteal Pool was initiated by three Laotian villages in the late 1990s. This initiative initially used rowboats, expanding to boats with engines by the early 2000s. Cambodia nationals initiated small-scale tourism to observe the dolphins at Chiteal Pool in the early 2000s, using fast speedboats from Stung Treng township.

p0240 In the late 1990s, an international nongovernment agency named Community Aid Abroad initiated small-scale dolphin-watching tourism using rowboats at Kampi Pool, 15 km north of Kratie township. This industry subsequently expanded to larger boats with engines in the early 2000s. Only seven families from the village were involved in this dolphin-watching tourism, an arrangement that subsequently created conflict and resentment among other village members who were not allowed to participate. Section 4 further discusses the biological, social, economic, and political ramifications of the dolphin-watching tourism.

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3. THE MEKONG DOLPHIN CONSERVATION PROJECT

p0245 In January 2001, the MDCP was initiated as part of the first author's Ph.D. research at James Cook University, Australia (Beasley 2007). This project represented the first comprehensive attempt to research and conserve the dolphin population along the entire lower Mekong River. Research was the primary focus of activities from 2001 to 2002, and dedicated conservation activities began in 2003. All activities were conducted in cooperation with the Cambodian Department of Fisheries, which was extremely supportive of all aspects of the project. Beasley was the full-time project manager for 4.5 years. The MDCP also comprised one full-time senior level Department of Fisheries official, various part-time provincial fisheries officials, and two full-time local staff. All project activities were designed to contribute

toward a comprehensive understanding of the dolphin population on which to base initiatives to ensure the population's long-term survival.

3.1. The Critically Endangered Status of the Mekong Dolphin Population

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The research results from the MDCP till April 2005, confirmed that the Irrawaddy dolphin population inhabiting the Mekong River is very small, declining, and facing continuing threats.

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3.1.1. Dolphin Distribution and Ranging Patterns

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MDCP conducted boat surveys from 2001 to 2005 along the entire lower Mekong River from the bottom of Khone Falls on the Laos/Cambodian border south to the Vietnamese Delta (including Tonle Sap Great Lake) (see Fig. 15.1). Over 14,000 km of survey effort were conducted along the river. These surveys confirmed that Irrawaddy dolphins are now primarily distributed along the Kratie township to Khone Falls river stretch (approximately 190 km) and rarely move south of Kratie township, even during the wet season. Although up to a hundred deep-water areas have been recorded between Kratie and Khone Falls, dolphins frequently occur in only 12 deep-water pools. Deep-water areas in the Mekong River have also been described as essential for fish and fisheries during the dry season (Coates *et al.*, 2003; Poulsen and Valbo-Jorgensen, 2001; Vannaren and Sean, 2001).

p0255

Intensive photo-identification studies were conducted to investigate the ranging patterns of individual dolphins, which were identified using distinctive features on their dorsal fins (such as nicks and injuries). Individual Irrawaddy dolphins exhibited extremely high site fidelity and preferred particular areas of the river. Analysis of the ranging patterns for the 15 most frequently sighted identifiable individuals showed that on average, each individual ranged over only 16 km² in the dry season

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(range: 0.7-73.0 km²), and used the same deep water pools each year. During the wet season, as a result of increased water levels and less obstruction to dolphin movements along the river, the area over which individual dolphins ranged expanded to 42 km² (range: 0.9-99.0 km²).

p0265 Four largely discrete subpopulations of dolphins were evident: (1) Kampi, (2) Koh Pidau, (3) Stung Treng, and (4) Chiteal (Fig. 15.4). Although dolphins from the Kampi and Koh Pidau subpopulations interacted during the wet season at Phum Kreing (2 km upstream from Kampi Pool), dolphins from the Stung Treng and Chiteal subpopulations appeared isolated both from each other, and from the other subpopulations.

s0060 3.1.2. A Critically Small Population

p0270 The abundance of the Irrawaddy dolphin population in the Mekong River was estimated using three methods: (1) capture-recapture analysis of photo-identified individuals, (2) line-transect methodology, and (3) direct count survey methodologies. The three survey methodologies were compared to ascertain the most appropriate survey technique for accurate and precise long-term monitoring (Beasley, 2007).

p0275 Boat surveys using direct counts and line-transect methodologies were undertaken throughout the lower Mekong River south of Khone Falls. During these surveys, dolphins were sighted only in the Kratie to Khone Falls river section—no dolphins were sighted south of Kratie township.

p0280 Ninety-nine adult dolphins were individually photo-identified during the 4-year study period, with 83% of the population estimated to be photographically identifiable (Fig. 15.5). A closed capture-recapture model (incorporating known mortalities) was used to estimate the size of the total population using photo-identification. Based on the results obtained from photo-identification, the total Irrawaddy dolphin population in the Mekong River was 127 individuals (range: 108-146), as of April



FIGURE 15.4 Distribution of Irrawaddy dolphins inhabiting the Mekong River, based on all dolphin sightings obtained between January 2001 and April 2005. Kratie province is shown on the left map and Stung Treng Province, which is further north (see Fig. 15.6) on the right map. Sightings are separated into dry season (red dots) and wet season (yellow dots). Map created by Erin LaBreaque and reproduced with her permission.

2005. Comparisons of survey techniques indicate photo-identification is the preferred methodology for population monitoring because of its efficiency and precision. Irrespective of the differences between survey methodologies, the

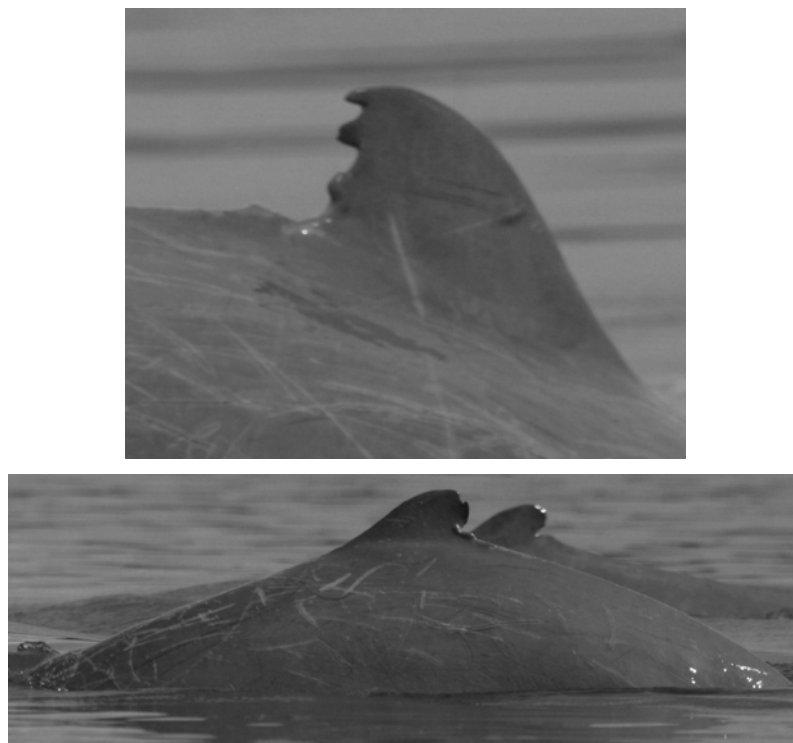


FIGURE 15.5 Photo-identification was one of the primary techniques used to estimate abundance of Irrawaddy dolphins in the Mekong River. Examples of excellent quality photographs of two well-known dolphins; KA05 Rags (top) and CH01 Chital (bottom), used in the capture-recapture analysis.

total number of Irrawaddy dolphins inhabiting the Mekong River is very small, and the population is now facing a very uncertain future.

Very small populations are at risk, simply because of their size (Berger, 1990; Caughley and Gunn, 1996; Reed *et al.*, 2003; Soule, 1986). Small populations are particularly susceptible to threats such as demographic stochasticity, environmental stochasticity (including natural catastrophes) and genetic stochasticity, (Caughley and Gunn, 1996). As a result of the small remaining Mekong dolphin population, it will be difficult to detect a statistically significant declining trend (Taylor and Gerrodette, 1993). By the time a trend is detected with a high level of statistical confidence, the population will be

approaching local extinction (Beasley, 2007). Scientists and managers have emphasized the need for a precautionary approach toward management of seemingly small and declining populations (Mayer and Simmonds, 1996; Pichler *et al.*, 2003; Thompson *et al.*, 2000). Such a precautionary approach should be taken for the Irrawaddy dolphin population inhabiting the Mekong River.

3.1.3. Social Structure

School dynamics and social structure were investigated using the photo-identified individuals. Average group size during the dry season was 6.8 dolphins + S.E. 0.2 (range: 1-19; $n = 405$); the corresponding figures for the wet season were 5.7 dolphins + S.E. 0.41

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(range: 1-34; $n = 107$). Analysis of the association patterns of individual dolphins (the frequency that individuals associate with other individuals in the population), were conducted using the computer program SOCPROG (~~developed by Hal Whitehead from Dalhousie University~~; Whitehead 1997, 2005). Association values ranged from 1 (animals always seen together) to 0 (individuals never seen together). The resulting association values demonstrated that individual dolphins were seen with a particular companion significantly more often than would be expected by chance. This indicated that the population is highly structured, with most individuals having preferred, long-term associates.

p0295 From a management standpoint, there are two primary implications of social structure studies.

p0300 Firstly, it is critical that effective on-the-ground conservation efforts are focused on each of the four subpopulations and their associated critical habitats. Some subpopulations are small (e.g., Chiteal); however, conservation and management efforts should continue to be a high priority for each area.

p0305 Secondly, translocation programs to repopulate critical areas are probably not a viable conservation option. Translocation programs in which dolphins from one community (e.g., Kampi) are moved to a smaller community (e.g., Chiteal) are unlikely to be beneficial to the long-term survival of the population. In addition to the high probability of mortality during capture and transport (Fisher and Reeves, 2005), the removal of one or more individuals from a socially stable group may negatively affect the group that the individual(s) are taken from, the individual(s) that are translocated to a new group, and/or the new group that the individual(s) are translocated into.

s0070 **3.1.4. Unsustainable Dolphin Mortalities**

p0310 In 2001, MDCP initiated a carcass recovery program throughout the lower Mekong River to collect and conduct necropsy on all dead

dolphins and attempt to determine the cause of mortalities. During the first few years of the stranding program few local people were aware of the reporting procedure (or MDCP), a situation that resulted in only a few carcasses being reported, often many months after a dolphin had died. However, at the end of 2002, MDCP conducted a large-scale awareness campaign about the importance of reporting dolphin carcasses. As a result of these efforts, dolphin carcasses were often reported within days of death from 2003 onwards. A total of 54 dolphin carcasses were recovered and/or confirmed between January 2001 and April 2005 (Gilbert and Beasley, 2006). Forty-three percent of all carcasses recovered were newborns (see Table 15.1). Interestingly, only one carcass of a juvenile dolphin has been recovered since 2001, potentially indicating that there is very little recruitment into the population as a result of the high number of newborn mortalities. Newborn mortalities after 2005 have continued to be high, with 16 in 2006, and nine as of April 2007 (WWF Cambodia Program, personal communication).

The cause of the high number of newborn p0315 deaths is unknown. If the Irrawaddy dolphin population inhabiting the Mekong River has any chance for survival, it is imperative that the cause(s) for newborn mortality are established, and subsequently managed. The population will not survive in the long term unless newborn survival increases.

Entanglement in gill nets and direct deaths p0320 through destructive fishing practices (e.g., dynamite fishing) are known causes of mortality of some adult dolphins. Other potential indirect causes of dolphin mortality include habitat degradation, contaminants, disease, boat harassment and noise, boat collision, reduced fish stocks, and inbreeding depression. As of April 2005, the Irrawaddy dolphin population in the Mekong River was estimated to be declining at a yearly rate of at least 4.8% on the basis of the mortality rate evident in the carcass

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TABLE 15.1 Total confirmed and unconfirmed dolphin mortalities in the Mekong River from January 2001 to April 2005

Year	Confirmed deaths	Unconfirmed deaths	Confirmed adults	Confirmed newborns/ young calves	Confirmed unknown age
Pre-2001	8	–	4	–	4
2001	3	–	2	1	–
2002	5	1	4 ^a	1	–
2003	15	3	10	5	–
2004	16	–	5	11	–
(Jan-April) 2005	7	–	2	5	–
Total	54	4	27	23	4
Total (2003 to April 2005)	38 (31)	3 (3)	17 (15)	21 (16)	–
Average/year (Jan 2003 to April 2005)	13 (15.5)	1 (1.5)	6 (7.5)	7 (8)	–

Note: Data obtained from Jan 2003 onward is considered to be reliable and close to representative of the majority of dolphins that died in Mekong River. Totals and averages are presented for January 2003 to April 2005 in the last two rows in brackets. Confirmed totals include one carcass that was reported from the Vietnamese Mekong River (photographic evidence was available).

^aOne animal recorded as a juvenile (OBRE02-01/04) is listed with the adults to differentiate it from newborns/young calves.

recovery program and field evidence that few newborns survive for more than one month.

p0325 An example of the unsustainable mortalities and population decline is evidenced at Chiteal Pool, situated on the Laos/Cambodian border. In 1991, Baird (1991, p. 2) stated “Although it is difficult to estimate the dolphin population near Hangorn village [Chiteal Pool] at this time, our group did see 20-30 animals there at one time.” Based on recent surveys, the Chiteal population has experienced a significant decline since 1991, and numbered only nine individuals, as of April 2005 (Beasley, 2007). As a result of high site fidelity exhibited by individual dolphins in the river and resightings through photo-identification, it is highly unlikely that this decline is associated with movements out of the area. Interestingly, one individual photo-identified in 1996 by Stacey (1996), has remained

resident at Chiteal Pool through the duration of MDCP activities (2001-2005), and still remained in the pool in 2007, a period of 11 years.

Based on the estimated Mekong dolphin population size (Beasley, 2007) and typical growth rate of a cetacean population (4% per year, calculated from Wade, 1998), the most conservative level of anthropogenic mortality that the Mekong dolphin population can currently withstand (the Potential Biological Removal) is less than one individual per year (Beasley, 2007). If the Irrawaddy dolphin population inhabiting the Mekong River has any chance of survival, the primary management goals related to mortality reduction must be to (1) determine the cause(s) of newborn mortality and subsequently mitigate the causative factors, and (2) reduce anthropogenic mortality to zero (ideally in cooperation with local communities).

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s0075 **3.1.5. Local Knowledge and Perceptions**

p0335 Interviews with local people can provide extensive information about flora, fauna, and ecosystem functioning that would take researchers years, if not decades, to obtain independently (Johannes *et al.*, 2000). Few historical accounts of dolphin occurrence in the Mekong River exist with which to compare current abundance and distribution records. However, as detailed in Section 2, the few historical published accounts indicate that dolphins were present throughout the lower Mekong River from the bottom of Khone Falls south to at least the Vietnamese/Cambodian border.

p0340 MDCP conducted extensive interviews with local communities throughout the lower Mekong River and associated tributaries (including Tonle Sap Great Lake) south to the Vietnamese Delta, to investigate the historical distribution of dolphins in the river and local perceptions toward dolphins and their conservation. A total of 497 local villagers were interviewed. The interviewees were mainly male fishers who spent much of each day on the river.

p0345 These interviews suggest a major decline in dolphin occurrence and abundance throughout most of the river. Reports confirm that dolphins previously occurred regularly from Kratie township south to the Vietnamese Delta, during both dry and wet seasons. Dolphins are now rarely sighted in this region. Interviewees identified the Kratie to Khone Falls river segment as the most important habitat remaining for dolphins in the lower Mekong River. These conclusions confirm the results of the MDCP dedicated boat surveys.

p0350 Local communities in both Cambodia and Laos hold very positive attitudes toward Irrawaddy dolphins, a situation which significantly assists with securing local cooperation for management strategies. Part of this local reverence results from local folklore about the Irrawaddy dolphin's human origins (see Box I and Box II).

Although dolphins are not currently deliberately caught in the Mekong River, dolphins reportedly suffered significant human-induced mortality during the 1950-1980s. The first major episode of direct catch reportedly occurred in the early 1950s, and was caused by a fishing lot owner in Tonle Sap. This man apparently did not want dolphins eating fish near his fishing lot, so he ordered his workers, at least once, to use a seine-net to catch and then kill as many dolphins as possible in the area around his fishing lot. The significant direct catch of dolphins before, during, and directly after the Vietnamese War/Pol Pot Regime periods, is probably responsible for a major decline in dolphin numbers. During the Pol Pot regime, many dolphins were allegedly captured in Tonle Sap Lake by the Khmer Rouge who used the oil from dolphins in lamps and motorbike and boat engines, and also ate dolphin meat. After the Pol Pot Regime when guns were abundant throughout the country, Vietnamese and Khmer soldiers reportedly shot at dolphins for target practice. Many interviewees from Stung Treng Province in Cambodia reported that they had observed groups of dead dolphins floating dead downstream after the Pol Pot Regime (Beasley, 2007).

Few of the respondents to the MDCP survey had recently sighted dolphins in the river south of Kratie township. Elderly respondents south of Kratie township reported that historically dolphins regularly occurred in the river in front of their village. However, now children in these same villagers have never seen dolphins and many children believe dolphins are mythical creatures, similar to dragons (Beasley, 2007).

3.2. MDCP Conservation Initiatives

MDCP research established that the Irrawaddy dolphin population inhabiting the Mekong River was small and facing unsustainable mortalities. In 2003, in parallel with

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BOX I

CAMBODIAN DOLPHIN FOLKLORE

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The legend of the dolphin in Cambodia refers to beliefs and gods from the Indian Brahmic civilization, which left a strong mark on the Khmer civilization (Lloze, 1973). According to the legend, as quoted from Lloze (1973):

There was once, near a Khmer village, a banian tree inhabited by a spirit. A young girl came to the tree one day to make an offering to the spirit, who, highly moved, recognised in her the woman that he had loved during one of his previous lives. In order to live once again with her, as he was still in love with her, he asked for the help of the powerful god Indra, who gave the spirit the power to change into a python so that he could go and see the young girl without being recognised by the people of the village. The spirit was therefore able, each night, to go and pay a loving visit to his beloved, to whom he had, of course, made it known who he was.

To complete the happiness of his lover, and to reward her parents for their co-operation, the spirit revealed to them the location of a treasure hidden in the forest that made the family very rich. This story spread and made the simple people very envious. In a neighbouring village, a peasant couple thought that it would be enough to marry their daughter off to a python in order to acquire a great fortune. The peasant therefore went to the forest and soon found an enormous python that was half dead of starvation. He brought the python

home and the preparations for the big ceremony began immediately. That night, the young bride was delivered to her starving husband, who, famished, started to devour her from the feet upwards. The cries of the poor bride made no difference as the parents were determined that this marriage be consummated.

The calm that descended again on the married couple's room raised the suspicions of the mother, who went to investigate. She went into the room and immediately understood the cause and effect between the disappearance of her daughter and the distended stomach of the full husband, and raised the alarm in the household. The father immediately opened the stomach of the animal and freed the girl, who was still alive but covered in foul-smelling mucus. Try as they might, washing her in warm water had no effect and the smell remained. The young girl decided to take a bucket and to go and wash herself with the water of the Mekong River. No result. Confused, shamed and desperate, she decided to throw herself into the river, after putting the wooden bowl on her head. Touched by her beauty and her youth, the spirit of the river took pity on her and turned her into a dolphin. This is how the legend of the dolphin came about, this extraordinary animal with the body of a woman, and the rounded and bald head, as if covered by a receptacle with a rounded base.

continuing research, MDCP initiated a series of conservation initiatives that aimed to contribute to conservation of the remaining dolphin population. These activities consisted of (1) large-scale local and government notification of the dolphin carcass recovery program and importance of reporting dolphin carcasses; (2) public-awareness raising of dolphin conservation

efforts through workshops, production of posters, information leaflets, and a Mekong dolphin coloring book; (3) increased enforcement of existing fisheries regulations through provision of a boat, engine and per diems to the local fisheries office; (4) initiation of an Integrated Conservation Development Project (ICDP) named "Dolphins for Development," which aimed to

BOX II

LAO DOLPHIN FOLKLORE

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Baird commented (1991, pg. 4), "One of the main reasons why many Laos people believe that dead people are reincarnated as dolphins is because there is a widely known traditional Lao fairy-tale about dolphins that has helped to popularise this idea".

p0020

The following account of the fairy tale was provided by Ian Baird and is reproduced with his permission. It should be noted that there are various versions of this fairy tale, each somewhat different. This is one common version:

"Long ago, in the time of our ancestors, there was a young princess in Luang Phrabang named Nang Sida. She liked to trade, and asked her father, the king, if she could go to do commerce in China. He reluctantly agreed, but he insisted that a servant be assigned to protect her during the trip. His name was Thao Kha. Although it was closer to travel overland from Luang Phrabang to China, the journey over the mountains was hard and dangerous. Therefore, it was decided that it would be better to travel down the Mekong River to the South China Sea, and from there to travel along the coast to China. Therefore, a large raft was prepared, and all kinds of food and goods for trading were put on the raft. Finally Nang Sida and Thao Kha started downstream. A chicken, a duck, a frog, a peafowl and a drongo bird were also on the raft with them. During this age it was said that people and animals could talk to each other.

After travelling many days down the Mekong River by raft, they approached the Khone Falls just north of the present-day border between Laos and Cambodia. Both Nang Sida and Thao Kha were unfamiliar with this part of the Mekong River, and did not know about the Waterfalls along the river. As they approached the Li Phi Waterfalls (Somphamit Waterfalls) (not the Khone Phrapheng Waterfalls as some people have incorrectly

reported), the chicken was standing at the front of the boat, and was the first to see the Falls. He called out, "chote, chote, chote" (the sound of a chicken, which also means 'stop, stop, stop' in English). The duck then became aware of the impending disaster and called out, "vat, vat, vat" (the sound of a duck, which also means to paddle to shore in English). The frog decided to take a look and jumped into the water. He could see the Falls from underwater, and when he came up, he called out, "leuk, leuk, leuk" (the sound of a frog, which also means 'deep, deep, deep' in English). The drongo bird flew up in the air and could see that the raft was going to go over the high Waterfalls. He called out, "sia khong sia sen, sia khong sia sen" (the sound of a drongo, which also means that one will lose his life in English). Finally, the peafowl called out, "peo vong, peo vong, peo vong" (the sound of a peafowl, which also means to follow the main channel of water in English).

Nang Sida and Thao Kha heard all the animals, and consulted about the situation. Nang Sida said, "Most of the animals say not to go any further, but the peafowl says to go ahead. Who should we listen to?" Thao Kha answered that the peafowl was larger than the other animals, and was their leader, so they should follow its advice. Nang Sida agreed, and so they kept going straight downriver, and soon after the raft went over the Li Phi Waterfalls. Those birds that could fly were able to survive, but everyone else died. Nang Sida was reincarnated as 'Nok Sida' (a river tern bird), and Thao Kha was reincarnated as 'Pa Kha' (a dolphin).

This story can explain some of the behaviour of the dolphins to this day. The dolphins never travel upriver of the Khone Falls, because Thao Kha dares not enter Laos. He fears that the king of Luang Phrabang will harshly punish him for not being

Continued

BOX II (cont'd)

able to follow his duty and protect the life of Nang Sida.

Secondly, one can observe that wherever there are dolphins in the Mekong River, there are river terns flying near the surface of the river nearby. River terns eat fish, as do dolphins. When the dolphins chase small minnows, they often try to escape, swimming near the surface of the water. This provides the river terns with the perfect opportunity to dive down and catch minnows to

eat. The dolphins appear to provide them with good chances for feeding. This can, in fact, be observed in nature, and it is believed that this occurs because Thao Kha is still the servant of Nang Sida, and therefore is obliged to help her find food to eat.

This story illustrates how the dolphin and the river tern came to be, and why they are as they are today."

provide direct tangible benefits to the local community in return for their cooperation with conservation activities; and (5) development of a Mekong Dolphin Conservation and Management Plan (which was formally adopted as Cambodian national policy in January 2005).

p0370 Probably the most significant conservation activity to contribute toward the conservation of the remaining dolphin population was the Dolphins for Development ICDP. This project was conducted in collaboration with a local Cambodian NGO, the Cambodian Rural Development Team (CRDT).

s0085 3.2.1. Dolphins for Development ICDP

p0375 It is now widely acknowledged that community participation is crucial to the long-term success of conservation strategies (Alpert, 1996). To encourage local coexistence with wildlife, there is a need to estimate and offset the economic costs of wildlife conservation, and importantly, to make wildlife conservation beneficial to local people (Prins, 1992; Prins *et al.*, 2000). The feasibility of community-based conservation initiatives (Berkes, 2004; Barrett *et al.*, 2001), and the usefulness of establishing protected areas (Wilke *et al.*, 2006) are still hotly debated. Recent attempts have been made to investigate strategies and incentives to increase local community cooperation with endangered

species' conservation, primarily in terrestrial protected areas (Ferraro, 2002). These conservation incentives lie on a spectrum from indirect (e.g., diversification of livelihood projects) to direct (e.g., land purchases), with respect to their conservation objectives (Ferraro, 2001; Ferraro and Kiss, 2002; Ferraro and Simpson, 2001; Main *et al.*, 1999; McShane and Wells, 2004).

The Dolphins for Development ICDP aimed to p0380 provide tangible benefits to local communities in exchange for their cooperation with conservation efforts. Project components included (1) rural development and diversification of livelihoods; (2) management of the existing community-based ecotourism; (3) education and awareness raising; and (4) strengthening stakeholder relationships. The first Dolphins for Development project was initiated in Kampi Village (adjacent to Kampi Pool) in April 2004. A second project was initiated at Chiteal Village (on the Laos/Cambodian border), in December 2005 (Beasley, 2005).

CRDT was able to build on the existing p0385 relationships established by MDCP in each village to initiate the development projects. CRDT then regularly emphasized the close link between dolphin and habitat conservation and the development and livelihood diversification activities that the community was receiving. Although the project was limited by the seasonal flooding of the areas, the low capacity of

villagers, and occasional political interference, examples of observable measures of short-term success included (1) increased infrastructure in the village; (2) diversification of livelihoods through provision of livestock and seeds; (3) increased ability of the villagers for infrastructure construction and livestock care; (4) community benefit from the dolphin-watching tourism through a community development fund; and (5) apparent (but unquantified) reduction of fishing activity in Kampi and Chit-eal pools.

p0390 Interviews to gauge each community's knowledge of dolphins, perceptions of dolphins, and conservation and socioeconomic status were conducted prior to the implementation of the Dolphins for Development project. It will now be important to repeat the questionnaire, to assess the success/failure of various project components (see the importance of project evaluation in Margoluis and Salafsky, 1998).

s0090 **4. THE ECONOMIC, POLITICAL, AND SOCIAL COMPLEXITIES OF MEKONG DOLPHIN CONSERVATION**

p0395 The three countries of the lower Mekong region; Laos, Cambodia, and Viet Nam, are developing quickly and face burgeoning pressures from human overpopulation, excessive exploitation of resources, poverty, lack of basic services, and wide-scale corruption at all social levels. When developing strategies to conserve and manage the Irrawaddy dolphin population in the Mekong River (as well as other flora and fauna), consideration of economic, political, biological, and social factors is of major importance. It is now recognized that successful conservation biology requires the integration of all these considerations (McShane and Wells, 2004). As Stankey and Shindler (2006) state:

effective policies for management of rare and little-known species must not only be scientifically valid and cost-effective but also consistent with prevailing social beliefs and values. Failure to foster understanding and support will leave management dominated by conflict and continued species loss.

The conservation situation in the Mekong p0400 River is beginning to resemble the dire situation in the Yantze River, China, where efforts to manage the Yangtze River dolphin, or baiji (*Lipotes vexillifer*) have failed. The baiji has recently been proclaimed "effectively extinct" after a large-scale survey throughout the river failed to sight a single individual (Lovgren, 2006). This unfortunate situation is largely as a result of extreme anthropogenic pressures (e.g., dam construction, agricultural and industrial pollution, riverine development, boat traffic, and fishing) associated with an exploited habitat, where 5% of the world's total human populations lives (Dudgeon, 2005; Yang *et al.*, 2006). Although baiji conservation efforts have been evident since the 1980s, the commitment to baiji conservation efforts by international NGOs, the Chinese government, and various stakeholders has been debated (Reeves and Gales, 2006). A major impediment to baiji conservation is the severely degraded state of the Yangtze River. There are no prospects for improvement in the near future (Dudgeon, 2005; Reeves and Gales, 2006). Recent debates regarding baiji conservation efforts are evident in the literature and unfortunately it appears that the baiji will be the first modern day cetacean species to become extinct (Dudgeon, 2005; Reeves and Gales, 2006; Wang *et al.*, 2006; Yang *et al.*, 2006).

Regardless of the future directions of baiji p0405 conservation efforts (if any), it is imperative that lessons are learnt from the unsuccessful efforts to date. The problems of habitat destruction, high human population growth in the catchment, and lack of stakeholder involvement and commitment need to be considered

and appropriate solutions applied to conservation of the Irrawaddy dolphin population inhabiting the Mekong River, and other freshwater dolphin populations.

s0095 **4.1. Early Progress with Dolphin Conservation in the Mekong River**

p0410 Although various issues associated with dolphin-watching tourism at Chiteal and Kampi pools were evident before MDCP began in the late 1990s, there was little economic and political interest in dolphin conservation in the region during the early 2000s. The Cambodian government (through the Department of Fisheries) was supportive of research and conservation activities, and MDCP was able to conduct most activities with little government intervention. The dolphin-watching tourism industry presented one of the greatest challenges to conservation (see Section 2.2), particularly at Chiteal Pool on the Laos/Cambodian border, where few restrictions were imposed on the boats involved with dolphin-watching tourism, or the revenue generated from the industry. The situation was initially somewhat different at Kampi Pool. An agreement for increased community benefit was reached between government and the Kampi community at the end of 2004 (discussed further in Section 4.4), and it seemed that the area showed promise for positive ecotourism.

s0100 **4.2. Recent Developments**

p0415 In January 2005, the World Wildlife Fund for Nature (WWF) Cambodia Program assumed formal responsibility for dolphin research and management in the Mekong River, as part of their Mekong Living Water's Initiative. In mid-2005, the Cambodian government developed the Commission for Dolphin Conservation, to direct future dolphin conservation efforts. The Commission initially had responsibilities for both dolphin conservation and the

promotion of tourism development, a potential conflict of interest when dolphins are a major target of tourism efforts. Large-scale tourism development focusing on the dolphins is now planned for the Kampi to Khone Falls river section. Already the number of tourism boats operating at Kampi Pool has increased to 20 (compared to 9 in 2005).

In 2005, the Cambodian Government also p0420 decreed that the Kratie to Khone Falls river stretch would be a gill net free area, in a well-intentioned attempt to conserve the remaining dolphin population from a major source of anthropogenic mortality. Unfortunately, there was no prior consultation with the local communities along the river, who commonly use gill nets for subsistence fishing. Additionally, no alternative livelihoods were provided (except independently by CRDT at Kampi and Chiteal Villages in 2004), or gear modification trials conducted, before this legislation came into effect. These well-enforced initiatives have inevitably alienated the local people, despite the communities' positive perceptions toward dolphins and demonstrated willingness to participate in small-scale management efforts previously initiated by MDCP.

4.3. Large-Scale Conservation Concerns s0105

Serious concerns for the survival of the dolphin population now exist resulting from various sources of habitat degradation. p0425

4.3.1. Dam Construction s0110

Plans for dam construction across the main-stream Mekong River in southern Laos and Cambodia are of paramount concern. The construction of a single large run-of-the-river dam in the mainstream Mekong River in southern Laos or Cambodia could quickly catalyze the extinction of the remaining Mekong dolphin population. The negative effects of large-scale dams on major river systems are well documented (Dudgeon, 2000a,b,c,d; McCully, 2001). p0430

p0435 Two dams are currently in the planning stage. One situated just north of Sombok, Kratie Province, is currently being investigated by a Chinese company. There are reportedly two options for this dam, one being a large-run-of-the-river dam that would block all traffic and fish migrations, and the other a smaller dam across part of the river, that would still allow boat traffic to pass (TERRA, 2007).

p0440 A second dam, the Don Sahong dam, is now planned for the mainstream Mekong River in the Khone Falls area, Khong District, Champasak Province, southern Laos. Recently, a Malaysian company, Mega First Corporation Berhad (MFCB), reportedly signed an agreement with the Laos government to conduct an 18-month feasibility study for the Don Sahong dam, with the goal of signing an agreement to build the dam if the study's results are favorable (TERRA, 2007). Construction of this dam would have significant negative ramifications for fisheries, the environment, tourism, and all communities along the Mekong whose livelihood depends on sustained fisheries, including communities in neighboring countries such as Cambodia, Viet Nam, and Thailand. As stated by Phil Hirsch, Director, Australian Mekong Resource Centre, in an open letter to governmental and international agencies responsible for managing and developing the Mekong River "the location of this proposed dam is probably the worst possible place to site a 240 MW project since it is the point of maximum concentration of fish migration in the river that supports to world's largest freshwater fishery" (TERRA, 2007).

s0115 **4.3.2. Contaminants and Disease**

p0445 As mentioned previously, the Irrawaddy dolphin population will not survive in the long term in the Mekong River unless the cause(s) of newborn mortality is established, and managed effectively. A major cause for concern, particularly for newborns, is the potential for contaminants to be released into the Mekong

ecosystem, working up the trophic level to potentially lethal levels in the dolphin population. In many cetacean populations, contaminants are known to be passed from the mothers' milk onto newborns, which can lead to reproductive failure, immunosuppression, and congenital defects (De Guise *et al.*, 1995). An example of the effects of contaminants is shown by a high incidence of tumors in the St Lawrence beluga (*Delphinapterus leucas*) population of Canada. This cetacean population has been recorded as having some of the highest concentrations of polychlorinated biphenyls (PCBs) in blubber of all cetaceans (De Guise *et al.*, 1995; Gauthier *et al.*, 1998).

Small-scale gold mining is prevalent in Cambodia, as documented in a recent report by Oxfam America (Sieng, 2004). Associated with these gold mines is the potential for mercury (used to separate gold from sediment), to enter waterways and accumulate in fish, which are subsequently eaten by dolphins (and humans). Other contaminants originating from agriculture uses and/or industry are additional cause for concern. p0450

Disease and toxins in the water system may also affect the dolphins' health, or even cause death, particularly in the event that the dolphins' immune system may be already compromised by other factors, such as habitat degradation, stress from boats, lack of prey, and/or reduced genetic fitness. p0455

s0120 **4.4. Dolphin-Watching Tourism: A Case Study of Economic Interests Influencing Conservation**

As explained above, there are two locations in the Mekong River where tourists can view Irrawaddy dolphins, Chiteal and Kampi pools. Tourism was initiated at Kampi Pool in 1997 by an international NGO, Community Aid Abroad, with a local committee of seven villagers from Kampi Village. From 1997 to 2000, viewing of dolphins was conducted p0460

sporadically from land, with no formal management. International tourists were also able to view dolphins by small rowboat, opportunistically, for a small fee (US\$1). Only the seven families were allowed to participate in the dolphin-watching tourism. In 2001, the seven villagers changed the small rowboats to larger “stand-up” paddle-boats with motors and sunshades over the boats for the tourists. These arrangements ensured tourist comfort and enabled dolphin viewing all year round (previously, the small rowboat was unsafe when the current was strong during the wet season).

p0465 In 2002, the Kratie Tourism Department became formally responsible for dolphin-watching tourism at Kampi Pool and cooperated with the seven families. No other families were allowed to participate in the venture and the financial benefits (50% of revenue) were distributed only to the seven families, with Kratie Tourism Department receiving the remaining revenue. Most villagers were unable to participate in the tourism but had lost their rights to fish in the pool as a result of a Provincial Decree prohibiting fishing in the pool in the early 2000s. Conflict was rife and the seven families became segregated from the other villagers. No management plan existed for tourism development and the boats were unregulated. Local people were unaware that the sound from the boat motors and the boats’ activities had the potential to interfere with the dolphins’ daily activities. Additionally, villagers were unable to communicate with foreign tourists and no information (verbal or printed) was provided to the tourists regarding the dolphins, or their conservation status in the river. Thus, the situation was unmanaged and unregulated and unable to contribute to dolphin conservation or management.

p0470 In March 2004, MDCP initiated a project to promote the sharing of revenue to the local community from the dolphin-watching tourism industry, as part of the Dolphins for Development project (see Section 2.1). The aims of

the community-based tourism project were to (1) promote community benefit from dolphin-watching tourism implemented prior to this project’s inception; (2) encourage effective management of this industry to minimize threats to the dolphin group inhabiting this area; and (3) promote visitor satisfaction and awareness raising of dolphin conservation and status.

MDCP developed dolphin-watching guidelines in cooperation with the boat owners and Kratie Department of Tourism, and produced awareness materials for tourists (printed in both English and Khmer). To promote community benefit, discussions and workshops were undertaken with all relevant stakeholders throughout the remainder of 2004. In December 2004, a written agreement was finalized and signed by the Kratie Department of Tourism to ensure that an entrance fee (US\$2 per international tourist, US\$0.15 per national tourist) would be introduced and shared between the community (40% for development activities), Department of Tourism (30% to ensure maintenance of the tourism site), and Department of Fisheries (30% for dolphin conservation activities). However, all revenue from the boat hire (US\$2-4 per hour for each boat) continued to go to the government and boat owners only. Critical to the success of this agreement was that the community had the capacity to manage these funds adequately and that all activities were accountable and transparent to preempt corruption. CRDT played an essential role in this process through the establishment and development of a Village Development Committee (VDC) that was able to initiate an effective process for management.

The newly formed Government Commission for Dolphin Conservation cancelled this agreement in January 2007—despite a national policy on poverty alleviation. The commission instead allowed the community to operate two of the 20 tourist boats cooperatively, and distribute the revenue gained from these two boats among the remaining 124 families. A flat

entrance fee of US\$7 per person was charged, as of April 2007; US\$1.50 was distributed to the relevant boat owners, and all other proceeds went to the government—no other revenue from the entrance fee went back to the community. Allowing more tourist boats to operate in the pool has significantly reduced the benefits to each boat owner, exacerbated village hostilities, and increased the level of boat harassment dolphins are exposed to daily.

p0485 There is no information on the effects the 20 tourist boats currently operating at Kampi Pool are having on the resident dolphins. However, studies of other dolphin populations indicate that continuing dolphin-watching tourism may have detrimental impacts. Such reported impacts have included (1) changes in swim direction (Lemon *et al.*, 2006; Nowacek *et al.*, 2001); (2) lengthened interbreath intervals (Lusseau, 2003a); (3) reduction in inter-individual distances (Bejder *et al.*, 1999); (4) changes in the types of surface behaviors exhibited (Lemon *et al.*, 2006); reductions in resting behavior (Constantine *et al.*, 2004; Lusseau, 2003b); (5) an increase in breathing synchronicity between individuals (Hastie *et al.*, 2003); (6) and increased rates of whistle production (Buckstaff, 2004).

p0490 The cumulative short-term effects outlined above may result in serious long-term conservation concerns. For example, in Shark Bay, Western Australia, bottlenose dolphins moved out of their preferred habitat in response to increased dolphin-watching tourism and the reproductive potential of females exposed to dolphin-watching tourism appears to have decreased (Bejder *et al.*, 2006).

p0495 As a result of the critically endangered status of the Mekong dolphin population, adequate studies on the effects of dolphin-watching tourism on dolphins in the Mekong River would be beneficial before the industry expands further at Kampi Pool, or to other areas of the river that dolphins are known to inhabit.

5. THE POTENTIAL FOR SUSTAINABLE CONSERVATION

s0125

The Irrawaddy dolphin population inhabiting the Mekong River now numbers fewer than 127 individuals, is declining, and facing continued threats. The survival of the dolphins is inextricable linked to the well-being of local communities along the river and requires their support for conservation.

p0500

To be effective, conservation initiatives must be ecologically, managerially, socially, and economically sustainable (Fig. 15.6). The present management arrangements for the dolphins in the Mekong River do not meet these criteria. While the complete ban on gill net fishing over 190 km river stretch may be designed to remove a significant threat to the dolphins, this arrangement is not sustainable from a social or managerial perspective because it has the potential to negatively affect thousands of local subsistence villagers along the river, and is likely to create significant resentment and hostility toward dolphins in the river. The present tourism arrangements at Kampi Pool are also unlikely to be locally accepted or sustainable, particularly since the effects of the dolphin-watching tourism on dolphin behavioral ecology remain unknown.

p0505

Establishing the cause(s) of newborn mortality is of critical importance to the populations' long-term survival. The retrieval of fresh dolphin carcasses to enable necropsy and adequate tissue examination by a qualified veterinarian is essential to this process. As evidenced during the MDCP, as a result of the remoteness of the river section that the dolphins inhabit, dolphin carcass retrieval fundamentally relies on the support and cooperation of the local community living along the river. Thus, the merits of a large-scale ban on gill-netting which may reduce dolphin entanglements must be carefully balanced against the negative effects of

p0510

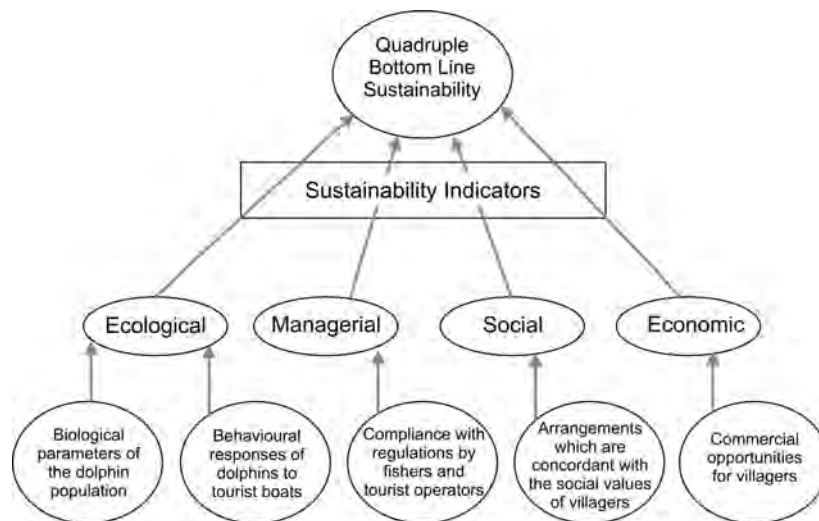


FIGURE 15.6 Conceptual framework for the arrangements required to ensure the sustainability of the Mekong River dolphin population. Modified from a diagram developed by Alastair Birtles and his research group at James Cook University.

alienating the local community and reducing their participation in conservation efforts, such as carcass recovery.

p0515 As with many conservation programs worldwide, it is a difficult management decision to gauge if short-term gains are worth the long-term loss of community support. For subsistence communities, the long-term loss may not just be a lack of support for the conservation efforts toward that species, but a loss of appreciation and support for any future conservation programs. As stated by Taylor and Gerrodette (1993), “endangered populations leave little margin for recovery from incorrect management decisions.”

p0520 Habitat degradation is also a serious concern. Even with the most comprehensive management plan accepted by all stakeholders, dolphins will not survive in the river if adequate habitat is not available. Dolphins rely on deep-water areas during the dry season and annual fish migrations to replenish fish stocks. The construction of

dams along the mainstream lower Mekong River (particularly southern Laos or Cambodia), will no doubt substantially increase the risk of the Mekong dolphin population’s extinction.

6. CONCLUSIONS

s0130

The freshwater Irrawaddy dolphin is a charismatic mega-vertebrate distributed along important river ecosystems. Such species have the potential to be effective flagship species for more generic freshwater biodiversity conservation initiatives that would benefit other riverine flora and fauna and local subsistence communities (Fig. 15.7).

p0525

The Irrawaddy dolphin population inhabiting the Mekong River is a remarkable natural asset. It will be a major loss to the people, government, culture, and environment of all lower Mekong countries if this dolphin population disappears forever.

p0530



f0040 **FIGURE 15.7** An Irrawaddy dolphin from Kampi Pool, Kratie Province, Mekong River. The Irrawaddy dolphin is a charismatic mega-vertebrate species that is ideal as a flagship species in the Mekong River. Photograph: Yim Sak Sang. (See Color Plate 24)

s0135 7. RECOMMENDATIONS

p0535 Based on four and a half years' experience researching and conserving the Mekong dolphin population, we provide the following recommendations for ways forward to contribute to the effective conservation of dolphins in the river.

- u0015 • Continue and expand the carcass recovery program, to ensure a qualified veterinarian examines all carcasses to (1) determine cause of death; (2) examine tissue samples for contaminants and disease; and (3) collect relevant samples for life history analyses. Establishing the cause of newborn death should be the highest priority.
- u0020 • Initiate immediate discussions and cooperation with local communities and relevant stakeholders to find a sustainable resolution to the gill net entanglements and preservation of fish stocks in the river. A detailed socioeconomic study of the effects of the gill net ban, local perceptions and potential solutions would be very beneficial.

- Based on the results of the socioeconomic survey above, reassess the ban on gill-netting from the entire 190 km river stretch, and if appropriate, instead focus conservation and rural development efforts on the deep-pool habitats commonly frequented by dolphins during the dry season. u0025
- Conduct immediate studies on the effects of dolphin-watching tourism on dolphins in the river and initiate management as required. These studies are essential before the industry expands further at Kampi Pool, or to other areas of the river dolphins are known to inhabit. u0030
- Conduct an independent review and evaluation of dolphin conservation (WWF Cambodian Mekong Dolphin Conservation Project and Government Commission on Dolphin Conservation) and rural development/livelihood diversification (Cambodian Rural Development Team) activities as a matter of priority, with appropriate program adaptation if required. u0035
- Continue dedicated long-term monitoring of the dolphin population, preferably through photo-identification. u0040
- Encourage all stakeholders (particularly high-level government officials), to express significant concern over plans to construct any dams on the mainstream Mekong River. u0045

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