

TURTLE CONSERVATION FUND

Species Recovery Plan

(Taxon Captive Management Plan and Field Action Plan)

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16 December 2002

Species:

Batagur baska, River Terrapin.





Distribution: Eastern India and Bangladesh through Myanmar (=Burma), Thailand, Cambodia, southern Vietnam and peninsular Malaysia to Sumatra, Indonesia.

Habitat: Tidal areas of estuaries of large rivers, and during the nesting season (late December to early March), ranges far upstream in these rivers.


Protected Status:


 CITES I

 Quotas: (unknown)

 The species is fully protected from all forms of exploitation under domestic legislation in India, Indonesia, Myanmar and Thailand. It is scheduled for inclusion in as-yet unapproved legislation in Cambodia, and is not legally protected in Bangladesh and Vietnam (though export would be prohibited under their CITES obligations) (P.P. van Dijk, personal Communication).


Conservation Status:


 IUCN Red List -Critically Endangered

 Summary of trade and threats: Presumed extinct in Myanmar, Vietnam, and Singapore. Eggs and adults are over exploited for food. Populations are also declining due to destruction of mangrove forests, sand mining, damming of rivers (Moll, 1990; Moll and Moll, 2000), and probably pollution (P.P. van Dijk, personal communication) (see conservation and research needs section below for more details).



Status In Captivity:

 20.35.50 (105) from 13 institutions listed worldwide in ISIS and in the international studbook currently under preparation at Cleveland Metroparks Zoo (Table 1).

 *Batagur* has successfully reproduced outside Asia only at the Bronx Zoo. One female there produced four clutches over eleven years (1990, 1995, 1999, 2001).

Reproductive success in Asian collections is not fully known at this time; however, head starting, captive propagation and/or hatchery programs exist in the following countries:

1. Malaysia: This program is administered by the Department of Wildlife and National Parks - PERHILITAN, in conjunction with District Offices. Captive breeding facilities for *Batagur* are located at a) Bota Kanan in Perak (established in 1968), b) Bukit Paloh in Terengganu (established in 1976), and c) Bukit Pinang in Kedah (established in 1978) (bin Abdul, 1998).
2. Thailand: A *Batagur* breeding facility is located at the Thai Fisheries Department's Satun Freshwater Fisheries Development Station at La-nguin in Satun Province.
3. India: Eggs are removed from West Bengal Forest Department Project Tiger Sanctuary at Bagmara to a hatchery at Pakhiralaya.

Reproduction is fairly widespread in these facilities, but training is needed in husbandry, veterinary care and egg incubation techniques (Moll and Moll, 2000; P.P. van Dijk, personal communication).

TMG Point Person(s): Hugh Quinn, Ph.D. (General Curator, Cleveland Metroparks Zoo, Cleveland, Ohio USA), and John Behler (Curator, Department of Herpetology, Wildlife Conservation Society - Bronx Zoo, Bronx, New York USA).

Identify the TSA partners in this TMG and Describe their expertise and abilities (Note: additional partners will be solicited as the program develops) (numbers in parentheses indicate number of *Batagur* male, female and unknown sex, respectively at the facilities indicated):

-  John Behler, Wildlife Conservation Society -Bronx Zoo: large heated indoor pool; four successful breedings. (5.6.1)
-  Hugh Quinn, Cleveland Metroparks Zoo: two large heated indoor pools; interested in importing founder stock from Asian collections to North American collections. (2.3.0)
-  Dan Badgley, Columbus Zoo. (0.0.0)
-  Francis Lim, Singapore Zoological Gardens: (8.12.0)
-  Alan Kardon, San Antonio Zoo: Large outdoor enclosures with natural well water flowing through at a constant temperature year round. (1.3.0)
-  Don Boyer, San Diego Zoo: Large, outdoor pool. (1.1.0)
-  Lonnie McCaskill, Disney's Animal Kingdom; interested in importing founder stock; will construct new, outdoor off-exhibit facilities. (0.0.0)
-  Gerald Kuchling, Chelonia Enterprises. (0.0.0)
-  Peter Paul van Dijk, IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. (0.0.0)
-  Scott Pfaff, Riverbanks Zoo; interested in exhibiting and reproducing, indoor facilities (0.0.0)
-  John Brueggen, St. Augustine Alligator Farm; Outdoor facilities available. (0.0.0)
-  Harald Artner, Chelonia 2002; indoor facilities. (0.0.0)
-  David Martini (0.0.0)
-  Bill Neisling (Florida); Outdoor Facility. (0.1.0)

Provide signatures of all partners indicating that they agree to TSA Guidelines for participation in the TMG, and that they will comply with the recommendations of that particular TMG



Describe suitability of facilities participating in this TMG:

North America: The indoor facilities indicated above have large indoor pools (Cleveland Metroparks Zoo, Wildlife conservation Society - Bronx Zoo). Outdoor facilities that Disney's Animal Kingdom may construct are large pools. The San Antonio Zoo has large outdoor enclosures with natural well water flowing through at a constant temperature year round. Bill Neisling (Florida) has a large outdoor pool.

Malaysia: Jasmi bin Abdul (1998) reports that in Malaysia the breeding complex at Bota Kanan, Perak consists of breeding ponds and an artificial sandbar for nesting, as well as amenities for rangers and visitors. The hatchery has been designated a tourist site, and attracts many visitors. There are also three large culture ponds. The main pond is divided into four compartments to raise hatchlings to four-years of age (which are then released). The other two ponds are for breeding adults. The program began in 1968 with an initial stock of 68 *Batagur*. More adults were introduced in subsequent years. The total *Batagur* population at Bota Kanan in 1998 was 4,914.

Breeding of the terrapin at Bukit Pinang, Kedah began in 1978. The ponds here are slightly smaller than those at Bota Kanan, Perak, and about 1,800 animals reside at this facility.

Breeding at Bukit Paloh, Ulu Terengganu began in 1976. The ponds here are also slightly smaller than those at Perak, and about 1,040 animals reside here.

In Malaysia, eggs are collected in the wild by licensed collectors near the above facilities each year. About 5,000 eggs are collected annually in Terengganu and Kedah, but about 24,000 are harvested in Perak (bin Abdul, 1998). The Department of Wildlife and National Parks (PERHILITAN) buy 20% of the eggs collected by the villagers for its breeding programs in the above three facilities. PERHILITAN rangers go to the nesting beaches to buy the eggs before they are sold to the public. Eggs are then incubated in artificial nests, about 60 cm deep, accommodating 20 - 30 eggs each. The openings to the nests are fenced with wire mesh to protect them from predators, and to prevent hatchlings from escaping. Hatching success is 40% - 85%. Styrofoam boxes filled with sand are also used to incubate some eggs. Hatching success is higher with this method. Young are fed kangkong (*Ipomea* sp.), ripe banana and fish meal. They are released in their respective river systems at an age of about four years. Since 1968, over 30,000 young *Batagur* have been released into the Perak River.



Thailand: van Dijk (1999) reports that the only population remaining in Thailand exists in captivity at the Satun Freshwater Fisheries Development Station at La-ngu in Satun Province. This station was established in the early 1980s for breeding *Batagur baska* as well as *Callagur borneoensis*. It is located in a bend of the Klong La-ngu River and includes a sandy river beach on its grounds that was a natural breeding site until recently. For protection and control of the animals, a small section of the river and this nesting beach were fenced. Adult animals were caught whenever possible, and placed in this enclosure.


The *Batagur* here originated not only from Klong La-ngu itself, but also from other provinces, from both the Andaman Sea and the Gulf of Thailand coasts. The total population is less than 100 mature, wild-caught individuals, plus an unknown number (probably in the low 100s) of captive born offspring of different ages. Reproductive success is low compared to the number of mature females held at the station. The conditions under which these animals are maintained need to be improved significantly. This, in turn, should lead to improvements in the numbers of eggs and hatchlings produced. Many captive-born *Batagur* from this station have been released at a number of sites in Thailand, including Sirnagarind, Tha Thung Na, and Sirikit reservoirs; Thale Noi wetland and Klong La-ngu. Most of these sites are not conducive to *Batagur* survival, and there has been no reported sightings at any of the above locations since release.


A concern is that all *Batagur* are kept at one site. The consequences of an infectious disease or other calamity striking this single site would be horrendous. It would be desirable to establish a second site and move about half the animals there. Suitable release sites for animals produced at the station need to be identified. Such potential sites include the Klong La-ngu area itself, the mangroves of Laem Son National Park, and perhaps Khao Sam Roi Yot National Park (van Dijk, 1999).


Descriptions of other Asian and Indian facilities are not yet available.





Describe the ultimate goal of your captive population:

 **Reintroduction through maintaining a viable captive population (assurance colony) over time.** The goal is to maintain a large (300 specimens) captive population as an assurance colony (exclusive of the above mentioned facilities in Malaysia and Thailand) that is capable of producing large numbers of offspring for reintroduction should this become necessary. This figure (300) is a liberal estimate, and may actually be lowered once appropriate analyses are conducted to estimate population size needed to meet the genetic goal stated below. Note: The goal of the Asian hatcheries described in the above section is to release hatchling and head-start turtles (see the conservation and research needs section below for more details).

 **Genetic goal:** The population will be managed to retain 90% gene diversity over 100 years.

 **Number of founders (those wild-caught animals that have successfully reproduced in captivity) and potential founders (those wild-caught animals that have not yet reproduced in captivity) existing and number needed:** Fifteen potential and at least two founders exist in North American collections. It is unknown if there is more than one founder male, as the founder female at the Bronx Zoo was housed with several males at the times of her reproductive events. Although the International Species Inventory System (ISIS) shows 79 specimens exist in Asian collections (Table 1), the number of founders and potential founders is not yet known. However, there are about 50 - 100 mature, wild collected animals plus hundreds of captive-hatched offspring, some approaching maturity, in Thailand, with larger numbers in Malaysia (see above descriptions of Asian facilities) (P.P. van Dijk, personal communication). Therefore, if large holdings of founders and potential founders exist in these collections, there may already be enough animals in captivity to meet the genetic goal of this program. **Problem:** Populations from the Andaman Sea - Straits of Malacca may be genetically different from South China Sea populations, and animals from different coasts have certainly been brought together in the Satun Breeding Centre in Thailand and possibly stock or hatchlings have been moved between river basins within Peninsular Malaysia. Meanwhile, these Thai-Malay animals are definitely recognizably different from India-Bangladeshi animals (which almost certainly are not in western collections) (P.P. van Dijk, personal communication).

 **Origin and location of founders and potential founder specimens:** There are minimally two founders in North American collections, and these are both held at the Wildlife Conservation Society - Bronx Zoo. The number of founders and potential founders in Asian institutions is unknown at this time (Table 1).

 **Target Population Size, i.e., the number of specimens required to maintain a genetically viable and demographically stable captive population. This number will be based on the reproductive and life history characteristics of the particular species, and may require the input of a biologist with small population management experience.** A population analysis has not yet been conducted for this species. Few data for such an analysis are available, making the results speculative at best. Based on the longevity and fecundity of this species, a target population size of 100 is probably sufficient to meet our genetic goal. Therefore, our arbitrary population size of 300 should be more than adequate to sustain this species. As further population data are available on *Batagur*, analyses will be conducted to further refine the target population size. Caution must be taken to not allow this species to needlessly consume limited space available for other large riverine forms (i.e., *Callagur*, *Orlitia*). Attaining our goal of maintaining 300 turtles will require recruiting partners with additional indoor or year round outdoor facilities with adequate space, and in forming partnerships with Asian institutions such as Singapore Zoological Gardens, Khao

Kheow Open Zoo (Thailand), Taiping Zoo (Malaysia), Zoo Negara (Malaysia), and Malacca Zoo.

Define length of program: Long-term management (100 years) vs. short-term (emergency rescue/holding): This is a long-term program with a 100 year goal.
Identify the sources for specimens included in this Management Plan: Sufficient captive specimens probably already exist to manage a healthy population, hence most likely no additional specimens from the wild will be needed. Confiscated turtles, however, should be integrated into the captive gene pool.

Are husbandry techniques known?

If unknown, describe your techniques for husbandry and reproduction: Husbandry techniques are generally known, but breeding in North America has been known to occur at only one institution (Wildlife Conservation Society - Bronx Zoo) from only one female. Techniques need to be developed so this species can be consistently reproduced at multiple facilities. Multiple males may be an important factor in successful breeding, as may be seasonal changes in temperature, water level, water chemistry and food intake (P.P. van Dijk, personal communication).

Has the species reproduced in captivity: Yes, multiple times, but in North America from only one female at only one institution. Reproduction in Asian institutions is relatively widespread, but training in husbandry, veterinary care and incubation techniques would be beneficial (P.P. van Dijk, personal communication).

Does the species have a good or poor history in captivity? Relatively good. Survives and grows well, but consistent reproductive success is problematic.

Are there genetic issues that need to be resolved with this species?

Is this a wide-ranging species with many sub-populations where cryptic taxa may exist? Wirot (1979) described *Batagur baska ranongensis* from Thailand as differing by its flat, round carapace, as opposed to the elongated, narrower carapace of normal adult *B. baska*. However, this probably just represents an abnormal growth pattern, as all juvenile *B. baska* are rounded, but become more elongated with age. Moll has told us that *B. baska* from the east coast of Malaysia differ in coloration from those of the west coast. Male animals of the Indian-Bangladeshi population develop red courtship coloration at the base of the neck and forelimbs, with the head and most of the neck deep black (Das, 1991; E.O. Moll, personal communication). This is unlike other populations, which have only the black coloration of the head, neck and forelimbs, with no red pigment. E. O. Moll has also noted a skeletal difference in the few skeletons that are available. In the shell of the Malaysian *Batagur* there is a fusion of two pleurals leaving a gap between posterior neurals. The two skeletons examined by him from the south Asia population (India/Bangladesh) do not show the pleural fusion. If this holds-up in examination of other specimens, the populations could potentially be considered separate species.



🐢 Do insular sup-populations exist that may differ genetically from mainland populations? No differences noted to date, and most likely identical to the western peninsular Malaysian population (P.P. van Dijk, personal communication).

Describe your TMG's plan for managing this species:

🐢 **Managed as large groups or as pairs:** *Batagur* is probably best managed in groups with multiple males and perhaps also multiple females.

🐢 **Describe how surplus will be managed once target population size is reached:** We anticipate managing a captive population of approximately 300 specimens (or perhaps less) while striving to equalize representation from as many of the wild-caught specimens as possible. As unrepresented specimens contribute to the population, some turtles from over-represented founder lines may need to be surplused to create space. Space will be the primary limiting factor in designating surplus specimens.

🐢 **Describe plan for dispersal of offspring:** If surplus stock cannot be placed with other TSA partners, then other non-participating private parties, institutions or organizations will be utilized.

🐢 **Describe the methods you will use to individually identify the turtles in this captive population:** All specimens should be PIT tagged when appropriate size is attained for permanent identification. Hatchlings should be uniquely identified utilizing other means until they can be PIT tagged.



Have Range Country Partners been identified?

🐢 **Have linkages with NGOs and range country programs been investigated for collaborative and eventual repatriation/relocation efforts?** Zoos in Asia, especially those with current holdings of this species, will be encouraged to collaborate with this program. It may also be important to work with the Department of Wildlife and National Parks in Malaysia and with the Satun Fisheries Station in Satun Province, Thailand. These two organizations have captive populations of adult *Batagur* and are breeding them in captivity. A population

being raised in West Bengal, India may be the only one from the northern population (India/Bangladesh). However, it may have been derived from individuals of a single clutch (E.O. Moll, personal communication).

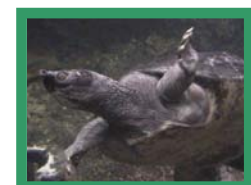
Describe conservation and research needs for this species: This section is divided into *ex-situ* (in captivity) and *in-situ* (in nature) conservation needs. Key conservation issues are first defined within each of these two divisions, then specific projects that may help rectify these issues are presented.

Ex-situ Conservation Needs

Key Conservation Issues: Challenges involve developing appropriate husbandry and veterinary care programs for *Batagur* at certain facilities, especially in Asia. Improving turtle enclosures and supportive structures and equipment plus training for better animal care and incubation practices should accompany these programs. While the basic husbandry and veterinary care needs of *Batagur* are fairly well known, this information has not reached all facilities that may be important to the long-term management of this species in captivity. Other *ex-situ* challenges involve appropriate genetic and demographic management for long-term maintenance of captive populations. Another basic *ex-situ* need is to develop procedures for consistent, successful reproduction, as this species does not regularly reproduce in captivity.

Specific Projects:

1. **Husbandry and Population Management Training:** Training of a) North American Taxon Management Group (TMG) leaders in studbook keeping and population management, and b) Asian turtle caretakers in husbandry and veterinary care (particularly personnel from the Malay and Thai head-start facilities mentioned in the above Status in Captivity section) is a project proposed by Cleveland Metroparks Zoo. This project additionally provides funding for Asian turtle facility enhancement, and the creation of an Asian Regional Coordinator (for Tortoise and Freshwater Turtle Conservation) position(s). This is a two year program, with a total budget \$159,748. \$60,000 has already been received from the G.G. Wade Foundation (Cleveland, Ohio) and Cleveland Zoological Society. A \$75,000 grant proposal has been submitted to the Institute of Museum and Library Services (IMLS) by Cleveland Metroparks Zoo for additional funding.
2. **Temperature Dependent Sex Determination (TDSD):** Research is needed in this field, as many eggs are currently incubated in Malaysian, Thai and Indian hatcheries as components of release programs. TDSD will also be important in other captive breeding and long-term captive management programs for *Batagur*. The only significant funding needed for this project would be for analysis of hormone levels in hatchling blood samples. The problem here is that the analysis most likely would be done in the US from samples taken in Asia. In doing so, CITES I permits would be required. Alternatively, it may be possible to link with Thai and Malaysian universities if protocols are developed. Total budget unknown.
3. **Reproductive Biology of *Batagur*:** Cleveland Metroparks Zoo is in the initial stages of developing a project to simultaneously trace 1) estrogen, progesterone and testosterone levels, and 2) ovarian and testicular development (through ultrasound imagery), while all the time looking at behavioral and environmental correlates with these factors. This research will help us better understand the reproductive cycles of *Batagur*, and provide insight into consistently reproducing this species in a captive environment. Total budget unknown.



In-Situ Conservation Needs

- Key Conservation Issues: Factors resulting in the decline of *Batagur* in the wild are summarized by Moll (1990) and Moll and Moll (2000), and include:
1. Direct removal of animals and eggs from the wild for human food.
 2. Destruction of nesting beaches by sand mining.
 3. Creation of dams that:
 - a. alter downstream water levels (flooding beaches when regular water releases are made during nesting season).
 - b. destroy downstream nesting beaches (by: 1) washing them away during water releases, 2) not allowing sand to wash downstream to re-form or maintain them, and 3) depositing silt over the sand beaches making them inappropriate for nesting).
 - c. block migration routes from estuaries to upstream nesting beaches.
 4. Destroy mangrove forests that provide prime foraging habitat for this species.
 5. Pollution of rivers with domestic effluent and agro-industrial pollutants, particularly pesticides (P.P. van Dijk, personal communication).

In situ conservation needs for *Batagur* should address these issues, and thus involve 1) enforcing of existing protective measures for the species, 2) establishing reserves that contain both foraging and nesting areas, including providing assistance in enforcing regulations for protection in existing reserves (less of an issue than the fact that there are no adequate protected areas fully embracing an entire population's feeding and nesting habitats) (P.P. van Dijk, personal communication), and 3) conducting public education programming in and around such reserves and in non-protected areas (where *Batagur* populations exist) (Moll, 1990; Moll and Moll, 2000).

Additionally, techniques need to be developed to successfully re-establish populations within the historic range (or bolster fragile extant populations) of this species from captive bred or head started turtles. Such techniques are not well established, and programs for other reptiles employing them have received criticism as to their conservation effectiveness (Burke, 1991; Dodd and Seigel, 1991; Reinert, 1991; Seigel and Dodd, 2000). These programs must first 1) rectify the cause of decline suffered by the historic or fragile populations, and 2) employ structured, evaluative measures to assess their usefulness and, if necessary, appropriately adjust their methodology. Only by utilizing sound, scientific principles in designing, implementing and evaluating release programs will we evaluate their usefulness as conservation tools.

Specific Projects:

1. Support of Existing Reserves:

Malaysia: Peter Paul van Dijk tells us that there is a good *Batagur* population in the Setiu River of NE peninsular Malaysia that nests in a nominally protected area at the estuary. There's *Callagur* there as well. Dino Sharma (WWF-MY) has worked on the *Callagur* for years and would be interested in expanding conservation and research work to *Batagur* if funding and dedicated staff to do the field management could be obtained. Qualifications needed are ability to speak Malay and having an understanding of turtle ecology and conservation biology. Total budget unknown.

E.O. Moll suggests (personal communication) that a good possibility for another reserve in Malaysia is at Bota Kanan, Perak. The West Malaysian Department of Wildlife and National Parks declared this nesting area (probably the best in Malaysia) a sanctuary. Unfortunately, it is largely a sanctuary in name only. While river terrapin adults are protected in the region, egg collecting is still permitted by obtaining a license. Sand mining is also allowed. If the Department of Wildlife could be talked into giving the eggs and animals protection and prohibiting sand mining, this would be an excellent nesting reserve. Ideally, another preserve would need to be established in the estuary of the river protecting the habitat, particularly the small tributaries, where the turtles feed at high tide. The area gazetted on the Dugun River (east coast) for egg collection would be another possibility. Total budget unknown.

Sumatra: There may also exist good possibilities in Sumatra, but specific areas have yet to be identified.

Thailand: There is also potential to implement protection of the Klong La-ngu (=La-ngu Creek) in Satun, Thailand, and restore the existing nesting beach to *Batagur*. The nesting beach is within the compound of the Satun fisheries station, but since all the *Batagurs* are penned-in, not much is happening at the moment. Lots of potential (P.P. van Dijk, personal communication). Total budget unknown.

Cambodia: *Batagur* was re-discovered at Sre Ambel, Cambodia in January 2001 (along the Kaong River, Kompong Seila District, Koh Kong Province) by the Department of Fisheries and Wildlife Conservation Society. Conservation measures needed are to 1) safeguard nesting sites, 2) protect the non-breeding population, 3) raise awareness to people living near this population of the conservation importance of this species, and 4) monitor fishing activities and enforce fisheries laws (Sovannara, 2002). Specific recommended actions include: 1) conduct further surveys to locate additional nesting sites, 2) carry-out additional educational programming in villages and schools along the Kaong River, 3) monitor the *Batagur* population to detect trends, and 4) utilize telemetry to define use areas outside of the nesting season. Total budget unknown.



2. Nesting Beach Restoration/Protection: Nesting beach restoration/protection should be an integral, emphasized part of protected areas (as outlined in #1 above).
3. Survival of Head Started/Hatchery Released *Batagur*: All head started animals should minimally be marked (simply shell-notch each cohort). Raising a few of them for a year or so, and putting transmitters on them would help evaluate releases. If these releases are to continue, there needs to be an evaluation process set in place to see if the program is doing any good (or harm!). Perhaps some good ideas on this issue can be developed in a first year of interaction with Thai and Malaysian partners while implementing the husbandry and veterinary care courses. Total budget unknown.

4. Dams: Dams are also a problem with *Chitra* (P.P. van Dijk, personal communication). E.O. Moll (personal communication) suggests trying to get dam operators to not flood sand banks during the several months that the turtles are nesting and the eggs are developing.
5. A stock-taking activity with on-the-ground inspection of Asian facilities and captive stocks as well as pulling together all available habitat and wild population status data, followed by a thorough discussion of management options, would be very desirable. There are a couple of independent populations established over the past decade or two with different management practices in place, and it would be good to evaluate what worked and why, and what did not work and why (P.P. van Dijk, personal communication). This activity could potentially be conducted by the Asian Coordinator(s) outlined in the above section on *ex-situ* specific projects. Total budget unknown.
6. Systematics: As mentioned in the above section on genetic issues, there are systematic questions that need to be addressed. In particular, the northern populations (India and Bangladesh) may be highly distinctive from the others, and the eastern and western Malay populations may be, to a lesser degree, differentiated. Total budget unknown.

Selected Literature: The following section lists a few papers, reports and books that contain information about *Batagur baska* that may be of interest to those working with this species. Copies of some are available without charge from Cleveland Metroparks Zoo (Hugh Quinn, hrq@clevelandmetroparks.com).

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Table 1. Summary of Living *Batagur baska* in Collections (16 December 2002)

North America

Location	Founder/ Potential Founders	Total Population
Wildlife Conservation Society (Bronx Zoo)	5.2.0	5.6.1
San Antonio Zoo	1.0.0	1.3.0
Cleveland Metroparks Zoo	2.2.0	2.3.0
Honolulu Zoo	1.1.0	1.1.0
Bill Neisling (FL)	0.1.0	0.1.0
San Diego Zoo	0.1.0	1.1.0
Total	9.7.0	10.15.1

Asia

Location	Founder/ Potential Founders	Total Population
Khaokhew ¹	Unknown	0.0.40
Singapore ²	Unknown	8.12.0
Taiping ³	Unknown	2.8.0
Kuala Lumpur ⁴	Unknown	0.0.9
Total	Unknown	10.20.49

¹ Khaokhew represents combined ZPO holdings from the following Thailand Facilities:

- a. Khao Kheow Open Zoo, P.O. Box 6 (M007), Bang Phra, Sri Racha, Choburi 20210 THAILAND.
- b. Chiang Mai Zoo, 100 Huay Kaew Rd., Chiang Mai, Thailand (Dr. Sumate Kamolnorrath complied Thai holdings).
- c. Dusit Zoo, 71 Rama 5 Road, Dusit, Bangkok 10300, Thailand (2.0.14 Batagur) (Mr. Johnathan Murray, Curator of Reptiles, Advisor to the Director General ZPO - Thailand, jem808@hotmail.com).
- d. Samut Prakon Crocodile Farm, 555 Moo 7, Taiban Rd., Samut Prakon, Thailand.
- e. La-Ngu Terrapin Breeding Center, Fisheries Department of Thailand, Satun, THAILAND.

² Singapore Zoological Gardens, 80 Mandai Lake Rd., Singapore 719826, SINGAPORE (Francis Lim, Senior Assistant Curator, francis@zoo.com.sg).

³ Taiping Zoo, MPT P.O. Box 1151, 34008 Taiping PERAK, MALAYSIA.

⁴ Zoo Negara. Kuala Lumpur, Hulu Kelang, Ampang, Selanger 68000, MALAYSIA.

Note 1: No information has yet been received from Boa Kanan Terrapin Breeding Center, 32600 Bota Kanan, Perak Darul Redzuan, MALAYSIA.

Note 2: Numbers indicate (males.females.unknown sex).

Revised 16 December 2002.