CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

Inclusion of all species of the Genus *Kachuga* spp. in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) – with the exception of *Kachuga tecta* (Gray, 1831) that is already included in Appendix I:

According to Article II, paragraph 2 (a) of the Convention fulfilling the criteria A and B i in Annex 2 a of Resolution Conf. 9.24

Kachuga (Kachuga) dhongoka*	(Gray, 1834)
Kachuga (Kachuga) kachuga*	(Gray, 1831)
Kachuga (Pangshura) sylhetensis*	(Jerdon, 1870)
Kachuga (Kachuga) trivittata*	(Duméril & Bibron, 1864)

* Moll (1997) divided *Kachuga* in two subgenera, with *Pangshura* containing the small- and medium sized species. Recent publications even discuss whether *Pangshura* is a separate genus (Das 2001, 2002).

and according to Article II, paragraph 2 (a) of the Convention fulfilling the criterion A in Annex 2 b of Resolution Conf. 9.24

Kachuga (Pangshura*) *smithii*	
Kachuga (Pangshura) smithii smithii*	(Gray, 1863)
Kachuga (Pangshura) smithii pallidipes*	(Moll, 1987)
Kachuga (Pangshura*) *tentoria*	
Kachuga (Pangshura) tentoria tentoria*	(Gray, 1834)
Kachuga (Pangshura) tentoria circumdata*	(Mertens, 1969)
Kachuga (Pangshura) tentoria flaviventer*	(Günther, 1864)

* Moll (1997) divided *Kachuga* in two subgenera, with *Pangshura* containing the small- and medium sized species. Recent publications even discuss whether *Pangshura* is a separate genus (Das 2001, 2002).

B. Proponent

India and the United States of America.

C. Supporting statement

Two types of trade increasingly threaten Asian chelonians: Firstly, the large-scale trade for food and medicinal preparations is estimated to involve several million turtles annually (Compton 2000; McCord 1998; Salzberg 1998; Jenkins 1995). Secondly, a smaller but increasing number of turtles are exported as pets (Compton 2000; Thorbjarnarson *et al.* 2000; Pro Wildlife 2000).

About 25 percent of the world's chelonian species are presently affected by the demand of East Asian food markets. The number of chelonians on sale at Chinese markets alone is estimated between 12 and 20 million specimens annually, with most of them originating from the wild (Altherr & Freyer 2000; Meier 1999). Experts fear that many Asian turtle species will soon face extinction (Behler, cited in Kaesuk Yoon 1999; Pritchard 1997). As especially the trade for food is unselective, the variety of turtle species that are on sale depends on which species occur in the region. Already some rare species have disappeared from the markets and are supplemented by other species from countries further and further

away from the consumer countries. In general, every available turtle specimen is on sale and every available transport route, including roads, aircrafts, ships etc., is used (Pro Wildlife 2000; Compton 2001; ATTWG 2000). The parties to CITES have recognized the threat to chelonians in Resolution Conf. 11.9., that urges parties to undertake a number of steps for the conservation of especially Asian freshwater turtles and tortoises.

The genus *Kachuga* (English: Roofed Turtles) is found in Bangladesh, India, Nepal, Myanmar and Pakistan. All over the Indian subcontinent and throughout East and Southeast Asia, chelonians are exploited for subsistence and commercial use. International trade plays an increasing role, putting additional pressure on already dwindling populations:

Bangladesh is the center of turtle trade within and from South Asia (Bhupathy *et al.* 2000). All native chelonian species, including *Kachuga dhongoka, K. kachuga, K. smithii, K. sylhetensis* and *K. tentoria*, are exploited for local and international trade and their populations are losing ground (Rashid & Khan 2000). Local trade has been in existence for a long time, without having an adverse impact on the wild population (Rashid *in litt.* 2002). On an international level trade began in the mid-70ies. The number of species exploited increased from eight in the 1950s to seventeen in the mid-eighties (Rashid *in litt.* 2002). Rashid & Khan (2000) describe the situation as follows: *"With increased commercialization, which has involved massive collection throughout the year all over the country, an abrupt decline of turtle populations has been noticed."* Between 1981 and 1990 Bangladesh on average earned about USD 600,000 per year from turtle exports (Sarker & Hossain 1997). Since the early 90ies freshwater turtle exports boomed and resulted in a peak value of more than USD 8 million in 1996 / 1997 (Rashid & Khan 2000). Compared to the middle eighties the proceeds of turtle exports increased to more than the tenfold. The increasing trade is a serious threat to all native species, including *Kachuga spp.*. Major importers were countries in Southeast and East Asia, such as China, Thailand, Korea, Hong Kong, Singapore, Japan and Malaysia. Lower numbers of specimens were sent to pet markets in Germany, Italy, the UK and the USA (Rashid & Khan 2000; Thorbjarnarson *et al.* 2000).

In India, chelonians are heavily exploited for national and international commercial trade (McDougal 2000; Whitaker 1997). Populations of most native species declined, and in parallel prices at markets rose sharply. *Kachuga* species are affected by this trade (Whitaker 1997; Choudhury & Bhupathy 1993) and populations are decreasing (CAMP/BCPP 1997). Confiscations in India suggest that there are turtle trade routes to / from Bangladesh, Myanmar, Singapore and China (Compton 2000).

In Nepal, chelonians were widely distributed throughout several regions in the past. However, populations in the floodplains of many rivers sharply decreased as a result of collection, trade and habitat alteration (Shrestha 1997a). Exports of freshwater turtles aggravate this trend and a number of species, including representatives of the genus *Kachuga*, have become rare.

In Myanmar the existence of busy exports of native chelonians mainly to markets in southern China are undoubted even if this trade and its effects on wild populations remain largely unquantified, due to a lack of studies on distribution, status and trends (Platt *et al.* 2000). However, the authors emphasize that populations of native chelonians are now severely depleted, and some species may even face extinction.

Data on the situation of turtles in Pakistan are scarce. However, there are indications for increasing exports of turtles from Pakistan to China (Meier 1999, cited in Pro Wildlife 2000), Hong Kong (Lau *et al.* 1995), and Taiwan (Chen *et al.* 2000). These exports include specimens of different *Kachuga* species. *Kachuga smithii* and *Kachuga tentoria* are also shipped to pet markets in Europe and the USA (Marxsen 2001, IDB 2001).

During market surveys in China herpetologists in recent years found increasing numbers of chelonians originating from the Indian subcontinent, currently at least 20 species, including specimens of *Kachuga* spp. (Valentin 2000). McCord (1998) reports *K. dhongoka, K. kachuga, K. smithii, K. tecta,* and *K. tentoria* all being impacted by the food trade primarily in Guangzhou and Shenzhen, China. At least part of the shipments from South Asia is re-exported from China to Hong Kong (Lau *et al.* 1995).

As a consequence of unsustainable off-take, in combination with habitat loss, populations of all *Kachuga* species are in serious decline. *Kachuga sylhetensis* populations were depleted by 90 percent in only 10 years (CAMP/BCPP 1997). The still more abundant species *Kachuga smithii* and *Kachuga tentoria*, recently experienced significant population declines as they are now used as substitutes for formerly preferred species, that are no longer available in sufficient amounts. Due to human population growth and increasing economic development in South and East Asian countries it has to be assumed that the demand for chelonians, including *Kachuga* spp. will increase further in the near future. Late-maturing animals such as freshwater turtles are easily over-collected (Burke *et al.* 2000; Klemens 2000). Given their comparatively low reproduction rate Roofed Turtles are not able to compensate the ongoing, clearly unsustainable off-take.

The *IUCN SSC Tortoise and Freshwater Turtle Specialist Group* has reviewed the IUCN Red List status (IUCN 1996) for Asian turtles and recommended a higher classification for all but one *Kachuga* species included in this proposal (IUCN/SSC TFTSG 2000). With one species characterized as "critically endangered", three as "endangered" and two as "lower risk", and all of these six species with significant decline of wild populations due to over-exploitation, an inclusion of *Kachuga* spp. (with the exception of *Kachuga tecta* that is already listed in Appendix I) in CITES Appendix II is not only justified but also necessary to reduce off-take to a sustainable level. A listing of all Asian chelonians in at least Appendix II was recommended by several workshops (AC 2002a; ATTWG 2000). Although additional protection measures, including enforcement of national laws, conduction of comprehensive market surveys, and extension of protection areas are also necessary, a CITES Appendix II listing of *Kachuga* spp. would be a vital step for the medium- and long-term survival of Roofed Turtles and is strongly recommended (Rhodin *in litt.* 2001b; c; Pro Wildlife 2000).

Table 1 summarizes population status and trend of the six *Kachuga* species that are covered by the present proposal as well as threats to their survival.

Species	Countries of origin	Population status	Population trend	Threats
Kachuga dhongoka Three-striped roofed turtle	Bangladesh, India, Nepal, Myanmar (?)	IUCN (2000): "endangered" (EN A1cd + 2cd), upgraded from formerly "lower risk, not threatened" in Red List (1996); Bangladesh: critically endangered India: endangered / critically endangered	Within 10 years decline of 20 percent, indications for commercial extinction, local extinction in some regions of India	National and international trade for consumption of eggs, meat and shells; habitat destruction
Kachuga kachuga Red-crowned roofed turtle	Bangladesh, India, Nepal, Myanmar (?)	IUCN (2000) "critically endangered" (CR A1cd), upgraded from formerly "endangered" in Red List (1996) Bangladesh: endangered; India: critically endangered; Nepal: rare	Decline of more than 80 percent within 20 years; local extirpation in Bangladesh	National and international trade for consumption of eggs, meat and shells; habitat destruction
Kachuga smithii Brown roofed turtle	Bangladesh, India, Nepal, Pakistan	IUCN (2000): "lower risk, not threatened"; formerly not listed in Red List (1996) Bangladesh: endangered	local populations experience over-exploitation; decline not quantified	National and international trade for consumption of eggs, meat and shells; exports for international pet market; habitat destruction
Kachuga sylhetensis Assam roofed turtle	Bangladesh, India	IUCN (2000): "endangered" (EN B1 + 2c), upgraded from formerly "data deficient" in Red List (1996) Bangladesh: endangered; India: critically endangered	Collapse by 90 percent within 10 years	National and international trade for consumption of eggs, meat and shells; habitat destruction
Kachuga tentoria Indian roofed turtle	Bangladesh, India, Nepal	IUCN (2000): not included in Red List; however recommended as "lower risk" by the IUCN/SSC TFTSG 2000) Bangladesh: endangered , India: vulnerable for *K.t. circumdata* and *K.t. flaviventer;* Nepal: rare	Decline of more than 20 percent within 10 years; decreasing abundance on sale	National and international trade for consumption of eggs, meat and shells; exports for international pet trade, habitat destruction
Kachuga trivittata Burmese roofed turtle	Myanmar	IUCN (2000): "endangered" (EN A1c), now even discussed for "critically endangered" or even "extinct"	Sharp decline of populations, locally extinct in Irrawaddy delta	National and international trade for consumption of eggs, meat and shells; habitat destruction

Kachuga dhongoka

1. Taxonomy

1.1 Class: Reptilia

1.2 Order: Testudines (Chelonia)

1.3 Family: Bataguridae

1.4 Species: *Kachuga (Kachuga) dhongoka* (Gray, 1834)

1.5 Scientific synonyms: *Emys dhongoka* (Gray, 1834)
Emys duvaucelii (Duméril & Bibron, 1835)
Kachuga hardwickii (Gray 1869)

1.6 Common names:

English:	Three-striped roof(ed) turtle, Dhongoka roof turtle
French:	Kachuga à cou rayé
Spanish:	
Bangladesh:	dura kaitta
Bengali:	sada katha, boro katha
German:	Dhongoka-Dachschildkröte
Hindi:	dhoor, dhona, dhundi
Nepal:	Dodare, Dodari

1.7 Code numbers:

2. Biological parameters

Specimens of *Kachuga dhongoka* are of medium to large size and have a characteristic pointed second vertebral scute entering the third vertebral scute. Compared to other *Kachuga* species the carapace of the three-striped roofed turtle is flat-domed and the central keel is less prominent. The carapace is rather roughly textured, dark olive or brown with three black stripes on the vertebral and pleural regions, whereas the plastron varies in color from yellow to grayish. At lateral sides of the gray-colored head lightened patches are marked (Rogner 1995; Das 1991). Legs are strong, with small claws and well-formed webs. Forelimbs have five claws. Sexual dimorphism is significant: Females range up to 48 cm in length, males only to 26 cm. Males possess stronger, thicker tails (Shrestha 1997a; Ernst & Barbour 1989). The cloaca of males extend beyond the rim of the carapace (Das 1991).

Nesting season is observed from March to April (Whitaker & Andrews 1997). Das (1991) notes that egg retention during winter is assumed, when this species may be dormant. The clutch size is 21 to 35 oval eggs, buried in sandbanks in a depth of 18 to 27 cm (Shrestha 1997a; Das 1991). Hatchling occurs after an incubation period of about 80 days, depending on external temperature (Rogner 1995; Das 1991).

2.1 Distribution

Countries of origin: Bangladesh, India, Nepal, Myanmar (?)

Ten fragmented locations have been defined (CAMP/BCPP 1997).

In Bangladesh *Kachuga dhongoka* is mainly distributed in the south-central and southern wetlands, in Noakhali, Barisal and Patuakhali districts (Rashid & Khan 2000). Populations are reported from Kali Ganga and Padma (= Ganges) Rivers in Dhaka District (Moll 1997).

Populations in India are limited to the northeastern part of the country and are reported to live in drainages in Brahmaputra and Ganges (EMBL 2001). However, no recent records confirm their presence in Brahmaputra (Choudhury *et al.* 2000). Das (1991) lists Bihar (Bettiah, Kahalgaon, Rajmahal), Uttar Pradesh (Ghaziabad, Etawah, Agra, Allahabad, Bateshwar, Kainjraghat, Faizabad, Varanasi, Corbett National Park), Madhya Pradesh (Barenda, Sagar), Rajasthan (Bharatpur), and West Bengal (Titagarh, Calcutta, Salt Lake) as localities. According to Moll (1997) the Chambal River in Rajasthan District, India, is a stronghold for *Kachuga dhongoka*.

In Nepal populations of *Kachuga dhongoka* are reported by Shrestha (1997a) and Rogner (1995). Schleich (1999) notes that populations occur in Chitwan National Park.

According to van Dijk (1997) existence of *Kachuga dhongoka* in Myanmar was reported, but without substantiation.

2.2 Habitat availability

The three-striped roofed turtle has a mainly riverine lifestyle and usually inhabits deep, clean and clear freshwater rivers and large wetlands (Rashid & Khan 2000). The habitat is limited to altitudes between 0 and 500 meter (CAMP/BCPP 1997). In India it is found in the main Ganges river and large tributaries (Choudhury *et al.* 2000). *Kachuga dhongoka* is a good swimmer and diver. As a very shy species it immediately drops from basking sites to deep waters whenever it is disturbed (Rogner 1995). Sand banks, rocks and wood are used as basking sites (Das 1991).

Habitat quality and quantity of *Kachuga dhongoka* has been seriously reduced in large portions of its distribution range, caused by human population growth, urbanization, loss of wetland, sediment accumulation in rivers and pollution. This is reported for the Ganges system in India (Smith 1994; Leatherwood & Reeves 1994), Nepal (Shrestha 1997b), and Bangladesh (Rashid & Khan 2000; Das 1997). Populations of *Kachuga dhongoka* in the Chambal River are severely impacted by the destruction of preferred nesting banks through sand mining. A similar extent of destruction of nesting sites is also documented for Kali Ganga and Padma (= Ganges) in Bangladesh (Moll & Moll 2000; Moll 1997).

Additionally, river pollution severely degrades chelonian habitat in India and Bangladesh (Rashid & Khan 2000; Das 1991). The IUCN/SSC TFTSG (1991) emphasizes the widespread use of insecticides and their impact upon aquatic organisms, including riverine turtles. The use of agrochemicals may cause infertility, sterility and the thinning of eggshells, resulting in high losses of offspring (Sarker & Hossain 1997).

Van Dijk (2000) also notes the impact of river dams, which are built to generate electricity in power stations, leading to coastal erosion and reduced water temperature and oxygen content. Dams that are built upstream of nesting sites prevent the downstream flow of sand from replacing mined or eroded nesting beaches. Additionally, periodical release of water in massive amounts may cause extensive erosion. On the other hand, dams downstream nesting sites may disturb nesting migrations (Moll 1997). Accordingly, intense damming and withdrawal of water from the Ganges, as reported by Leatherwood & Reeves (1994), poses serious pressures to local populations of *Kachuga dhongoka*. Also, in Nepal rivers, e.g. the Koshi River in eastern Nepal, are greatly impacted by damming, draining of swamps, diversion, canalization, and pollution (Shrestha 1997b).

2.3 Population status

Whereas in the 1996 IUCN Red list *Kachuga dhongoka* was classified as "lower risk, not threatened", the IUCN Red List (2000) recently upgraded this species to "endangered", based on criteria A1cd + 2cd. This means a population reduction of at least 50 percent within the last decade, due to habitat loss and actual or potential levels of exploitation (IUCN 1994).

The status in Bangladesh is described as "extremely rare" (Bhupathy *et al.* 2000), and populations are listed as "critically endangered" in the IUCN-Bangladesh Red Data Book (Rashid & Khan 2000; Sarker & Hossain 1997).

In India *Kachuga dhongoka* is regarded as "rare throughout its range" (Choudhury *et al.* 2000) or even "critically endangered" (Bhupathy *et al.* 2000). Although formerly classified as "vulnerable", Indian populations are now considered as "endangered" (IUCN/SSC TFTSG 2000), based on observed population reduction and predicted decline due to decrease in extent of occurrence, area of occupancy and/or quality of habitat (CAMP/BCPP 1997). In 1997, the Indian population was estimated at over 10,000 specimens, with more than 2,000 of them being mature individuals (CAMP/BCPP 1997). One decade ago, populations of *Kachuga dhongoka* in the Ganga were described as "fairly common" (Das 1991). However, regarding the recommended new IUCN classification as "endangered" current numbers of specimens are assumed to be lower. Already in 1984 *Kachuga dhongoka* was recommended for an inclusion in Annex IV of the *Indian Wildlife Protection Act* to monitor the heavy trade in this species (Moll, cited in IUCN/SSC TFTSG 1991).

In Nepal this species is reported as "rare" (Shrestha 1997a).

2.4 Population trends

Populations are in decline in Bangladesh (Rashid & Khan 2000) and India (Choudhury *et al.* 2000). Within ten years a 20 percent decline of populations has been observed (CAMP/BCPP 1997), caused by over-collection and loss of habitat. This population decline was also indicated by market records in India, where in 1983 *Kachuga dhongoka* was observed to be on sale at seven markets, In 1990 it was reported to be available occasionally (Moll 1990), whereas in 1993 no specimens were found at markets (Choudhury & Bhupathy 1993). There are no recent market records from the last years, potentially due to its rarity (Bhupathy *et al.* 2000). As a consequence of the continuing negative population trend the former IUCN Red List classification "lower risk" was now reviewed and changed to "endangered" (IUCN Red List 2000). Also, Indian populations are now considered "endangered" instead of "vulnerable" (CAMP/BCPP 1997).

2.5 Geographic trends

According to Choudhury *et al.* (2000) local extinction of *Kachuga dhongoka* from many areas in India, especially the Brahmaputra basin has to be feared. Populations in Kali Ganga and Padma (= Ganges) Rivers in Dhaka District (Bangladesh) and Chambal River in Rajasthan District (India) are in decline (Moll 1997). Whereas Moll (1987, cited in Choudhury *et al.* 1999) reported the occurrence of *Kachuga dhongoka* in Sonapur (Kamrup, Assam), a later survey failed to detect specimens in this area (Choudhury *et al.* 1999).

2.6 Role of the species in its ecosystem

Kachuga dhongoka is reported to mainly feed on plants (Shrestha 1997a), with male specimens being more omnivorous (Rogner 1995). Molluscs that have been found in the faeces seem to play a role in the diet of male specimens (Das 1991). Accordingly, this species may influence the plant community composition, by distributing seeds, and vegetation structure in its habitat. Consumption of molluscs, worms and insects contributes to the control of these prey species. Furthermore, eggs and hatchlings of freshwater turtles are relevant prey for other species, e.g. for monitors, herons, and some small mammalian predators (Wirth, *pers. comm.* 1998). Van Dijk (2000) emphasizes that the ecological role of turtles, including interactions between turtles of different species, in general can be significant.

2.7 Threats

Collection of *Kachuga dhongoka* for human consumption is known from all countries of origin. In general large-bodied chelonians are preferred for consumption, and pressure is particularly high on populations in north-eastern parts of India (Choudhury & Bhupathy 1993). Both factors apply to *Kachuga dhongoka*, illustrating the threat by over-collection. Meat is consumed for both commercial and subsistence use in India (Choudhury *et al.* 2000; Choudhury & Bhupathy 1993) and Nepal (Shrestha 1997b; Ernst *et al.* 1997). In Bangladesh, too overexploitation for commercial export and domestic consumption has a serious impact on all native chelonians, including *Kachuga dhongoka* (Sarker & Hossain 1997). Use of shells for medical purposes is reported from Nepal, where shells of smaller specimens are also used for the production of masks and souvenirs (Ernst *et al.* 1997). *Kachuga dhongoka* is affected by exports to East-Asian food markets (Pro Wildlife 2000; McCord 1998). If *Kachuga dhongoka* does occur in Myanmar it is probably affected by exploitation for local consumption (Platt *et al.* 2000; Jenkins 1995).

As described under 2.2 habitat destruction has negative or even dramatic consequences for *Kachuga dhongoka* populations all over its range, and is due to human population growth, urbanization, loss of wetland, sediment accumulations in rivers and erosion, sand mining, river dams and river pollution (Rashid & Khan 2000). Also, losses and a reduced reproduction rate due to the use of insecticides and agrochemicals must be emphasized.

3. Utilization and trade

Kachuga dhongoka populations are exploited for national and international trade. This trade includes live animals, meat, eggs and shells, the latter being used for the preparation of traditional medicine but also for tourist souvenirs. This exploitation occurs on an unsustainable level, causing further decline of populations of *Kachuga dhongoka*.

3.1 National utilization

Bangladesh: Local consumption of native turtles is significant in Bangladesh (Bhupathy *et al.* 2000; Sarker & Hossain 1997). Whereas originally other species such as *Geocleyms hamiltoni, Hardella thurjii, Kachuga tecta* and others were the most abundant species on sale, as a result of depleted populations all other native species, including specimens of *Kachuga dhongoka,* are now used as substitutes (Rashid & Khan 2000). This trade also includes the eggs of the affected species.

India: Besides widespread subsistence use throughout its range (Choudhury *et al.* 2000) *Kachuga dhongoka* is also traded locally for food (CAMP/BCPP 1997; Choudhury & Bhupathy 1993). Subsistence use of *Kachuga dhongoka* is reported from the Indian states Uttar Pradesh and Bihar, in the latter state the species is also exploited commercially (Choudhury & Bhupathy 1993; Whitaker 1997). Whereas in 1983 *Kachuga dhongoka* was observed to be on sale at seven markets, in 1993 no specimens were found on markets (Choudhury & Bhupathy 1993). The species is only recorded occasionally in domestic markets (Moll 1990). In the recent past there have been no market records (Bhupathy *et al.* 2000). The reason may be a decline of wild populations, in combination with stricter controls of trade.

Nepal: Local markets selling turtles have been reported by Bhupathy *et al.* (2000). There is a considerable turtle trade in the Terai, Narayanghat, Biratnagar as well as in Mahendra Nagar. Different ethnic groups are involved in this trade, as the Tharu, Darahi, Raji, and Majhis, who sell both meat and eggs (Shrestha 1997a). Shells are used for both production of medical purposes and souvenirs for tourists. For the latter product small specimens are preferred (Ernst *et al.* 1997). Meat is eaten by high-caste Hindu people (Shrestha 1997).

Myanmar: Existing populations of *Kachuga dhongoka* are probably used for local consumption. It is reported that in general native populations are collected all over the year (Platt *et al.* 2000; Jenkins 1995).

3.2 Legal international trade

In recent surveys herpetologists observed an increasing number of turtle species and specimens at food markets in southern China, that originate from the Indian subcontinent, including specimens of *Kachuga dhongoka* (McCord 1998; Pro Wildlife 2000). Representatives of the genus *Kachuga* were also found on sale at food markets in Hong Kong (Lau *et al.* 2000) and Taiwan (Chen *et al.* 2000). However, in most cases the country of origin is not clearly identifiable. As one of to the large-growing species of its genus *Kachuga dhongoka* is particularly attractive for food markets but not popular in most pet markets.

Bangladesh is the center of the turtle trade within and from South Asia, and all native species are involved in this trade. Bangladesh not only serves as a regional collection center, but also as a trans-shipment point for neighboring countries (Bhupathy *et al.* 2000). All species are affected by these exports (Sarker & Hossain 1997), including *Kachuga dhongoka*. The major center for chelonian exports is the metropolitan capital city, Dhaka, where turtles collected all over the country are sold to exporters. Additionally, Chittagong and Khulna are centers for export. Twenty registered agencies are involved in the turtle export, with 10 of them in Dhaka, four in Chittagong, two in Khulna, and one each in Barisal, Brahmanbaria, Chandpur, and Mymensingh (Rashid & Khan 2000). Main countries of destiny are China and, to a lesser extent, India (Bhupathy *et al.* 2000). Between 1994 and 1996, Taiwan imported more than 9,400 kg of hard-shelled turtle shells from Bangladesh, including specimens of *Kachuga* spp. (Chen *et al.* 2000). As specimens of *Kachuga tecta* repeatedly have been observed at food markets in China (McCord 1998), Taiwan (Chen *et al.* 2000) and Hong Kong (Lau *et al.* 2000) and all native species are traded, it must be assumed that *Kachuga dhongoka* is also part of Bangladesh's exports to these regions. However, Bhupathy *et al.* (2000) stress that exported numbers of *Kachuga dhongoka* are probably small, due to its rarity. In general, in the middle of the 90s the international trade significantly changed: In response to an export ban on frog legs the meat packing and shrimp industry started processing turtles, that are now exported as frozen meat (Bhupathy *et al.* 2000).

China: *Kachuga dhongoka* has been documented in live turtle markets in small numbers in the 1990s (McCord 1998).

India: According to Rashid & Khan (2000) turtle shipments, worth USD 10,000, were imported from Bangladesh in 1996/1997.

Japan: Live specimens of *Kachuga dhongoka* are offered in the Internet by Japanese pet shops (Superpetweb 2001).

Nepal: Transports of large amounts of wildlife to China and India from and through Nepal do exist, with the regions Kakarbhitta, Biratnagar, Birganj, Bhairahawa, Nepalganj, Dhangadi, and Mahendranagar being key transit points (Gajurel 2000). This obviously includes a limited but increasing export of chelonians to China (Pro Wildlife 2000). Additionally, shipments of turtles from Nepal to Bangladesh and India (that might ultimately be destined to China) are suspected (Bhupathy *et al.* 2000; Pro Wildlife 2000). Furthermore, an extensive trade in decorated curio masks, made from turtle shells, is reported (Bhupathy *et al.* 2000). These exports are unselective and may include *Kachuga dhongoka*.

Myanmar: Exports of chelonians from Myanmar to China take place, e.g. to Xing Ping market, Guangzhou Province in southern China (Artner & Hofer 2001), and to markets in Ruili, Yunnan Province (Kuchling 1995). If *Kachuga dhongoka* is native to Myanmar, it is probably affected by

these exports, too, as large-growing turtle species are preferred for the food markets and aquatic turtles in general are exploited for consumption all over the year (Jenkins 1995).

3.3 Illegal trade

Bangladesh: According to a blanket protection of all wildlife species that was decided in 1994 trade in any species without permission is illegal. This is also true for local trade. However, this law is neither implemented nor monitored and no legal action is taken against local collectors or traders (Rashid *in litt.* 2002).

India: According to Rashid & Khan (2000) there are smuggling routes to China, obviously via the border sites Karimganj in the Northeast of India and Baliganj, Shiliguri in the North. Chelonians caught from the Chambal and other rivers of Kota region of North-West Indian state of Rajasthan and destined for China, Malaysia and other countries were confiscated (PTI 1999). Turtles originating from southern India for pet and food trade are moved overland to Madras and then shipped by air to Singapore (Bhupathy *et al.* 2000). Seizures of turtle shipments in northern India, that had been destined for China via Bangladesh, are reported (Reuters 2000). As trans-border smuggling is also reported to and from Bangladesh it is difficult to distinguish whether turtles that are smuggled to China originally come from Bangladesh or India (Rashid & Khan 2000). Whereas it has to be assumed that this illegal trade formerly affected *Kachuga dhongoka*, current export numbers are obviously low due to its rarity (Bhupathy *et al.* 2000).

Nepal: No data.

3.4 Actual or potential trade impacts

Populations of large-bodied *Kachuga* species, such as *Kachuga dhongoka*, are severely damaged by commercial exploitation for both subsistence and commercial use (Choudhury & Bhupathy 1993). Accordingly, populations of *Kachuga dhongoka* are in decline in India and Bangladesh, mainly caused by over-exploitation for food and medicine for both national and international trade. In India they are locally extinct from many areas (Choudhury *et al.* 2000). According to Bhupathy *et al.* (2000) Indian populations of *Kachuga dhongoka* must be regarded as "critically endangered" due to past over-harvesting. Exploitation for commercial export and domestic consumption has a negative or even dramatic impact on wild populations of all native chelonians, including *Kachuga dhongoka* (Das 1997; Sarker & Hossain 1997). Overexploitation for commercial export and domestic consumption is also a tremendous threat to all native chelonians of Bangladesh, including *Kachuga dhongoka* (Sarker & Hossain 1997). Similar threats can be assumed for Nepal, from where large-scale exports of wildlife to China and India take place (Gajurel 2000). With regard to the huge but still growing and largely unselective demand for turtles particularly from East Asian food markets it has to be assumed that international trade will have an increasingly detrimental impact on remaining populations of *Kachuga dhongoka*.

3.5 Captive breeding for commercial purposes (outside country of origin)

According to BCPP (1997) captive breeding is moderately difficult. Obviously, captive breeding in non-native countries exists neither in zoos (ISIS 2001), nor on a commercial level.

4. Conservation and Management

4.1 Legal status

4.1.1 National

Bangladesh: *Kachuga dhongoka* is obviously listed in Schedule 1 of the *Bangladesh Wildlife Preservation Act* (BWPA), 1974, and is therefore not protected (Bhupathy *et al.* 2000).

India: Unknown.

Nepal: None.

4.1.2 International

None.

4.2 Species management

4.2.1 Population monitoring

Kachuga dhongoka is included in the IUCN/SSC Action Plan Rating 3, that covers species for which specific conservation projects and status surveys are required (IUCN/SSC TFTSG 1991). However, the realization of those measures is not known.

4.2.2 Habitat conservation

India: No specific efforts for *Kachuga dhongoka* exist (Choudhury *et al.* 2000).

4.2.2 Habitat conservation

In Nepal laws have been enacted to protect the habitat of aquatic animals, including turtles (Shrestha 1997). Eight national parks, four wildlife reserves, four conservation areas, and one hunting reserve have been established (Anon. 1998), from which wild populations of *Kachuga dhongoka* might benefit. However, these protected areas have not been specifically established for chelonians.

4.2.2 Habitat conservation

In 2001, India and Nepal agreed to develop an eco-region adjoining the border areas of both countries, covering *Royal Chitwan National Park, Royal Baridia National Park* and *Royal Shuklaphanta Wildlife Reserve* of Nepal and *Dudhwa National Park, Katarniaghat Wildlife Reserve, Sohelwa Wildlife Sanctuary, Valmiki Tiger Reserve, Swehingaohegi Barga Wildlife Reserve* and *Corbett-Rajaji National Park* in India (Xinhua News Agency 2001). Turtle populations inhabiting these areas may benefit from this measure.

4.2.3 Management measures

For populations in India habitat management and monitoring of species has been recommended (CAMP/BCPP 1997). Captive specimens are held at the Madras Crocodile Bank, India (Praschag 1999), but Whitaker & Andrews report that captive breeding was not successful, and that wild eggs are hatched (1997).

4.3 Control measures

4.3.1 International trade

None.

4.3.2 Domestic measures

India: None (Choudhury *et al.* 2000).

5. Information on Similar Species

Discrimination of turtle hatchlings by species is generally very difficult (Lehr *pers. comm.* 1999). Young specimens of many species show a prominent keel at the carapace and patterns of pale lines at their heads.

6. Other Comments

According to the co-chair of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, Anders Rhodin (2002; *in litt.* 2001b; c), *Kachuga dhongoka* is a top-priority species for a listing on CITES Appendix II. Das (*in litt.* 2002) recommends an Appendix II listing of roofed turtles, too. As a result of a CITES technical workshop on the conservation of and trade in freshwater turtles and tortoises, held in Kunming 25th to 28th March 2002, the Appendix II listing of *Kachuga* spp. was also recommended (AC 2002a). Support for all listing proposals presented at the technical workshop was also acknowledged by the CITES working group on freshwater turtles and tortoises at the 18th meeting of the Animals Committee (AC 2002b).

7. Additional Remarks

Kachuga kachuga

1. Taxonomy

1.1	Class:	Reptilia
1.2	Order:	Testudines (Chelonia)
1.3	Family:	Bataguridae
1.4	Species:	*Kachuga (Kachuga) kachuga* (Gray, 1831)
1.5	Scientific synonyms:	*Emys kachuga* (Gray, 1831) *Emys lineata* (Gray, 1831) *Batagur ellioti* (Gray, 1863) *Kachuga fusca* (Gray, 1870) *Kachuga lineata* (Boulenger, 1889)
1.6	Common names:	English: Red-crowned roof(ed) turtle, Bengal roof turtle, Sail terrapin French: Kachuga à front rouge Spanish: Bangladesh: Bengali: adi kori katha German: Kachuga-Dachschildkröte, Bengalische Dachschildkröte Hindi: lal tilakwala Kachuga, sal Italian: Kachuga fronte rossa Nepal: Dodare, Dodari
1.7	Code numbers:	

2. Biological parameters

Kachuga kachuga, the red-crowned roofed turtle, is one of the largest representatives of its genus, with males growing up to 29 cm and females up to 56 cm and reaching a weight of 15 to 25 kilogram. Further sexual dimorphism is distinct: Male specimens have an olive or brown elliptical carapace with a yellow plastron; the central keel is prominent on the second and third vertebral shields. A red patch is conspicuous on top of the head, whereas a series of seven red to red-brown longitudinal stripes can be found on the neck (Ernst & Barbour 1989). In contrary, Das (1991) reports only six stripes on the neck. The colors are particularly bright during breeding season (Shrestha 1997a). The head of males have a red-colored upper side and blue to gray-colored flanks (Rogner 1995) with two yellow stripes on the sides of head (Das 1991). Females are dark and drab with little or no pattern, have a thinner and shorter tail, an olive to blue colored head, and silvery or yellow mandibles. Skin of head is smooth anteriorly and divided into irregular scales posteriorly (Das 1991). Specimens of *Kachuga kachuga* can be distinguished from *Kachuga dhongoka* by the absence of dark streaks along the carapace and the larger size of the female (Shrestha 1997a).

Nesting occurs near to the riverbank, with a distance of only one to 30 meters to the water line. The clutch size is 11 to 30 eggs of long and oval form; nesting season is from March to April, with a report of a gravid female in December (Das 1991). Hatchlings, with a size of 6 cm and a weight of 36 grams, can be observed after an incubation period of 80 to 86 days (Whitaker & Andrews 1997; Rogner 1995).

2.1 Distribution

Countries of origin: Bangladesh, India, Nepal, Myanmar (?)

Overall distribution of *Kachuga kachuga* is restricted (Das 1997).

Bangladesh: *Kachuga kachuga* primarily inhabits the watershed of the Ganges river (EMBL 2001). The IUCN/SSC TFTSG (1991) reports this species from the Padma (= Ganges) River in the district of Rajshahi, Ganges delta. Populations have also been assigned to the Jamuna river and Chittagong Hill Tracts (Sarker & Hossain 1997) as well as Kali Ganga River in Dhaka District (Moll 1997). Rashid & Khan (2000) report a recent unconfirmed record from the Kangshi River, Netrokona District in the North, and note that populations live in in Noakhali, Barisal, and possibly Netrokona.

Populations in India inhabit parts of Chambal, Yamuna, Ganga and northern Gaghra, less than 10 fragmented locations are known (CAMP/BCPP 1997). Das (1991) lists Bihar (Rajmahal, Bhagalpur, Purnea), Punjab (Ferozpur, Valmik Nagar), Uttar Pradesh (Lucknow, Bateshwar, Allahabad), West Bengal (Salt Lake), Madhya Pradesh (Barenda in the Chambal) as specific localities. According to Moll (1997) the Chambal River in Rajasthan District, India, is a stronghold for *Kachuga kachuga*. Reports from Brahmaputra, Godavari, and Kristina river basins are unverified (Choudhury *et al.* 2000; Iverson 1992).

Nepal: Populations are reported from eastern and western Nepal, including Babai, Koshi, Mahakali, Narayani and Rapti rivers of western Nepal (Shrestha 1997a).

Existence of *Kachuga kachuga* in Myanmar was reported, however van Dijk (1997) emphasizes that these are anecdotes without substantiation.

2.2 Habitat availability

Kachuga kachuga is usually restricted to deep rivers with clean water (Rashid & Khan 2000). It prefers waters with sandy ground (Choudhury *et al.* 2000) in an altitude of 300 to 500 meters (CAMP/BCPP 1997). Sand banks are preferred as nesting and basking sites (Shrestha 1997a), and basking periods are obviously limited to warm months (Rogner 1995). As this species depends on high water quality it is likely that its habitat is negatively affected by river pollution in the Ganges delta in Bangladesh (Rashid & Khan 2000). Negative effects of river pollution on chelonians are also reported from India (Das 1997; Choudhury *et al.* 2000) and Nepal (Shrestha 1997b). The IUCN/SSC TFTSG (1991) emphasized the widespread use of insecticides especially in the Ganges delta and their impact upon aquatic organisms, including riverine turtles. Those agrochemicals may cause infertility, sterility and the thinning of eggshells, resulting in high losses of offspring (Sarker & Hossain 1997).

In general, habitat destruction imposes further pressure on *Kachuga kachuga* populations all over its range. In India populations of *Kachuga kachuga* are threatened by fishing, human interference and habitat loss (CAMP/BCPP 1997; Das 1997). Sand mining has an especially detrimental impact on the habitat of *Kachuga kachuga*, as the best nesting beaches have been destroyed. This fatal consequence is reported from Chambal River (Rajasthan and Madhya Pradesh) in India, as well as from Kali Ganga and Padma River (= Ganges) in Bangladesh, where river banks are heavily commercially exploited for sand mining (Moll & Moll 2000; Moll 1997). Additionally, populations of *Kachuga kachuga* suffer from loss of wetland, sediment accumulations in rivers, and sand mining (Rashid & Khan 2000).

Van Dijk (2000) also emphasizes the impact of river dams, which are built to generate electricity in power stations, resulting in coastal erosion and reduced water temperature and oxygen content. Negative consequences of dams for nesting areas of riverine turtles are described in the section for *Kachuga dhongoka*, chapter 2.7. As intense damming and withdrawal of water from the Ganges

are reported (Leatherwood & Reeves 1994), these factors put serious pressure on local populations of *Kachuga kachuga*. Populations in Nepal obviously suffer from damming, diversion and canalization, too (Shrestha 1997b).

2.3 Population status

Kachuga kachuga is now classified as "critically endangered", based on criterion A1cd (IUCN Red List 2000), meaning a population reduction of at least 50 percent in the last 10 years, due to habitat loss and actual or potential levels of exploitation (IUCN 1994). This upgrading, compared to the former status "endangered" in the IUCN Red List (1996), is due to the continuing disappearance over much of its range (IUCN/SSC TFTSG 2000). The population size has been reported to be less than 1,000 specimens in total (CAMP/BCPP 1997). According to Das (1997) *Kachuga kachuga* belongs to the ten most-threatened chelonians of the Oriental region.

In Bangladesh the red-crowned roofed turtle is described as "rare" (Rashid & Khan 2000) or "occasional" (Sarker & Hossain 1997) and is classified as "endangered" in the IUCN-Bangladesh (1999) Red Data Book.

India: Whereas only a few years ago populations of *Kachuga kachuga* have been classified as "vulnerable" on a national level, (CAMP/BCPP 1997), they are now regarded as "critically endangered" (Bhupathy *et al.* 2000). However, Choudhury *et al.* (2000) consider the status of this "elusive" species as "undetermined".

Nepal: Populations are described as "rare" (Shrestha 1997a).

2.4 Population trends

Populations in India have suffered a decline of more than 80 percent within a twenty year period, resulting in a population of less than 1,000 specimens in total (CAMP/BCPP 1997). As the ongoing depletion of this species is reflected by a recently upgrading of the IUCN Red List status from "endangered" to "critically endangered" (IUCN Red List 2000), current numbers are probably even lower. Already in 1984 dwindling numbers of *Kachuga kachuga* resulted in the recommendation that it should be included in Annex I of the *Indian Wildlife Protection Act* (Moll, cited in IUCN/SSC TFTSG 1991). Recent declines in trade levels obviously reflect an increasing rarity of populations in the wild (Das 1997). Collapse of wild populations may be reflected by the disappearance from food markets in India, where in 1983 *Kachuga kachuga* was observed to be on sale at three markets, but in 1993 no specimens were found on markets (Choudhury & Bhupathy 1993).

2.5 Geographic trends

Heavy collection pressure of turtles in the Ganges delta in Bangladesh is feared to lead to the local extirpation of species living in that area (IUCN/SSC TFTSG 1991). Populations in Kali Ganga and Padma (= Ganges) Rivers in Dhaka District (Bangladesh) and Chambal River in Rajasthan District (India) are in decline (Moll 1997).

2.6 Role of the species in its ecosystem

This species is reported to be herbivorous, although in captivity omnivorous feeding is also well accepted (CAMP/BCPP 1997). Accordingly, this species may influence the plant community composition, by distributing seeds, and vegetation structure in its habitat. Furthermore, turtle eggs and hatchlings are prey for monitors, herons, and some small mammalian predators (Wirth, *pers. comm.* 1998). Van Dijk (2000) emphasizes that in general the ecological role of turtles can be significant, including interactions between turtles of different species.

2.7 Threats

The principle threat to *Kachuga kachuga* is excessive exploitation for food (Thjorbarnarson *et al.* 2000). Turtles are extensively consumed for food and medical purposes all over the range of *Kachuga kachuga*. Furthermore, exports to East Asian markets increasingly take place (McCord 1998; Sarker & Hossain 1997). Already in 1991 *Kachuga kachuga* was reported to be under pressure by over-exploitation for eggs and meat (IUCN/SSC TFTSG 1991). In India (Choudhury *et al.* 2000; Das 1997) and Bangladesh (Rashid & Khan 2000) native populations of chelonians, including *Kachuga kachuga,* are exploited because of their meat and their shells. In Nepal, eggs are collected for human consumption (Shrestha 1997b). Additionally, all native chelonian species are exploited as food and for medical purposes (Ernst *et al.* 1997). Large-bodied species like *Kachuga kachuga* are in particular demand at food markets, with turtle populations in north-eastern India being under especially high pressure by both commercial and subsistence use (Choudhury & Bhupathy 1993). Large-scale wildlife exports from Nepal to India and China (Gajurel 2000) may also cover specimens of *Kachuga kachuga*. As in Myanmar aquatic turtles in general are exploited for local consumption all over the year (Platt *et al.* 2000; Jenkins 1995), potentially existing populations of *Kachuga kachuga* would presumably also be affected by this off-take.

Habitat destruction is a major threat to populations of *Kachuga kachuga* all over its range. Negative consequences of reduced habitat availability are reported from India (Das 1997, CAMP/BCPP 1997), Bangladesh (Moll 1997, Rashid & Khan 2000), and Nepal (Shrestha 1997b). Habitat quality and quantity suffer from sand mining (Moll 1997), damming (Shrestha 1997b), river pollution (Das 1997; Rashid & Khan 2000), loss of wetland, and urbanization. All these factors have a tremendous impact on populations of *Kachuga kachuga* and their reproductive potential by destroying nesting sites and reducing survival rates of offspring (Sarker & Hossain 1997).

3. Utilization and trade

Kachuga kachuga is exploited for consumption on both subsistence and commercial level. National and international trade include live individuals, meat and shells. This exploitation occurs on an unsustainable level, causing further decline of populations. *Kachuga kachuga*, as a large-growing species, is highly attractive for food markets. Accordingly, this species belongs to the species of Tropical Asia that are most affected by trade (Das 1997).

3.1 National utilization

Bangladesh: Whereas originally other species such as *Geocleyms hamiltoni, Hardella thurjii, Kachuga tecta* and others were the most abundant species on sale, as a result of depleted populations all other native species, including specimens of *Kachuga kachuga,* are now used as substitutes, using both meat and shells (Rashid & Khan 2000). In the Ganges delta exploitation of turtles and their eggs, including *Kachuga kachuga*, is reported to be extremely heavy (IUCN/SSC TFTSG 1991).

India: Local consumption of meat and shells is reported (CAMP/BCPP 1997; Bhupathy *et al.* 2000; Choudhury *et al*. 2000). However, according to Whitaker (1997) this trade has gone "underground" as a consequence of the establishment of a protection status for chelonians. This factor, in combination with the decline of wild populations may cause the disappearance from food markets: Whereas in 1983 *Kachuga kachuga* was on sale at three markets, in 1993 no specimens were found on markets (Choudhury & Bhupathy 1993).

Nepal: There is considerable turtle trade in the Terai, Narayanghat, Biratnagar as well as in Mahendra Nagar. Different ethnic groups are involved in this trade, e.g. the Tharu, Darahi, Raji, and Majhis, who sell both meat and eggs for local consumption (Shrestha 1997a). Although detailed data are not available, it is likely that *Kachuga kachuga* is involved in this trade.

Myanmar: It must be assumed that *Kachuga kachuga*, if native to Myanmar, is affected by local collections that take place all over the year (Jenkins 1995).

3.2 Legal international trade

In recent surveys herpetologists observed an increasing number of species and specimens at food markets in southern China, that originate from the Indian subcontinent, including specimens of *Kachuga kachuga* (McCord 1998). However, in most cases the country of origin is not clearly identifiable. Belonging to the large-growing species of its genus *Kachuga kachuga* is especially attractive for food markets.

Bangladesh: The central role of Bangladesh for the turtle trade within and exports from the Indian subcontinent is described in details in chapter 3.2. of the *Kachuga dhongoka* proposal. *Kachuga kachuga* specimens are probably involved in this trade, too. Sarker & Hossain (1997) report exports of *Kachuga kachuga* to China. Furthermore, between 1994 and 1996, Taiwan imported more than 9,400 kg of hard-shelled turtle shells from Bangladesh, including specimens of *Kachuga* spp. (Chen *et al.* 2000). However, detailed data on specific volume of *Kachuga kachuga* in these exports from Bangladesh is lacking.

China: *Kachuga kachuga* has been documented in live turtle markets in small numbers in the 1990s (McCord 1998).

India: None.

Myanmar: Exports of chelonians from Myanmar to China take place, e.g. to Xing Ping market, Guangzhou Province in southern China (Artner & Hofer 2001), and to markets in Ruili, Yunnan Province (Kuchling 1995). If *Kachuga kachuga* is native to Myanmar, it has to be assumed that it is affected by these exports, too, as large-growing turtle species are preferred for the food markets and aquatic turtles in general are exploited for local consumption all over the year (Jenkins 1995).

Nepal: Exports of chelonians are described in detail in chapter 3.2. of the *Kachuga dhongoka* proposal. Ernst *et al.* (1997) report about trade of *Kachuga kachuga* from Nepal to China.

3.3 Illegal trade

Bangladesh: See section 3.3. of *Kachuga dhongoka.*

India: Seizures of turtle shipments in northern India, that were destined to China via Bangladesh, are reported (Reuters 2000). Chelonians caught from the Chambal and other rivers of Kota region of North-West Indian state of Rajasthan and destined for China, Malaysia and other countries were confiscated (PTI 1999).

However, it is not known whether *Kachuga kachuga* is part of these shipments. This species has not been found at recent market surveys (Bhupathy *et al.* 2000).

3.4 Actual or potential trade impacts

Populations of large-sized species, such as *Kachuga kachuga*, are especially threatened in north-eastern India. *Kachuga kachuga* is one of the species most affected by trade (Thorbjarnarson *et al.* 2000; Choudhury & Bhupathy 1993). Recent declines in trade levels are obviously caused by an increasing rarity of populations in the wild (Bhupathy *et al.* 2000; Das 1997). Already in the early 90ies local extirpation of chelonian species that inhabit the Ganges delta was feared according to the IUCN/SSC TFTSG (1991): "Collectors are bringing stock from further and further afield". However, the impact is not known in detail (Choudhury *et al.* 2000).

Overexploitation for commercial export and domestic consumption is a serious threat to all native chelonians of Bangladesh, including *Kachuga kachuga* (Sarker & Hossain 1997). A similar impact can be assumed for populations in Nepal, where large-scale exports of wildlife to China and India do occur (Gajurel 2000). With regards to the huge and even growing demand of East Asian food markets, this threat will even increase in the future. Trade has a dramatic impact on the survival chances of this species given the fact, that the few remaining specimens of *Kachuga kachuga* are still used for local consumption in India (Bhupathy *et al.* 2000).

3.5 Captive breeding for commercial purposes (outside country of origin)

There is only little experience in the keeping of *Kachuga kachuga*, correspondingly captive breeding is neither known at private husbandry nor recorded from zoos within the last six months (Rogner 1995; ISIS 2001). However, according to Choudhury & Bhupathy (1993) several Indian zoos keep *Kachuga kachuga*, namely Madras Crocodile Bank; Deori Gharial Breeding Centre, Morena; Kukrail Turtle Breeding Centre; and Vanvihar, Bhopal.

4. Conservation and Management

4.1 Legal status

4.1.1 National

Bangladesh: *Kachuga kachuga* is listed in Schedule 1 of the *Bangladesh Wildlife Preservation Act* (BWPA, 1974) and therefore not protected (Bhupathy *et al.* 2000).

India: In the *Indian Wildlife Protection Act* (IWPA), 1972, this species is listed in Schedule I, meaning a total protection: Possession and / or national trade are prohibited or regulated (Choudhury & Bhupathy 1993; CAMP/BCPP 1997).

Nepal: None.

4.1.2 International

None.

4.2 Species management

4.2.1 Population monitoring

This species has been included in the IUCN/SSC Action Plan Rating 1, characterizing *Kachuga kachuga* as a threatened species in need of specific conservation measures (SSC/TFTSG 1991). Monitoring of *Kachuga kachuga* has been recommended by CAMP/BCPP (1997).

4.2.2 Habitat conservation

India: Whereas CAMP/BCPP (1997) noted that habitat management was not known, meanwhile river sanctuaries are reported to exist in the Ganges river system (Choudhury *et al.* 2000).

In Nepal laws have been enacted to protect the habitat of aquatic animals, including turtles (Shrestha 1997). In January 1997 turtle-specific conservation measures were started in the Koshi Tappu Wildlife Reserve (Ernst *et al.* 1997). Additionally, eight national parks, four wildlife reserves, four conservation areas, and one hunting reserve have been established (Anon. 1998), from which wild populations of *Kachuga kachuga* might benefit.

In 2001, India and Nepal agreed to develop an eco-region adjoining the border areas of both countries, covering *Royal Chitwan National Park, Royal Baridia National Park,* and *Royal Shuklaphanta Wildlife Reserve* of Nepal and *Dudhwa National Park, Katarniaghat Wildlife Reserve, Sohelwa Wildlife Sanctuary, Valmiki Tiger Reserve, Swehingaohegi Barga Wildlife Reserve* and *Corbett-Rajaji National Park* in India (Xinhua News Agency 2001). Populations of *Kachuga kachuga* inhabiting these areas may benefit from this measure.

4.2.3 Management measures

In India captive breeding attempts for *Kachuga kachuga* exist in Morena, Madhya Pradesh and Lucknow, Uttar Pradesh (Choudhury *et al.* 2000). This program reportedly is collecting wild-laid eggs for artificial incubation and presumably releasing hatchlings (Das 1991). Captive specimens are also reported from the Madras Crocodile Bank (Praschag 1999), but captive breeding failed and only wild eggs have been hatched according to Whitaker & Andrews (1997).

4.3 Control measures

4.3.1 International trade

None.

4.3.2 Domestic measures

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5. Information on Similar Species

Das (1991) emphasizes a superficial similarity of *Kachuga kachuga* with several other batagurines of the Indian subcontinent.

6. Other Comments

Kachuga kachuga has been characterized as one of the 10 most threatened chelonians of the Oriental region (Das 1997). The author (*in litt.* 2002) recommends an Appendix II listing of all roofed turtles. According to the co-chair of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, Anders Rhodin (2002; *in litt.* 2001b; c), *Kachuga kachuga* is one of the top-priority species for future CITES listings. In this context, Rhodin recommends a listing of the whole genus *Kachuga*.

As a result of a CITES technical workshop on the conservation of and trade in freshwater turtles and tortoises, held in Kunming 25th to 28th March 2002, the Appendix II listing of *Kachuga* spp. was recommended (AC 2002a). Support for all listing proposals presented at the technical workshop was also acknowledged by the CITES working group on freshwater turtles and tortoises at the 18th meeting of the Animals Committee (AC 2002b).

7. Additional Remarks

Kachuga smithii

1. Taxonomy

1.1	Class:	Reptilia
1.2	Order:	Testudines (Chelonia)
1.3	Family:	Bataguridae
1.4	Species:	*Kachuga (Pangshura) smithii* *Kachuga (Pangshura) smithii smithii* (Gray, 1863) *Kachuga (Pangshura) smithii pallidipes* (Moll, 1987)
1.5	Scientific synonyms:	*Batagur smithii* (Gray, 1863)
1.6	Common names:	English: Brown roof(ed) turtle, brown river turtle *Kachuga smithii smithii:* Common brown roofed turtle *Kachuga smithii pallidipes*: Pale-footed brown roofed turtle French: Kachuga de Smith Spanish: Bangladesh: majhari kaitta Bengali: vaittal katha Dutch: Smith´s dakschildpad German: Braune Dachschildkröte, Smith´s Dachschildkröte *Kachuga smithii smithii:* Smith's Dachschildkröte *Kachuga smithii pallidipes*: Blaßfüßige Dachschildkröte Hindi: chapant, chapatua Italian: Kachuga di Smith Pakistani:
1.7	Code numbers:	

2. Biological parameters

Kachuga smithii belongs to the small-sized subgenus *Pangshura* and shows a strong sexual dimorphism: Males of *Kachuga smithii* have a carapace length of 8 to 10 cm, whereas females are significantly larger with an average carapace size of more than 15 cm, with some specimens growing up to 23 cm (Rashid & Swingland 1997; Shrestha 1997a). Females have short tails with the vent under the carapace, whereas males have longer, thicker tails with the vent beyond the carapace (Ernst & Barbour 1989).

Compared to other *Kachuga*-species the elliptical carapace of *Kachuga smithii* is flat-domed (Rogner 1995), which probably enables the species to swim well (Das 1991). The carapace is olive brown with a blackish keel along the midline, and a yellowish margin of the shell. There is a distinct reddish stripe on the neck extending from the mouth, and a reddish blotch behind the eye. *Kachuga smithii* has a yellowish upper beak and blue eyes. Limbs are webbed and bear enlarged scales. Forelimbs have five claws (Shrestha 1997a). Two subspecies are recognized, based on the coloration of head, penis, shell and limbs (Das 1991):

Kachuga smithii smithii has a plastron pattern of large black blotches narrowly bordered with yellow on each scute. Sides of head, anterior surface of limbs, feet and penis are darkly pigmented. The carapace is of brownish olive color with mid-dorsal dark brown stripe, whereas plastron, bridge and ventral side of marginal are mainly dark but narrowly bordered with light yellow. Dorsal side of head and neck are olive. Behind the eye a tawny reddish-brown blotch is marked, and vague stripes exist on the lateral part of the neck. The skin on outer surface of limbs is olive with band-like scales on forelegs that are lighter than

the ground color. On hind legs and rump prominent striping is marked (Rashid & Swingland 1997; Das 1991).

Kachuga smithii pallidipes differs from the nominate form by the absence of a plastral pattern and a reduction of pigment on limbs, feet, penis, and head, which lacks the brownish-red temporal blotch of the nominate form (Das 1991). The carapace is light grayish olive to brownish olive with a pale yellow rim around the periphery and a single mid-sagittal black line, broken in some specimens. The plastron is straw yellow and immaculate, without a dark pattern, but dark blotches on the ventral sides of marginals. The head is of brownish olive color and lightly mottled with smoky gray dorsally. Behind the eyes the skin is creamy white. The throat is immaculate and unmarked; mandibles are colored in a bright spectrum yellow. The neck is smoky gray dorsally with faint stripes, with the ventral side being unmarked and without stripes. Forelimbs are smoky gray above the elbow and lateral half of forelegs. Large triangular scales are formed on lateral border of the foreleg, toes and webbing are yellow (Rashid & Swingland 1997).

Whereas life expectancy in the wild is not known, captive specimens of *Kachuga smithii* older than 13 years have been documented (Reckel 2001). According to Verma & Sahi (1996) attainment of maturity in males is a function more related to the size than the age of the turtle. The minimum carapace length of males at maturity was more than 56 mm. *Kachuga smithii* has a low reproduction rate, with a clutch size of only 3 to a maximum of 11 eggs, which are of white color and elongated form (Das 1991). Mating season is from July to September (Rashid & Swingland 1997), nesting season between August and November (Whitaker & Andrews 1997). As nesting sites sand banks are preferred (Shrestha 1997a). Size of hatchlings is less than 4 cm in carapace length (Rashid & Swingland 1997).

2.1 Distribution

Countries of origin: Bangladesh, India, Nepal, Pakistan

Kachuga smithii is native to Pakistan, North West India (Indus river system), and Bangladesh (rarely in the Ganges river) (Shrestha 1997). As terra typica the river Chenab in North-western India is reported (EMBL 2001). In Assam populations are confirmed from Kaziranga National Park, Manas National Park, Orang Wildlife Sanctuary, Dhubri, the southern bank of the Brahmaputra in Kamrup District, and Jorhat (Choudhury *et al.* 1999, Das 1991). Populations have also been recorded at Kapurthala, Punjab (Das 1991). In Nepal populations of *Kachuga smithii* inhabit the Koshi River in the eastern part of the country (Shrestha 1997a). Populations in Bangladesh are reported from Pabma and Jamuna Rivers (Sarker & Hossain 1997) as well as Kali Ganga and Padma (= Ganges) Rivers in Dhaka District (Moll 1997). Das (1991) adds Rajshahi and Kushtia as locations.

Kachuga smithii smithii is known from Bangladesh, India and Pakistan (EMBL 2001). Populations of this subspecies in India live in Lower Middle Ganges, Indus and Brahmaputra, with the type locality being River Chenab (CAMP/BCPP 1997; Iverson 1992). According to Das (1991) this subspecies inhabits Assam (Manas Tiger Reserve), Bihar (Kahalgaon, Rajmahal), Punjab (Ludhiana, Ferozpur), and Uttar Pradesh (Gorakhpur, Katerniaghat) in India. There are at least 10 fragmented locations (CAMP/BCPP 1997). In Bangladesh this subspecies is distributed in the central, northern, and north-central areas (Rashid & Khan 2000), including the Nameri National Park (Praschag & Fachbach 2001). Sanghar (Jamvai Head, Dokri), Larkana (Rice Canal), and Lahore are reported as localities in Pakistan (Das 1991). Recently, Edds (1998) also notes that populations occur in Nepal, precisely at the border of Saptari/ Sunsari Districts.

Kachuga smithii pallidipes has been found in India and Nepal (EMBL 2001). As type locality Gandak River, Bherihari Wildlife Sanctuary, Bettiah District, Bihar, is reported (Iverson 1992). This subspecies inhabits northern tributaries of Ganges and Upper Ganges, with a total of more than 10 locations (CAMP/BCPP 1997). However, Rashid & Khan (2000) report that this subspecies is also found in Bangladesh, namely in the central, south central, and southern parts. Populations in Nepal

have been observed in Narayani River near Tribeni Ghat, Koshi, Gandaki, Karnali, and Mahakali rivers (Shrestha 1997a).

2.2 Habitat availability

This riverine, rapidly swimming species strongly prefers shallow, slow-running waters, including dead rivers, with sandy banks and weedy vegetation, including algae (Rashid & Swingland 1997; Shrestha 1997a). Occasionally, individuals can be found in lakes and ponds connected to rivers (Ernst & Barbour 1989) as well as marshes (Rashid & Swingland 1997). Dutta (1997, cited in Choudhury *et al.* 1999) notes that *Kachuga smithii* inhabits rocky riverine habitat with clear water. Areas with macrophytic growth are preferred (Das 1995, cited in Choudhury *et al.* 1999). This species is sympatric with *Kachuga tentoria* and *Kachuga tecta* (Rashid & Swingland 1997). Seasonal activity patterns of *Kachuga smithii* are described, with a hibernation period between December and early March that is spent in smooth and muddy grounds (Rashid & Swingland 1997). Reduced activities have also been observed during dry season (Das 1991). Specimens bask in aggregations and retreat to the water at the least disturbance (Ernst & Barbour 1989).

Whereas the habitat of *Kachuga smithii smithii* is located at an altitude of 200 to 500 meter, *Kachuga smithii pallidipes* can be found up to 600 meter (CAMP/BCPP 1997).

Populations of *Kachuga smithii* severely suffer from habitat destruction in relevant parts of its distribution range. All chelonians in Bangladesh are negatively affected by human population growth, urbanization, loss of wetland, sediment accumulations in rivers, and sand mining (Rashid & Khan 2000). Vital nesting sites of *Kachuga smithii* have been destroyed by sand mining in Bangladesh, e.g. at the Kali Ganga River and Padma River (= Ganges), where river banks are heavily commercially exploited for sand mining (Moll & Moll 2000; Moll 1997).

Van Dijk (2000) also emphasizes the impact of river dams, which are built to generate electricity in power stations, resulting in coastal erosion and reduced water temperature and oxygen content. Those dams may prevent the downstream of sand that otherwise might replace mined or eroded nesting areas or might interfere with nesting migrations. Furthermore periodical release of water in massive amounts can cause severe erosions (Moll 1997). Accordingly, intense damming and withdrawal of water from the Ganges, as reported by Leatherwood & Reeves (1994), are a serious threat to local populations of *Kachuga smithii*. Damming projects, such as the Chisapani Dam may also impact local populations that inhabit the Karnali River in Nepal (Reeves *et al.* 1996).

It has to be feared that the quality of habitat of *Kachuga smithii* in the Ganges delta in Bangladesh is also heavily damaged by the widespread use of insecticides in this area and their impact upon aquatic organisms, including riverine turtles (IUCN/SSC TFTSG 1991). Additionally, the use of agrochemicals may cause infertility, sterility and the thinning of eggshells, resulting in high losses of offspring (Sarker & Hossain 1997).

Despite all these environmental factors, in India substantial areas of appropriate habitat obviously remain (Choudhury *et al.* 2000).

2.3 Population status

Whereas *Kachuga smithii* was not included in the 1996 IUCN Red List it is now classified as "lower risk, not threatened" (IUCN Red List 2000). Already in 1991 Das describes *Kachuga smithii* as "poorly known and not appearing abundant anywhere".

Bangladesh: *Kachuga smithii* is classified as "endangered" in the IUCN-Bangladesh (1999) Red Data Book (Rashid & Khan 2000). Whereas both subspecies are reported as "not common" in Bangladesh (Rashid & Swingland 1997), respectively "few" (Sarker & Hossain 1997), Rashid &

Khan (2000) note that this species is "relatively common" in the tributaries and distributaries of the old Brahmaputra River.

India: Both subspecies of *Kachuga smithii* have been classified on a national basis as "lower risk – least concern" (CAMP/BCPP 1997). The total number of specimens of *Kachuga smithii smithii* is estimated to be more than 10,000, whereas the number of mature individuals is not known. The population size of the second subspecies, *Kachuga smithii pallidipes*, is reported to exceed 20,000 animals (CAMP/BCPP 1997). However, in Kamrup District in Assam, *Kachuga smithii* is the least common turtle species (Choudhury *et al.* 1999).

Nepal: Population status is described as "indeterminate" (Shrestha 1997a).

Pakistan: *Kachuga smithii smithii* has been reported to be "common" (CAMP/BCPP 1997).

2.4 Population trends

Although not listed in the 1996 IUCN Red List *Kachuga smithii* is now classified as "lower risk" (IUCN Red List 2000). This new classification reflects that populations show a negative trend.

A population decrease of both, *Kachuga smithii smithii* and *Kachuga smithii pallidipes* has been observed in India, however exact figures of decline are not known. According to CAMP/BCPP (1997) for the latter subspecies the negative trend may have stopped because irrigation projects offered additional habitat A German retail trader reported that 10 years ago *Kachuga smithii* was found on stock lists of importers more or less regularly, whereas now this species is difficult to acquire (Geckonia *pers. comm*. 2001). Declining populations eventually might cause this trend.

2.5 Geographic trends

Populations at Kali Ganga and Padma (= Ganges) Rivers in Dhaka District, Bangladesh, are in decline (Moll 1997).

2.6 Role of the species in its ecosystem

Reports on the diet of *Kachuga smithii* are controversial: Rashid & Swingland (1997) describe the species as totally herbivorous, whereas in other literature at least the subspecies *Kachuga smithii pallidipes* is reported to be omnivorous and acceptance of omnivorous food is also noted for *Kachuga smithii smithii* (CAMP/BCPP 1997). Das (1991) reports that prawns have been found in the stomach of *Kachuga smithi* specimens and that fishermen use small prawns as bait. In captivity, individuals also feed on fresh fish, frogs, insects, worms, fruits and plants (Ernst & Barbour 1989). Accordingly, this species may influence the plant community composition, by distributing seeds, and vegetation structure in its habitat. Consumption of frogs, worms and insects may contribute to a control of these prey species. Furthermore, turtle eggs and hatchlings are prey for monitors, herons, and some small mammalian predators (Wirth, *pers. comm.* 1998). Van Dijk (2000) emphasizes that in general the ecological role of turtles can be significant, including interactions between turtles of different species.

2.7 Threats

Consumption of chelonians for food and medicine takes place on an unsustainable level: Over-collection for commercial export and domestic consumption is a tremendous threat to all native chelonians of Bangladesh, including *Kachuga smithii* (Rashid & Khan 2000; Sarker & Hossain 1997). Populations in India are threatened by exploitation for meat (Choudhury *et al.* 2000; Choudhury & Bhupathy 1993), whereas in Nepal an impact by over-fishing, habitat modification and pollution is reported (Shrestha 1997a). Additionally, all turtle species in Nepal are exploited for food and medical use, with shells of smaller specimens such as *Kachuga smithii* also being used for the

production of souvenirs and masks (Ernst *et al.* 1997). Large-scale exports of wildlife from Nepal to China and India (Gajurel 2000) may also cover specimens of *Kachuga smithii*. In Pakistan, freshwater turtles, which have become a significant export item to South-east and East Asian countries, are threatened by this trade (Rizvi 2000).

Habitat destruction imposes further pressure on populations of *Kachuga smithii* in most parts of its distribution range, as described for Bangladesh (Rashid & Khan 2000), India (Das 1997; Leatherwood & Reeves 1994), and Nepal (Shrestha 1997a). Main negative factors are intense sand mining (Rashid & Khan 2000; Moll 1997), damming (Van Dijik 2000), and river pollution (IUCN/SSC TFTSG 1991; Shrestha 1997a). Excessive use of insecticides not only damages vitality and fertility in adult specimens but also seriously reduces offspring by thinning eggshells (Sarker & Hossain 1997).

Trade in *Kachuga smithii* for the international pet market causes additional off-take from wild populations.

3. Utilization and trade

National as well as international trade in *Kachuga smithii* is intense. According to Rashid & Khan (2000) turtles form an important source of meat protein for some low-income non-Muslims, as well as tribal people living in or near remote forested areas. *Kachuga smithii* is obviously consumed as food and medicine all over its distribution range (Pro Wildlife 2000). Trade in this species is not limited to local or regional consumption but also occurs on an international level. Besides the use of dead animals as meat and shells, eggs are consumed, too. Additionally, low numbers of live specimens of *Kachuga smithii* are exported for the international pet market.

3.1 National utilization

Bangladesh: The use of turtles and their eggs as food source has a long tradition. However, when the commercialization of the turtle trade developed, the formerly subsistence collection of turtles switched to a well-organized and intensive exploitation. All native species, including *Kachuga smithii*, are affected by domestic consumption (Sarker & Hossain 1997). Rashid & Khan (2000) estimate that in Bangladesh more than 50,000 people are involved in the exploitation of turtles, including fishermen, subsistence collectors, traditional hunters and professional collectors. Turtles are captured with fishing nets, hook lines, by diving, muddling, harpooning and other methods. The daily output of a hunter or collector is about five to eight chelonians. As this exploitation is not selective on a species-basis, *Kachuga smithii* is now used as a substitute for formerly abundant species on sale that were depleted (Rashid & Khan 2000).

India: According to CAMP/BCPP (1997) national trade in both *Kachuga smithii smithii* and *Kachuga smithii pallidipes* is not known. However, subsistence use of *Kachuga smithii* has been reported (Choudhury *et al.* 2000). Exploitation for subsistence consumption was documented for the Indian states Uttar Pradesh, Bihar, and Assam (Choudhury & Bhupathy 1993). Bhupathy *et al.* (2000) even emphasize a large-scale local use. According to Whitaker (1997) part of this trade has gone "underground", when turtles were protected. Specimens have been found in the markets of northern West Bengal in winter months (Das 1991).

Nepal: Juvenile as well as adult specimens are used as pets. Additionally, eggs are consumed for food. There is a considerable turtle trade in the Terai, Narayanghat, Biratnagar as well as in Mahendra Nagar, which covers all native species, including *Kachuga smithii*. Different ethnic groups are involved in this trade, as the Tharu, Darahi, Raji, and Majhis, who sell both meat and eggs (Shrestha 1997a).

Pakistan: no data.

3.2 Legal international trade

Food markets and Traditional Medicine

In recent surveys herpetologists observed an increasing number of species and specimens at food markets in southern China, that originate from the Indian subcontinent, including specimens of *Kachuga smithii* (McCord 1998; Pro Wildlife 2000). However, in most cases the country of origin is not clearly identifiable.

Bangladesh: The central role of Bangladesh for the turtle trade within and exports from the Indian subcontinent is described in details in chapter 3.2. of the *Kachuga dhongoka* proposal. *Kachuga smithii* specimens are involved in this trade, too (Bhupathy *et al.* 2000; Sarker & Hossain 1997). Between 1994 and 1996, Taiwan imported more than 9,400 kg of hard-shelled turtle shells from Bangladesh, including specimens of *Kachuga* spp. (Chen *et al.* 2000). Rashid & Khan (2000) report exports of *Kachuga smithii*, mainly as substitute for *Kachuga tecta*, that is internationally protected by CITES Appendix I. Whereas specimens of *Kachuga tecta* have repeatedly been observed at food markets in China (McCord 1998), Taiwan (Chen *et al.* 2000) and Hong Kong (Lau *et al.* 2000), *Kachuga smithii*, living sympatrically with *Kachuga tecta,* is obviously part of exports to these countries, too.

India: According to Bhupathy *et al.* (2000) *Kachuga smithii* is exported in low numbers but according to Choudhury *et al.* (2000) there are no exports.

Nepal: General exports of chelonians are described in detail in chapter 3.2. of the proposal for *Kachuga dhongoka*. It has to be assumed that this largely unselective trade may also involve specimens of *Kachuga smithii*. There are indications for exports of *Kachuga smithii* to China (Ernst *et al.* 1997).

Pakistan: In Pakistan near the border to China increasing numbers of dead specimens of native turtles have been found indicating exports of chelonians, with dead specimens being sorted out before passing the border (Meier 1999, cited in Pro Wildlife 2000). This export is reported to be increasing, in order to satisfy orders worth millions of USD from South-east and East Asian countries, however detailed data on the volume of turtle exports are lacking. Most shipments are destined for Thailand, Singapore, Hong Kong, South Korea and Taiwan (Rizvi 2000). Lau *et al.* (2000) confirm that since 1992 chelonians originating from Pakistan are on sale at food markets in Hong Kong. Between 1994 and 1996, Taiwan imported more than 7,200 kg of hard-shelled turtle shells from Pakistan, including specimens of *Kachuga* spp. (Chen *et al.* 2000). As other *Kachuga* species, e.g. *Kachuga tecta*, that have been found at food markets in China (McCord 1998), Hong Kong (Lau *et al.* 2000) and Taiwan (Chen *et al.* 2000) originated from Pakistan (Fellowes & Hau 1997) it must be assumed that *Kachuga smithii* is part of exports to East Asia, too.

International pet trade

In Europe specimens of *Kachuga smithii* are on sale in the pet trade, e.g. in Germany and Switzerland (Pro Wildlife 2000; Anon. 2000), the Netherlands (Dutch Animal Products 2001), France (Savannah 2001) and Spain (Triton Animales 2001). Prices per animal vary significantly: In 1997 retail traders in Germany offered specimens of *Kachuga smithii* for about 32 USD (Marxsen 1997), whereas in 2001 the price was between 50 to 80 USD (Mende 2001; Aquaterra 2001). One retail trader reported Pakistan as the country of origin (Marxsen *pers. comm.* 2001). In Switzerland specimens with a carapace size of 10 cm and originating from India were offered for 75 USD (Theiler 1998). In Spain individuals are on sale for about 90 USD (Triton Animales 2001), in the Netherlands for 27 USD (Dutch Animal Products 2001) and in France for 36,50 USD (Savannah 2001).

Japan: Live specimens of *Kachuga smithii* are offered in the Internet by several Japanese pet shops (e.g. Superpetweb 2001).

United States of America: In the internet an US importer offered specimens of *Kachuga smithii*, that are said to origin from Pakistan (IDB 2001). Between September and November 2001, the USA imported approximately 300 wild-caught individuals of *Kachuga smithii* from Pakistan for the pet trade (US FWS *pers. comm*. 2002; US FWS *in litt.* 2000)

Between December 1996 and January 2002 about 300 wild-caught individuals of unnamed species of *Kachuga*, originating from Pakistan, were imported into the United States of America (US FWS *in litt.* 2002). Specimens of *Kachuga smithii* that is native to Pakistan may have been included in these shipments.

3.3 Illegal trade

Bangladesh: See section 3.3. of *Kachuga dhongoka.*

India: Seizures of turtle shipments in northern India, that were destined to China via Bangladesh, are reported (Reuters 2000). Illegal trade of *Kachuga smithii* has to be assessed (Choudhury *et al.* 2000).

3.4 Actual or potential trade impacts

Populations of both subspecies of *Kachuga smithii* are in decline, mainly due to an unsustainable exploitation for food and medicine on both national and international level. Exploitation for commercial export and domestic consumption is a tremendous threat to all wild populations (Das 1997; Sarker & Hossain 1997). With regard to the huge but still growing and largely unselective demand for turtles particularly from East Asian food markets it has to be assumed that international trade will have an increasingly detrimental impact on remaining populations of *Kachuga smithii*.

3.5 Captive breeding for commercial purposes (outside country of origin)

Captive breeding on a commercial level does not exist. Occasionally, captive breeding of *Kachuga smithii* was successful at private keepers in Europe (Rogner 1995), whereas in zoos no hatchling was recorded within the last six months (ISIS 2001). According to the *International Species Information System* (ISIS 2001) four specimens of *Kachuga smithii* are kept in Zoo Leipzig, Germany, with two of each sex. Furthermore, Zoo Baltimore holds four females, and one specimen of unknown sex is kept in Zoo New York Bronx.

4. Conservation and Management

4.1 Legal status

4.1.1 National

Bangladesh: *Kachuga smithii* is obviously listed in Schedule 1 of the *Bangladesh Wildlife Preservation Act* (BWPA, 1974) and therefore not protected (Bhupathy *et al.* 2000).

India: Unclear.

Nepal: None.

Pakistan: No data.

4.1.2 International

None.

4.2 Species management

4.2.1 Population monitoring

A field study of the biology of *Kachuga smithii* was recommended (Das 1991).

4.2.2 Habitat conservation

Bangladesh: Populations in the Nameri National Park may benefit from unspecific conservation measures.

In India no specific efforts for *Kachuga smithii* exist (Choudhury *et al.* 2000).

In Nepal laws have been enacted to protect the habitat of aquatic animals, including turtles (Shrestha 1997). In January 1997 turtle-specific conservation measures were started in the Koshi Tappu Wildlife Reserve (Ernst *et al.* 1997). Additionally, eight national parks, four wildlife reserves, four conservation areas, and one hunting reserve have been established (Anon. 1998), from which wild populations of *Kachuga smithii* might benefit. However, these protection areas have not been specifically established for chelonians.

In 2001, India and Nepal agreed to develop an eco-region adjoining the border areas of both countries, covering *Royal Chitwan National Park, Royal Baridia National Park* and *Royal Shuklaphanta Wildlife Reserve* of Nepal and *Dudhwa National Park, Katarniaghat Wildlife Reserve, Sohelwa Wildlife Sanctuary, Valmiki Tiger Reserve, Swehingaohegi Barga Wildlife Reserve* and *Corbett-Rajaji National Park* in India (Xinhua News Agency 2001). Populations of *Kachuga smithii* that inhabit these areas may benefit from this measure.

Pakistan: No data.

4.2.3 Management measures

In India monitoring of both subspecies and habitat protection have been recommended (CAMP/BCPP 1997; Das 1991). A small-scale captive hatching and rearing facility exists at Narora (Choudhury *et al.* 2000). Additionally, captive specimens have been reported from the Madras Crocodile Bank, although captive breeding failed (Whitaker & Andrews 1997).

4.3 Control measures

4.3.1 International trade

None.

4.3.2 Domestic measures

India: None.

5. Information on Similar Species

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6. Other Comments

According to the co-chair of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, Anders Rhodin (2002; *in litt.* 2001b; c), *Kachuga* spp. should be listed at CITES Appendix II. Das (*in litt.* 2002) recommends an Appendix II listing of roofed turtles, too.

As a result of a CITES technical workshop on the conservation of and trade in freshwater turtles and tortoises, held in Kunming 25th to 28th March 2002, the Appendix II listing of *Kachuga* spp. was recommended (AC 2002a). Support for all listing proposals presented at the technical workshop was also acknowledged by the CITES working group on freshwater turtles and tortoises at the 18th meeting of the Animals Committee (AC 2002b).

7. Additional Remarks

Kachuga sylhetensis

1. Taxonomy

1.1	Class:	Reptilia
1.2	Order:	Testudines (Chelonia)
1.3	Family:	Bataguridae
1.4	Species:	*Kachuga (Pangshura) sylhetensis* (Jerdon, 1870)
1.5	Scientific synonyms:	*Pangshura sylhetensis* (Jerdon, 1870) *Jerdonella sylhetensis* (Gray, 1870)
1.6	Common names:	English: Assam roof(ed) turtle, Sylhet roofed turtle French: Kachuga de l'Assam Spanish: Bangladesh: sylheti kaitta Bengali: kath kathua, sylhet kori kathua German: Assam-Dachschildkröte Mizo: tui-satel (?) Rhiang: tetu-singmanakong
1.7	Code numbers:	

2. Biological parameters

Kachuga sylhetensis is the smallest representative of its genus, with males only growing up to a carapace length of 8 to 10 cm and females up to 20 cm. Due to this small carapace size *Kachuga sylhetensis* has been included in the subgenus *Pangshura*. The elliptical carapace is highly domed, has a strong vertebral keel and is formed like a roof, giving this genus its common English name. Marginalia at the back are strongly toothed. As a unique characteristic *Kachuga sylhetensis* has 26 marginalia (Praschag & Fachbach 2001), in contrary to 24 marginalia, the typical number for all recent turtles (Das 1991). Additionally, the species can be distinguished from other *Kachuga* specimens by an orange to red, sickle-formed band behind its eyes. Additionally, reddish to pink stripes are distinct at the outside of the lower jaw. Head and extremities are of dark-gray to brown color. At the lateral and underside of the neck nine yellow-beige colored stripes are mostly visible. The tail has a dark gray to brown surface, whereas its bottom is cream-colored. The forelegs have very distinct webs (Praschag & Fachbach 2001).

The carapace is olive to brown in color, with a paler, dirty yellow to beige keel. Young specimens and even some males have a clear wavelike camouflage color, similar to *Chitra indica* (Praschag & Fachbach 2001). The plastron is insignificantly shorter than the carapace, yellow in color and has a dark-brownish patch on each marginal plate. The head is of middle-size, with the snout being taller than the lower jaw.

Mating season of the Assam roofed turtle is during the rainy season, between June and August. *Kachuga sylhetensis* tends to have a low reproduction rate. Six to 12 eggs are laid per clutch, with a medium clutch size of 8 to 9 eggs. The egg-laying season extends from late October to February, with the main activities in November and December. Hatchlings can be mainly observed in March and April (Praschag & Fachbach 2001).

2.1 Distribution

Countries of origin: Bangladesh, India

Kachuga sylhetensis does have a widespread distribution range (Choudhury *et al.* 1999) but is only occurring in low numbers. According to the IUCN/SSC Tortoise and Freshwater Turtle Group (2000) *Kachuga sylhetensis* apparently only occurs scarcely in scattered localities and its distribution is restricted to the evergreen forest tracts northeast of the Indian subcontinent, with records from both north and south of the Brahmaputra river (Das 1997; Das 1991). Terra typica is the Sylhet river in Khasi Hills, India (EMBL 2001).

In Bangladesh *Kachuga sylhetensis* is restricted to the hill streams of north-eastern regions, namely Sylhet and Jukiganj (Rashid & Khan 2000). Rajshahi at the western border of Bangladesh to India was reported as an additional location (Annandale 1907, cited in Praschag & Fachbach 2001).

In India it occurs in North Bengal, Assam, Tripura and Chittagong Hills, where more than 10 locations have been identified (CAMP/BCPP 1997). Populations in Cachar Hills (Assam), Garo and Khasi Hills (Meghalaya), and Naga Hills (Nagaland) were reported (IUCN/SSC TFTSG 1991). Records exist from Assam (Cachar Hills, Manas Tiger Reserve, Kolathua village in Sibsagar District), Arunachal Pradesh (Namuri), Nagaland (Naga Hills), Meghalaya (Terria Ghat, Cherrapunji, Garo Hills), and recently Mizoram, extending its range along the hill states (Choudhury *et al.* 2000; Das 1991). Specimens have been proven in Rupahi River (Manas National Park), Nameri Wildlife Sanctuary, Dibru Wildlife Sanctuary, Ghilamara near North Lakhimpur, and recently also in Kamrup District (Praschag & Fachbach 2001). Praschag & Fachbach (2001) also recorded populations in the Lava river near Sonapur, the Kaziranga National Park, Barak River near Silchar, Brahmaputra in Tezpur, as well as near Bisnath Ghat. Recently, for the first time evidence of *Kachuga sylhetensis* in the state Coochbehar was reported, precisely in a lake at Balabhat village in West Bengal. At least four specimens have been caught at that location (Times of India 2001).

2.2 Habitat availability

Kachuga sylhetensis has a strong aquatile lifestyle and inhabits silty low elevation streams (Choudhury *et al.* 2000) in an altitude of zero to 300 meter (CAMP/BCPP 1997). According to Choudhury *et al.* (1999) this species is restricted to hill streams, where individuals are washed down in the plains after heavy precipitation. Praschag & Fachbach (2001) note, that specimens prefer waters with dense-growing plants and may also inhabit ponds. Male and immature individuals mainly live in stagnant waters such as shallow, dead side branches, whereas females avoid these areas and inhabit flowing, deep regions of the main branches. However, in slow-flowing waters with sandy ground specimens can also be found. The Assam roofed-turtle has a secretive, nocturnal lifestyle and is reported to be very shy (Praschag & Fachbach 2001; Das 1991). During the day animals hide between rocks or roots, always contacting the ground. In contrary to other representatives of the subgenus *Pangshura,* the extremely shy *Kachuga sylhetensis* never uses river banks for sunbathing, but only basks on floating objects like roots, branches or trunks of trees, that are surrounded by water and enable the animal to immediately escape and drop into water at the slightest disturbance (Praschag & Fachbach 2001).

Besides human consumption this species is mainly threatened by loss of habitat (Choudhury *et al.* 2000; CAMP/BCPP 1997; Praschag & Fachbach 2001; Das 1997). In Bangladesh, too all chelonians are affected by human population growth, urbanization, loss of wetland, sediment accumulations in rivers, and sand mining (Rashid & Khan 2000). Moll & Moll (2000) stress that nesting beaches of *Kachuga sylhetensis* are damaged by sand mining at Kali Ganga and Padma in Bangladesh. Furthermore, deforestation (Praschag & Fachbach 2001) and conversion of forests to plantations cause erosion and therefore have a significant impact on the original habitat quality and quantity of *Kachuga sylhetensis* (IUCN/SSC TFTSG 2000). Van Dijk (2000) also emphasizes the impact of river dams, which are built to generate electricity in power stations, resulting in coastal

erosion and reduced water temperature and oxygen content. According to Moll (1997) dams may prevent the downstream flow of sand from replacing eroded or mined nesting areas and also may disrupt nesting migration. Furthermore the author notes, that an excessive erosion is caused by periodical release of massive amounts of water.

2.3 Population status

Whereas in the IUCN Red List (1996) *Kachuga sylhetensis* was classified as "data deficient", recently this species was upgrades as "endangered", based on criteria B1 + 2c (IUCN Red List 2000), meaning a limited distribution range, severely fragmented populations and habitat loss (IUCN 1994). The higher status of "critically endangered" was also discussed, but the available data were assessed to be insufficient to justify this status for the whole range. At present, higher densities of *Kachuga sylhetensis* can only be observed in well-protected areas (Praschag & Fachbach 2001).

Bangladesh: *Kachuga sylhetensis* is described as "rare, only known from a few specimens" (Rashid & Khan 2000) and "extremely rare" (Bhupathy *et al.* 2000). Correspondingly, it is proposed as "endangered" in the IUCN-Bangladesh (1999) Red Data Book. According to Praschag & Fachbach (2001) populations of *Kachuga sylhenensis* in Bangladesh are threatened by extinction.

India: The detailed population size is not known. However, as a result of the dramatic breakdown of its populations *Kachuga sylhetensis* has been classified as "critically endangered" on a national level (CAMP/BCPP 1997). This classification is based on criteria A1a, 1c, signifying e.g. *"observed population reduction due to decline in extent of occurrence, area of occupancy and/or habitat quality"*. This species is described as "rare" in part of its range and even "very rare" in Ngengpui, Mizoram (Choudhury *et al.* 2000). According to Bhupathy *et al.* (2000) its status is generally even "extremely rare". Choudhury *et al.* (1999) emphasize that *Kachuga sylhetensis* is the rarest species of the genus *Kachuga* in the Kamrup District, Assam. Populations in Assam closely face extinction, and stable populations only survived in protected areas (Praschag & Fachbach 2001).

2.4 Population trends

Within a period of 10 years the population of *Kachuga sylhetensis* collapsed by 90 percent (CAMP/BCPP 1997), representing the severest population decline of all *Kachuga* species in the recent past. Locally, populations became extinct (Praschag & Fachbach 2001). In the remaining distribution range there are only a few recent records (Bhupathy *et al.* 2000). The fatal depletion of wild populations is reflected by the recent upgrading of classification in the IUCN Red List from "data deficient" (1996) to "endangered" (2000).

2.5 Geographic trends

In Meghalaya local populations of *Kachuga sylhetensis* have been severely depleted by intensive logging activities, remaining specimens are restricted to protected forest areas (Praschag & Fachbach 2001).

2.6 Role of the species in its ecosystem

Kachuga sylhetensis is omnivorous, even taking small freshwater fishes (Das 1991), although it prefers a vegetarian diet, which is mainly available during the rainy seasons (Praschag & Fachbach 2001). Accordingly, this species may influence the vegetation structure and plant community composition, by distributing seeds, in its habitat. During the dry season diet is obviously composed of algae, mollusks, worms, shrimps and larvae from insects (Praschag & Fachbach 2001). Consumption of snails, worms, small fishes and insects contributes to a control of these prey species. Furthermore, turtle eggs and hatchlings are prey for monitors, herons, and some small mammalian predators (Wirth, *pers. comm.* 1998). Van Dijk (2000) emphasizes that the ecological

role of turtles, including interactions between turtles of different species, in general can be significant.

In some regions *Kachuga sylhetensis* lives sympatrically with other *Kachuga* species. However, in larger rivers *Kachuga sylhetensis* cannot withstand the competition with larger species such as *K. smithii* and *K. tentoria*. Accordingly, in areas where these species occur abundance of the Assam roofed turtle is low. Where other *Kachuga* species have disappeared, densities of *Kachuga sylhetensis* populations are higher (Praschag & Fachbach 2001).

2.7 Threats

Facing the recent collapse of its populations any further off-take will have a fatal impact on populations of *Kachuga sylhetensis* in both India (CAMP/BCPP 1997; Praschag & Fachbach 2001; Das 1997) and Bangladesh (Rashid & Khan 2000). Overexploitation for commercial export and domestic consumption is a tremendous threat to all native chelonians of Bangladesh, including *Kachuga sylhetensis* (Sarker & Hossain 1997).

As described in 2.2 of this proposal habitat destruction, e.g. through sand mining (Moll 1997), river pollution (Sarker & Hossain 1997), dams (Van Dijk 1997; Moll 1997), and deforestation (Praschag & Fachbach 2001) has negative or even dramatic consequences for *Kachuga sylhetensis* all over its range.

3. Utilization and trade

Specimens of *Kachuga sylhetensis* are collected for both domestic consumption and commercial exports. Trade includes meat, shells and eggs, the latter being largely restricted to domestic markets. Additionally, there are indications for low-level exports of *Kachuga sylhetensis* for the international pet market.

3.1 National utilization

Bangladesh: Whereas originally other species such as *Geocleyms hamiltoni, Hardella thurjii, Kachuga tecta* and others were the most abundant species on sale, as a result of depleted populations all other native species, including specimens of *Kachuga sylhetensis,* are now used as substitutes (Rashid & Khan 2000). This trade also includes the eggs of the affected species. According to Bhupathy *et al.* (2000) consumption of *Kachuga sylhetensis* is limited to a local range.

India: There are unconfirmed reports on trade (Das 1991, cited in Choudhury *et al.* 2000). Native people consume *Kachuga sylhetensis* throughout its range. Exploitation for subsistence use was documented for the Indian states Arunachal Pradesh and Assam (Choudhury & Bhupathy 1993). Specimens also have been collected within protected reserves (Choudhury *et al.* 2000). Due to their larger size females are preferred (Praschag & Fachbach 2001). However, according to Whitaker (1997) the trade in turtles has gone "underground", when they became protected.

3.2 Legal international trade

Bangladesh: The central role of Bangladesh for the turtle trade within and exports from the Indian subcontinent is described in details in chapter 3.2. of the *Kachuga dhongoka* proposal. However, no detailed export data for *Kachuga sylhetensis* are available (Bhupathy *et al.* 2000). Between 1994 and 1996, Taiwan imported more than 9,400 kg of hard-shelled turtle shells from Bangladesh, including specimens of *Kachuga* spp. (Chen *et al.* 2000). However, as specimens of *Kachuga tecta* repeatedly have been observed at food markets in China (McCord 1998), Taiwan (Chen *et al.* 2000) and Hong Kong (Lau *et al.* 2000), it must be feared that *Kachuga sylhetensis* already are or will become part of exports to these areas, too.

India: No legal trade

There are unconfirmed reports on trade for the international pet market involving *Kachuga sylhetensis* (Choudhury & Bhupathy 1993), but details are not known. Due to its rarity *Kachuga sylhetensis* is obviously scarcely available in the international pet trade. However, as a small-growing and very rare species a demand of some Western turtle enthusiasts for *Kachuga sylhetensis* cannot be excluded.

3.3 Illegal trade

Bangladesh: See section 3.3. of *Kachuga dhongoka*.

India: No data.

3.4 Actual or potential trade impacts

Populations of *Kachuga sylhetensis* experienced a dramatic collapse of 90 percent within recent years (BCPP/CAMP 1997), caused by over-collection and loss of habitat. Facing the dramatic decline and the very low numbers of recent records (Bhupathy *et al.* 2000) it is obvious that continuous unsustainable off-take of *Kachuga sylhetensis* poses a tremendous threat to the survival of this species.

3.5 Captive breeding for commercial purposes (outside country of origin)

According to Rogner (1995) captive breeding is not reported from private keepers in Europe. The *International Species Information System* (ISIS 2001) does not record populations of *Kachuga sylhetensis* in zoos.

4. Conservation and Management

4.1 Legal status

4.1.1 National

Bangladesh: *Kachuga sylhetensis* is obviously listed in Schedule 1 of the *Bangladesh Wildlife Preservation Act* (BWPA), 1974, and therefore not protected (Bhupathy *et al.* 2000).

In India this species is listed in Schedule I of the *Indian Wildlife Protection Act* (IWPA) 1972, meaning a total protection, as possession and trade are prohibited (CAMP/BCPP 1997).

4.1.2 International

None.

4.2 Species management

4.2.1 Population monitoring

This species is included in the Action Plan Rating 2 of IUCN/SSC, which covers species of restricted distribution in need of status investigation (IUCN/SSC TFTSG 1991). Monitoring and life history studies have been recommended for *Kachuga sylhetensis* (CAMP/BCPP 1997; Das 1991), but have not been realized yet.

4.2.2 Habitat conservation

Bangladesh: Populations of *Kachuga sylhetensis* are reported from the national parks Nameri and Kaziranga (Praschag & Fachbach 2001), where they benefit from habitat conservation.

India: No specific conservation measures for *Kachuga sylhetensis* exist. However, populations are present in protected areas in northeastern India (Choudhury *et al.* 2000), e.g. the Manas Sanctuary.

4.2.3 Management measures

None.

4.3 Control measures

4.3.1 International trade

None.

4.3.2 Domestic measures

India: None.

5. Information on Similar Species

In the past, specimens of *Kachuga sylhetensis* were later re-identified as *Kachuga tentoria flaviventer* (Rashid & Swingland 1997). This indicates that non-experts easily mix up both species.

6. Other Comments

According to the co-chair of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, Anders Rhodin (2002; *in litt.* 2001b; c), *Kachuga spp.* should be listed at CITES Appendix II. Das (1991) recommended auto-ecological studies of this species. Recently, the author (*in litt.* 2002) recommended an Appendix II listing of roofed turtles, too.

As a result of a CITES technical workshop on the conservation of and trade in freshwater turtles and tortoises, held in Kunming 25th to 28th March 2002, the Appendix II listing of *Kachuga* spp. was recommended (AC 2002a). Support for all listing proposals presented at the technical workshop was also acknowledged by the CITES working group on freshwater turtles and tortoises at the 18th meeting of the Animals Committee (AC 2002b).

7. Additional Remarks

Kachuga tentoria

1. Taxonomy

1.1 Class: Reptilia

1.2 Order: Testudines (Chelonia)

1.3 Family: Bataguridae

1.4 Species: *Kachuga (Pangshura) tentoria*
*Kachuga (Pangshura) tentoria tentoria** (Gray, 1834)
*Kachuga (Pangshura) tentoria circumdata*** (Mertens, 1969)
Kachuga (Pangshura) tentoria flaviventer (Günther, 1864)

* *tentoria is listed as a subspecies of tecta by Smith, 1931*
** *circumdata is listed as a subspecies of tecta by King & Burke, 1989*

1.5 Scientific synonyms: *Emys tentoria* (Gray, 1834)
Emys (Pangshura) tectum var. intermedia (Blanford, 1870)
Pangshura leithii (Gray, 1870)
Kachuga intermedia (Boulenger, 1889)
Pangshura tentoria (Moll, 1987)

1.6 Common names:

English:	Indian roofed turtle, (Indian) tent turtle *Kachuga tentoria tentoria*: Penninsular tent turtle *Kachuga tentoria circumdata*: Pink-ringed tent turtle *Kachuga tentoria flaviventer*: Yellow-bellied tent turtle, plain-bellied tent terrapin
French:	Kachuga carénée
Spanish:	
Assamese:	halika dura
Bangladesh:	vaitthal kaitta
Bengali:	majhari katha
German:	Indische Zeltschildkröte, Indische Dachschildkröte *Kachuga tentoria tentoria*: Indische Zeltschildkröte *Kachuga tentoria circumdata*: Rosaring-Zeltschildkröte *Kachuga tentoria flaviventer*: Blaßbäuchige Zeltschildkröte
Gujarati:	rangin kachubo
Italian:	Taratuga a tetto indiana
Oriya:	pani kaicha, andeiche kaichha

1.7 Code numbers:

2. Biological parameters

Specimens of *Kachuga tentoria* show a distinct sexual dimorphism: Carapace length reaches an adult size of up to 14 cm for males and 30 cm for females. Males have long, thick tails with the vent beyond the carapace, whereas tails of females are short, with the vent under the carapace (Ernst & Barbour 1989). *Kachuga tentoria* has a pale-olive arched elliptical carapace and a pale pink to yellow plastron. The head is dull olive, with a series of reddish patches behind the eyes, and a pointed snout (Das 1991). There is a distinct marking behind the tympanum. The highly domed carapace is elevated and rounded in adults, carrying a prominent vertical keel, that forms a strong spiny process (Shrestha 1997a, Das 1991). Coloration of the shell, head, and neck is variable in the different subspecies:

Kachuga tentoria tentoria has a dark plastron pattern and no pleuro-marginal ring or reddish markings. Whereas the carapace is brown unicolor, except for an amber stripe along the mid-dorsal keel from vertebral 1-3, the plastron is yellow with large dark blotches on each scute, bridge, axillary, inguinal, and underside of marginals (Rashid & Swingland 1997). Carapace length of the nominate form can reach 23 cm (Das 1991). The head is olive brown, with an clay band present behind the eye. In this clay band a red post-ocular spot is marked (Das 1991). Additionally, there is a smaller red mark located at the dorsal posterior edge of the eye, as well as a poorly defined thin red line in the occipital region. Mandibles are straw yellow. The neck shows dull straw-yellow stripes on lateral and ventral portions. Limbs are of olive color, with edges of scales cream. The rump is marked with vertical black and cream stripes. Males are smaller than females and have longer tails (Rashid & Swingland 1997).

Kachuga tentoria circumdata is the largest subspecies, reaching a carapace length of up to 26.5 cm. The carapace is of olive green color with a pink pleuro-marginal ring. The yellow plastron shows large, dark blotches. A pink postocular spot and pink bars behind the eyes are visible at the olive green head (Das 1991).

Kachuga tentoria flaviventer is a small subspecies with reduced pigmentation, a plastron without pattern, and little or no striping on neck and rump. Male specimens are significantly smaller than females, only reaching less than half of the females' carapace size. Males have a brownish-olive colored carapace, a light mid-dorsal stripe with a pale orange wash on vertebrals 1 and 2, cream on vertebral 3 that is fading on following vertebrals. Plastron, bridge and underside of marginals are unpatterned cream. The head is pale, mottled with brownish olive, and a nearly unmarked patch washed with pale salmon extending from behind the eye back over rear crown of the head, contacting the patch from the other side. Immediately posterior, a dark horizontal line marks juncture of head and neck, with the neck pale cream and unmarked. Carapaces of females have a light buff ground color and a darker central stripe. Their plastron is without pattern but dark blotches are present on the underside of marginals. The head of females is smoky gray on the dorsal side, cream laterally and on mandibles. Furthermore, a light cinnamon brown spot is located behind the eye and another at posterior dorsal edge of the eye (Rashid & Swingland 1997).

Whereas life expectancy in the wild is not known, captive specimens of *Kachuga tentoria* of more than 11 years have been reported (Reckel 2001). *Kachuga tentoria* has a low reproduction rate, with a clutch size of only 3 to maximal 12 eggs, with most nests containing 4 to 8 eggs (Rashid & Swingland 1997). Whereas the clutch size of *Kachuga tentoria tentoria* was reported to be 3-6, in *K. t. circumdata* it was 3-12, and in *K. t. flaviventer* a clutch size of 6-10 eggs have been observed (Das 1991). The nesting season is between October and December, and incubation period is from 125 to 144 days (Whitaker & Andrews 1997). Das (1991) mentions a second nesting time for the subspecies *Kachuga tentoria tentoria* after January. Hatchling size is reported to be about 4 cm (Rogner 1995). Nests are unexpanded holes, 15-26 cm in depth, seven to 40 meters from the water line (Rashid & Swingland 1997; Das 1991).

2.1 Distribution

Countries of origin: Bangladesh, India, Nepal

This species inhabits lower Ganges and northeastern coastal drainages of India and Bangladesh (FLMNH 2001). In Bangladesh, populations in Kali Ganga and Padma (= Ganges) River, both Dhaka District, have been recorded (Moll 1997). Additionally, specimens of *Kachuga tentoria* were observed near Rajshahi, Gaffargaon, and Raipur (Noakhali) (Rashid & Swingland 1997). In India populations are known from Chambal River (Rajasthan District) and Khasrota (Orissa District) (Moll 1997). In Assam, specimens have been reported from the Kaziranga National Park, Manas National Park, Sibasagar, Dibru Saikhowa, and recently also from the Kamrup District (Choudhury *et al.* 1999).

There are controversial reports on the distribution of *Kachuga tentoria tentoria*. According to the CAMP/BCPP (1997) this subspecies is limited to three locations in central, southern and eastern parts of India: Mahanadi, Godavari, and Krishna rivers. Populations have been recorded from Orissa (Tikarpara, Cuttack, Sambalpur, Nanaj, Puri), Andhra Pradesh (Manthani), Madhya Pradesh (Bilaspur), and Maharashtra (Dhond, Pune) (Das 1991). Rashid & Swingland (1997) also reported populations in Bangladesh, more precisely in Padma (= Ganges) and Brahmaputra Rivers in northern Bangladesh. Further specimens have been found near Rajshahi, Gaffargaon, and Raipur (Noakhali). As type locality Dukhun (= Deccan) is reported (Iverson 1992).

Kachuga tentoria circumdata inhabits the upper and central Ganges as well as the Jamuna river (FLMNH 2001; Iverson 1992). This subspecies is endemic to India and known from eight locations in western, central and North India, more precisely in the western tributaries of Ganges, Chambal, and Tapi (CAMP/BCPP 1997). As type locality "Meerut" in India is reported (Iverson 1992). According to Das (1991) populations have been recorded at Madhya Pradesh (Deogarh), Uttar Pradesh (Meerut, Lucknow, Etawah, Bateshwar), and Gujarat (Surat).

Kachuga tentoria flaviventer is distributed in Bangladesh, India and Nepal. It is identified from less than 10 locations at Bihar and Uttar Pradesh (CAMP/BCPP 1997), including the Koshi Tappu Dam, where it lives sympatrically with *Kachuga smithii* (Schleich 1999). Das (1991) lists Bihar (Sambharsa Ghat, Bettiah, Kahalgaon), Uttar Pradesh (Katerniaghat, Gorakhpur), and West Bengal as known localities with the last one probably originating from markets. In Bangladesh, populations range from the old Brahmaputra in central Bangladesh south to Greater Noakhali and adjacent districts (Rashid & Khan 2000; Rashid & Swingland 1997). Populations in Nepal are known from the Koshi River, Gandaki, Karnali, and Mahakali rivers (Shrestha 1997a). According to Edds (1998) a further location is the Narayani River at Nawalparasi District.

2.2 Habitat availability

Kachuga tentoria lives sympatric with *Kachuga tecta* and *Kachuga smithii*. It is a purely aquatic species and prefers flowing rather than stagnant water with some vegetation (Rashid & Swingland 1997). Backwaters and still pools of large and small rivers are the preferred habitat for this active swimmer (Shrestha 1997a). Indian roofed turtles also favor soft ground and abundant aquatic vegetation (Ernst & Barbour 1989). As basking sites rocks and tree trunks are used (Das 1991). Whereas *Kachuga tentoria circumdata* and *Kachuga tentoria tentoria* inhabit rivers in an altitude of zero to 600 meter, specimens of *Kachuga tentoria flaviventer* can be found at an altitude of 150 to 300 meters (CAMP/BCPP 1997).

Habitat destruction poses serious pressure to populations of *Kachuga tentoria.* Populations in Bangladesh are presumably negatively affected by human population growth, urbanization, loss of wetland, sediment accumulations in rivers, and sand mining (Rashid & Khan 2000).

The quality of habitat of this species in the Ganges delta in Bangladesh seems to be heavily damaged: The IUCN/SSC TFTSG (1991) emphasized the widespread use of insecticides in this area and their impact upon aquatic organisms, including riverine turtles. The use of agrochemicals may cause infertility, sterility and the thinning of eggshells, resulting in high losses of offspring (Sarker & Hossain 1997). Populations of *Kachuga tentoria* have been heavily affected by agricultural and industrial pollution, including DDT and pesticides, as well as trapping and netting operations (Shrestha 1997a).

Sand mining has destroyed vital nesting sites of *Kachuga tentoria*, as reported from Kali Ganga River and Padma River (= Ganges) in Bangladesh, and Chambral River as well as Khrasrota River in India, where sand mining caused heavy commercial exploitation of river banks (Moll 1997; Sarker & Hossain 1997). Moll & Moll (2000) report severe damage of nesting beaches of *Kachuga tentoria* at Kali Ganga and Padma in Bangladesh, Chambal (Rajasthan and Madhya Pradesh) and Khrasrota (Orissa) in India. Van Dijk (2000) also emphasizes the impact of river dams, which are built to

generate electricity in power stations, resulting in coastal erosion and reduced water temperature and oxygen content. Dams, that have been built upstream prevent the downstream flow of sand from replacing eroded or mined nesting beaches and furthermore may interfere with nesting migrations (Moll 1997). In Nepal, rivers, such as the Koshi River in eastern Nepal, are greatly impacted by damming, diversion, and canalization (Shrestha 1997b). Also, local populations of *Kachuga tentoria* in the western part of the country, e.g. inhabiting the Karnali River, might be affected by damming projects (Reeves *et al.* 1996).

2.3 Population status

Whereas *Kachuga tentoria* was formerly described as "very common" (Das 1991) and is not included in the 2000 IUCN Red List, the IUCN/SSC TFTSG (2000) now considers the status as "lower risk". The population size of the Indian endemic *Kachuga tentoria circumdata* is estimated at above 20,000 specimens in total (CAMP/BCPP 1997).

Bangladesh: *Kachuga tentoria* has been described as "uncommon" (Rashid & Swingland 1997) and is proposed as "endangered" in the IUCN-Bangladesh (1999) Red Data Book. However, Rashid & Khan (2000) describe the status of both native subspecies, *Kachuga tentoria tentoria* and *Kachuga tentoria flaviventer*, as "common". Accordingly, the authors recommend further evaluation of its status.

India: The endemic subspecies *Kachuga tentoria circumdata* has been classified as "vulnerable", based on criteria A1a, 1c, meaning: "*population reduction observed due to decline in area of occupancy, extent of occurrence and/or quality of habitat*". This classification was also chosen for *Kachuga tentoria flaviventer*, based on criteria B1, 2c, meaning: "*restricted distribution, limited location, continuing decline observed in extent of occurrence, area of occupancy and/or quality of habitat*" (CAMP/BCPP 1997). The third subspecies, *Kachuga tentoria tentoria*, is classified as "lower risk – near threatened" and characterized as "*widely distributed, but populations are affected by threats*" (CAMP/BCPP 1997). *Kachuga tentoria* is described as "common in many areas of its range" (Choudhury *et al.* 2000).

Nepal: Populations of *Kachuga tentoria flaviventer* are described as "rare" (Shrestha 1997a).

2.4 Population trends

A decline of more than 20 percent within a decade has been documented for *Kachuga tentoria circumdata* (CAMP/BCPP 1997). A decrease has also been observed for populations of *Kachuga tentoria flaviventer* (CAMP/BCPP 1997). As a consequence inclusion in the IUCN Red List and the status "lower risk" is now recommended (IUCN/SSC TFTSG 2000). According to Choudhury *et al.* (2000) populations in India are presumed to be stable. On the other hand, this species seems to disappear from food markets in India: Whereas in 1983 *Kachuga tentoria* was observed to be on sale at seven markets, in 1993 no specimens were found on markets (Choudhury & Bhupathy 1993).

2.5 Geographic trends

Populations of *Kachuga tentoria* are in decline at several locations. This trend was reported from Bangladesh, precisely Kali Ganga and Padma (= Ganges) Rivers in Dhaka District, and from India, precisely Khasrota River, Orissa District, and Chambal River, Rajasthan District (Moll 1997).

2.6 Role of the species in its ecosystem

Females of *Kachuga tentoria* are described as strictly herbivorous, whereas males and juveniles have an omnivorous diet, which also includes prawns and beetles (Rashid & Swingland 1997; CAMP/BCPP 1997; Das 1991). The subspecies *Kachuga tentoria circumdata* is described to be

omnivorous (CAMP/BCPP 1997). However, a study of Bhupathy (1993) indicates that females of this subspecies are herbivorous, too, mainly feeding on grass, weed, submerged aquatic plants and fruit. The author notes that *Kachuga tentoria* may consume large quantities of food, reaching up to 15 percent of its body weight. Accordingly, *Kachuga tentoria* may influence the vegetation structure and plant community composition, by distributing seeds, in its habitat. Das (1991) estimates that *Kachuga tentoria* helps to control water-weed growth. Consumption of molluscs, worms and insects by males and juveniles contributes to a control of these prey species. Furthermore, turtle eggs and at least a part of hatchlings are prey for monitors, herons, and some small mammalian predators (Wirth, *pers. comm.* 1998). Van Dijk (2000) emphasizes that the ecological role of turtles, including interactions between turtles of different species, in general can be significant.

2.7 Threats

Human consumption is a significant threat to the Indian roofed turtle: Whereas fishing, human interference and harvest for food have been identified as threats for all subspecies, *Kachuga tentoria circumdata and Kachuga tentoria tentoria* are also negatively impacted by trade (CAMP/BCPP 1997). All turtle species native to Nepal are exploited for food and for medical use. Shells of smaller specimens are also used for the production of souvenirs and masks (Ernst *et al.* 1997). It must be assumed that this species is also affected by the large-scale exports of wildlife from Nepal to China and India (Gajurel 2000). Overexploitation for commercial export and domestic consumption is also a tremendous threat to all native chelonians of Bangladesh, including *Kachuga tentoria* (Rashid & Khan 2000; Sarker & Hossain 1997).

Although the abundance of *Kachuga tentoria* in international pet trade is low, this factor causes further off-takes from wild populations.

Habitat loss and habitat degradation may impose further environmental threats to this species. Main factors are river pollution, with DDT having a fatal role (Shrestha 1997a), sand mining (Moll 1997; Sarker & Hossain 1997), and damming (Van Dijk 2000; Reeves *et al.* 1996). More details are given in chapter 2.2. of this proposal.

In Myanmar, there are indications for the establishment of non-native red-eared sliders, *Trachemys scripta elegans*, which may compete with *Kachuga tentoria* for remaining habitat (van Dijk 1997).

3. Utilization and trade

Kachuga tentoria is not only used on a domestic level for both meat and shell, but is also affected by exports, with China and other East Asian countries playing an increasing role as importers.

3.1 National utilization

Bangladesh: The use of turtles and their eggs as food source has a long tradition. However, when the commercialization of the turtle trade developed, the formerly subsistence collection of turtles switched to a well-organized and intensive exploitation. Rashid & Khan (2000) estimate that in Bangladesh more than 50,000 people are involved in the exploitation of turtles, including fishermen, subsistence collectors, traditional hunters and professional collectors. Capture occurs using fishing nets, hook lines, diving, muddling, harpooning and other methods. The daily output of a hunter or collector is about five to eight chelonians. As this exploitation is not selective on a species-basis, *Kachuga tentoria* is now used as a substitute species for formerly abundant species on sale that were depleted (Rashid & Khan 2000).

India: Local trade in *Kachuga tentoria circumdata* and *Kachuga tentoria tentoria* are reported but not quantified (CAMP/BCPP 1997). At least for subsistence use *Kachuga tentoria* is involved in trade, especially in the Indian states Arunachal Pradesh, Assam, Bihar, and Uttar Pradesh (Choudhury &

Bhupathy 1993). However, disappearance of this species from food markets is indicated: Whereas in 1983 *Kachuga tentoria* was observed to be on sale at seven markets, in 1993 specimens were no longer found at markets (Choudhury & Bhupathy 1993). Das (1991) reported that large specimens are exploited for the meat trade, and that specimens are maintained at Hindu shrines in Orissa.

Nepal: There is a considerable turtle trade in the Terai, Narayanghat, Biratnagar as well as in Mahendra Nagar. Different ethnic groups are involved in this trade, e.g. the Tharu, Darahi, Raji, and Majhis, who sell both meat and eggs (Shrestha 1997a).

3.2 Legal international trade

Food markets and Traditional Medicine

In recent surveys herpetologists observed an increasing number of species and individuals at food markets in southern China, originating from the Indian subcontinent, including specimens of *Kachuga tentoria* (McCord 1998). However, in most cases the country of origin is not clearly identifiable. As specimens of *Kachuga tecta* repeatedly have been observed at food markets in China (McCord 1998), Taiwan (Chen *et al.* 2000) and Hong Kong (Lau *et al.* 2000), it must be assumed that *Kachuga tentoria,* as a species that lives sympatrically with *Kachuga tecta*, is part of exports to these areas, too.

Bangladesh: Between 1994 and 1996, Taiwan imported more than 9,400 kg of hard-shelled turtle shells from Bangladesh, including specimens of *Kachuga* spp. (Chen *et al.* 2000). The central role of Bangladesh for the turtle trade within and exports from the Indian subcontinent is described in details in chapter 3.2. of the *Kachuga dhongoka* proposal. *Kachuga tentoria* specimens are probably part of this trade, too. However, detailed data are missing.

India: None.

Nepal: General exports of chelonians are described in details in chapter 3.2. of the proposal for *Kachuga dhongoka*. It has to be assumed that this largely unselective trade also includes available specimens of *Kachuga tentoria.*

International Pet Trade

Bhupathy *et al.* (2000) report exports in low numbers for the international pet trade. At least part of these exports is destined for the European market. Juvenile specimens of *Kachuga tentoria circumdata* have been offered in Switzerland for 113 USD (Theiler 1998). Furthermore, in Japan specimens of *Kachuga tentoria* are offered in the Internet by pet shops (Superpetweb 2001). Also in the USA specimens of *Kachuga tentoria circumdata* were on sale in the Internet, supposedly originating from Pakistan (IDB 2001). However, as this subspecies is endemic to India, legality of the origin must be doubted. Between December 1996 and January 2002 about 300 wild-caught individuals of unnamed species of *Kachuga*, originating from Pakistan, were imported into the United States of America (US FWS *in litt.* 2002). It is not clear whether specimens of *Kachuga tentoria* were included in these shipments.

3.3 Illegal trade

Bangladesh: See section 3.3. of Kachuga dhongoka.

India: Seizures of turtle shipments in northern India, which were destined to China via Bangladesh, are reported (Reuters 2000). Chelonians caught from the Chambal and other rivers of Kota region of North-West Indian state of Rajasthan and destined for China, Malaysia and other countries were confiscated (PTI 1999). Presumably, Kachuga tentoria is part of these illegal shipments.

3.4 Actual or potential trade impacts

Populations of *Kachuga tentoria* in recent years experienced a decline of 20 percent, which must be mainly attributed to over-collection (CAMP/BCPP 1997). Regarding the huge and even increasing as well as largely unselective demand especially of East Asian food markets it has to be assumed that this international trade will have a dramatic and even growing impact on remaining populations of *Kachuga*. Overexploitation for commercial export and domestic consumption is a tremendous threat to all native chelonians of Bangladesh, including *Kachuga tentoria* (Sarker & Hossain 1997).

3.5 Captive breeding for commercial purposes (outside country of origin)

According to BCPP (1997) captive breeding of *Kachuga tentoria circumdata* and *Kachuga tentoria tentoria* is very difficult. Captive breeding at private breeders is not known. Also in zoos, within the last six months no single hatchling was reported (ISIS 2001). According to the *International Species Information System* (ISIS 2001) only four individuals of *Kachuga tentoria* are kept in zoos in the USA. Three of them, all females, are held in the Baltimore Zoo and one of unknown sex in Zoo New York Bronx. Additionally, one female of the subspecies *Kachuga tentoria circumdata* is kept in the Baltimore Zoo.

4. Conservation and Management

4.1 Legal status

4.1.1 National

Bangladesh: *Kachuga tentoria* is obviously listed in Schedule 1 of the *Bangladesh Wildlife Preservation Act* (BWPA), 1974, and therefore not protected (Bhupathy *et al.* 2000).

India: Unclear.

Nepal: None.

4.1.2 International

None.

4.2 Species management

4.2.1 Population monitoring

CAMP/BCPP (1997) recommended monitoring of *Kachuga tentoria circumdata* and *Kachuga tentoria flaviventer*, whereas for *Kachuga tentoria tentoria* they additionally recommended surveys, life-history studies and limiting factor research. However, according to Choudhury *et al.* (2000) no efforts for species management were conducted in India.

4.2.2 Habitat conservation

Habitat management has been recommended for *Kachuga tentoria circumdata* (CAMP/BCPP 1997). According to Choudhury *et al.* (2000) no specific measures on habitat conservation were needed or attempted.

In Nepal eight national parks, four wildlife reserves, four conservation areas, and one hunting reserve have been established (Anon. 1998), from which wild populations of *Kachuga tentoria* might benefit. However, these protection areas have not been specifically established for chelonians. In January 1997 turtle-specific conservation measures were started in the *Koshi Tappu Wildlife Reserve* (Ernst *et al.* 1997).

In 2001, India and Nepal agreed to develop an eco-region adjoining the border areas of both countries, covering *Royal Chitwan National Park, Royal Baridia National Park,* and *Royal Shuklaphanta Wildlife Reserve* of Nepal and *Dudhwa National Park, Katarniaghat Wildlife Reserve, Sohelwa Wildlife Sanctuary, Valmiki Tiger Reserve, Swehingaohegi Barga Wildlife Reserve* and *Corbett-Rajaji National Park* in India (Xinhua News Agency 2001). Populations of *Kachuga tentoria* inhabiting these areas may benefit from this measure.

4.2.3 Management measures

Whereas for *Kachuga tentoria circumdata* no captive breeding program does exist in India there is a breeding population of *Kachuga tentoria tentoria* in Sayajiibaug Zoo, Baroda (CAMP/BCPP 1997). Additionally, captive specimens are known from the Madras Crocodile Bank (Praschag 1999), but captive breeding failed (Whitaker & Andrews 1997).

4.3 Control measures

4.3.1 International trade

None.

4.3.2 Domestic measures

India: None.

5. Information on Similar Species

In the past, specimens of *Kachuga sylhetensis* were later re-identified as *Kachuga tentoria flaviventer* (Rashid & Swingland 1997). This indicates that both species are easily mixed up.

6. Other Comments

According to the co-chair of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, Anders Rhodin (2002; *in litt.* 2001b; c), *Kachuga* spp. should be listed at CITES Appendix II. In this context Rhodin also recommends to include *Kachuga tentoria* by look-alike reasons. Das (*in litt.* 2002) recommends an Appendix II listing of roofed turtles, too.

As a result of a CITES technical workshop on the conservation of and trade in freshwater turtles and tortoises, held in Kunming 25th to 28th March 2002, the Appendix II listing of *Kachuga* spp. was recommended (AC 2002a). Support for all listing proposals presented at the technical workshop was also acknowledged by the CITES working group on freshwater turtles and tortoises at the 18th meeting of the Animals Committee (AC 2002b).

7. Additional Remarks

Kachuga trivittata

1. Taxonomy

1.1 Class: Reptilia

1.2 Order: Testudines (Chelonia)

1.3 Family: Bataguridae

1.4 Species: *Kachuga (Kachuga) trivittata* (Duméril & Bibron, 1835)

1.5 Scientific synonyms: *Emys trivittata* (Duméril & Bibron, 1835)
Kachuga peguensis (Gray, 1869)
Kachuga trilineata (Gray, 1869)
Kachuga fusca (Gray, 1870)
Batagur iravadica (Anderson, 1878?)

1.6 Common names:

English:	Burmese roof(ed) turtle
French:	Kachuga de Birmanie
Spanish:	
German:	Dreistreifen-Dachschildkröte
Indian:	

1.7 Code numbers:

2. Biological parameters

Kachuga trivittata is the largest species of its genus, with females growing up to 60 cm and males reaching a maximum size of 45 cm. As further sexual dimorphism males have long, thick tails (Ernst & Barbour 1989). The carapace of males is brownish or olive and shows three dark longitudinal stripes, with the middle being placed on the keel. Females have a brown or olive unicolored carapace. The keel is not prominently developed in both sexes. The plastron and bridge are yellow to orange in color (Rogner 1995). *Kachuga trivittata* is closely related to *Kachuga kachuga* (Jenkins 1995).

Data on reproduction of *Kachuga trivittata* is scarce. Nesting season is from December to January, and nesting sites are sandy riverbanks above the tidal limits. Clutch size is about 25 eggs (Rogner 1995) that are largely elongated and have flexible shells (Ernst & Barbour 1989).

2.1 Distribution

Countries of origin: Endemic to Myanmar

According to Platt *et al.* (2000) *Kachuga trivittata* is only known from Irrawaddy (= Ayeyarwady) and Salween (= Tanlwin) river systems in Myanmar. This species has an overall restricted distribution (Das 1997). Iverson *et al.* (1998) report five isolated locations, including Chindwin District Kuang Hein, Bhamo, Pegu, Maulmein rivers, and a location near Tessarim. Despite a discussion about the existence of populations in the Chinese province Yunnan these are not confirmed (EMBL 2001; FLMNH 2001).

2.2 Habitat availability

*Kachuga trivittat*a has an aquatic lifestyle and inhabits large, deep rivers and lakes; juveniles prefer shallow waters (Rogner 1995). Das (1997) reports estuaries as habitat.

Formerly common in the Ayeyarwady basin, populations of *Kachuga trivittata* significantly dropped during the last century (van Dijk 1997). Upstream deforestation, resulting in excessive silt deposition over nesting beaches, had a large impact on habitat availability (Platt *et al.* 2000). Intense logging activities are reported from Myanmar, resulting in an annual deforestation rate of 800,000 hectares. Herewith, Myanmar has one of the five highest rates of forest decline worldwide (Martin 1997; van Dijk 1997). Van Dijk (2000) also emphasizes the impact of river dams, which are built to generate electricity in power stations, resulting in coastal erosion and reduced water temperature and oxygen content. The negative consequences of dams, which on one hand prevent the downstream flow of sand and herewith the recovery of eroded and mined nesting areas and on the other hand may disrupt nesting migrations, are described by Moll (1997). Additionally, the possible establishment of invasive species, such as red-eared sliders (*Trachemys scripta elegans*) gives reason for serious concern (van Dijk 1997).

2.3 Population status

In the IUCN Red List (2000) *Kachuga trivittata* is classified as "endangered", based on criterion A1c, meaning a population decline of at least 50 percent within the last decade, due to habitat loss. The IUCN/SSC TFTSG (2000) now notes that this species is even a candidate for "critically endangered" or even "extinct" because no single specimen has been recorded since 1935.

According to the *International Species Information System* (ISIS 2001) populations of *Kachuga trivittata* in zoos are not known.

2.4 Population trends

In general numbers of native turtles in Myanmar have dropped tremendously at local dealers, indicating decreasing populations in the wild (van Dijk 1997). As a native species *Kachuga trivittata* is obviously in decline, and exploitation is continuing (Platt *et al.* 2000). Decline of wild populations of *Kachuga trivittata* is reflected by the discussion of the IUCN/SSC TFTSG (2000) whether this species might be even a candidate for "critically endangered" or "extinct". Historic accounts suggest that in the 19th century *Kachuga trivittata* was commonly found in the Ayeyarwady delta. These observations were based on egg harvests and nesting densities. Whereas the number of nesting females (of both *Kachuga trivittata* and *Batagur baska*) in the Ayeyarwady delta has been about 2,600 animals in the middle of the 19th century, these numbers declined sharply, last specimens have been observed in 1982 (van Dijk 1997). According to a recent survey there was no evidence for extant populations (Thorbjarnarson *et al.* 1999, cited in Platt *et al.* 2000). The IUCN/SSC TFTSG (2000) even notes that since 1935 no single specimen was recorded.

2.5 Geographic trends

In the Ayeyarwady delta, where *Kachuga trivittata* was formerly common, populations obviously became extinct as a consequence of chronic over-harvesting of eggs and adult specimens (Platt *et al.* 2000; Bhupathy *et al.* 2000).

2.6 Role of the species in its ecosystem

Kachuga trivittata is herbivorous (Ernst & Barbour 1989). Accordingly, this species may influence the vegetation structure and plant community composition, by distributing seeds, in its habitat. Eggs and hatchlings of freshwater turtles are prey for other species, e.g. for monitors, herons, and some small mammalian predators (Wirth, *pers. comm.* 1998). Van Dijk (2000) emphasizes that the ecological role of turtles, including interactions between turtles of different species, in general can be significant.

2.7 Threats

Collection of *Kachuga trivittata* for food and for medical use had fatal consequences for wild populations: Extinction of local populations in the Ayeyarwady delta was attributed to long-term, chronic over-harvesting of both eggs and adult individuals (Platt *et al.* 2000; Das 1997). Aquatic turtles in general, including *Kachuga trivittata*, are exploited for local consumption all over the year (Jenkins 1995). According to Barzyk (1999) nesting females are the preferred target of hunters, who mainly use nylon lines with fish hooks. As a consequence, breeding females that are vital for the long-term survival are removed.

Van Dijk (1993, cited in Jenkins 1995) estimated that eggs of the Burmese roofed turtle are heavily collected, too.

Habitat loss and habitat degradation may impose further environmental threats on *Kachuga trivittata*. Additional threats include large-scale deforestation (Platt *et al.* 2000; Martin 1997) and damming (Van Dijk 2000). Further details are given in chapter 2.2. of this proposal.

3. Utilization and trade

There is an ongoing demand for both eggs and adult specimens of *Kachuga trivittata*. Plastrons of locally consumed chelonians are sold to traders for export (Platt *et al.* 2000), connecting the national and international trade in chelonians. According to Platt *et al.* (2000) turtle collection is generally a part-time occupation to provide supplemental income. However, there are also professional hunters who mainly receive their income from trade in chelonians. Platt *et al*. (2000) describe the abundance of turtle trade as follows: "Significantly, nearly every village we visited seemed to have at least one individual who purchased turtles regularly." *Kachuga trivittata* is reported to be obviously still collected for local consumption. This collection affects eggs as well as adult specimens (Bhupathy *et al.* 2000). Nesting females are the preferred target of collectors, who use lines with fish hooks (Barzyk 1999).

3.1 National utilization

Aquatic species such as *Kachuga trivittata* are caught with nets. Villagers claimed turtle meat as an essential part of their diet, including *Kachuga trivittata*. However, accurate figures for the numbers used are lacking (Jenkins 1995). There is a local demand for meat, although some ethnic groups refuse to consume turtle meat. Ongoing local consumption of *Kachuga trivittata* is assumed, including harvesting of eggs (Bhupathy *et al.* 2000; Jenkins 1995).

3.2 Legal international trade

None.

3.3 Illegal trade

A large-scale illegal trade in chelonians from Myanmar to China has long been suspected. Most turtles that are caught in Myanmar are destined for export, with at least a part of this trade using traditional smuggling routes for wildlife into Yunnan province in China (Martin 1997). This trade covers live specimens as well as plastrons, with the latter being remnant from local meat consumption. Additionally, a smaller number of chelonians is also smuggled into Bangladesh. The center of turtle trade in Myanmar is Mandalay, from where turtles are shipped overland into northeastern Myanmar and then to China. Additionally, turtles are also exported to Thailand (Bhupathy *et al.* 2000; Martin 1997). Local traders often hold live specimens for a longer time until enough animals have been collected for shipments, resulting in a high pre-export mortality (Platt *et al.* 2000).

The sale of turtle species from Myanmar at the Chinese Xing Ping market, Guangzhou Province in southern China (Artner & Hofer 2001) and at food markets in Ruili, Yunnan Province (Kuchling 1995) is evidence for exports of chelonians from Myanmar to China. As a species native to Myanmar *Kachuga trivittata* may be affected by these exports, too, because large-growing turtle species are preferred for the food markets.

3.4 Actual or potential trade impacts

The unsustainable harvesting of *Kachuga trivittata* in the past had fatal consequences for wild populations and led to the extinction of local populations in the Ayeyarwady delta (Platt *et al.* 2000; Das 1997). Aquatic turtles in general, including *Kachuga trivittata*, are exploited for local consumption all over the year (Jenkins 1995). Thorbjarnarson *et al.* (2000) emphasize that *Kachuga trivittata* belongs to the chelonians that are most threatened by excessive exploitation for food. Van Dijk (1993, cited in Jenkins 1995) estimated that eggs of the Burmese roofed turtle are heavily collected, too. As a large-growing species *Kachuga trivittata* is especially attractive for national and international food markets. With regards to the mass exports of chelonians from Myanmar to China (IUCN/SSC TFTSG 2000) it has to be feared that remaining specimens of *Kachuga trivittata* are tremendously threatened by trade. Any further off-take of this extremely rare species may lead to its extinction.

3.5 Captive breeding for commercial purposes (outside country of origin)

No data.

4. Conservation and Management

4.1 Legal status

4.1.1 National

In Myanmar both Fisheries and Forestry laws protect chelonians. Permits for collection of turtles for commercial purposes are not issued (Platt *et al.* 2000). However, consumption for subsistence use is allowed (Jenkins 1995).

4.1.2 International

None.

4.2 Species management

4.2.1 Population monitoring

Kachuga trivittata was included in the Action Plan Rating 1 of IUCN/SSC, as this threatened species needs specific conservation measures (IUCN/SSC TFTSG 1991).

4.2.2 Habitat conservation

There are several sanctuaries and protected areas in Myanmar. Van Dijk (1997) noted the existence of 15 wildlife sanctuaries and three national parks, of which some are located near the Irrawaddy river system and one wildlife sanctuary is in the southern part of Salween River. Additionally, the expansion of protected areas is continuing throughout the country. Especially conservation of nesting sites is recommended on a site-by-site basis (van Dijk 1997).

4.2.3 Management measures

Enforcement of anti-poaching is inefficient according to Platt *et al.* (2000) and measures are not specifically directed to chelonian habitat.

4.3 Control measures

4.3.1 International trade

None.

4.3.2 Domestic measures

Trade permits are not issued for chelonians (Platt *et al.* 2000).

5. Information on Similar Species

According to Das (in litt 2002) *Kachuga trivittata* may not be a valid species, but perhaps a synonym of *Callagur borneoensis*.

6. Other Comments

According to the co-chair of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, Anders Rhodin (2002; *in litt.* 2001b; c), *Kachuga spp.* Should be listed at CITES Appendix II. This recommendation is also given by van Dijk (1997) and Das (*in litt.* 2002). Platt *et al*. (2000) emphasize: "With the exception of *Lissemys scutata*, all chelonian species in Myanmar should be regarded as threatened by levels of harvest that are almost certainly unsustainable... Without rapid implementation of protective measures, turtle populations may disappear before even basic ecological studies can be undertaken". Jenkins already in 1995 recommended to review whether *Kachuga trivittata* should be included in the CITES appendices (Jenkins 1995).

As a result of a CITES technical workshop on the conservation of and trade in freshwater turtles and tortoises, held in Kunming 25th to 28th March 2002, the Appendix II listing of *Kachuga* spp. was recommended (AC 2002a). Support for all listing proposals presented at the technical workshop was also acknowledged by the CITES working group on freshwater turtles and tortoises at the 18th meeting of the Animals Committee (AC 2002b).

7. Additional Remarks

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