

CHELONIAN ADVISORY GROUP

Association of Zoos and Aquariums (AZA)

Chelonian Advisory Group

Regional Collection Plan

4th Edition

December

2015

Editor

Chelonian TAG Steering Committee

**ASSOCIATION
OF ZOOS &
AQUARIUMS**

TABLE OF CONTENTS

Introduction

Mission	3
Steering Committee Structure	3
Officers, Steering Committee Members, and Advisors	4
Taxonomic Scope	6

Space Analysis

Space.....	6
Survey	6
Current and Potential Holding Table Results.....	8

Species Selection Process

Process	11
Decision Tree	13
Decision Tree Results	14
Recommendations.....	30
Species Recommendation Matrix.....	31

Species Management Accounts

North America	33
South America	73
Africa and Madagascar	89
Asia.....	116

Appendix I: Animal Program Summary	182
-------------------------------------------------	-----

Appendix II: Animal Program Roles, Goals, and Essential Actions Table.....	187
-----------------------------------------------------------------------------------	-----

Appendix III: Recommendation Update Table.....	195
-------------------------------------------------------	-----

Appendix IV: IUCN Red List of Threatened Species™ status of tortoises and freshwater turtles ..	200
--------------------------------------------------------------------------------------------------------	-----

Appendix V: ChAG Pet Policy Statement	208
----------------------------------------------------	-----

Appendix VI: ChAG Red-eared Slider Turtle Policy Recommendations	209
-------------------------------------------------------------------------------	-----

AZA
CHELONIAN ADVISORY GROUP
REGIONAL COLLECTION PLAN

Mission—The Chelonian Advisory Group Regional Collection Plan is intended to assist AZA institutions in the selection of freshwater turtle and tortoise species to be included in their collections. Selections should be consistent with an institutional collection plan, which considers the institution’s conservation mission relative to the status and conservation needs of the species. We seek to better unite the efforts of the Turtle Survival Alliance’s Turtle Survival Center as well as with qualified private breeders to help create viable assurance colonies for as many of the world’s Endangered and Critically Endangered IUCN chelonians as possible. Specifically, through a Species Selection Process we identify the priority taxa which will benefit from captive management through AZA programs.

Steering Committee structure-

- The Chelonian Advisory Group Steering Committee consists of a Chair, Vice Chair, Secretary, and eight additional voting members.
- Steering committee member positions are elected for three year terms; these terms are staggered so that two or three positions are open for election every other year.
- The Chair and Vice Chair are standing positions.
- Notices announcing open steering committee positions will be posted on the Chelonian Advisory Group List Server.
- Any Institutional Representative may be nominated, with their permission, to serve on the steering committee. Only Institutional Representatives can serve on the steering committee and only Institutional Representatives can vote for new committee members.
- Steering committee members are expected to dedicate enough time to carry out the associated duties of the Chelonian Advisory Group. Duties may include such tasks as preparing, reviewing, and voting on the Regional Collection plan, reviewing and voting on studbook keeper and SSP program applicants, preparing and reviewing advisory group policies and guidelines, and other associated tasks that may arise.
- Voting procedure, 2/3rds approval by the elected committee members is required for a majority. If voting results in a tie, the Chair will cast the deciding vote.
- The steering committee advisers serve in a non-voting capacity; they include our veterinary adviser, treasurer, and general advisers.
- All AZA institutions are allowed to appoint an Institutional Representative to the Chelonian Advisory Group.

Officers and Steering Committee Members

OFFICERS

Michael Ogle, ChAG Chair
Zoo Knoxville
3500 Knoxville Zoo Drive
Knoxville TN 37914

Phone: 865-637-5331 x 1201
FAX: 865-637-1943
email: mogle@zooknoxville.org

Barry Downer, ChAG Vice-Chair
Oklahoma City Zoo
2000 Remington Place
Oklahoma City, OK 73111

Phone: 405-425-0671
FAX: 405-425-0207
email: bdowner@okczoo.org

Stan Mays, Secretary (term expires 2018)
Houston Zoo
6200 Hermann Park Drive
Houston, TX 77030-1603

Phone: 713-533-6527
FAX: 713-533-6755
email: stanmays@aol.com

Dave Collins, Treasurer
Tennessee Aquarium
One Broad Street
Chattanooga, TN 37402

Phone: 423-785-4081
FAX: 423-785-4074
Email: dec@tennis.org

STEERING COMMITTEE

Nate Nelson (term expires 2016)
Sedgwick County Zoo
5555 W. Zoo Blvd.
Wichita, KS 67212

Phone: 316-266-8265
FAX: 316-942-3781
email: nnelson@scz.org

Brad Poynter (term expires 2016)
Phoenix Zoo
455 N. Galvin Parkway
Phoenix, AZ 85008

Phone: 602-286-3849
FAX: 602-286-3843
email: bpoynter@phoenixzoo.org

Craig Pelke (term expires 2016)
San Antonio Zoo
3903 N. St. Marys
San Antonio, TX 78212

Phone: 210-734-7184
FAX: 210-734-7291
Email: cpelke@sazoo.org

Jason Bell (term expires 2016)
Philadelphia Zoo
3400 West Girard Ave
Philadelphia, PA 19104

Phone: 215-243-5319
FAX: 215-243-0219
Email: bell.jason@phillyzoo.org

Bill Hughes (term expires 2018)
Tennessee Aquarium
One Broad Street
Chattanooga, TN 37402

Phone: 423-785-4126
FAX: 423-785-4074
Email: bhh@tennis.org

Paul Gibbons (term expires 2018)
Turtle Conservancy/Behler Chelonian Center
1696 McNell Road
Ojai, CA 93023

Phone: 212-353-5060
FAX: 212-353-5014
Email: paul@turtleconservancy.org

Christina Castellano (term expires 2016)
Utah's Hogle Zoo
2600 Sunnyside Avenue
Salt Lake City, UT 84108

Phone: 801-584-1756
FAX: 801-584-1762
Email: ccastellano@hoglezoo.org

Andy Daneault (term expires 2018)
Disney's Animal Kingdom
P.O. Box 10000
Lake Buena Vista, FL 32830

Phone: 407-938-2368
FAX: 407-939-6391
Email: andre.j.daneault@disney.com

GENERAL ADVISERS

Rick Hudson
President, Turtle Survival Alliance
1989 Colonial Parkway
Fort Worth, TX 76110

Phone: 817-759-7177
FAX: 817-759-7401
Email: rhudson@fortworthzoo.org

Dwight Lawson
Executive Director
Oklahoma City Zoo & Botanical Garden
2000 Remington Place
Oklahoma City, OK 73111

Phone: 405-425-0230
FAX: 405-425-0207
Email: dlawson@okczoo.org

VETERINARY ADVISERS

Joe Flanagan, DVM
Chief Veterinarian
Houston Zoo
6200 Hermann Park Drive
Houston, TX 77030

Phone: 713-533-6628
FAX: 713-533-6764
Email: jflanagan@houstonzoo.org

Paul Gibbons, DVM
Turtle Conservancy/Behler Chelonian Center
1696 McNell Road
Ojai, CA 93023

Phone: 212-353-5060
FAX: 212-353-5014
Email: paul@turtleconservancy.org

TAXONOMIC SCOPE

The scope of the Association of Zoos and Aquariums (AZA) Chelonian Advisory Group (ChAG) includes all tortoises and freshwater turtles of the world. The two living suborders Cryptodira and Pleurodira represent the fourteen living families of extant turtles (Turtle Taxonomy Working Group, 2014). At this time the ChAG does not include the superfamily Chelonoidea (sea turtles). The specific taxa considered in the Regional Collection Plan process as well as their IUCN Red List of Threatened Species™ designations are provided in Appendix IV.

Suborder	Family	Number of Species per Family
Cryptodira	Carettochelyidae (Fly River Turtles)	1
	Chelydridae (Snapping Turtles)	4
Cryptodira		
Cryptodira	Dermatemydidae (Central American River Turtles)	1
Cryptodira	Emydidae (Pond, Box, and Water Turtles)	53
Cryptodira	Geoemydidae (Pond and River Turtles)	69
Cryptodira	Kinosternidae (Mud and Musk Turtles)	26
Cryptodira	Platysternidae (Chinese Big-headed Turtles)	1
Cryptodira	Testudinidae (Tortoises)	60
Cryptodira	Trionychidae (Softshell Turtles)	31
Pleurodira	Chelidae (Austro-South American Side-necked Turtles)	56
Pleurodira	Pelomedusidae (African Side-necked Turtles)	18
Pleurodira	Podocnemididae (Side-necked Turtles)	8

Reference

Turtle Taxonomy Working Group. 2014. Turtles of the World, 7th edition: annotated checklist of taxonomy, synonymy, distribution with maps, and conservation status. Conservation Biology of Freshwater Turtles and Tortoises: a Compilation project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. Chelonian Research Monographs: 5(7):000.329-479

SPACE ANALYSIS

Space is the largest problem affecting all AZA Taxon Advisory Groups, and with the need for many assurance colonies for freshwater turtles and tortoises, the ChAG is no different. While the ChAG does believe in institutional collection planning to benefit individual institutions, we feel that we offer a large enough diversity of species that one of our SSP or candidate programs should meet most collection needs while benefitting the ChAG at the same time. The space analysis quantifies space available for maintaining turtles, both terrestrial and aquatic, in North American zoos and aquariums for AZA cooperative management programs.

Survey – A space survey was sent to all AZA accredited institutions in the spring of 2015. The survey asked how many individual turtles for each of the existing 41 SSP’s and 8 Candidate programs could be held at their facilities. To obtain an estimate of turtle space available for additional captive management programs, institutions were also asked how many enclosures they currently maintain for chelonians as well as plans for possible future enclosures (on and off exhibit) in the next five years could be accommodated. For a better understanding of the types of turtle spaces available, institutions were asked to prepare their responses according to 1) Aquatic/Semi Aquatic Enclosure size (small, up 100 gallons; medium, 100-500 gallons; large, over 500 gallon exhibits) and 2) Terrestrial Enclosure size (small, up to 25 square feet; medium 26-140 square feet; large over 140 square feet). The responses received were only interpreted as physical space available for our programs. The ChAG believes that partnering with other TAGs (Freshwater Fish TAG, many avian TAGs, Lemur TAG), would benefit all of our programs through quality mixed species exhibits and off exhibit holding.

Results – 133 out of 160 AZA (83%) accredited institutions surveyed responded to the space survey through their institutional representative.

Based on the data presented in Table 1, zoos are willing to commit a substantial amount of space to ChAG SSP programs. Unlike in previous RCP's, the potential holding for many of our program species has the potential to increase. For example, Roti Island Snake-necked Turtle (*Chelodina mccordi*), requires about 90 spaces to maintain a viable population, and within the next five years that potential holding can increase to 182 (Table 2), which is drastically different from the previous RCP. In fact, an increase in potential holding space is available for 36 out of 49 managed programs. By making a concerted effort with our program leaders and institutional representatives, we should be able to balance some of those programs that have less than sustainable holding space with those that already have more than adequate representation in AZA facilities.

A reoccurring problem for the ChAG is that our programs dealing with larger species (especially large aquatic species) show lower than sustainable space holding capabilities. This is unfortunately too common across many Taxon Advisory Groups and not just within the ChAG. Collaboration with other TAGs might make it easier to circumvent this problem (for example working with the Crocodile Advisory Group (CAG) to make sure some of our larger Asian riverine turtles are available for institutions that are planning on building new Indian Gharial (*Gavialis gangeticus*) exhibits).

Table 1. Current and potential chelonian exhibit holdings by husbandry/habitat type.

Husbandry Type	Enclosure Size	Current Holdings	Future Holdings
Aquatic/Semi Aquatic	Small (up to 100 gallons)	465	528
	Medium (100-500 gallons.)	158	177
	Large (Over 500 gallon exhibits)	166	161
Totals		789	866
Terrestrial	Small (Up to 25 sq. ft)	414	371
	Medium (26- 140 sq. ft)	201	205
	Large (Over 140 sq. ft)	163	141
Totals		778	717
Grand Totals		1567	1583

Andy Odum (SPMAG Member) estimated that 100, 90, and 80 individual turtles are required to maintain SSP populations (90% genetic variation for 100 years) for small (4-6 inches), medium (7-11 inches), and large (12+ inches) turtle species, respectively. These figures should be interpreted as reasonable estimations based on the assumptions that turtles, 1) are long-lived (i.e., some over 75-100 years), 2) have a long reproductive life (little or no evidence of reproductive senescence), and 3) have a low mortality rate once established. Dividing the species into size classes makes the assumption that size is positively correlated with longevity and reproductive output. The above species probably have diverse life history traits, although such information is scant. Given this, it is felt that trying to provide a more analytical approach to estimate target population sizes would not yield more accurate results. In some instances, populations have already grown larger than the minimum required due to more holding space being available. For those populations the ChAG has increased those estimates to match reality.

Table 2. Current and potential chelonian holding for our program species.

Species	Current Holding	Potential Holding Totals (1-5 years)
<i>Emys marmorata</i> (Northern Western Pond Turtle)	148	210
<i>Emys pallida</i> (Southern Western Pond Turtle)	46	100
<i>Clemmys guttata</i> (Spotted Turtle)	306	221
<i>Cuora mccordi</i> (McCord's Box Turtle)	86	107
<i>Geoemyda spengleri</i> (Black-breasted Leaf Turtle)	136	232
<i>Heosemys annandalii</i> (Yellow-headed Temple Turtle)	104	70
<i>Indotestuda forstenii</i> (Forsten's Tortoise)	95	73
<i>Kinixys homeana</i> (Home's Hingeback Tortoise)	28	71
<i>Malacochersus tornieri</i> (Pancake Tortoise)	369	302
<i>Pyxis a. arachnoides</i> (Common Spider Tortoise)	144	250
<i>Pyxis a. brygooi</i> (Northern Spider Tortoise)	106	131
<i>Sacalia quadriocellata</i> (Four-eyed Turtle)	41	104
<i>Astrochelys radiata</i> (Radiated Tortoise)	368	364
<i>Testudo kleinmanni</i> (Egyptian Tortoise)	127	148
<i>Heosemys spinosa</i> (Spiny Turtle)	64	79
<i>Cuora galbinifrons</i> (Flowerback Box Turtle)	67	66
<i>Cuora mohoutii</i> (Keeled Box Turtle)	17	53
<i>Graptemys flavimaculata</i> (Yellow-blotched Map Turtle)	87	103
<i>Manouria emys emys</i> (Burmese Brown Tortoise)	120	97
<i>Manouria e. phayrei</i> (Burmese Mountain Tortoise)	78	81
<i>Leucocephalon yuwonoi</i> (Sulawesi Forest Turtle)	67	74
<i>Batagur borneonensis</i> (Painted Terrapin)	79	87
<i>Pyxis planicauda</i> (Madagascar Flat-tailed Tortoise)	82	133
<i>Glyptemys muhlenbergii</i> (Bog Turtle)	29	92
<i>Glyptemys insculpta</i> (Wood Turtle)	73	235
<i>Batagur affinis</i> (River Terrapin)	53	66
<i>Pyxis a. oblonga</i> (Southern Spider Tortoise)	30	64
<i>Astrochelys yniphora</i> (Ploughshare Tortoise)	31	98
<i>Graptemys oculifera</i> (Ringed Map Turtle)	24	22
<i>Cuora bouretti</i> (Indochinese Box Turtle)	25	30
<i>Chelodina mccordi</i> (Roti Island Snake-necked Turtle)	96	182
<i>Dermatemys mawii</i> (Central American River Turtle)	3	18

Species	Current Holding	Potential Holding Totals (1-5 years)
<i>Orlitia borneensis</i> (Malaysian Giant River Turtle)	83	71
<i>Kinixys erosa</i> (Forest Hinge-back Tortoise)	15	25
<i>Cuora pani</i> (Pan's Box Turtle)	74	77
<i>Cuora trifasciata</i> (Chinese Three-striped Box Turtle)	103	108
<i>Geochelone platynota</i> (Burmese Star Tortoise)	102	173
<i>Manouria impressa</i> (Impressed Tortoise)	85	56
<i>Terrapene coahuila</i> (Coahuilan Box Turtle)	66	75
<i>Terrapene carolina mexicana</i> (Mexican Box Turtle)	25	25
<i>Chelonoidis nigra becki</i> (Volcan Wolf Giant Tortoise)	8	34
<i>Chelonoidis nigra microphyes</i> (Volcan Darwin Giant Tortoise)	61	52
<i>Chelonoidis nigra nigrita</i> (Galapagos Giant Tortoise)	27	92
<i>Chelonoidis nigra vandenburghi</i> (Volcan Alcedo Giant Tortoise)	12	22
<i>Chelonoidis nigra vicina</i> (Iguana Cove Giant Tortoise)	6	58
<i>Heosemys depressa</i> (Arakan Forest Turtle)	45	62
<i>Cuora picturata</i> (Southern Flowerback Box Turtle)	11	26
<i>Mauremys annamensis</i> (Vietnamese Pond Turtle)	70	73

SPECIES SELECTION PROCESS

Process—Species recommended for captive management programs were evaluated as described below:

1. Species already ranked endangered or critically endangered by the IUCN or that were proposed as endangered or critically endangered by the TFTSG were subjected to a decision tree (Figure 1) to determine whether *ex situ* captive management within AZA would be beneficial. Prospective managed species were then reviewed according to WCMC criteria. Due to delays in publishing IUCN Species Specialist Group Recommendations we have also included those published by the Tortoise and Freshwater Turtle Specialist Group: at this link: http://www.iucn-tftsg.org/wp-content/uploads/file/Accounts/crm_5_000_checklist_v7_2014.pdf
2. Formal evaluation was confined to species in these categories as they were deemed the most likely to potentially benefit from captive management. Several additional species are proposed for program management on the basis of the professional expertise of the Steering Committee and the IUCN TFTSG.
3. Due to the overwhelming number of endangered or critically endangered freshwater turtles and tortoises, the ChAG did not evaluate any other threatened level (vulnerable, threatened, etc.) as defined by the IUCN.

Management Options (Program Definitions):

Green SSP Programs

- Green SSP Programs have a population size equal to or greater than 50 individuals.
- This population is able to retain > 90.0% GD for 100+ years or 10+ generations.
- The population is presently sustainable demographically with a sufficiently large population size and a positive growth rate to reach 100 years or 10 generations.

Yellow SSP Program

- Yellow SSP Programs have a population size (total N at the time of population planning) equal to or greater than 50 individuals.
- The population is not able to retain at least 90.0% GD over for 100+ years or 10+ generations.
- The population may have never been formally planned, or was planned more than 5 years ago, so that the population sustainability score cannot be properly assessed.

Red SSP Programs

- Red SSP Programs have a population size between 20 and 49 individuals unless accepted models can demonstrate long-term sustainability.

Candidate Programs

- Candidate Programs do not meet the minimum criteria to be an SSP Program.
 - Candidate Programs may have a population size fewer than 20 individuals, and/or
 - Candidate Programs may have a fewer than 3 participating AZA member institutions.
- Candidate Program populations may meet minimum SSP criteria, but are not designated as an SSP Program because they do not yet have a published AZA Regional Studbook.

Phase-out and phase-in species

- “Phase-out species” refer to species currently held within AZA that the TAG recommends the specific action of removing or reducing the population to reallocate resources toward another formally managed Animal Program. This may be indicated as an active process (sending animals to other zoological regions) or over time (through attrition), for example.
- “Phase-in species” refer to species currently unrepresented within the AZA that the TAG recommends the specific action of bringing into AZA member facilities. If phase-in species are listed, the TAG should develop specific goals for this population to be added.

TAG monitored populations

The TAG may include an appendix that lists additional species that, although not recommended to be an SSP or Candidate Program, are frequently cared for in AZA member institutions (e.g., budgies, lorikeets, some fish and invertebrates, American Alligators, etc.). The TAG may choose to track or monitor these populations informally, and may recommend them for formal AZA Animal Programs in the future. However, until that time, these will be considered unmanaged populations that the TAG only wishes to monitor informally.

Only those taxa selected using the Species Selection Criteria may be further designated by the TAG as an AZA SSP and/or Candidate Programs.

Not Recommended

Species not currently in AZA institutions and the TAG recommends it not be brought into a captive management program at this time.

Figure 1. Decision tree to assess appropriateness of captive management.

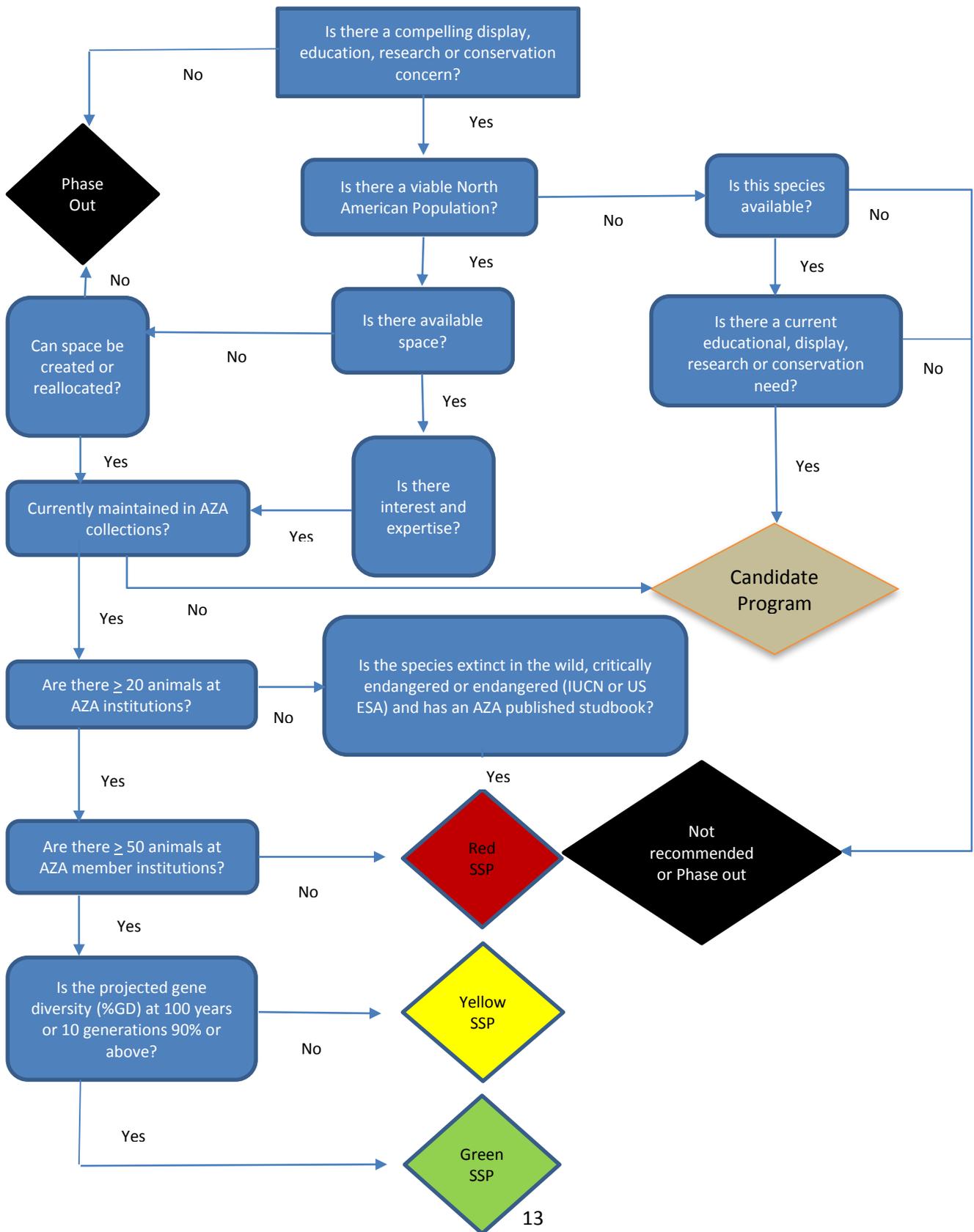


Table 3: Decision Tree Results

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population? *	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Astrochelys radiata</i> (Radiated tortoise)	YES	YES	YES	YES	YES	YES	Green SSP
<i>Astrochelys yniphora</i> (Ploughshare tortoise)	YES	NO	YES	YES	YES	YES	Red SSP
<i>Batagur affinis</i> (Southern River Terrapin)	YES	NO	NO	NO	NO	YES	TAG Monitored
<i>Batagur borneoensis</i> (Painted terrapin)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Batagur dhongoka</i> (Three-striped Roof Turtle)	YES	NO	NO	YES	NO	NO	Not Recommended
<i>Batagur kachuga</i> (Red-crowned Roof Turtle)	YES	NO	NO	NO	NO	NO	Not Recommended

***A viable North American population include any species that can be legally acquired from the pet trade, non-AZA facilities, or legally collected from the wild, if a population is not already present in AZA insitutions.**

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Batagur kachuga</i> (Red-crowned Roof Turtle)	YES	NO	NO	NO	NO	NO	Not Recommended
<i>Batagur trivittata</i> (Burmese Roofed Turtle)	YES	NO	NO	NO	NO	NO	Not Recommended
<i>Chelodina mccordi</i> (Roti Island Snake-necked Turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Chelodina pritchardi</i> (Pritchard's Snake-necked Turtle)	YES	NO	YES	YES	NO	NO	Not Recommended
<i>Chelonoidis n. becki</i> (Volcan Wolf Giant Tortoise)	YES	NO	YES	YES	NO	YES	Candidate Species (Red SSP)
<i>Chelonoidis n. microphyes</i> (Volcan Darwin Giant Tortoise)	YES	YES	YES	YES	YES	YES	Yellow SSP

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Chelonoidis n. nigrita</i> (Santa Cruz Giant Tortoise)	YES	YES	YES	YES	YES	YES	Red SSP
<i>Chelonoidis n. vandenburghi</i> (Volcan Alcedo Giant Tortoise)	YES	NO	YES	YES	NO	YES	Red SSP
<i>Chelonoidis n. vicina</i> (Cerro Azul Giant Tortoise)	YES	NO	YES	YES	NO	YES	Red SSP
<i>Chitra chitra</i> (Striped Narrow-headed Softshell Turtle)	YES	NO	NO	NO	NO	NO	TAG Monitored
<i>Clemmys guttata</i> (Spotted Turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Cuora aurocapitata</i> (Yellow-headed Box Turtle)	YES	NO	YES	YES	NO	NO	TAG Monitored

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Cuora bourretii</i> (Indochinese Box Turtle)	YES	YES	YES	YES	NO	NO	Red SSP
<i>Cuora flavomarginata</i> (Yellow-marginated Box Turtle)	YES	YES	YES	YES	YES	NO	TAG monitored
<i>Cuora galbinifrons</i> (Flowerback Box Turtle)	YES	YES	YES	YES	YES	YES	Red SSP
<i>Cuora mccordi</i> (Mccord's Box Turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Cuora mouhotii</i> (Keeled Box Turtle)	YES	YES	YES	YES	YES	YES	Red SSP
<i>Cuora pani</i> (Pan's Box Turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Cuora picturata</i> (Southern Vietnamese Box Turtle)	YES	NO	YES	YES	NO	YES	Red SSP

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Cuora trifasciata</i> (Three-striped Box Turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Cuora yunnanensis</i> (Yunn's Box Turtle)	YES	NO	YES	YES	NO	NO	TAG Monitored
<i>Cuora zhoui</i> (Zhoui's Box Turtle)	YES	NO	YES	YES	NO	NO	TAG Monitored
<i>Dermatemys mawii</i> (Central American River Turtle)	YES	NO	NO	NO	NO	YES	TAG Monitored
<i>Elyseya bellii</i> (Bell's Snapping Turtle)	NO	NO	NO	NO	NO	NO	Not Recommended
<i>Elusor macrurus</i> (Mary River Turtle)	YES	NO	YES	YES	NO	NO	Not Recommended
<i>Emydoidea blandingii</i> (Blanding's Turtle)	YES	YES	YES	YES	YES	NO	Candidate Species (Yellow SSP)

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Emys marmorata</i> (Northern Western Pond Turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Emys pallida</i> (South Western pond turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Erymnochelys madagascarensis</i> (Madagascar Big-headed Turtle)	YES	NO	NO	NO	YES	NO	TAG Monitored
<i>Geochelone platynota</i> (Burmese Star Tortoise)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Geomyda japonica</i> (Ryukyu Black-breasted Leaf Turtle)	YES	YES	YES	NO	NO	NO	Not Recommended
<i>Geoemyda spengleri</i> (Black-breasted Leaf Turtle)	YES	YES	YES	YES	YES	YES	Green SSP

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Glyptemys insculpta</i> (Wood Turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Glyptemys muhlenbergii</i> (Bog Turtle)	YES	YES	YES	YES	YES	YES	Red SSP
<i>Graptemys caglei</i> (Cagle's Map Turtle)	YES	YES	YES	YES	NO	NO	Candidate-Phase In
<i>Graptemys flavimaculata</i> (Yellow-blotched Map Turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Graptemys gibbonsi</i> (Pascagacoula Map Turtle)	YES	YES	YES	YES	NO	NO	Candidate-Phase In
<i>Graptemys oculifera</i> (Ringed Map Turtle)	YES	YES	YES	YES	YES	YES	Red SSP
<i>Graptemys pearlensis</i> (Pearl River Map Turtle)	YES	YES	YES	YES	NO	NO	Candidate-Phase In

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Heosemys annandalii</i> (Yellow-headed Temple Turtle)	YES	YES	NO	NO	YES	YES	Yellow SSP
<i>Heosemys depressa</i> (Arakan Forest Turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Heosemys spinosa</i> (Spiny Hill Turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Indotestudo elongata</i> (Elongated Tortoise)	YES	YES	NO	NO	YES	NO	Not Recommended
<i>Indotestudo forsteni</i> (Forsten's Tortoise)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Kinixys erosa</i> (Serrated Hinge-back Tortoise)	YES	YES	YES	YES	YES	NO	Candidate Species

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Kinixys homeana</i> (Home's Hinge-back Tortoise)	YES	YES	YES	YES	YES	NO	Candidate Species
<i>Leucocephalon yuwonoi</i> (Sulawesi Forest Turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Malacochersus tornieri</i> (Pancake Tortoise)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Manouria emys emys</i> (Burmese Mountain Tortoise)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Manouria emys phayrei</i> (Burmese Brown Tortoise)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Manouria impressa</i> (Impressed Tortoise)	YES	YES	YES	YES	YES	YES	Yellow SSP

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Mauremys annamensis</i> (Vietnamese Pond Turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Mauremys mutica</i> (Asian Yellow Pond Turtle)	YES	YES	YES	YES	NO	NO	Not Recommended
<i>Mauremys nigricans</i> (Red-necked Pond Turtle)	YES	YES	NO	YES	NO	NO	Not Recommended
<i>Mauremys reevesii</i> (Three-keeled Pond Turtle)	YES	YES	NO	YES	NO	NO	Not Recommended
<i>Mauremys reevesii megacephala</i> (Big-headed Reeves Pond Turtle)	NO	YES	NO	YES	NO	NO	Not Recommended
<i>Mauremys sinensis</i> (Chinese Striped-necked Pond Turtle)	YES	YES	YES	YES	YES	NO	Not Recommended

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Mesoclemmys dahli</i> (Dahl's Toad-headed Turtle)	NO	NO	NO	NO	NO	NO	Not Recommended
<i>Mesoclemmys hogei</i> (Hoge's Side-necked Turtle)	NO	NO	NO	NO	NO	NO	Not Recommended
<i>Nilssonina formosa</i> (Peacock Softshell Turtle)	NO	NO	NO	NO	NO	NO	Not Recommended
<i>Orlitia borneensis</i> (Bornean River Turtle)	YES	YES	YES	YES	YES	YES	Candidate Species (Yellow SSP)
<i>Palea steindachneri</i> (Wattle-necked Softshell Turtle)	NO	NO	NO	NO	NO	NO	Not Recommended
<i>Pangshura sylhetensis</i> (Assam Roofed Turtle)	YES	NO	NO	NO	NO	NO	Not Recommended

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Pelochelys cantorii</i> (Cantor's Giant Softshell Turtle)	YES	NO	NO	NO	NO	NO	Not Recommended
<i>Platysternon megacephalum</i> (Big-headed Turtle)	YES	YES	YES	YES	YES	NO	TAG Monitored
<i>Podocnemis lewyana</i> (Magdalena River Turtle)	NO	NO	YES	YES	NO	NO	Not Recommended
<i>Psammobates geometricus</i> (Geometric Tortoise)	YES	NO	YES	YES	NO	NO	Not Recommended
<i>Pseudemydura umbrina</i> (Western Swamp Turtle)	NO	NO	NO	NO	NO	NO	Not Recommended

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Pseudemys alabamensis</i> (Alabama Red-bellied Turtle)	NO	YES	NO	YES	NO	NO	Not Recommended
<i>Pyxis arachnoides arachnoides</i> (Common Spider Tortoise)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Pyxis arachnoides brygooi</i> (Northern Spider Tortoise)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Pyxis arachnoides oblonga</i> (Southern Spider Tortoise)	YES	YES	YES	YES	YES	YES	Red SSP

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Pyxis planicauda</i> (Madagascar Flat-tailed Tortoise)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Rafetus euphraticus</i> (Euphrates Softshell Turtle)	NO	NO	NO	NO	NO	NO	Not Recommended
<i>Rafetus swinhoei</i> (Yangtze Giant Softshell Turtle)	NO	NO	NO	NO	NO	NO	Not Recommended
<i>Sacalia bealei</i> (Beal's Four-eyed Turtle)	YES	YES	YES	YES	YES	NO	Candidate Species (Red SSP)
<i>Sacalia quadriocellata</i> (Four-eyed turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Siebenrockella leytenis</i> (Philippine Pond Turtle)	YES	NO	YES	YES	NO	NO	Not Recommended

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Sternotherus depressus</i> (Flattened Musk Turtle)	YES	YES	YES	YES	NO	NO	Not Recommended
<i>Terrapene coahuila</i> (Coahuila Box Turtle)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Terrapene carolina mexicana</i> (Mexican Box Turtle)	YES	NO	YES	NO	YES	NO	TAG Monitored
<i>Testudo h. hermanni</i> (Hermann's Tortoise)	NO	YES	NO	YES	NO	NO	Not Recommended
<i>Testudo kleinmanni</i> (Egyptian Tortoise)	YES	YES	YES	YES	YES	YES	Yellow SSP
<i>Trachemys adiutrix</i> (Brazilian Slider)	NO	NO	NO	NO	NO	NO	Not Recommended

Species	Is there a compelling conservation, display, education or research need?	Is there a viable North American Population?	Is there available space, interest, expertise?	Can space be created or reallocated?	Are there > 20 animals in >3 AZA institutions?	Is the species extinct in the wild, critically endangered or endangered and has an AZA published studbook?	Decision Tree outcome
<i>Trachemys taylori</i> (Cuatro Ciénegas Slider)	NO	NO	NO	NO	NO	NO	Not Recommended
<i>Vijayachelys silvatica</i> (Cochin Forest Cane Turtle)	NO	NO	NO	NO	NO	NO	Not Recommended

Recommendations—Adopt the following new programs and program changes:

1. Southern River Terrapin (*Batagur affinis*) – Has been recommended to change from a Red SSP to TAG monitored due to a small population size and lack of breeding.
2. Central American River Turtle (*Dermatemys mawii*) – Has been recommended to change from Red SSP to TAG Monitored due to a small population size and lack of breeding.
3. Blanding’s Turtle (*Emydoidea blandingii*) – Establish program and publish studbook in the next five years.
4. Cagle’s Map Turtle (*Graptemys caglei*) – Establish program through acquisition of animals through legal sources. Work with local wildlife authorities to see if there is an interest in a reintroduction project.
5. Pascagoula River Map Turtle (*Graptemys gibbonsi*) - Establish program through acquisition of animals through legal sources. Work with local wildlife authorities to see if there is an interest in a reintroduction project.
6. Pearl River Map Turtle (*Graptemys pearlensis*) - Establish program through acquisition of animals through legal sources. Work with local wildlife authorities to see if there is an interest in a reintroduction project.
7. Alabama Red-bellied Turtle (*Pseudemys alabamensis*) – Phase out since there is no interest in AZA institutions or state wildlife agency for captive management of species at this time.
8. Beal’s Four-eyed Turtle (*Sacalia bealei*) – Establish a program and publish studbook in the next five years.

TAG Monitored Species

Southern River Terrapin (<i>Batagur affinis</i>)	Striped Narrow-headed Softshell Turtle (<i>Chitra chitra</i>)	Yellow-headed Box Turtle (<i>Cuora aurocapitata</i>)
Yellow-marginated Box Turtle (<i>Cuora flavomarginata</i>)	Yunn’s Box Turtle (<i>Cuora yunnanensis</i>)	Zhoui’s Box Turtle (<i>Cuora zhoui</i>)
Central American River Turtle (<i>Dermatemys mawii</i>)	Madagascar Big-headed Turtle (<i>Erymnochelys madagascarensis</i>)	Big-headed Turtle (<i>Platysternon megacephalum</i>)
Mexican Box Turtle (<i>Terrapene carolina mexicana</i>)		

Table 4. Species Recommendation Matrix

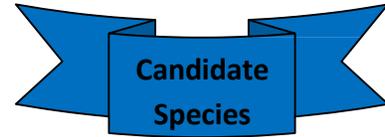
The Chelonian TAG designed this matrix to assist institutions in species selection. There are many factors that go into selecting the right species for an institution and the RCP should be referenced prior to selecting a species. This species recommendation matrix categorizes the species by geographic region, adult sizes and habitat needs to facilitate in the species selection process.

		Geographic Region			
		Asia	Africa	Americas	
Terrestrial	Small		Egyptian Tortoise <i>(Testudo kleinmanni)</i>		
			Madagascar Flat-tailed Tortoise <i>(Pyxis planicauda)</i>		
			Common Spider Tortoise <i>(Pyxis a. arachnoides)</i>		
			Northern Spider Tortoise <i>(Pyxis a. brygoi)</i>		
			Southern Spider Tortoise <i>(Pyxis a. oblonga)</i>		
			Pancake Tortoise <i>(Malacochersus tornieri)</i>		
			Home's Hinge-back Tortoise <i>(Kinixys homeana)</i>		
	Medium		Burmese Star Tortoise <i>(Geochelone platynota)</i>	Ploughshare Tortoise <i>(Astrochelys yniphora)</i>	
			Forsten's Tortoise <i>(Indotestudo forsteni)</i>	Radiated Tortoise <i>(Astrochelys radiata)</i>	
			Impressed Tortoise <i>(Manouria impressa)</i>	Forest Hinge-back Tortoise <i>(Kinixys erosa)</i>	
			Arakan Forest Turtle <i>(Heosemys depressa)</i>		
	Large		Burmese Black Tortoise <i>(Manouria emys phayrei)</i>		Galapagos Tortoise <i>(Chelonoidis nigra ssp.)</i>
			Brown Forest Tortoise <i>(Manouria emys emys)</i>		

Geographic Region

		Asia	Africa	Americas
Aquatic / Semiaquatic	Small	Four-eyed Turtle <i>(Sacalia quadriocellata)</i>		Northern Western Pond Turtle (<i>Actinemys marmorata</i>)
		Roti Island Snake-neck Turtle (<i>Chelodina mccordi</i>)		Southern Western Pond Turtle (<i>Actinemys pallida</i>)
		Flowerback box turtle (<i>Cuora galbinifrons</i>)		Ringed Map Turtle (<i>Graptemys oculifera</i>)
		Indochinese box turtle (<i>Cuora bourreti</i>)		Spotted Turtle (<i>Clemmys guttata</i>)
		Southern Vietnamese flowerback box turtle (<i>Cuora picturata</i>)		Yellow-blotched Map Turtle (<i>Graptemys flavimaculata</i>)
		Keeled Box Turtle (<i>Cuora mouhotii</i>)		Bog Turtle (<i>Glyptemys muhlenbergii</i>)
		McCord's Box Turtle (<i>Cuora mccordi</i>)		Coahuilan Box Turtle (<i>Terrapene coahuila</i>)
		Black-breasted leaf Turtle (<i>Geoemyda spengleri</i>)		Cagle's Map Turtle (<i>Graptemys caglei</i>)
		Beal's Four-eyed Turtle (<i>Sacalia bealei</i>)		
	Medium	Vietnamese Pond Turtle (<i>Mauremys annamensis</i>)		Wood Turtle (<i>Glyptemys insculpta</i>)
		Chinese 3-striped Box Turtle (<i>Cuora trifasciata</i>)		Blanding's Turtle (<i>Emydoidea blandingii</i>)
		Spiny Turtle (<i>Heosemys spinosa</i>)		Pascagoula Map Turtle (<i>Graptemys gibbonsi</i>)
		Sulawesi Forest Turtle (<i>Leucocephalon yuwonoi</i>)		Pearl River Map Turtle (<i>Graptemys pearlensis</i>)
	Large	Painted Terrapin (<i>Batagur borneoensis</i>)		
		Malaysian Giant Turtle (<i>Orlitia borneensis</i>)		
		Yellow-headed Temple Turtle (<i>Heosemys annandalii</i>)		

NORTH AMERICA SPECIES ACCOUNTS



Blanding's Turtle

Emydoidea blandingii



Photo by Bradley M. Poynter

Species Summary:

Emydoidea blandingii is a medium-sized (to 26cm) turtle with an elongated smooth carapace. This North American species is found in Nova Scotia and the Great Lakes regions. A semi-aquatic turtle, it lives in eutrophic habitats of clean shallow water and glacial lakes with abundant aquatic vegetation. The core habitat of *E. blandingii* consists of a permanent wetland and a suite of other usually smaller and more temporary wetlands, such as vernal pools, that are used by adults and hatchlings as temporary refugia and seasonal feeding grounds.

Program Purposes:

Blanding's turtle is listed as Endangered by IUCN TFTSG specialist group and is not listed on CITES, but it is proposed for Appendix II. Populations continue to decline with habitat fragmentation, due to their complex habitat requirements for various life stages. Several zoos have had head-start programs for this species and have conducted field work to conserve it.

Exhibit Qualities:

Blanding's turtles can be exhibited by themselves, in groups, or with other native turtles. They are quite distinct with their bright yellow throat, and they exhibit very well in underwater viewing or while basking. They are hardy and long lived (up to 75 years).

Educational Qualities:

Emydoidea blandingii offers many educational opportunities for zoos. The species' complex habitat requirements allows for discussion about various biomes, as well as habitat fragmentation. The natural history of the species lends itself to discussion about glaciation, evolution, feeding mechanics, speciation, temperature dependent sex determination (how global warming effects animals that exhibit this trait), etc.

Care and Facilities:

This is an extremely hardy species that adapts well in a managed setting. They may be housed easily indoors or outdoors and given the proper set up, they may be allowed to brumate outdoors. A minimum depth of water is 8 inches, but it may be as deep as you like. Rough concrete is not preferred, as they may abrade their plastrons, and a basking area with an adequate heat source is necessary. Water temperature may fluctuate with the seasons or they may be kept at room temperature.

These turtle are omnivores, so feeding a varied diet is preferred. They will take almost anything, including turtle pellet or brittle, crayfish, fish, snails, earthworms, crickets, and occasional produce.

Program Goals:

- Work with PMC to create a breeding and transfer program.
- Increased breeding pairs at institutions
- Find institutions interested in getting involved in the program.

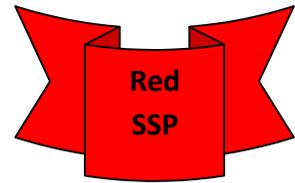
Program Contact:

Vacant (New Program)

NORTH AMERICA SPECIES ACCOUNTS

Bog Turtle

Glyptemys muhlenbergii



Species Summary:

This unique and small species of freshwater turtle is confined to the mountain bogs, fens, and other associated wetlands of the Appalachian Mountains and nearby piedmont areas in the eastern United States. Rarely seen in the wild or captivity, this species is the keystone vertebrate for its threatened ecosystem.

Program Purposes:

Glyptemys muhlenbergii is listed as threatened on the United States Endangered Species Act, a CITES Appendix I species, as well as Critically Endangered by the IUCN Red List of Threatened Species™. Their numbers continue to drop as their habitat is converted for agricultural purposes, or naturally through succession, due to lack of habitat management.

Exhibit Qualities:

Bog Turtles are admittedly not the best species as a sole exhibit animal. Their tendency to hide either in grasses or in the peat muck at first disturbance does not work well at many institutions, but because the unique ecosystem in which they live is full of many threatened flora species, creating a tiny version of an Appalachian bog will be pleasing and educational to guests. Plus the extra incentive that some guests will take in finding a turtle will be that much more rewarding if they are able to see one.

Educational Qualities:

This species offers many educational opportunities for zoos. The turtles and their entire ecosystem are found nowhere else but along the Appalachian Mountains and surrounding piedmont areas. They are highly threatened with extirpation throughout their range due to habitat destruction and collection for the pet trade. *G. muhlenbergii* are also the smallest species of turtle in the United States, and potentially the world. Because of the factors mentioned above, this species should be considered a high priority for captive and/or field work with any AZA institution that is found within their range.

Care and Facilities:

Once established and offered the proper set up, these turtles are known to thrive in captivity for many years. This species does best when maintained outdoors year round, pending of course an institution is within or near the range of the turtle. Outdoors they can be maintained in tubs that are buried into the ground to protect against freezing temperatures during the winter months. Adding a 12-18" layer of peat moss with continually flowing water is an adequate base level. Sedge mounds with sphagnum moss will supply the turtles with plenty of basking opportunities as well as areas for them to hibernate under during the winter.

Although they are omnivorous, Bog Turtles will primarily consume crickets, earthworms, and other invertebrates, along with processed diets such as turtle brittle.

Program Goals:

- Working with the PMC to create a breeding and transfer plan
- Increase breeding at institutions
- Find additional institutions interested in joining this SSP

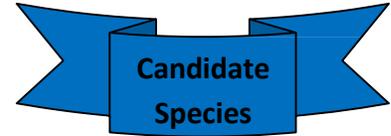
Program contact:

Michael Ogle
Studbook Keeper and SSP Coordinator
Zoo Knoxville
mogle@zooknoxville.org
865-637-5331 x 1201

NORTH AMERICA SPECIES ACCOUNTS

Cagle's Map Turtle

Graptemys caglei



Species Summary:

The Cagle's Map Turtle (*Graptemys caglei*), one of the smaller species of map turtles, is a Texas endemic with its range limited to the creeks, rivers, and riverine impoundments of the Guadalupe and San Antonio River system of south-central Texas. They have also been found sparingly in the San Marcos River.

Cagle's Map Turtles occur in riverine habitat with limestone bedrock bottoms interspersed with pools with silt and gravel bottoms, and gravel bars. Optimal habitat is in areas with riffles and pools. Preferred basking areas are fallen trees and shrubs, logs, rocks, and cypress knees.

Adult females reach a maximum carapace length (CL) of 21.3 cm, with males being smaller than females and measuring no larger than 12.6 cm in length. A true "saw-back," the saw-backed vertebral keel is well developed and black on juveniles and males, but tends to be less conspicuous on adult females. All carapace scutes are olive or brown in color with light map-like markings, while the plastron scutes are creamy-yellow with dark seams.

Cagle's Map Turtles are carnivorous with any vegetative material consumed likely ingested inadvertently. Prey consists of aquatic invertebrates of all life stages. Stomach contents of wild turtles have been primarily caddis fly larva, as well as some snails.

Program Purposes:

The IUCN Red List of Threatened Species™ considers the Cagle's Map Turtle Endangered, in large part due to its already limited range being reduced by half to two-thirds since 1974. The species is now restricted to a single stretch of roughly 120 km of the lower Guadalupe River, where this habitat is under consistent threat of habitat degradation, disturbance, and water diversion. Being an exceedingly shy species with a physiological need for extensive

basking, human disturbances on river habitat can create a long-term low-level detrimental effect. The species is trending towards a Critically Endangered listing unless an immediate response to habitat alterations is not enlisted.

Exhibit Qualities:

Cagle's Map Turtles, like all map turtles, are beautiful and striking to look at, which is enhanced by their propensity to bask openly or actively forage in an exhibit's water column. Consideration should be taken when installing basking furniture to ensure proper basking for turtles, as well as great viewing angles for zoo visitors.

This species can be displayed in mixed-species scenarios with various mammal, bird, amphibian, and fish species, as well as other species of aquatic turtles, with consideration taken for all species' needs and temperaments. Mixed-species exhibits with these combinations have the potential to be a very active and beautiful exhibit. Snake species ideally should be avoided due to the potential for protozoan and/or bacterial transfers from turtle to snake.

Interpretive Messages:

- Limited and sensitive natural ranges-most Map Turtles' home ranges are restricted to one or two river drainages of the southeastern United States. The combination of a limited natural habitat/range and increasing pressures on wild populations places them in a fragile state. Any detrimental effect in the native range or with the wild population has a drastic effect on the species long-term.
- Importance of healthy riverine ecosystems-benefits of a healthy river system benefit all creatures, including humans.
- Negative effects of over collection- As with all chelonian species, Map Turtles have slow reproductive rates and cannot compete with collection for the pet trade and consumption (local and international).

Care and Facilities:

Cagle's Map Turtles can be maintained in a similar manner to other aquatic turtles, with some basic necessities met through water quality, enclosure furniture, lighting and diet. The majority of the enclosure can be aquatic as long as appropriate basking structures are in place for thermoregulatory purposes. If reproduction of the species is planned, an appropriate terrestrial area for egg deposition is required as well. Map Turtles in general are powerful and agile swimmers, so depth and surface area of water can vary, as long as the turtles have the appropriate space to freely swim and navigate naturally. Plentiful water volume can improve the activity and aesthetics of the exhibit.

All species of aquatic turtles can be considered "messy," not only from waste produced but also in the manner in which they eat fleshy/meaty food items. An adequate life support system (LSS) is a high priority for water quality, animal health, and exhibit aesthetics. LSS can be easily installed and maintained with basic methods of filtration (ex. sand filters), as well as with supplemental filtration (UV sterilizers). It is recommended when designing a LSS for turtles to over-filter the water volume. Besides appropriate LSS maintenance, regularly scheduled water changes should be performed, but can easily be incorporated in LSS backwashes.

Lighting, both ambient and basking, should be bright and include UVB. Basking lamps should provide a basking temperature of 95-105 F, and should be placed over logs or other enclosure furniture that allows the turtle to easily access basking areas. Ideally, an annual photoperiod cycle should be implemented to create a more natural environment as well as the potential promotion of reproductive and other natural behaviors. Bright and well-placed lighting will not only benefit the turtles but also improve the exhibit aesthetics.

Nutritional needs can be easily met through combinations of live prey items, as well as commercially prepared pelleted diets. Live or frozen/thawed prey items can consist of minnows, amphibian larva, earthworms, crickets, and mealworms. Many companies make high quality pelleted foods that can be a great way to supplement vitamin and mineral needs. A varied diet is optimal for good nutrition and dietary enrichment. Most species of aquatic turtles quickly learn that animal care staff are food dispensers, which allows for fairly easy monitoring of food intake.

Recommendations:

This beautiful and active aquatic turtle species can be easily added to existing aquatic exhibits in singular or mixed species exhibits, both indoors and out. While available turtles may be infrequent, all Cagle's Map Turtles that become available legally or through confiscations should be acquired, even if only for short-term holding for other institutions looking to work with the species. This dynamic Texas endemic will likely need assistance in the form of captive assurance colonies to ensure its existence with its natural habitat steadily decreasing.

Program Goals:

- Elevate species to an SSP; enlist species champion to manage SSP/Studbook
- Establish managed program in zoological facilities for potential assurance colony purposes; pair up and reproduce limited numbers of turtles in captivity
- When possible, bring in new individuals from confiscations, donations, etc. for captive assurance colonies to maintain highest degree of genetic diversity

Program Contact:

Vacant (New Program)

NORTH AMERICA SPECIES ACCOUNTS

Coahuilan Box Turtles *Terrapene coahuila*



Species Summary:

Terrapene coahuila is the only species of aquatic box turtle in existence in North America. This small species is less than 25cm in length. It is only found in one small valley in Mexico. Sadly, it is in decline in the wild due to habitat destruction. An increased exhibition of this species would serve as a great ambassador for celebrating the rich biodiversity of Mexico.

Program Purposes:

Terrapene coahuila is listed as CITES Appendix I and is an Endangered species as listed by IUCN Red List of Threatened Species™. It is endemic to the marshland in the Cuatro Ciénegas basin in Mexico. This small area sustains the largest biodiversity in North America. The majority of the valley's endemic plants and animals are listed by the Mexican government as threatened or endangered, and in 1994 most of the valley was declared a Natural Protected Area by the federal government. Unfortunately, it is still at risk because of agriculture and irrigation diverting the only water sources. The population is also fragmented due to watershed desiccation and manmade barriers between ponds. Other invasive turtles are moving in on this keystone species' territory and disturbing this unique ecosystem.

A small captive population currently exists in zoos and is not a source of animals for release into the wild. This assurance colony's goal is to make sure that turtles will be protected for the future. This species needs to be managed to ensure genetic sustainability.

Currently no conservation programs are planned for this species. The only hope for wild

counterpart survival is the preservation of natural habitat.

Exhibit Qualities:

Terrapene coahuila is an active turtle and exhibits well in a naturalistic environment. Because it is largely aquatic, it can often be seen swimming or visibly basking. The requirement for space is not large, and shallow water is preferable. It does well in a mixed species exhibit with similar sized turtles, small perching birds, fish, and lizards.



Educational Qualities:

Terrapene coahuila fits nicely into programs discussing specialized chelonian adaptations, endemism, endangered species, and human-wildlife conflict. With a lifespan up to 40 years, this small turtle makes a safe investment for zoos and aquariums. The species is also regularly available for placement, generally tactile and can be easily transported.

Interpretive messages:

- Endemism
- Habitat loss
- Invasive species threats
- Unique box turtle adaptation- plastron hinge, only aquatic box turtle species
- Endangered species

Care and Facilities:

Most AZA facilities should be able to easily care for this freshwater turtle. It requires minimal veterinary care and is inexpensive to feed. A diet consisting of about half plant matter and half insects suits this opportunistic omnivore well. Insects such as crickets, kingworms, earthworms, and phoenix worms can be offered. Nutritionally complete gel diets (amphibian carnivore/omnivore gel) are also used as dietary addendums at some institutions, but care should be taken to avoid excess protein.

As their unofficial name implies, the aquatic box turtle is indeed an aquatic creature. It spends roughly 90% of its time in water, enough time that algae will commonly grow on the exterior of their shells. They spend the majority of their time in marshlands amongst tall grass, brush, and water. They strongly prefer areas with shallow water, mud bottom and dense vegetation. *T. coahuila* can be housed indoors or outdoors, though an indoor enclosure would require UV lighting and a supplemental heat source. Ideally the species should be maintained outdoors during warm weather. Plantings or hides should be available for retreat and to aid in thermoregulation. Multiple animals can be housed together.

Other Notes:

Terrapene coahuila displays well, is not space intensive, and thrives in pairs or harems, which makes it an excellent candidate for any reptile facility.

Program Goals:

- Locate more founders to increase genetic diversity
- Continue breeding and increase offspring from aging founders
- Increase institutional participants within AZA

Program contact:

Trent Barnhart
Studbook Keeper and SSP Coordinator
Santa Barbara Zoo
tbarnhart@sbzoo.org
805-962-5339 ext 178

NORTH AMERICA SPECIES ACCOUNTS

Northern Western Pond Turtle
Emys marmorata



Species Summary:

The Northern Western Pond Turtle, *Emys marmorata*, is a semi-aquatic turtle found primarily along the northern west coast of North America, from the Sierra Nevada foothills east of the San Joaquin Valley in California, and into areas north through Washington State and Vancouver, Canada. Some unusual outlier groups and admixed populations exist within the range of the Southern Western Pond Turtle, but those are thought to be human mediated movements or releases. Throughout most of its range, it is the only native aquatic freshwater turtle, though there is some overlap with Western painted turtles in Oregon. In recent times, this shy and elusive animal is often outcompeted by more aggressive non-native released pet turtles.

The phylogenetic relationship of the Western Pond Turtle has recently changed supporting previously recognized subspecies descriptions as unique species based on molecular studies. The Center for North American Herpetology refers to the two species as the Northern Western Pond Turtle, *Emys marmorata*, and the Southern Western Pond Turtle, *Emys pallida*. Besides molecular differentiation, the northern species is morphological identified by the presence of a pair of large, triangular inguinal plates in the majority of specimens and by an overall darker coloration of the throat and neck than the southern species.

Program Purposes:

Historically found from southern British Columbia to northern Baja California, Western Pond Turtles once dominated freshwater systems throughout the west coast of North America (Germano and Bury, 2001). The pond turtle faces numerous challenges throughout its range, though most are associated with water use. This is most obvious in California, where a desperate need for water for a growing population and agricultural industry is a major concern and is exacerbated by the current ongoing drought. Declining habitat and low

connectivity between populations coupled with widespread disease issues threatens the Washington State population. Urbanization, habitat fragmentation, impact of illegal marijuana cultivation, introduced bullfrogs and largemouth bass, introduced pet turtles, and potential impact of global climate change are threatening turtle numbers in all west coast states. Pond turtles have declined precipitously or been extirpated entirely in some parts of their range, with the result that they are now listed as Endangered in Washington, a Sensitive-Critical Species in Oregon, and as a Species of Special Concern in California. Research is underway by zoos, academic institutions and state wildlife agencies to evaluate habitat, investigate disease issues, and head-start animals to boost declining populations. As an AZA SAFE species, increased coordinated collaboration between these individuals and agencies should aid effective conservation efforts and provide increased data on population status.

Most of the Western Pond Turtles held in zoos are rescues deemed “not releasable” because they were from unknown localities, captured under unknown circumstances, or were held with other turtles and are potential disease risks. These animals are primarily exhibit and education animals, with limited captive breeding occurring.

Exhibit Qualities:

Though shy in the wild, they are an active turtle in exhibits and can provide an interesting, dynamic display. They are not aggressive and cohabit well with other species of turtles and aquatic animals, often seen basking on logs or rocks throughout the day.

Similar to most aquatic turtles, they do require deep enough water to dive into vegetation or hiding locations if spooked and must have exposure to UVB light and hot basking areas.

Educational Qualities:

Many Northern Western Pond Turtles will accept handling for short periods of time and are used in educational programs. They are valuable ambassadors of their rarely seen wild counterparts, and useful for explaining turtle conservation efforts and the importance of maintaining natural freshwater systems.



Interpretive Messages:

- Freshwater system and wetland conservation
- Habitat loss and climate change
- Invasive species threats (pet turtles, bullfrogs)
- Turtle conservation
- North American endemic species

Care and Facilities:

Northern Western Pond Turtles are a hardy species and can be long lived, healthy animals when appropriate diet, water quality, and thermoregulatory opportunities are provided.

Outdoors, direct sun is the ideal form of UVB for optimum health; however, indoor basking can replicate those conditions if outdoor housing is not an option. These turtles will often stack on top of one another or line up on slanted logs or basking sites to get the best possible sun/light exposure. Multiple basking sites are needed if there are small or subordinate animals to ensure that they get adequate UVB, which can be provided with UV and heat-emitting combined bulbs.

Enclosure size and type can vary but should be able to house several animals (can be multiple species) in order to create a complex, engaging habitat. These turtles will use and investigate land space, but, though not ideal, can also be housed in water-only exhibits with lots of haul out areas. Land space is critical if there are adult females that will be looking for nesting locations. Having an area with sandy soil will allow female pond turtles to naturally lay eggs. Without nesting opportunities on land, females may deposit eggs directly into the water, but they may also retain eggs. Water temperature can vary; however, if temperatures get below 12°C, the animals may begin seeking areas outside of the water to estivate or haul out of the water.

Pond turtles are generalist feeders (Ernst and Lovich, 2009). They are not able to swallow food on land but can transport food from land to water for swallowing (Holland, 1994). In the wild, they feed on aquatic plants (often *Daphnia*), algae, insects, aquatic

invertebrates, fish, and carrion. Though omnivorous, in captivity they have a definite preference for animal matter and can be sustained on turtle gels and pellets, fish, mice and gut loaded insects.

Other Notes:

- As with many other turtle species, the Northern Western Pond Turtle exhibits temperature dependent sex determination.
- There are currently five AZA institutions with WPT head-start programs: Woodland Park Zoo, Oregon Zoo, Oakland Zoo, San Francisco Zoo and Gardens, and San Diego Zoo.

Program Goals:

- Determine sex and age estimates for captive population that has large amount of unknown data.
- Genetically test all turtles of unknown collection location in captive population to assign to new species designation.
- Work with AZA facilities, AZA SAFE, and partner organizations as needed for investigation of risk factors, prevalence, and training for detection of septicemic cutaneous ulcerative disease (SCUD).
- Create a working group to generate a general husbandry manual for AZA facilities head-starting Pond Turtles.
- Assist with establishment and management of WPT Range-wide Conservation Coalition and implementation of the AZA SAFE WPT Conservation Action Plan.
- Collaborate with partner organization and WPT holding facilities (AZA and non-AZA) to increase public awareness of WPT status, threats, and to promote conservation actions.

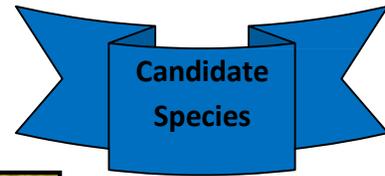
Program Contacts:

Jessie Bushell
Studbook Keeper and SSP Coordinator
San Francisco Zoo and Gardens
jessieb@sfoo.org
415.753.7080 x7079



NORTH AMERICA SPECIES ACCOUNTS

Pascagoula Map Turtle *Graptemys gibbonsi*



Species Summary:

The Pascagoula Map Turtle (*Graptemys gibbonsi*) is a small to medium-sized fully aquatic species found only in the Pascagoula River drainage system of southeastern Mississippi, including the Leaf, and Cickasawhay Rivers. Sexual dimorphism is rather pronounced, with adult females growing to more than twice the size and ten times the mass of adult males. Females of this species are also known for their exceptionally enlarged heads with very broad jaws. Females may weigh close to 3.5kg whereas males rarely weigh more than 350g. In addition to being markedly smaller, males also have longer and thicker tails in comparison to females and a narrower head. They do not have the longer fore claws which other species of map turtles use in courtship rituals. This species, as with all map turtles, are visually striking animals, making them highly desired by the pet trade, one of many reasons the species has declined. The wide variety of yellow markings and stripes on the animal's legs and face coupled with their extreme sexual dimorphism and the megacephaly found in adult females make them an interesting and attractive specimen and lend them to making spectacular exhibit animals. Though map turtles are mistaken to be shy and somewhat secretive, given the correct habitat they can easily lend to making a rather dynamic exhibit, especially captive born animals.

Program Purposes:

Formerly described in 1992, little is known about the natural history of the Pascagoula Map Turtle. Much of the published information that does exist concerns the Pearl River Map Turtle (*Graptemys pearlensis*), a species that was considered to be a separate population of *Graptemys gibbonsi* but was, in fact, determined to be a separate species in 2010. The Yellow-

blotched Map Turtle (*Graptemys flavimaculata*), a federally protected turtle species, is sympatric with *Graptemys gibbonsi* in the Pascagoula River system and is often given more focus and attention due to its protected status. However, based on recent surveys, the Pascagoula Map Turtle has declined by 80-90% since the 1950s. At one time, both species were found in somewhat equal ratios during population surveys throughout their range but, due in part to the continued decline of *Graptemys gibbonsi* and the protection afforded to *Graptemys flavimaculata*, that ratio has now been skewed 5 to 1 in favor of the Yellow-blotched Map Turtle. This continued decline, despite improvements that have helped the Yellow-blotched Map Turtle begin to recover, has led to the recent recommendation to list the Pascagoula Map Turtle (*Graptemys gibbonsi*) as a Threatened species under the USFWS. It is also considered a Species of Greatest Conservation Need in the state of Mississippi and has been listed as Endangered on the IUCN Red List of Threatened Species™. Major threats affecting this species are due to human impact, including water pollution that negatively impacts the mollusk populations these turtles feed and rely on, indiscriminate shooting of the turtles for target practice, collection for the pet trade, habitat alteration to accommodate commercial shipping, the destruction of nesting beaches and sandbars, and the unintentional increased populations of predators, such as raccoons and feral cats, that easily adapt to human settlements and readily feast upon turtle nests, nesting females and hatchlings. These continued known threats coupled with the potential for unpredictable catastrophic events, such as Hurricane Katrina, give us evidence as to why we need a program to establish and maintain a genetically robust assurance colony.

Exhibit Qualities:

In addition to being visually striking, the Pascagoula Map Turtle spends much of its time actively basking or foraging for foods, lending it to be a rather dynamic exhibit specimen. They can also be included in mixed species exhibit housing a number of other turtle species, American Bullfrogs, small fishes, American Beavers, Wood ducks, and possibly others. These turtles quickly associate their keepers with food and can be rather easily target trained to a feeding station. Deadfall, used as both a basking area and as a shallow underwater refuge, placed within the exhibit slightly away from the center spotlight will provide adequate security for the turtles to display very well, even in nocturnal exhibits.

Interpretive Messages:

Outside of a few river systems United States and Canada, *Graptemys* are found nowhere else in the world. This uniqueness lends to rather significant messaging. Though turtles and tortoises are globally threatened, conservation does not have to focus on exotic species, as there are a number of species within the AZA's geographic boundaries, including the Pascagoula Map Turtle, which needs the community and its public supporters to champion. Other messages that can be highlighted may include:

- the importance of healthy river ecosystems and how they benefit humanity – flood damage mitigation, clean drinking water, economically important recreational and commercial activities, etc.
- the longevity of chelonians in general – we must be willing to protect them at least for several decades to allow for significant improvements
- the inability to sustainably harvest most turtles for any reason, coupled with addressing the Asian Turtle Crisis and how that is beginning to affect North American species



Care and Facilities:

Pascagoula Map Turtles thrive in any standard aquatic exhibit and have no special needs, though consideration should be given to their presumed dietary specialization. Though they are naturally found in faster moving river systems, clean and warm water is more important than water flow. Map turtles seem to appreciate slightly warmer water and basking temperatures than may be expected. They readily accept a wide variety of foods, including standard commercial turtle pellets, earthworms, crickets, pink mice, shrimp, clams, crabs, fish, and poultry. Based on a few natural history studies, this species, along with other megacephalic Map turtles, appears to be a mollusk specialist and is not found in riverine habitats that do not support a robust population of mollusks. Species of snails, mussel, and clams are often found in their digestive systems, and these food items appear to be favored among reproductive females, perhaps for the increased calcium needed to produce eggs. Though not known if these specialized foods are a requirement to the overall long-term health of this species, it is recommended to replicate their natural diet as much as possible in captivity. Several institutions that maintain map turtles also offer a Turtle Gel. Each institution has a slightly different recipe but all are similar and include a rehydrated commercial pellet, a mixture of greens and produce, additional vitamins and minerals, and gelatin. These gels are well-received by the turtles. They may be offered food daily in small amounts, but they also do fine when fed 3 times per week. The amount of food is more important than the frequency, and weights should be monitored regularly, especially of females in breeding situations. Pascagoula Map Turtles do not require much space - the equivalent of 100 gallons for a single female and 40 gallons for a single male- but they seem to be flexible with their spatial requirements and can thrive in small or large exhibits that have adequate basking opportunities. In light of emerging research that has shown that chelonians verbally communicate with one another and appear to be much more social than previously thought, it is not recommended to keep Map Turtles as singletons unless the situation is unavoidable.

Recommendations:

This species does not require a lot of space and can easily be added to existing turtle or fish aquaria, specifically those that highlight North American river ecosystems. Outside of the potential female reproductive health issues, common in all reptilian species, the Pascagoula Map Turtle is rather resilient and easy to care for, but attention should also be given to their

presumed dietary needs. There are very few animals in AZA institutions, and establishing an assurance colony is not possible with this current population. The SSP coordinator will strongly encourage AZA institutions that are currently working with other map turtles to consider adding this species to their collection. The SSP coordinator also welcomes institutions that are interested in working with map turtles to consider adding this species to their collection.

Program Goals:

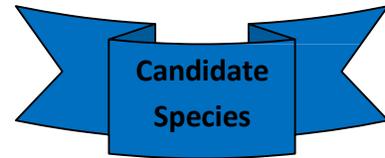
- Establish an Assurance Colony within the AZA Community and its trusted cooperatives
- Increase AZA Holding and Breeding Space for this new program
- Establish growth rates, maturity rates, dietary requirements and other captive care parameters that are, at this time, unknown and essential for the long term success of this population

Program Contact:

Vacant (New Program)

NORTH AMERICA SPECIES ACCOUNTS

Pearl River Map Turtle *Graptemys pearlensis*



Species Summary:

The Pearl River Map Turtle (*Graptemys pearlensis*) is a small to medium-sized fully aquatic species found only in the Pearl River drainage system of south-central Mississippi and southeastern Louisiana, including the Bogue Chitto and Strong Rivers. Sexual dimorphism is rather pronounced, with adult females growing to more than twice the size and ten times the mass of adult males. Females of this species are also known for their exceptionally enlarged heads with very broad jaws. Females may weigh close to 3kg, whereas males rarely weigh more than 300g. In addition to being markedly smaller, males also have longer and thicker tails in comparison to females and a narrower head. They do not have the longer fore claws which other species of map turtles use in courtship rituals. This species, as with all map turtles, are visually striking animals, making them highly desired by the pet trade, one of many reasons the species has declined. The wide variety of yellow markings and stripes on the animal's legs and face coupled with their extreme sexual dimorphism and the megacephaly found in adult females make them an interesting and attractive specimen and lend them to making spectacular exhibit animals. Though map turtles are mistaken to be shy and somewhat secretive, given the correct habitat, they can easily lend to making a rather dynamic exhibit, especially captive born animals.

Program Purposes:

Little is known about the natural history of the Pearl River Map Turtle (*Graptemys pearlensis*). This turtle was considered to be a separate population of *Graptemys gibbonsi* but was in fact determined to be a separate species in 2010. The Ringed Map Turtle (*Graptemys oculifera*), a federally protected turtle species, is sympatric with *Graptemys pearlensis* in the Pearl River system and is often given more focus and attention due to its protected status. However, based

on recent surveys, the Pearl River Map Turtle has declined by 80-90% since the 1950s. A number of surveys at that time found Pearl River Map Turtles to be twice as common as Ringed Map Turtles. Surveys conducted in recent years have found that, due in part to the continued decline of *Graptemys pearlensis* and the protection afforded to *Graptemys oculifera*, that ratio has now been skewed 5 to 1 in favor of the Ringed Map Turtle and that the Pearl River Map Turtle appears to be nearly absent in parts of range. Despite improvements that have helped the Ringed Map Turtle stabilize, the Pearl River Map Turtle has continued to decline. It is listed as a Species in Need of Management in the state of Mississippi but it is not protected in Louisiana and has been afforded no conservation status or protection via the USFWS. It is listed as Endangered on the IUCN Red List of Threatened Species™. Major threats affecting this species are human impact, including water pollution that negatively impacts the mollusk populations these turtles feed and rely on, indiscriminate shooting of the turtles for target practice, collection for the pet trade, habitat alteration to accommodate commercial shipping, the destruction of nesting beaches and sandbars, and the unintentional increased populations of predators, such as raccoons and feral cats, that easily adapt to human settlements and readily feast upon turtle nests, nesting females and hatchlings. These continued known threats, coupled with the potential for unpredictable catastrophic events, such as Hurricane Katrina, give us evidence as to the primary reason for establishing and maintaining a genetically robust population assurance colony.

Exhibit Qualities:

In addition to being visually striking, the Pearl River Map Turtle spends much of its time actively basking or foraging for foods, lending it to be a rather dynamic exhibit specimen. They can also be included in mixed species exhibits housing a number of other turtle species, American Bullfrogs, small fishes, American Beavers, Wood ducks, and possibly others. These turtles, like many others, quickly associate their keepers with food and can be rather easily target trained to a feeding station. Deadfall, used as both a basking area and as a shallow underwater refuge, placed within the exhibit slightly away from the center spotlight will provide adequate security for the turtles to display very well even in nocturnal exhibits.

Interpretive Messages:

Outside of a few river systems in the United States and Canada, *Graptemys* are found nowhere else in the world. This uniqueness lends to rather significant messaging. Though turtles and tortoises are globally threatened, conservation does not have to focus on exotic species, as there are a number of species within the AZA's geographic boundaries, including the Pearl River Map Turtle, which needs the community and its public supporters to champion. Other messages that can be highlighted may include:

- the importance of healthy river ecosystems and how they benefit humanity – flood damage mitigation, clean drinking water, economically important recreational and commercial activities, etc.
- the longevity of chelonians in general – we must be willing to protect them at least for several decades to allow for significant improvements
- the inability to sustainably harvest most turtles for any reason, coupled with addressing the Asian Turtle Crisis and how that is beginning to effect North American species



Care and Facilities:

Pearl River Map Turtles thrive in any standard aquatic exhibit and have no special needs, though consideration should be given to their presumed dietary specialization. Though they are naturally found in faster moving river systems, clean and warm water is more important than water flow. Map turtles seem to appreciate slightly warmer water and basking temperatures than may be expected. They readily accept a wide variety of foods, including standard commercial turtle pellets, earthworms, crickets, pink mice, shrimp, clams, crabs, fish, and poultry. Based on a few natural history studies, this species, along with other megacephalic Map Turtles, appears to be a mollusk specialist and is not found in riverine habitats that do not support a robust population of mollusks. Species of snails, mussel, and clams are often found in their digestive systems, and these food items appear to be favored among reproductive females, perhaps for the increased calcium needed to produce eggs. Though not known if these specialized foods are a requirement to the overall long-term health of this species, it is recommended to replicate their natural diet as much as possible in captivity. Several institutions that maintain map turtles also offer a Turtle Gel. Each institution has a slightly different recipe, but all are similar and include a rehydrated commercial pellet, a mixture of greens and produce, additional vitamins and minerals and gelatin. These gels are well received by the turtles. They may be offered food daily in small amounts, but they also do fine when fed 3 times per week. The amount of food is more important than the frequency, and weights should be monitored regularly, especially of females in breeding situations. Pearl River Map Turtles do not require much space - the equivalent of 100 gallons for a single female and 40 gallons for a single male - but they seem to be flexible with their spatial requirements and can thrive in small or large exhibits that have adequate basking opportunities. In light of emerging research that has shown that chelonians verbally communicate with one another and appear to be much more social than previously thought, it is not recommended to keep map turtles as singletons unless the situation is unavoidable.

Recommendations:

This species does not require a lot of space and can easily be added to existing turtle or fish aquaria, specifically those that highlight North American river ecosystems. Outside of the potential female reproductive health issues common in all reptilian species, the Pearl River Map Turtle is rather resilient and easy to care for, but attention should also be given to their presumed dietary needs. There are very few animals in AZA institutions, and establishing an assurance colony is not possible with this current population. The SSP coordinator strongly encourages AZA institutions that are currently working with other map turtles to consider

adding this species to their collection. The SSP coordinator also welcomes institutions that are interested in working with map turtles to consider adding this species to their collection.

Program Goals:

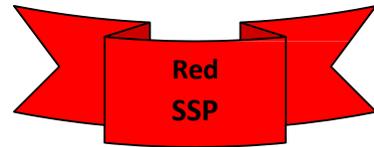
- Establish an Assurance Colony within the AZA Community and its trusted cooperatives
- Increase AZA Holding and Breeding Space for this new program
- Establish growth rates, maturity rates, dietary requirements and other captive care parameters that are at this time unknown and essential for the long term success of this population

Program Contact:

Vacant (New Program)

NORTH AMERICA SPECIES ACCOUNTS

Ringed Map Turtle *Graptemys oculifera*



Species Summary:

The Ringed Map Turtle, sometimes referred to as the Ringed Sawback, (*Graptemys oculifera*), is one of the smallest Map Turtles species and is found only in the Pearl River drainage system of south-central Mississippi and southeastern Louisiana, including the Yockanookany, Bogue Chitto and the Porter Rivers. Sexual dimorphism is rather pronounced, with adult females growing to more than twice the size and several times the mass of adult males. Females may weigh close to 800g whereas males rarely weigh much more than 100g. In addition to being markedly smaller, males also have longer and thicker tails in comparison to females, a slightly narrower head, and longer fore claws which they use in courtship rituals. This species is one of the more visually striking Map Turtles, making them highly desired by the pet trade, one of many reasons the species has declined. The yellow to orange rings and bars covering an overall black turtle coupled with a wide variety of stripes on the animal's legs and face make them an attractive specimen and make them spectacular exhibit animals. Though Map Turtles are mistaken to be shy and somewhat secretive, given the correct habitat they can easily lend to making a rather dynamic exhibit, especially captive born animals.

Program Purposes:

The Ringed Map Turtle was listed as federally threatened in 1986 under the Endangered Species Act, and they are listed as state endangered within the borders of Mississippi and

threatened in Louisiana. Critical habitat has not been yet designated or protected, and other components of the Fish and Wildlife Service's recovery plan have yet to be realized. The Ringed Map Turtle has been downgraded to IUCN Red List of Threatened Species™ vulnerable on the IUCN Red List of Threatened Species™ because not enough information is known about their population trend to qualify as endangered. Though some populations appear stable, this species is still in need of conservation because of its small range, water quality deterioration, siltation and the subsequent loss of invertebrate food sources, reservoir construction, channelization, and other habitat modifications for navigation. In some locations, most of these threats have been mitigated, but a simple significant increase in human recreational activities has negatively affected basking and nesting behaviors. For a species with a low reproductive output, these threats, along with an increase in natural predator populations, are making recruitment difficult to accomplish. Along with these continued known threats, the potential for unpredictable catastrophic weather events, the main purpose of this program is to establish and maintain a genetically robust population assurance colony.

Exhibit Qualities:

In addition to being visually striking, the Ringed Map Turtle spends much of its time actively basking or foraging for foods, leading it to be a rather dynamic exhibit specimen. They can also be included in mixed species exhibits housing a number of other turtle species, American Bullfrogs, small fishes, American Beavers, Wood ducks and possibly others. These turtles quickly associate their keepers with food and can be rather easily target trained to a feeding station. Deadfall, used as both a basking area and as a shallow underwater refuge when placed within the exhibit slightly away from the center spotlight, will provide adequate security for the turtles to display very well, even in nocturnal exhibits.

Interpretive Messages:

Graptemys are found in only a few rivers in the Southeastern United States. This uniqueness lends to rather significant messaging. Though turtles and tortoises are globally threatened, conservation does not have to focus on exotic species as there are a number of species within the AZA's geographic boundaries which need the community support. Other messages that can be highlighted may include:

- the importance of healthy river ecosystems and how they benefit humanity – flood damage mitigation, clean drinking water, economically important recreational and commercial activities, etc.
- the longevity of chelonians in general – we must be willing to protect them at least for several decades to allow for significant improvements
- the inability to sustainably harvest most turtles for any reason
- addressing the Asian Turtle Crisis and how that is beginning to effect North American species



Photo Credit: Robert Jones

Care and Facilities:

Ringed Map Turtles thrive in many standard aquatic exhibit and have few special needs. Though they are naturally found in faster moving river systems, clean and warm water is more important than water flow. Map Turtles seem to appreciate slightly warmer temperatures than may be expected. They readily accept a wide variety of foods, including standard commercial turtle pellets, earthworms, crickets, pink mice, shrimp, clams, crabs, fish, and poultry. Several institutions that maintain this species also offer a Turtle Gel which includes commercial pellets, a mixture of greens and produce, additional vitamins and minerals and gelatin. Turtles may be offered food daily in small amounts, but they also do fine when fed 3 times per week. The amount of food is more important than the frequency and weights should be monitored regularly especially of females in breeding situations. Ringed Map Turtles do not require much space, the equivalent of 75 gallons for a trio of adults, but they seem to be flexible with their spatial requirements and can thrive in small or large exhibits that have adequate basking opportunities. In light of emerging research that has shown that chelonians verbally communicate with one another and appear to be much more social than previously thought, it is not recommended to keep Map Turtles as singletons unless the situation is unavoidable.

Recommendations:

This species does not require a lot of space and can easily be added to existing turtle or fish aquaria, specifically those that highlight North American river ecosystems. Outside of potential female reproductive health issues, common in all reptilian species, the Ringed Map Turtle is rather resilient and easy to care for. The managed population is rather small (16.6.2) and very little breeding/hatching has occurred in the last decade. The SSP coordinator strongly encourages AZA institutions that currently manage females of this species to breed them or transfer them to an institution that has the desire to breed them.

Program Goals:

- Focus resources on breeding
- Relocate animals out of AZA institutions that are not interested in breeding
- Resolve unknown parentage issues



Program contact:

Sara Plesuk
Studbook Keeper and SSP Coordinator
Omaha's Henry Doorly Zoo
reptiles@omahazoo.com
402-738-2043

NORTH AMERICA SPECIES ACCOUNTS



Southern Western Pond Turtle *Emys pallida*



Species Summary:

The Southern Western Pond Turtle, *Emys pallida*, is a semi-aquatic turtle found along the southern west coast of North America, from the San Francisco Bay Area south through the Central Coast Range on the eastern side of the San Joaquin Valley, into southern California and Baja California, Mexico (Spinks *et al.*, 2014). Throughout its range, it is the only native aquatic freshwater turtle. In recent times, this shy and elusive animal has often been outcompeted by more aggressive, non-native released pet turtles.

The phylogenetic relationship of the Western Pond Turtle has recently changed, supporting previously recognized subspecies descriptions as unique species based on molecular studies. The Center for North American Herpetology refers to the two species as the Northern Western Pond Turtle, *Emys marmorata*, and the Southern Western Pond Turtle, *Emys pallida*. Besides molecular differentiation, the southern species is morphologically identified by lack of small, sometimes rectangular or round, inguinal plates in the majority of specimens and by an overall lighter coloration of the throat than the northern species.

Program Purposes:

Historically found from southern British Columbia to northern Baja California, Western Pond Turtles once dominated freshwater systems throughout the west coast of North America. The Pond Turtle faces numerous challenges throughout its range, though most are associated with water use. This is most obvious in California, where a desperate need for water for a growing population and agricultural industry is a major concern and is exacerbated by the current ongoing drought. Urbanization, habitat fragmentation, impact of illegal marijuana cultivation, introduced bullfrogs and largemouth bass, introduced pet turtles, and potential impact of global climate change are threatening turtle numbers in all west coast states. Pond Turtles have declined precipitously or been extirpated entirely in some parts of their range, with the result that they are now listed as Endangered in Washington, as a Sensitive-Critical Species in Oregon, and as a Species of Special Concern in California. Research is underway by zoos, academic institutions, and state wildlife agencies to evaluate habitat, investigate disease issues, and head-start animals to boost declining populations. As an AZA SAFE species, increased coordinated collaboration between these individuals and agencies should aid effective conservation efforts and provide increased data on population status.

Most of the Western Pond Turtles held in zoos are rescues deemed “not releasable” because they were from unknown localities, captured under unknown circumstances, or were held with other turtles and are potential disease risks. These animals are primarily exhibit and education animals, with limited captive breeding occurring.

Exhibit Qualities:

Though shy in the wild, they are an active turtle in exhibits and can provide an interesting, dynamic display. They are not aggressive and cohabit well with other species of turtles and aquatic animals, often seen basking on logs or rocks throughout the day.

Similar to most aquatic turtles, they do require deep enough water to dive into vegetation or hiding locations if spooked and must have exposure to UVB light and hot basking areas.

Educational Qualities:

Many Western Pond Turtles will accept handling for short periods of time and are used in educational programs. They are valuable ambassadors of their rarely seen wild counterparts, and useful for explaining turtle conservation efforts and the importance of maintaining natural freshwater systems.

Interpretive Messages:

- Freshwater system and wetland conservation
- Habitat loss and climate change
- Invasive species threats (pet turtles, bullfrogs)
- Turtle conservation
- North American endemic species

Care and Facilities:

Western Pond Turtles are a hardy species and can be long lived, healthy animals when appropriate diet, water quality, and thermoregulatory opportunities are provided.

Outdoor, direct sun is the ideal form of UVB for optimum health; however, indoor basking can replicate those conditions if outdoor housing is not an option. These turtles will often stack on top of one another or line up on slanted logs or basking sites to get the best possible sun/light exposure. Multiple basking sites are needed if there are small or subordinate animals to ensure that they get adequate UVB, which can be provided with UV and heat-emitting combined bulbs.

An enclosure's size and type can vary, but should be able to house several animals (can be multiple species) in order to create a complex, engaging habitat. These turtles will use and investigate land space, but can also be housed in water-only exhibits with lots of haul out areas, though this is not ideal. Land space is critical if there are adult females that will be looking for nesting locations. Having an area with sandy soil will allow female Pond Turtles to naturally lay eggs. Without nesting opportunities on land, females may deposit eggs directly into the water, but they may also retain eggs. Water temperature can vary; however, if temperatures get below 12°C, the animals may begin seeking areas outside of the water to estivate or haul out of the water.

Pond Turtles are generalist feeders. They are not able to swallow food on land but can transport food from land to water for swallowing. In the wild, they feed on aquatic plants (often *Daphnia*), algae, insects, aquatic invertebrates, fish, and carrion. Though omnivorous, in captivity they have a definite preference for animal matter and can be sustained on turtle gels and pellets, fish, mice and gut loaded insects.

Other Notes:

- As with other turtle species, the Western Pond Turtle exhibits temperature dependent sex determination.
- There are currently five AZA institutions with WPT head-start programs: Woodland Park Zoo, Oregon Zoo, Oakland Zoo, San Francisco Zoo and Gardens, and San Diego Zoo.

Program Goals:

- Determine sex and age estimates for captive population that has large amount of unknown data
- Genetically test all turtles of unknown collection location in captive population to assign to new species designation
- Work with AZA facilities, AZA SAFE, and partner organizations as needed for investigation of risk factors, prevalence, and training for detection of septicemic cutaneous ulcerative disease (SCUD)
- Create a working group to generate a general husbandry manual for AZA facilities head-starting Pond Turtles
- Assist with establishment and management of WPT Range-wide Conservation Coalition and implementation of the AZA SAFE WPT Conservation Action Plan

- Collaborate with partner organization and WPT holding facilities (AZA and non-AZA) to increase public awareness of WPT status, threats, and promote conservation actions

Program Contact:

Jessie Bushell

Studbook Keeper and SSP Coordinator

San Francisco Zoo and Gardens

jessieb@sfzoo.org

415.753.7080 x7079



NORTH AMERICA SPECIES ACCOUNTS

Spotted Turtle *Clemmys guttata*



Joe Crowley

Species Summary:

A small turtle of diverse wetland habitats, *Clemmys guttata* is an attractive exhibit species suitable to spaces which would preclude larger turtles and are an asset in a mixed species habitat. Spotted turtles exemplify the need for local conservation of endangered species.

Program Purposes:

Clemmys guttata is listed in CITES Appendix II and as Endangered in the IUCN Red List of Threatened Species™. With a generation time of probably over 25 years, the species is likely to have suffered more than 50% overall reduction in numbers, much of this being irreversible through habitat loss. At remaining locations, habitat succession may be a challenge, while population recovery from past collection for pet trade and ongoing traffic and other accidental mortality, and recolonization of any new sites with suitable habitat, is slow and constrained by subsidized predators and possibly climatic changes. Spotted turtles are legally protected to some degree from exploitation in most states and provinces in which they are found, but protection is not yet consistent or universal over the turtle's range.

Exhibit Qualities:

The size and attractive appearance of spotted turtles tends to make them charismatic to zoo and aquarium visitors. With an adult length around 10-15cm, *Clemmys* can be exhibited in spaces which would be prohibitively small for many other turtle species. This aspect, together with their benign demeanor, lends them to be an excellent choice for many mixed species exhibits. A variety of other native amphibians and reptiles such as *Chrysemys*, *Glyptemys*, *Terrapene*, *Nerodia* or adult anuran and *Ambystomid* salamander species could all be compatible with this turtle species.

**Educational Qualities:**

Spotted turtles represent a native and often local species in need of conservation efforts. This species can be used to illustrate how loss and fragmentation of wetland habitats, pollution, and collection for pets can bring native species to an endangered status.

Interpretive Messages:

- Native endangered species
- Wetlands protection
- Problems of removing animals from the wild
- Camouflage – aquatic plant pattern (duckweed)

Care and Facilities:

Spotted turtles are relatively easy to care for in captivity. Two adult Clemmys can do well in a 20 gal. aquarium with equal land and water areas. They can also do well in larger, more complex multi-species exhibits. However, spotted turtles are not strong swimmers and they should be provided with water depths between 4 and 6 inches. They have been known to drown in deep water. Water temperatures of 65 °F with air temperature between 75 ° and 80°F and basking area 85°to 90°F are ideal for this species.

Spotted turtles have been regarded as predominantly carnivorous and will eat a variety of invertebrates, fish, meat or pellets such as ReptoMin® or Mazuri® Aquatic Turtle Diet. Given the opportunity, many will readily consume algae, duckweed, watercress or other aquatic plants. Romaine lettuce can be a favorite. Calcium supplements should be given and a source of UVB lighting is essential.



Other Notes:

This species seems to have been taken for granted, especially in areas where it is found locally. Breeding has been haphazard and animals have moved in and out of collections without regard to maintaining a healthy captive population. The development and implementation of a breeding and transfer plan can bring this species into a sustainable captive population.

Program Goals:

- Generate Breeding and Transfer Plan
- Initiate Breeding and Transfer Plan
- Attempt to encourage conservation efforts that will help sustain wild populations of *Clemmys guttata*.

Program contact:

Rich Rosevear
Studbook Keeper and SSP Coordinator
LeHigh Valley Zoo
rosevear@lvzoo.org
610-799-4171 x 230

NORTH AMERICA SPECIES ACCOUNTS

Wood Turtle

Glyptemys insculpta



Species summary:

This charismatic turtle can be found in large portions of the American northeast and Midwest, as well as portions of Canada. Its mastery of both aquatic and terrestrial habitats and its ability to exist comfortably in some of North America's coldest environments make it an excellent representative of the adaptability of North American reptiles.

Program Purposes:

Wood Turtles are listed as CITES Appendix II and Endangered under the IUCN Red List of Threatened Species™. The species status is currently under review by US Fish and Wildlife. It is locally listed at various levels in most of its range, including Wisconsin, Minnesota, New Jersey, Virginia, Connecticut, Maine, Massachusetts, Michigan, New Hampshire, New York, and West Virginia, Nova Scotia, Quebec, and Ontario.

Exhibit Qualities:

Wood Turtle exhibits may consist of primarily terrestrial exhibits with large soaking pools, UV light, and basking. However, many facilities exhibit Wood Turtles in large, outdoor, multi-species exhibits, where they seem to breed more readily. They have been maintained with box turtles and various aquatic turtle species. Some male Wood Turtles may become aggressive in larger exhibits, both towards conspecifics and turtles of other species and may need to be removed. However there are several examples of mixed sex groups of Wood Turtles cohabitating well in these sorts of exhibits, and such occurrences

may come down to individual turtles and situations. In larger exhibits, it is important to provide ample basking areas and visual barriers, both in the water and on land, which may include foliage and logs. Adult Wood Turtles will hibernate on exhibit in their native range and do so successfully at several institutions.

Educational Qualities:

Wood Turtles fit nicely into programs highlighting both North American wildlife and turtle biology and conservation. Due to their lifestyle, Wood Turtles may be used to illustrate both aquatic and terrestrial adaptations and behaviors. Their bright colors and overall appearance make them a charismatic species. Provided that basic safety and sanitary precautions are taken, Wood Turtles should be able to interact closely with visitors.

Interpretative Messages:

- Native species
- Hibernation and temperate adaptations
- Chelonian behavioral complexity (earthworm stomping)
- Impacts of the pet trade
- Impacts of agriculture

Care and Facilities:

Due to their semi-terrestrial lifestyle, adult Wood Turtles require fairly large enclosures to thrive, with ideal enclosures measuring not less than 5' long by 3' wide, with water at least 1' deep. Outdoor enclosures may vary widely, but care should be taken to ensure they will keep out native predators, particularly raccoons. Wood Turtles require basking of 90-100 F in restricted areas when housed indoors, but are ideally kept outside with access to natural basking and sunlight. Like all turtles, Wood Turtles should be provided with UV light. A wide variety of hibernation techniques have been practiced, however animals maintained outdoors year round for this process appear to be the most prolific. Perhaps because of their variable wild habits, captive Wood Turtles may do well in a wide variety of set-ups.

Adult Wood Turtles will eat a large variety of food items. Vegetation provides the majority of their diet in the wild and should be the largest part of a captive diet, followed by earthworms. Wood Turtles will eat a wide variety of other invertebrates, and even carrion if offered.

Captive husbandry of Wood Turtle hatchlings should mimic adult set ups, with the exception that hatchlings may do better in a more aquatic set-up with a diet made up of more invertebrates. Current hatchling mortality is high in captive Wood Turtles, and further efforts to refine hatchling and juvenile husbandry are needed.



Wood Turtle in use as a programs animal at The Wild Center. Photo credits Leah Valerio

Program goals:

- Reduce hatchling mortality; improve communication regarding successful strategies for hatchling care.
- Further increase participation from non-AZA institutions



Wood Turtle exhibit at Clyde Peeling's Reptiland. Exhibit also includes red eared sliders, common pond sliders, yellow-bellied sliders, eastern box turtles and ornate box turtles. Photo credit Leslie Thompson

Program contact:

Megan Baumer
Studbook Keeper and SSP Coordinator
Fort Worth Zoo
mbaumer@fortworthzoo.org
817-759-7555

NORTH AMERICA SPECIES ACCOUNTS

Yellow-blotched Map Turtle *Graptemys flavimaculata*



Species Summary:

The Yellow-blotched Map Turtle, sometimes referred to as the Yellow-blotched Sawback, (*Graptemys flavimaculata*) is a small to medium-sized, fully aquatic species found only in the Pascagoula River drainage system of southeastern Mississippi, including the Leaf, Cickasawhay, and Escatawpa Rivers. Sexual dimorphism is rather pronounced, with adult females growing to more than twice the size and ten times the mass of adult males. Females may weigh close to 2kg, whereas males rarely weigh more than 200g. In addition to being markedly smaller, males also have longer and thicker tails in comparison to females, a slightly narrower head, and longer fore claws, which they use in courtship rituals. This species is one of the more visually striking Map Turtles, making them highly desired by the pet trade, one of many reasons the species has declined. The yellow to orange blotches and odd shapes covering an overall black turtle, coupled with a wide variety of yellow spots and stripes on the animal's legs and face make them an attractive specimen and lend them to making spectacular exhibit animals. Though Map Turtles are mistaken to be shy and somewhat secretive, given the correct habitat, they can easily lend to making a rather dynamic exhibit, especially captive born animals.

Program Purposes:

The Yellow-blotched Map Turtle was listed as federally threatened in 1991 under the Endangered Species Act, and they are listed as state endangered within the borders of Mississippi. At one time, this species was listed as Endangered on the IUCN Red List of Threatened Species™ and considered to be one of the top 25 most imperiled chelonians, but due to improved population estimates, the discovery of previously unknown populations, and improved water quality within some of their range which has allowed some of the overall population to recover, *Graptemys flavimaculata* was downgraded. It remains listed as Vulnerable, with a decreasing population trend because of its small range, severe declines within the largest known population, and human impact threats including indiscriminately shooting the turtles for target practice, collection for the pet trade, habitat alteration to accommodate commercial shipping, and destruction of nesting beaches and sandbars. In some locations, most of these threats have been mitigated, but a simple significant increase in human recreational activities has negatively affected basking and nesting behaviors. These continued known threats, coupled with the potential for unpredictable catastrophic weather events, the main purpose of this program is to establish and maintain a genetically robust population assurance colony.

Exhibit Qualities:

In addition to being visually striking, the Yellow-blotched Map Turtle spends much of its time actively basking or foraging for foods, making it a rather dynamic exhibit specimen. They can also be included in mixed species exhibits housing a number of other turtle species, American Bullfrogs, small fishes, American Beavers, Wood ducks and possibly others. These turtles quickly associate their keepers with food and can be rather easily target trained to a feeding station. Deadfall, used as both a basking area and as a shallow underwater refuge when placed within the exhibit slightly away from the center spotlight will provide adequate security for the turtles to display very well even in nocturnal exhibits.

Interpretive Messages:

Graptemys are found in only a few rivers in the Southeastern United States. This uniqueness lends to rather significant messaging. Though turtles and tortoises are globally threatened, conservation does not have to focus on exotic species. There are a number of species within the AZA's geographic boundaries which need the community's support. Other messages that can be highlighted may include:

- the importance of healthy river ecosystems and how they benefit humanity – flood damage mitigation, clean drinking water, economically important recreational and commercial activities, etc.
- the longevity of chelonians in general – we must be willing to protect them at least for several decades to allow for significant improvements
- the inability to sustainably harvest most turtles for any reason
- addressing the Asian Turtle Crisis and how that is beginning to effect North American species



Care and Facilities:

Yellow-blotched Map Turtles thrive in many standard aquatic exhibit and have few special requirements. Though they are naturally found in faster moving river systems, clean and warm water is more important than water flow. Map Turtles seem to appreciate slightly warmer temperatures than may be expected. They readily accept a wide variety of foods including standard commercial turtle pellets, earthworms, crickets, pink mice, shrimp, clams, crabs, fish and poultry. Several institutions that maintain this species also offer a Turtle Gel. Each institution has a slightly different recipe, but all are similar and include a rehydrated commercial pellet, a mixture of greens and produce, additional vitamins and minerals and gelatin. The turtles may be offered food daily in small amounts, but they also do fine when fed 3 times per week. The amount of food is more important than the frequency, and weights should be monitored regularly especially of females in breeding situations. Yellow-blotched Map Turtles do not require much space, the equivalent of 75 gallons for a single female and 40 gallons for a single male but they seem to be flexible with their spatial requirements and can thrive in small or large exhibits that have adequate basking opportunities. Emerging research shows that chelonians verbally communicate with one another and appear to be much more social than previously thought, so it is not recommended to keep Map Turtles as singletons unless the situation is unavoidable.

Recommendations:

This species does not require a lot of space and can easily be added to existing turtle or fish aquaria, specifically those that highlight North American river ecosystems. Outside of potential female reproductive health issues common in all reptilian species, the Yellow-blotched Map Turtle is rather resilient and easy to care for. The managed population is near to population goal, and breeding has become limited to known or potential founders. The SSP coordinator encourages AZA institutions to consider

displaying this species to provide holding space, allowing the population to grow in a genetically desirable direction.

Program Goals:

- Control breeding and limit it to only known wild founders or potential founders
- Resolve unknown parentage issues
- Increase AZA non-breeding holding space



Program contact:

Sara Plesuk
Studbook Keeper and SSP Coordinator
Omaha's Henry Doorly Zoo
reptiles@omahazoo.com
402-738-2043

SOUTH AMERICA SPECIES ACCOUNTS

Galápagos Tortoise

Chelonoidis nigra



Studbook AZA #71 San Diego Chelonoidis hoodensis or Española Island male tortoise repatriated to Charles Darwin Research Station, Santa Cruz Island, Galápagos, in 1977

Species Overview:

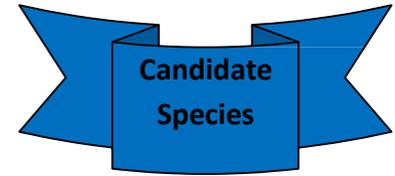
The Galápagos Tortoise has been bred with increasing frequency in AZA institutions over the past three decades, thanks to many successful captive breeding programs. Private facilities have also contributed significantly to the captive breeding of the Galápagos Tortoise. Based on the nine species listed in the Turtle and Tortoise Checklist by van Dijk et al., (2014), three species are extinct (*C. nigra*, *C. abingdonii* and *C. phantastica*), and of the remaining six extant tortoise species, only two (*C. vicina* and *C. darwini*) would be listed in the captive population. Furthermore, only *Chelonoidis vicina* would be considered secure in the United States, though all six extant tortoises would be more importantly secure in Galápagos Islands. Based on van Dijk et al. (2014), *C. microphyes*, *C. guntheri* and *C. vandenburghii* would all be synonymized under the Southern Isabela tortoise, *C. vicina*, which was also proposed by Pritchard (1996) based on morphology and field observations. Despite this revised taxonomy, which was based on referential taxonomic priority, IUCN red data list still maintains *Chelonoidis nigra* as 12 subspecies, with *C. n. abingdonii* recently listed as extinct. Furthermore, based on molecular information, both Caccone et al., (2002) and Louis (1997) could distinguish both *C. microphyes* and *C. vandenburghii*. Therefore, the AZA *Chelonoidis nigra* program will be managed by island or volcano populations, with *C. n. becki*, *C. n. microphyes*, *C. n. nigrita*, *C. n. vandenburghi*, and *C. n. vicina*, as the AZA tortoise captive populations. Moreover, the numerous captive-bred hybrids (designated by molecular genetics/pedigree analyses) will be managed as only exhibit display tortoises.

At this time, a Stable population exists for the five designated island or volcano specific tortoise populations within AZA institutions and select private participants; however, more breeding of potential founders needs to occur as soon as possible, as these individuals are getting very old reproductively. Managing this population as an assurance colony in AZA institutions and the private sector is the primary goal of this program.

SOUTH AMERICA SPECIES ACCOUNTS

Volcan Wolf Galápagos Tortoise

Chelonoidis nigra becki



Species Summary:

The Volcan Wolf Galápagos Tortoise inhabits the northernmost end of Isabela Island within the Galápagos archipelago. Volcan Wolf is the highest peak in all of the Galápagos Islands, and the volcanic terrain is sharp and rugged. The chelonian inhabitants of Volcan Wolf are smaller than the other four types of giant tortoises from Isabela Island, with males rarely weighing over 136kg. Volcan Wolf Galápagos Tortoises have shells that are “intermediate” between the saddlebacked and domed variations. Their plastrons are reduced in size compared to other tortoises in the genus, and their necks and limbs are slightly longer. It is likely that these morphological differences benefit the animals as they search for feeding opportunities on the often sharply-sloped regions of Volcan Wolf. This large, terrestrial, diurnal tortoise is threatened by competition for food by feral goats, and its offspring are threatened by feral cats. Within some areas of its range it also cohabitates with tortoises recently discovered to be partial matches for the genetic profiles of the now-extinct *C. n. nigra* and *C. abingdonii* populations.

Program Purposes:

As with all Galápagos Tortoises, this species has been strictly protected since 1971 by the Ecuadorean government, and exports from the Galápagos Islands or the Ecuadorean mainland are not possible. It is listed as Vulnerable by the IUCN Red List of Threatened Species™ (IUCN 2015) and as CITES Appendix I. Human exploitation for meat and oil eliminated in excess of 200,000 Galápagos tortoises throughout their range. Continued decline is from introduced predators and competitors for food.

There are currently just 3.3.2 Volcan Wolf Galápagos Tortoises within 4 AZA or cooperating facilities in the United States. It is the goal of this particular program to increase reproductive output and offspring survivorship. Unrelated individuals may exist in the North American private sector, and every attempt should be made to identify these individuals and incorporate them into the breeding population.

Exhibit Qualities:

The Galápagos Tortoise, like all other large tortoise species, is an excellent, active exhibit animal and always a favorite of the visiting public. Adult Galápagos Tortoises exhibited in year-round warm environments or with indoor winter exhibits are always popular, and having young tortoises in smaller indoor situations is also complementary. The Volcan Wolf Galápagos Tortoise is more aggressive and much more athletic than its domed-shelled Galápagos Tortoise relatives, and this may require more behavioral management and higher barriers than for other Galápagos Tortoises.

Educational Qualities:

The Galápagos Islands continue to be a popular tourist destination. This important UNESCO World Heritage Site has had an extensively documented history over the past four centuries, including the well-known voyage of the Beagle and Charles Darwin. Furthermore, this species and others found in the Galápagos Islands are found nowhere else in the world and need to be preserved for future generations. Educating guests and offering donation opportunities to assist the Charles Darwin Research Station with their work in the region will be key to saving the island archipelago of Galápagos, Ecuador.

Interpretive Messages:

- Endangered Species Conservation
- Gigantism
- Invasive species
- Island biogeography
- Adaptations
- Unsustainable hunting/harvesting

Care and Facilities:

For sub-adults and adults, outdoor space is needed for UV exposure, with southern, drier climates optimal. Temperature requirements are 70 to 100 F, with dense shade needed in higher temperatures. In areas where temperatures fall routinely below 65 F, heated adjacent night houses are required. Indoor conditions for rearing young or temporarily housing adults require a temperature range between 80 and 86 F with basking opportunities.

From a population management perspective, the SSP recommends that breeding adults be maintained outdoors in planned breeding situations, but that additional females be included, which can take breeding pressure from male tortoises. Pairs can be maintained in large open enclosures year round; minimum enclosure size is 1,200 square feet for two to three adults. Holding Galápagos Tortoises on a substrate devoid of grass is recommended to manage their diet, along with offering climbing opportunities for exercise and watering holes to soak. Their caloric requirements are low and their need for physical activity is great. These tortoises consume a traditional tortoise diet, but it must be limited and well-regulated to ensure a slow growth pattern for the Galápagos tortoise offspring. Care even needs to be taken when feeding adults, as they, too, can become obese rather quickly, which severely impacts reproduction and long-term survival.

The results of the incubation experiments (Española Tortoises) conducted in the 1980s indicate that at low incubation temperatures (25-27°C) males are produced, while at high temperatures (29-30°C) females are produced (Márquez et al. 1990). At present, eggs from each nest of the Volcan Wolf Galápagos Tortoises are incubated at two temperatures to obtain the best hatching success and a higher percentage of females, which is very important for rapid population growth. The duration of incubation varies depending on the temperature. At temperatures of 26 and 27°C, incubation lasts approximately 175 days. At temperatures higher than 29.5°C, the incubation period lasts approximately 110 to 125 days.

Other Notes:

Although Galápagos Tortoises have been maintained in captivity since the early 1900's, the first reproduction in an AZA institution did not occur until 1956. Since then, reproduction has increased steadily, but despite the numerous Galápagos Tortoises successfully hatched, husbandry needs to be seriously improved to be able to rear this species to adulthood, as a majority of the offspring produced in the 1990's have already died due to physiological problems related to rapid growth and obesity.

Program Goals:

- Continue to breed founders/ and rear potential founders in the SSP
- Find additional AZA holding institutions to raise offspring

Program Contact:

Edward Louis
Studbook Keeper and SSP Coordinator
Omaha's Henry Doorly Zoo
edlo@omahazoo.com

SOUTH AMERICA SPECIES ACCOUNTS

Volcan Darwin Galápagos Tortoise *Chelonoidis nigra microphyes*



Photo by Patricia Scanlan, Gladys Porter Zoo

Species Summary:

The Volcan Darwin Galápagos Tortoise inhabits the area west of Volcan Darwin. Volcan Darwin is located at the bottom of the upper third of Isabela Island within the Galápagos archipelago. These are giant tortoises with thick, domed carapaces. Males are larger than the females and can achieve lengths of over 1.21m and weights of over 226kg. This large, terrestrial, diurnal tortoise is threatened by competition for food by feral goats, and its offspring have been threatened by introduced rats and feral cats and dogs.

Program Purposes:

As with all Galápagos Tortoises, this species has been strictly protected since 1971 by the Ecuadorean government, and exports from the Galápagos Islands or the Ecuadorean mainland are not possible. It is listed as Endangered by the IUCN Red List of Threatened Species™ (IUCN 2015) and as CITES Appendix I. Human exploitation for meat and oil eliminated in excess of 200,000 Galápagos tortoises throughout their range.

Continued decline is from introduced predators and competitors for food.

There are currently 6.8.47 Volcan Darwin Galápagos Tortoises within 14 AZA and 2 cooperating facilities in the United States. It is the goal of this particular program to increase founder representation and offspring survivorship. Unrelated individuals may exist in the North American private sector, and every attempt should be made to identify these individuals and incorporate them into the breeding population.

Exhibit Qualities:

The Galápagos Tortoise, like all other large tortoise species, is an excellent, active exhibit animal and always a favorite of the visiting public. Adult Galápagos Tortoises exhibited in year-round warm environments or with indoor winter exhibits are always popular, and having young tortoises in smaller indoor situations is also complementary.

Educational Qualities:

The Galápagos Islands continue to be a popular tourist destination. This important UNESCO World Heritage Site has had an extensively documented history over the past four centuries, including the well-known voyage of the Beagle and Charles Darwin. Furthermore, this species and others found in the Galápagos Islands are found nowhere else in the world and need to be preserved for future generations. Educating guests and offering donation opportunities to assist the Charles Darwin Research Station with their work in the region will be key to saving the island archipelago of Galápagos, Ecuador.

Interpretive Messages:

- Endangered Species Conservation
- Gigantism
- Invasive species
- Island biogeography
- Adaptations
- Mutualism
- Unsustainable hunting/harvesting

Care and Facilities:

For sub-adults and adults, outdoor space is needed for UV exposure, with southern, drier climates optimal. Temperature requirements are 70 to 100 F, with dense shade needed in higher temperatures. In areas where temperatures fall routinely below 65 F, heated adjacent night houses are required. Indoor conditions for rearing young or temporarily housing adults require a temperature range between 80 and 86 F with basking opportunities.

From a population management perspective, the SSP recommends that breeding adults be maintained outdoors in planned breeding situations, but that additional females be included, which can take breeding pressure from male tortoises. Pairs can be maintained in large open enclosures year round; minimum enclosure size is 1,200 square feet for two to three adults. Holding Galápagos Tortoises on a substrate devoid of grass is recommended to manage their diet, along with offering climbing opportunities for exercise and watering holes to soak. Their caloric requirements are low, and their need for physical activity is great. These consume a traditional tortoise diet, but it must be limited and well-regulated to ensure a slow growth pattern for the Galápagos tortoise offspring. Care even needs to be taken when feeding adults, as they too can become obese rather quickly, which severely impacts reproduction and long term survival.

The results of the incubation experiments (Española Tortoises) conducted in the 1980s indicate that at low incubation temperatures (25-27°C) males are produced, while at high temperatures (29-30°C) females are produced (Márquez et al. 1990). At present, eggs from each nest of the Volcan Darwin Galápagos Tortoise are incubated at two temperatures to obtain the best

hatching success and a higher percentage of females, which is very important for rapid population growth. The duration of incubation varies depending on the temperature. At temperatures of 26 and 27°C, incubation lasts approximately 175 days. At temperatures higher than 29.5°C, the incubation period lasts approximately 110 to 125 days.

Other Notes:

Although Galápagos Tortoises have been maintained in captivity since the early 1900's, the first reproduction in an AZA institution did not occur until 1956. Since then, reproduction has increased steadily, but despite the numerous Galápagos Tortoises successfully hatched, husbandry needs to be seriously improved to be able to rear this species to adulthood, as a majority of the offspring produced in the 1990's have already died due to physiological problems related to rapid growth and obesity.

Program Goals:

- Continue to breed founders/ and rear potential founders in the SSP
- Find additional AZA holding institutions to raise offspring

Program contact:

Edward Louis
Studbook Keeper and SSP Coordinator
Omaha's Henry Doorly Zoo
edlo@omahazoo.com

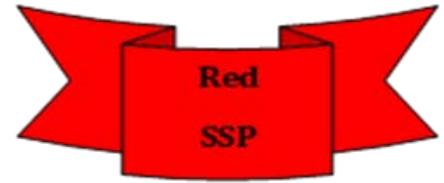
SOUTH AMERICA SPECIES ACCOUNTS

Santa Cruz Galápagos Tortoise

Chelonoidis nigra nigrita



Photo by Joe Flanagan, DVM



Species Summary:

The Santa Cruz Galápagos Tortoise inhabits the comparatively wet west and southwest regions on the island of Santa Cruz – an island centrally located within the Galápagos archipelago. These are giant tortoises with thick, domed carapaces. Males are larger than the females and can achieve lengths of over 1.21m and weights of over 226kg. The population on Santa Cruz is estimated at 3,000 animals. This large, terrestrial, diurnal tortoise is threatened by human encroachment and introduced species.

Program Purposes:

As with all Galápagos Tortoises, this species has been strictly protected since 1971 by the Ecuadorean government, and exports from the Galápagos Islands or the Ecuadorean mainland are not possible. It is listed as Endangered by the IUCN Red List of Threatened Species™ (IUCN 2015) and as CITES Appendix I. Human exploitation for meat and oil eliminated in excess of 200,000 Galápagos tortoises throughout their range.

Continued decline is from introduced predators and competitors for habitat and food.

There are currently 9.13.5 Santa Cruz Galápagos Tortoises within 7 AZA and 1 cooperating facility in the United States. It is the goal of this particular program to increase reproduction in the founder population as well as increase offspring survivorship. Recent successful reproduction at the Riverbanks Zoo in Columbia, South Carolina is very promising.

Unrelated individuals may exist in the North American private sector, and every attempt should be made to identify these individuals and incorporate them into the breeding population.

Exhibit Qualities:

The Galápagos Tortoise, like all other large tortoise species, is an excellent, active, exhibit animal and always a favorite of the visiting public. Adult Galápagos Tortoises exhibited in year-round warm environments or with indoor winter exhibits are always popular, and having young tortoises in smaller indoor situations is also complementary.

Educational Qualities:

The Galápagos Islands continue to be a popular tourist destination. This important UNESCO World Heritage Site has had an extensively documented history over the past four centuries, including the well-known voyage of the Beagle and Charles Darwin. Furthermore, this species and others found in the Galápagos Islands are found nowhere else in the world and need to be preserved for future generations. Educating guests and offering donation opportunities to assist the Charles Darwin Research Station with their work in the region will be key to saving the island archipelago of Galápagos, Ecuador.

Interpretive Messages:

- Endangered Species Conservation
- Gigantism
- Invasive species
- Island biogeography
- Adaptations
- Mutualism
- Unsustainable hunting/harvesting

Care and Facilities:

For sub-adults and adults, outdoor space is needed for UV exposure, with southern, drier climates optimal. Temperature requirements are 70 to 100 F, with dense shade needed in higher temperatures. In areas where temperatures fall routinely below 65 F, heated adjacent night houses are required. Indoor conditions for rearing young or temporarily housing adults require a temperature range between 80 and 86 F with basking opportunities.

From a population management perspective, the SSP recommends that breeding adults be maintained outdoors in planned breeding situations, but that additional females be included, which can take breeding pressure from male tortoises. Pairs can be maintained in large open enclosures year round; minimum enclosure size is 1,200 square feet for two to three adults. Holding Galápagos Tortoises on a substrate devoid of grass is recommended to manage their diet, along with offering climbing opportunities for exercise and watering holes to soak. Their caloric requirements are low, and their need for physical activity is great. These consume a traditional tortoise diet, but it must be limited and well-regulated to ensure a slow growth pattern for the Galápagos tortoise offspring. Care even needs to be taken when feeding adults, as they too can become obese rather quickly, which severely impacts reproduction and long term survival.

The results of the incubation experiments (Española Tortoises) conducted in the 1980s indicate that at low incubation temperatures (25-27°C) males are produced, while at high temperatures (29-30°C) females are produced (Márquez et al. 1990). At present, eggs from

each nest of the Santa Cruz Galápagos Tortoise are incubated at two temperatures to obtain the best hatching success and a higher percentage of females, which is very important for rapid population growth. The duration of incubation varies depending on the temperature. At temperatures of 26 and 27°C, incubation lasts approximately 175 days. At temperatures higher than 29.5°C, the incubation period lasts approximately 110 to 125 days.

Other Notes:

Although Galápagos Tortoises have been maintained in captivity since the early 1900's, the first reproduction in an AZA institution did not occur until 1956. Since then, reproduction has increased steadily, but despite the numerous Galápagos Tortoises successfully hatched, husbandry needs to be seriously improved to be able to rear this species to adulthood, as a majority of the offspring produced in the 1990's have already died due to physiological problems related to rapid growth and obesity.

Program Goals:

- Continue to breed founders/ and rear potential founders in the SSP
- Find additional AZA holding institutions to raise offspring

Program contact:

Edward Louis
Studbook Keeper and SSP Coordinator
Omaha's Henry Doorly Zoo
edlo@omahazoo.com

SOUTH AMERICA SPECIES ACCOUNTS

Volcan Alcedo Galápagos Tortoise

Chelonoidis nigra vandenburghi

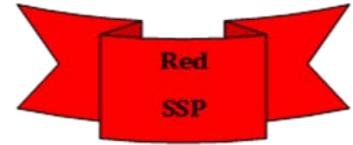


Photo by Gillian Lang, Oklahoma City Zoo

Species Summary:

The Volcan Alcedo Galápagos Tortoise is native to the caldera and surrounding southern slopes of Volcan Alcedo, which is situated in the central region of Isabela Island in the Galapagos archipelago. These are giant tortoises with thick, domed carapaces. Males are larger than the females and can achieve lengths of over 1.5m and weights of over 272kg. The population of Volcan Alcedo tortoises is estimated to be over 6,000, up from an estimated 3,000 in 1974. Santa Cruz is estimated at 3,000 animals. Thanks to Project Isabela, a massive goat eradication project that began in 1997 and ended in 2006, approximately 100,000 goats were eliminated from the northern parts of Isabela. The goats had caused massive ecosystem degradation, destroying areas of dense shade that had created vital drip pools for the tortoise population there. This large, terrestrial, diurnal tortoise has made an amazing comeback, but tourist access to Volcan Alcedo is closed to minimize threats by human encroachment and introduced species.

Program Purposes:

As with all Galápagos Tortoises, this species has been strictly protected since 1971 by the Ecuadorean government, and exports from the Galápagos Islands or the Ecuadorean mainland are not possible. It is listed as Vulnerable by the IUCN Red List of Threatened Species™ (IUCN 2015) and as CITES Appendix I. Human exploitation for meat and oil eliminated in excess of 200,000 Galápagos tortoises throughout their range.

There are currently 7.4.1 Volcan Alcedo Galápagos Tortoises within 7 AZA and 3 cooperating facilities in the United States. It is the goal of this particular program to increase reproduction in the founder population and ensure offspring survivorship. Of real concern is that there exists only one known egg-laying founder female; this animal resides at Oklahoma City Zoo. Unrelated individuals may exist in the North American private sector, and every attempt should be made to identify these individuals and incorporate them into the breeding population.

Exhibit Qualities:

The Galápagos Tortoise, like all other large tortoise species, is an excellent, active, exhibit animal and always a favorite of the visiting public. Adult Galápagos Tortoises exhibited in year-round warm environments or with indoor winter exhibits are always popular, and having young tortoises in smaller indoor situations is also complementary.

Educational Qualities:

The Galápagos Islands continue to be a popular tourist destination. This important UNESCO World Heritage Site has had an extensively documented history over the past four centuries, including the well-known voyage of the Beagle and Charles Darwin. Furthermore, this species and others found in the Galápagos Islands are found nowhere else in the world and need to be preserved for future generations. Educating guests and offering donation opportunities to assist the Charles Darwin Research Station with their work in the region will be key to saving the island archipelago of Galápagos, Ecuador.

Interpretive Messages:

- Endangered Species Conservation
- Gigantism
- Invasive species
- Island biogeography
- Adaptations
- Mutualism
- Unsustainable hunting/harvesting

Care and Facilities:

For sub-adults and adults, outdoor space is needed for UV exposure, with southern, drier climates optimal. Temperature requirements are 70 to 100 F, with dense shade needed in higher temperatures. In areas where temperatures fall routinely below 65 F, heated adjacent night houses are required. Indoor conditions for rearing young or temporarily housing adults require a temperature range between 80 and 86 F with basking opportunities.

From a population management perspective, the SSP recommends that breeding adults be maintained outdoors in planned breeding situations, but that additional females be included, which can take breeding pressure from male tortoises. Pairs can be maintained in large open enclosures year round; minimum enclosure size is 1,200 square feet for two to three adults. Holding Galápagos Tortoises on a substrate devoid of grass is recommended to manage their diet, along with offering climbing opportunities for exercise and watering holes to soak. Their caloric requirements are low, and their need for physical activity is great. These consume a traditional tortoise diet, but it must be limited and well-regulated to ensure a slow growth pattern for the Galápagos tortoise offspring. Care even needs to be taken when feeding adults, as they too can become obese rather quickly, which severely impacts reproduction and long term survival.

The results of the incubation experiments (Española Tortoises) conducted in the 1980s indicate that at low incubation temperatures (25-27°C) males are produced, while at high

temperatures (29-30°C) females are produced (Márquez et al. 1990). At present, eggs from each nest of the Volcan Alcedo Galápagos Tortoise are incubated at two temperatures to obtain the best hatching success and a higher percentage of females, which is very important for rapid population growth. The duration of incubation varies depending on the temperature. At temperatures of 26 and 27°C, incubation lasts approximately 175 days. At temperatures higher than 29.5°C, the incubation period lasts approximately 110 to 125 days.

Other Notes:

Although Galápagos Tortoises have been maintained in captivity since the early 1900's, the first reproduction in an AZA institution did not occur until 1956. Since then, reproduction has increased steadily, but despite the numerous Galápagos Tortoises successfully hatched, husbandry needs to be seriously improved to be able to rear this species to adulthood, as a majority of the offspring produced in the 1990's have already died due to physiological problems related to rapid growth and obesity.

Program Goals:

- Continue to breed founders/ and rear potential founders in the SSP
- Find additional AZA holding institutions to raise offspring

Program contact:

Edward Louis
Studbook Keeper and SSP Coordinator
Omaha's Henry Doorly Zoo
edlo@omahazoo.com

SOUTH AMERICA SPECIES ACCOUNTS

Albermarle Island Galápagos Tortoise *Chelonoidis nigra vicina*

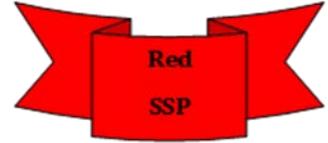


Photo by Joe Flanagan, DVM

Species Summary:

The Albermarle Island Galápagos Tortoise is native to the southwestern tip of Isabela Island in the Galapagos archipelago. These are large tortoises with thick, domed carapaces. Males are larger than the females and can achieve lengths of over 1.22m and weights of over 2.26kg. There are roughly 2,575 Albermarle Island giant tortoises residing at the foot of the Cerro Azul volcano. Pirates, whalers and seal hunters decimated this population over the past several centuries, and consumption by humans continued into the 1960s due to cattle companies that moved into the area. This large, terrestrial, diurnal tortoise has made somewhat of a comeback with protection and conservation intervention via removal of feral cats and pigs, as well as introduced rats.

Program Purposes:

As with all Galápagos Tortoises, this species has been strictly protected since 1971 by the Ecuadorean government, and exports from the Galápagos Islands or the Ecuadorean mainland are not possible. It is listed as Endangered by the IUCN Red List of Threatened Species™ (IUCN 2015) and as CITES Appendix I. Human exploitation for meat and oil eliminated in excess of 200,000 Galápagos tortoises throughout their range.

There are currently 4.2 Albermarle Island Galápagos Tortoises within 5 AZA and 1 cooperating facility in the United States. It is the goal of this particular program to stimulate a first time reproduction in the founder population and ensure offspring survivorship.

Unrelated individuals may exist in the North American private sector, and every attempt should be made to identify these individuals and incorporate them into the breeding population.

Exhibit Qualities:

The Galápagos Tortoise, like all other large tortoise species, is an excellent, active, exhibit animal and always a favorite of the visiting public. Adult Galápagos Tortoises exhibited in year-round warm environments or with indoor winter exhibits are always popular, and having young tortoises in smaller indoor situations is also complementary.

Educational Qualities:

The Galápagos Islands continue to be a popular tourist destination. This important UNESCO World Heritage Site has had an extensively documented history over the past four centuries, including the well-known voyage of the Beagle and Charles Darwin. Furthermore, this species and others found in the Galápagos Islands are found nowhere else in the world and need to be preserved for future generations. Educating guests and offering donation opportunities to assist the Charles Darwin Research Station with their work in the region will be key to saving the island archipelago of Galápagos, Ecuador.

Interpretive Messages:

- Endangered Species Conservation
- Gigantism
- Invasive species
- Island biogeography
- Adaptations
- Mutualism
- Unsustainable hunting/harvesting

Care and Facilities:

For sub-adults and adults, outdoor space is needed for UV exposure, with southern, drier climates optimal. Temperature requirements are 70 to 100 F, with dense shade needed in higher temperatures. In areas where temperatures fall routinely below 65 F, heated adjacent night houses are required. Indoor conditions for rearing young or temporarily housing adults require a temperature range between 80 and 86 F with basking opportunities.

From a population management perspective, the SSP recommends that breeding adults be maintained outdoors in planned breeding situations, but that additional females be included, which can take breeding pressure from male tortoises. Pairs can be maintained in large open enclosures year round; minimum enclosure size is 1,200 square feet for two to three adults. Holding Galápagos Tortoises on a substrate devoid of grass is recommended to manage their diet, along with offering climbing opportunities for exercise and watering holes to soak. Their caloric requirements are low, and their need for physical activity is great. These consume a traditional tortoise diet, but it must be limited and well-regulated to ensure a slow growth pattern for the Galápagos tortoise offspring. Care even needs to be taken when feeding adults, as they too can become obese rather quickly, which severely impacts reproduction and long term survival.

The results of the incubation experiments (Española Tortoises) conducted in the 1980s indicate that at low incubation temperatures (25-27°C) males are produced, while at high temperatures (29-30°C) females are produced (Márquez et al. 1990). At present, eggs from each nest of the Albermarle Island Galápagos Tortoise are incubated at two temperatures to obtain the best hatching success and a higher percentage of females, which is very important for rapid population growth. The duration of incubation varies depending on the temperature. At temperatures of 26 and 27°C, incubation lasts approximately 175 days. At temperatures higher than 29.5°C, the incubation period lasts approximately 110 to 125 days.

Other Notes:

Although Galápagos Tortoises have been maintained in captivity since the early 1900's, the first reproduction in an AZA institution did not occur until 1956. Since then, reproduction has increased steadily, but despite the numerous Galápagos Tortoises successfully hatched, husbandry needs to be seriously improved to be able to rear this species to adulthood, as a majority of the offspring produced in the 1990's have already died due to physiological problems related to rapid growth and obesity.

Program Goals:

- Continue to breed founders/ and rear potential founders in the SSP
- Find additional AZA holding institutions to raise offspring

Program contact:

Edward Louis
Studbook Keeper and SSP Coordinator
Omaha's Henry Doorly Zoo
edlo@omahazoo.com

AFRICA SPECIES ACCOUNTS

Common Spider Tortoise

Pyxis a. arachnoides



Species Summary:

This subspecies has become increasingly bred in AZA institutions over the last decade, thanks to many successful captive breeding programs. Of the three subspecies, the nominate form is the most secure in the United States, and, most importantly, the most secure in Madagascar.

Program Purposes:

Pyxis a. arachnoides is listed as a CITES Appendix I species as well as Critically Endangered by the IUCN Red List of Threatened Species™. This particular subspecies has the largest remaining range of the three subspecies in southwestern Madagascar.

Much of their habitat is protected by national parks, but slash and burn agriculture and collection for the black market pet trade in Asia are still taking a tremendous toll on this species.

Although this species has been maintained in captivity since 1975, the first reproduction in an AZA institution did not occur until 2001. Since then, reproduction has steadily increased as we began to understand what was needed to initiate development in the eggs. Similar to many chelonian eggs, Common Spider Tortoise eggs require a cooler period before development will begin. Eggs are typically cooled to 65F (18C) for one month before being placed back in a warm incubator where the embryo will begin to develop.

At this time, a Stable population exists within AZA institutions and select private participants, however, more breeding of potential founders needs to occur if we are to expect this species to be available to us in years to come. Managing this population as an assurance colony in AZA facilities and the private sector is the goal of this program.

Exhibit Qualities:

Of the entire *Pyxis* sp. complex, the Common Spider Tortoise makes the best exhibit animal. They are the most active and largest of the group, so they tend to generate interest from

guests while on exhibit. But like all *Pyxis*, this subspecies is only active for approximately 2/3^{rds} of the year during their warm season (temps ranging from upper 80's to 100F). They require a slightly cooler and drier period (mid 70's F with no water except for soaking once per week) for a minimum of two months out of the year. But because they can be mixed with several other species they are good candidates for mixed species exhibits. Commonly mixed species are Standing's Day Geckos (*Phelsuma standingii*), Panther Chameleons (*Furcifer pardalis*), Oustalet Chameleon's (*Furcifer oustaleti*), as well as Madagascar Spiny-tailed Iguanas (*Oplurus cuvieri*). Although it has not been tried, they would also probably exhibit well with some of the Mouse Lemur (*Microcebus* sp.) species from southwestern Madagascar too.

Educational Qualities:

The unique Spiny Forests of southwestern Madagascar are under severe threat from slash and burn agriculture practices and mining. This species and many others are found nowhere else in the world, and need to be preserved for future generations. Working with the local communities in Madagascar would be the best way to ensure this tortoise's preservation. Educating guests and offering donation opportunities to assist the Turtle Survival Alliance with their work in the region will be key to saving this area of Madagascar.

Care and Facilities:

As mentioned above, this species has adapted its life history to the seasonal patterns of the Spiny Forest. Replicating those conditions will lead to the best opportunities to successfully breed this critically endangered subspecies. From a population management perspective, the SSP recommends that adults be maintained in pair breeding situations.

Pairs can be maintained in an 8-10' sq foot enclosure year round, although it appears to stimulate better breeding results if the sexes are separated during the non-breeding season (November-April in the western hemisphere). Offering a deep substrate of sand and top soil with leaf litter and various hides allows the tortoises to feel comfortable on exhibit or off. They consume a traditional tortoise diet during their active period of the year, but they must be allowed to go dormant during the winter months.

Program Goals:

- Continue to recruit founders/potential founders in the SSP
- Find additional AZA holding institutions
- Import potential founders when possible

Program contact:

Michael Ogle
Studbook Keeper and SSP Coordinator
Zoo Knoxville
mogle@zooknoxville.org
865-637-5331 x 1201

AFRICA SPECIES ACCOUNTS

Egyptian tortoise *Testudo kleinmanni*



Species Summary:

One of the smallest tortoise species in the world, the Egyptian tortoise is an outgoing species that is active and displays well with other species, all while having a great conservation message to tell.

Program Purposes:

Testudo kleinmanni is listed in CITES Appendix I and as a Critically Endangered species in the IUCN Red List of Threatened Species™. Diminishing populations have given some scientists reason to speculate that Egyptian tortoises are genetically going extinct in the wild due to fragmentation of habitat. Historically ranging all along the Mediterranean coast from Western Libya, across Egypt and the Nile Delta, into Palestine and Jordan in a band that was believed to be nearly 75 miles wide, problems facing population health of Egyptian Tortoises continue to be exacerbated by human encroachment, over grazing, and over collection for the pet trade. Captive breeding of this species was first successful in the private sector in the mid 90's with AZA institutions following close behind.

Currently, a healthy population exists within AZA institutions, however, more breeding of

potential founders needs to occur if we are to expect this species to be available to us in years to come. Managing this population for long term sustainability as exhibit animals in AZA institutions is the current goal of this program.

There are currently two conservation programs for this species; however, re-introduction is unlikely for the foreseeable future. The only hope for wild populations will be the preservation of suitable habitat and protection from poaching, both of which are being addressed through in-situ conservation initiatives.

Exhibit Qualities:

Due to their small size, Egyptian tortoises are able to be housed in groups without altercation, making them a wonderful display species. Unlike many other small tortoise species, they spend a good amount of their day being active and moving about their enclosure. A naturalistic set up with a substrate of sand or crushed limestone with some dead fall, small xeric plants, and a couple of small rock piles, finished off with good UV lighting, ambient temperature of 80-85 degrees Fahrenheit, and a basking spot of 120 degrees Fahrenheit will provide this diurnal species with the appropriate environment.

This non-aggressive tortoise does extremely well in mixed species exhibits with small lizards such as Savigny's agama (*Trapelus savignii*), small mastigure species of the genus *Uromastyx*, skinks such as *Lygosoma sp.* and *Mabuya sp.*, Sandfish (*Scincus scincus*) and other small diurnal desert dwelling species from northern Africa, the Sinai peninsula, Jordan, and Israel.



Photo by Jennifer Pramuk

Educational Qualities:

Egyptian tortoises are one of the smallest species of tortoise in the world, with adult females rarely reaching over 12.7cm, and males are even smaller. An arid species, they have an exceptional ability to go without water for long periods of time and get most of the water they need from the food they eat. Studies have shown that they also have an affinity for eating snail shells that they will actively seek out and consume. In a recent study of the wild diet for Egyptian tortoise, it was calculated that the natural diet provides a calcium:phosphorous ratio that is nearly 4 times that of most tortoises natural diets and would explain the consumption of snail shells.

Interpretive messages:

- One of the smallest species of tortoise
- Adaptations to living in arid environments
- Unique dietary needs

Care and Facilities:

Testudo kleinmanni is a species easy to keep and care for. They should be kept on dry substrate, such as sand or crushed oyster shell, or a mixture of both, but they have been kept on a variety of different substrates such as indoor/outdoor carpeting, coconut fiber, dirt, and various combinations of all the above. The important thing to note is that it should be kept dry. While the substrate should be dry, they do require access to water either through weekly soaking, additional spraying of food, soaked food items, or daily misting of exhibit and the tortoises themselves. In the wild they would have access to coastal fog, where they are known to drink the accumulated moisture off of the plants early in the mornings.

Diet should consist of a variety of mixed greens, browse materials such as grass clippings, mulberry leaves or other, occasional pelleted diet soaked in water and should be dusted with calcium at each feeding. Powdered vitamin/mineral supplement should be used once a week as well. Feeding 3 times per week is recommended and amount should be determined by the consumption of the individual tortoise. This species should not be given fruit.

Other Notes:

Once common in zoos and private collections, disease has reduced numbers drastically throughout the US. At one time it was thought that there were less than 500 animals left in the wild, but it appears that was underestimated. There is currently a productive conservation effort going on *in situ* where local communities are getting support to help protect the tortoises in their native habitat.

Program Goals:

- Increase AZA institution participation by 5 institutions
- Import up to 50 new animals from captive European stock
- Increase the number of captive bred animals that have genetic value to the population

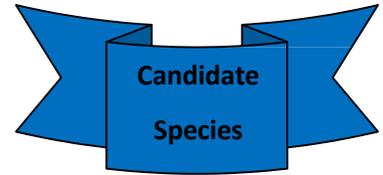
Program contact:

Barry Downer
Studbook keeper and SSP Coordinator
Oklahoma City Zoo
bdowner@okczoo.com
(405) 425-0671

AFRICA SPECIES ACCOUNTS

Forest Hingeback Tortoise

Kinixys erosa



Unique hinged carapace, note anterior tether hole used in the bushmeat trade. Photo by David Mifsud

Species Summary:

Reaching up to 40cm, the Forest Hingeback is the largest of the Hingeback tortoises, displaying the ability to enclose themselves entirely within their shells using a hinge across the back of the carapace.

An impressive exhibit animal, the outermost scales of the shell have a slightly upturned edge, giving it a serrated appearance, or “toothed skirt along the posterior shell margin.” This species inhabits Western coastal forests from Senegal South to Angola, including the Democratic Republic of the Congo.

Common names: Forest Hinged Tortoise, Serrated Hinge-back Tortoise, Schweigger’s Tortoise.

Program Purposes:

This species is listed as Data Deficient on the IUCN 2015.2 Red List of Threatened Species™ and CITES Appendix II, Family Testudinidae ssp.

It enjoys a large range, but its conservation status is not well known. Due to many factors exacerbating their preferred habitat, as well as hunting for bushmeat, their populations are declining.

Although rare imported specimens are available, they are often shy animals and may prove difficult to display. The captive population should be managed to ensure future availability of captive-hatched exhibit specimens and to relieve collection pressures on wild populations.

Interpretive Messages:

- Adaptation: Defense
- Camouflage
- Bushmeat: Human pressures
- Get Involved: SAFE- Saving Animals From Extinction, Turtle Survival Alliance, Tortoise and Freshwater Turtle Specialist Group



Photo by David Mifsud

Care and Facilities:

K. erosa requires a moist, humid environment, as in the wild it is found living around marshes, wetlands, and river banks. Substrate should include a thick layer of coconut mulch topped off with sphagnum moss, and a sunken pool for a good soak. Hides should be provided, including a layer of dried leaves.

Program Goals:

- Acquire more individuals; work with both AZA and private individuals/organizations to assess current captive population size and potential Studbook participants.
- Compile “Best Practices” resource for captive husbandry, building on successful programs currently established.

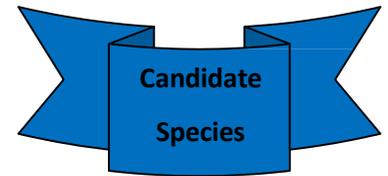
Program Contact:

Brenda Gunder
Studbook Keeper
Rolling Hills Zoo
Brenda@rollinghillszoo.org
785-827-9488 ext.143

AFRICA SPECIES ACCOUNTS

Home's Hingeback Tortoise

Kinixys homeana



Species Summary:

This West African tortoise belongs to a unique genus of chelonians that exhibits a rear hinged carapace. Generally not exceeding much more than 20cm in length, *K. homeana* are smaller and take up less exhibit space than many other tortoise species. Their coloration is variable, but they typically display a darker carapace and light yellow head and legs. As their numbers in the wild are rapidly decreasing, they ideally illustrate the perils of habitat loss and the overall plight of chelonian species worldwide.

Program Purposes:

Kinixys homeana is listed in CITES Appendix II and is classified by the IUCN Red List of Threatened Species™ as Vulnerable, although future assessments are likely to upgrade it to Critically Endangered due to widespread evidence that population numbers are decreasing through the entire range of the species. Habitat loss and fragmentation is the largest cause of the decline, but numbers are also significantly impacted by local collection for bushmeat, fetish and pet trades.

This species is not well represented in North American AZA facilities, and most of the institutions that do house *K. homeana* do not maintain pairs or breeding groups.

However, specimens are readily available in the public sector and wild caught founders can still be imported relatively cheaply. Species reintroduction is not likely for the foreseeable future, so the captive population should be managed and increased to a sustainable level.

Exhibit Qualities:

This species is somewhat shy and can be inactive for long periods of time, although they typically are always visible on exhibit. *Kinixys* is the only chelonian genus to possess a rear hinge, which develops as the tortoises grow and is not present in hatchlings. The recommended spatial requirement is three feet per inch of shell, but as these animals stay

relatively small, they are easy to fit in collections with limited space. Males can be territorial with each other, but with adequate room, groups can be successfully kept together. *K. homeana* is not typically an aggressive animal, so they do well in mixed species exhibits. They will dig to make shallow hollows in the substrate, but generally they are not as destructive as some tortoise species and do not wreak havoc on cage furnishings and exhibit plants.

Interpretive Messages

- Habitat Loss
- Bushmeat crisis, over collection for pet trade, and fetish market
- Compare/contrast with more familiar hinged box turtles
- The hinge as a defense mechanism

Care and Facilities

Wild caught specimens can be a challenge, and recent imports tend to have a high death rate. However, captive born tortoises and those that have been successfully acclimated to captivity are hardy and low maintenance animals. This species is more omnivorous than most tortoises and require sources of protein in their diets in addition to fruits and vegetables. They also readily consume commercial pelleted, gel, or biscuit foods. As a forest species, *K. homeana* tends to dislike direct sunlight and prefers shaded habitats.

While a UV source is important, they tend to utilize it less than many chelonians. They are also fond of water and will spend long stretches soaking, so they require a water source that is large enough to encompass their body length.



photo by Tomas Diagne

Program Goals:

- Create/complete a studbook for *Kinixys homeana*
- Increase AZA facility interest in this species, get those currently holding single individuals to hold pairs or groups to increase captive breeding
- Possibly import/acquire more founders while they are not tightly regulated
- Build an assurance colony of at least 200 individuals for optimal sustainability

Program Contact:

Kim Boyer
Studbook Keeper
Audubon Zoo
kinixysh@gmail.com
(504) 212-5343

AFRICA SPECIES ACCOUNTS

Madagascar Flat-tailed Tortoise

Pyxis planicauda



Species Summary:

This species is rare in the wild and in captivity. Captive breeding remains the most important component of this SSP, but they do mix well with other reptile species from their region to create a good conservation message for the plight of western Madagascar's unique forests.

Program Purposes:

Pyxis planicauda is listed as a CITES Appendix I species, as well as Critically Endangered by the IUCN Red List of Threatened Species™. This species has always had a small home range in western Madagascar, found primarily in the Kirindy forest.

Although their habitat is protected on paper, development for agricultural purposes has kept this species on the brink of extinction. Last population estimates placed the total remaining at just over 26,000 individuals. Due to their cryptic nature, field surveys typically only find only one to two *P. planicauda* per hectare.

Although this species has been maintained in captivity since 1975, the first reproduction in an AZA institution did not occur until 2002. Since then, reproduction has steadily increased as we began to understand what was needed to initiate development in the eggs. Similar to many chelonian eggs, Madagascar Flat-tailed Tortoises eggs require a cooler period before development will begin. Eggs are typically cooled to 65F (18C) for two months before being placed back in a warm incubator, where the embryo will begin to develop.

At this time, a stable population exists within AZA institutions and select private participants, however, more breeding of potential founders needs to occur if we are to expect this species to be available to us in years to come. Managing this population as an assurance colony in AZA institutions and the private sector is the primary goal of this program. Durrell Wildlife Conservation Trust (DWCT), based in Jersey, England, has been leading the field efforts for this species for over 25 years. They continue to routinely survey the wild population, plus maintain a captive breeding program in Madagascar for this critically endangered species. DWCT has shown that the best way to preserve a rare species is by working with the local

communities that reside in the area, and they continue that effort with the Madagascar Flat-tailed Tortoise.

Exhibit Qualities:

Admittedly, due to the unique life history traits of this species, *Pyxis planicauda* does not make for the best exhibit by itself. This species is only active for approximately 2/3rds of the year during their captive rainy season (misting system and temps ranging from upper 80s to 100F). They require a slightly cooler and drier period (mid 70sF with no water except for soaking once per week) for a minimum of three months out of the year. But because they can be mixed with several other species, they are good candidates for mixed species exhibits. Commonly mixed species are various Day Geckos (*Phelsuma* sp.), Panther Chameleons (*Furcifer pardalis*), Oustalet Chameleon's (*Furcifer oustaleti*), as well as Madagascar Spiny-tailed Iguanas (*Oplurus cuvieri*). Although it has not been tried, they would also probably exhibit well with some of the Mouse Lemur (*Microcebus* sp.) species from western Madagascar, too.

Educational Qualities:

This species and many others are found nowhere else in the world and need to be preserved for future generations. Working with the local communities in Madagascar would be the best way to assure that. Educating guests and offering donation opportunities to assist Durrell Wildlife Conservation Trust with their work in the region will be key to saving this area of Madagascar.

Care and Facilities:

As mentioned above, this species has adapted its life history to the unique forests of western Madagascar. Replicating those conditions will lead to the best opportunities to successfully breed this critically endangered species. From a population management perspective, the SSP recommends that adults be maintained in pair breeding situations. Pairs can be maintained in a 10-12' sq foot enclosure year round, although it appears to stimulate better breeding results of the sexes are separated during the non-breeding season (November-April in the western hemisphere). Offering a deep substrate of cypress mulch with leaf litter and various hides allow the tortoises to feel comfortable on exhibit or off. They consume a traditional tortoise diet, but they do require the addition of mushrooms on at least a weekly basis.

Program Goals:

- Improve founder representation
- Determine Temperature Dependent Sex Determination parameters
- Increase interest with AZA institutions

Program contact:

Michael Ogle
Studbook Keeper and SSP Coordinator
Zoo Knoxville
mogle@zooknoxville.org
865-637-5331 x 1201

AFRICA SPECIES ACCOUNTS

Northern Spider Tortoise

Pyxis a. brygooi



Species Summary:

This subspecies has been bred with increasing frequency in AZA institutions over the last decade, thanks to many successful captive breeding programs. Of the three subspecies, the northern form is the second most secure in the United States, but it is in serious decline in Madagascar.

Program Purposes:

Pyxis a. brygooi is listed as a CITES Appendix I species as well as critically endangered by the IUCN Red List of Threatened Species™. This particular subspecies has the second largest remaining range of the three subspecies in southwestern Madagascar. Much of their habitat is protected by national parks, but slash and burn agriculture and collection for the black market pet trade in Asia are still taking a tremendous toll on this species. This subspecies in particular also has the burden of being consumed by the local human population as well. The Vezo people do not believe it is taboo to eat this tortoise, unlike the Mahafaly and Antrandroy tribes further south.

The first reproduction in an AZA institution for this subspecies did not occur until 2004. Since then, reproduction has steadily increased as we began to understand what was needed to initiate development in the eggs. Similar to many chelonian eggs, Northern Spider Tortoise eggs require a cooler period before development will begin. Eggs are typically cooled to 65F (18C) for one month before being placed back in a warm incubator where the embryo will begin to develop.

At this time, a Stable population exists within AZA institutions and select private participants, however, more breeding of potential founders needs to occur if we are to expect this species to be available to us in years to come. Managing this population as an assurance colony in AZA institutions and the private sector is the primary goal of this program.

Exhibit Qualities:

Of the entire *Pyxis arachnoides* complex, the Northern Spider Tortoise is probably the worst choice as an exhibit animal. They are the least active of the group and will not generate much interest from guests if exhibited by themselves. Like all *Pyxis*, this subspecies is only active for approximately 2/3rds of the year during their warm season (temperatures ranging from the upper 80's to 100F). They require a slightly cooler and drier period (mid 70's F with no water except for soaking once per week) for a minimum of two months out of the year. But because they can be mixed with several other species they are good candidates for mixed species exhibits. Commonly mixed species are Standing's Day Geckos (*Phelsuma standingii*), Panther Chameleons (*Furcifer pardalis*), Oustalet Chameleon's (*Furcifer oustaleti*), as well as Madagascar Spiny-tailed Iguanas (*Oplurus cuvieri*). Although it has not been tried, they would also probably exhibit well with some of the Mouse Lemur (*Microcebus* sp.) species from southwestern Madagascar too.

Educational Qualities:

The unique Spiny Forests of southwestern Madagascar are under severe threat from slash and burn agriculture practices, mining, collection for the pet trade, and local consumption. This subspecies and many others are found nowhere else in the world, and need to be preserved for future generations. Working with the local communities in Madagascar would be the best way to ensure their preservation. Educating guests and offering donation opportunities to assist the Turtle Survival Alliance with their work in the region will be key to saving this area of Madagascar.

Care and Facilities:

As mentioned above, this species has adapted its life history to the seasonal patterns of the Mikea Spiny Forest. Replicating those conditions will lead to the best opportunities to successfully breeding this critically endangered subspecies. From a population management perspective, the SSP recommends that adults be maintained in pair breeding situations. Pairs can be maintained in a 8-10' square foot enclosure year round, although it appears to stimulate better breeding results if the sexes are separated during the non-breeding season (November-April in the western hemisphere). Offering a deep substrate of sand and top soil, with leaf litter and various hides, allows the tortoises to feel comfortable on exhibit or off. They consume a traditional tortoise diet during their active period of the year, but they must be allowed to go dormant during the winter months.

Program Goals:

- Continue to recruit founders/potential founders in the SSP
- Find additional AZA holding institutions
- Import potential founders when possible

Program Contact:

Michael Ogle
Studbook Keeper and SSP Coordinator
Zoo Knoxville
mogle@zooknoxville.org
865-637-5331 x 1201

AFRICA SPECIES ACCOUNTS

Pancake Tortoise

Malacochersus tornieri



Species Summary:

The African Pancake Tortoise (*Malacochersus tornieri*), also known as the Flat Shelled Tortoise, has some very unique characteristics compared to other chelonians. Their very flat, but often beautifully patterned, carapace, small size (average length is 15cm“), and interesting behavior has led them to become popular display and education animals at zoological institutions. They are an east African species native to southern Kenya and northern and eastern Tanzania. They are found in rocky outcrops called “kopjes.” Unfortunately, like many chelonian species, Pancake Tortoise populations their habitat are declining at an alarming rate.

Program Purposes:

The Pancake Tortoise is classified as Red List of Threatened Species™ulnerable on the IUCN Red List of Threatened Species™ and listed on Appendix II of the Convention on International Trade in Endangered Species (CITES). Wild populations are under threat, primarily from habitat destruction and exploitation for the pet trade. Over the last decade, intensive over- collecting of wild tortoises has severely threatened populations throughout its native range. In addition, altering land for agricultural purposes is of concern. Some wild populations are believed to be extirpated and/or depleted beyond long term survival due to the limited numbers of tortoises remaining and low reproductive rate.

Currently the AZA's Species Survival Plan population is stable with 127.120.122 individuals at 89 zoological institutions and select private participants. Since the beginning of the managed program in June 2007, there has been steady growth within the population from reproductive success and several confiscations of illegally collected tortoises. These confiscations have increased the number of potential founders and genetic diversity.

Regrettably, there are no strong national management programs protecting and conserving the species. There is much more to be studied regarding biology and behavior of this species to improve conservation actions.

Exhibit Qualities:

These hardy, long-lived tortoises make an excellent exhibit species due to their small size, natural history and noncomplex husbandry requirements. Their unique appearance and adaptations for living within rocky outcrops contributes to great flexibility when constructing exhibits. Enclosures approximately 3'x2'x2' can accommodate a breeding pair. With a properly designed enclosure, tortoises can be displayed in groups and mixed with various species of diurnal lizards. Larger exhibits with increased horizontal space can be constructed with appropriately positioned rock ledges that will allow the tortoises to showcase their unique climbing abilities.



Education Qualities:

This species has great conservation messaging and facilitates high educational value that can be shared with zoo visitors. Tortoises not included or intended for the breeding population can be used as program animals.

Interpretive messages:

- Threatened and endangered species conservation
- Species adaptations and characteristics for survival
- Population exploitation for the pet trade
- Human encroachment on wildlife
- Habitat destruction and fragmentation impacts

Care and Facilities:

Naturalistic enclosures should include sand/gravel type substrate with overlying secured rocks, creating crevices of 1 to 2 inches in height. The crevices will be utilized frequently by the tortoises as retreats. Providing good quality UV lighting, maintaining appropriate temperatures and offering a varied herbivorous diet is critical for their welfare. Ambient temperature ranges should be held between 70-84 F, with a basking spot of 90-100 F, allowing for seasonal variation. Viable egg incubation at approximately 30 C will result in hatching between 125 to 190 days. Hatchling care is similar to that of adults. Tortoises kept under suboptimal conditions will develop respiratory and other health problems.

Program Goals:

- Follow SSP recommendation breeding and transfer plans
- Increase the number of zoological participants (dependent on tortoise availability)
- Determine the sex of breeding-age animals (24 months of age) for inclusion in the breeding population
- Continue to partner with the Turtle Survival Alliance on long-term management of confiscated tortoises

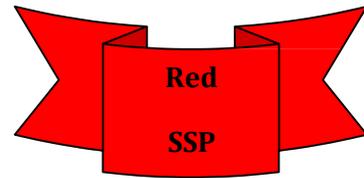
Program Contact:

Andy Daneault
Studbook Keeper and SSP Coordinator
Disney's Animal Kingdom
andre.j.daneault@disney.com
407-938-2368

AFRICA SPECIES ACCOUNTS

Ploughshare Tortoise (*Angonoka*)

Astrochelys yniphora



Species Summary:

The Ploughshare Tortoise is a large, herbivorous tortoise that lives in coastal bamboo scrub habitat in northwestern Madagascar. The species takes about 25 years to reach adulthood and weighs around 11-16kg. Lifespan likely exceeds 150 years. The shell is golden brown and remarkably spherical. The common name is derived from the gular projection that juts from the plastron directly beneath the head like the blade of a plow.

Program Purposes:

This species is listed in CITES Appendix I and Critically Endangered on the IUCN Red List of Threatened Species™. It is restricted to a small geographic range (less than 60 square km) in northwestern Madagascar near the coast around Baly Bay. The demographic strategy of this species relies upon numerous decades of reproduction after prolonged juvenility. Fecundity generally improves with size and age, so the largest, oldest females produce the most clutches with the best hatch rate. Few offspring are recruited into the breeding population because of limited habitat resources and a high rate of predation. The wild population has been small for decades, with unnatural pressure from habitat destruction for agriculture, predation by the invasive North African Boar, and occasional poaching. In the last 10 years, advances in inexpensive communication technology have allowed illegal international trade to increase, and the wild population has rapidly declined to about 500

individuals. Customs and wildlife trade officials confiscated 88 Ploughshare Tortoises from smugglers in Madagascar and 188 around the world between 2008 and 2015. Other than the repatriation of 33 tortoises from the Bronx Zoo to Madagascar in 1998, Malagasy government authorities have not responded to requests by international wildlife authorities to repatriate confiscated tortoises. Thus, a majority have died or disappeared from wildlife rescue centers. The North American Regional Studbook works in collaboration with the World Studbook to transfer confiscated tortoises into qualified institutions and create a global network of assurance colonies. With only a few hundred remaining in the wild, captive breeding could save the species from extinction.

Exhibit Qualities:

This is a large, charismatic, diurnal herbivore with active basking and foraging during mid to late morning and late afternoon. It is a highlight for Madagascar programs, particularly because its morphology and behavior are captivating, and it is so rare and endangered. It thrives in outdoor habitats with clumps of narrow-stemmed bamboo and low to medium forbs and grasses in climate zones with sunshine, warm temperatures, and humidity (particularly nighttime humidity).

Educational Qualities:

Some adult Ploughshare Tortoises are quite receptive to touch and light scratching on the shell and the soft skin on the neck and will rise up on all fours with an outstretched neck, similar to many Galapagos Tortoises. It is a poster-species for the role of the illegal wildlife trade in driving species toward extinction.



Conservationists engrave indelible identification marks into the shells of Ploughshare Tortoises to reduce their trade value and be able to identify them in if they enter the wildlife traffic.

Interpretive Messages:

The natural range of the Ploughshare Tortoise is restricted to less than 25 square miles near the coast of northwestern Madagascar. Most of the residents in this region survive by subsisting on the land and employing primitive agriculture with manual plows drawn by zebu cattle. To locals, these tortoises are like bricks of gold lying on the ground waiting to be picked up to help feed their families. Smugglers are ready and willing to buy tortoises and channel them into the ever-expanding illegal international trade in rare and endangered species. People of many cultures around the world believe turtles and tortoises bring good luck and long life. Wealthy collectors and trophy hunters covet this tortoise because it is extremely rare and has a strikingly beautiful, golden, high-domed shell. In tandem with the recent expansion of global cellphone and internet coverage, the population of this tortoise has crashed so that fewer than 500 now remain in the wild.

Conservationists are employing every possible tactic to combat the illegal trade; this includes engraving an indelible identification mark into the shell of all possible wild and captive tortoises. We hope this will reduce their natural beauty, making them less valuable and easier to identify on the black market. You can help by 1) never purchasing wild-caught tortoises, 2) alerting authorities like the US Fish and Wildlife Service whenever you suspect illegal wildlife trade activities, and 3) spreading the word that wild animals belong in their natural habitat so they can play their proper role in maintaining our ecosystem for generations to come.



Adult female Ploughshare Tortoise (Astrochelys yniphora) in its natural habitat during the rainy season. Note the shell of a land snail (lower right), clump grasses, and low-growing forbs in areas of open gravel interspersed with thick shrubs and dense bamboo.

Care and Facilities:

This species requires somewhat more specialized care than its closest relative, the Radiated Tortoise. Current holdings are at facilities where the tortoises can be outdoors at least during the day for much of the year. Daytime ambient high temperatures ideally reach 90-105°F year-round, and the tortoises are most active in the mid-to-late morning when skies are sunny, the air is humid, the ground is wet, and the temperature is approximately 84-86°F. Temperatures never fall below 70°F at night during the wet season, and dry season temperatures can fall to approximately 60°F at night when the substrate is completely dry and daytime conditions allow for thermoregulation, including direct sunlight or intense basking sites.

It might be possible to keep this species primarily indoors, but it thrives in outdoor habitats with clumps of narrow-stemmed bamboo, low forbs, and tussocks of medium to tall grass. Natural substrates should be well drained, with medium-sized surface gravel or pumice.

Mixed species enclosures are not recommended, particularly not with radiated tortoises, because the two species may be capable of interbreeding. Juveniles may be kept in groups if enclosures provide sufficient resources to avoid competition. Males and females must be kept separately because males will kill females. Adult males may need to be kept individually, except just before mating when males should be allowed opportunities for combat.

The diet should be composed primarily of grass, both fresh and dried as hay. Foraging on live warm-season grass (e.g., Bermuda grass or crabgrass) is ideal. Intermittent supplemental feeding can include very dark green leaves such as grape leaves, hibiscus, dandelion, etc. Occasional Mazuri tortoise diet can be offered. The tortoises browse on the shells of land snails in their natural habitat, but in captivity cuttle bone should be provided twice a month instead. Fresh, long stem grass hay is provided as browse and for bedding (at edges and under plant clumps) at all times. Young juveniles are provided with supplemental feedings of chopped hay and a greens mixture three times per week.

Program Goals:

- Acquire additional founders
- Obtain fertile eggs
- Develop incubation protocols

Program contact:

Paul M. Gibbons
Studbook Keeper and SSP Coordinator
Turtle Conservancy
paul@turtleconservancy.org
(212) 353-5060 Ext. 17

AFRICA SPECIES ACCOUNTS

Radiated Tortoise

Astrochelys radiata



Species Summary:

This large, extremely attractive tortoise makes for a stunning display animal and allows institutions to educate guests on the plight of many endemic fauna and flora native to Madagascar.

Program Purposes:

This tortoise is listed CITES Appendix I and as Critically Endangered by the IUCN Red List of Threatened Species™. Although this species can occur in high densities at some of sites in the wild, including some protected areas, it continues to receive an unsustainable level of pressure. Population models have predicted this species to reach extinction in 20-100+ years (although most estimates suggest extinction ~45 years into the future). Pressures on wild populations include habitat loss (from logging, slash-and-burn agriculture, charcoal production), collection for international trade (pet and traditional medicine), as well as consumption within the country. Most consumption takes place outside of the range of this animal, as locals consider harming this species as taboo (also known as Fady locally).

This species has historically been under-studied, with most research taking place in the last two decades. Most efforts in-situ are driven by the Turtle Survival Alliance (TSA) and its

partners. The TSA has focused its efforts on protecting this species by promoting community involvement to help provide protection of this species from outside collectors, and by offering ways to help sustain the community in a sustainable way. This is done in part by hiring local villagers as technicians on projects and by building strong positive messages of conservation by constructing schools. The TSA and its partners have also constructed several “Tortoise Rescue Centers” with the sole purpose of providing a specific place to house, care, treat, and release tortoises that are confiscated by authorities. Historically when large confiscations have taken place, the animals have either been housed in often precarious conditions or released immediately. These “Rescue Centers” provide a place to evaluate and properly take care of such confiscations. In addition to constructing these “Rescue Centers,” the TSA has also helped to initiate a study to compare soft release and hard release impacts on survivorship in Radiated Tortoises. Such a study is extremely important to determine how and what should be done for future confiscations.

Radiated Tortoises are bred with regularity both in the private sector and within AZA institutions. There is currently a healthy population within AZA facilities, but to sustain this species long term, more potential founders need to be bred and parentage needs to be monitored in order to maintain as diverse genetic stock as possible (i.e. stop herd breeding).

Exhibit Qualities:

Due to its large size, overall attractiveness, and the possibility of mixing in with other species, this tortoise makes for an excellent exhibit animal. This tortoise has been housed with a wide variety of species, including several chameleons native to Madagascar- notably Oustalet’s chameleon (*Furcifer oustaleti*), Standing’s day gecko (*Phelsuma standingi*), as well as a number of lemur species, including black and white ruffed lemurs (*Varecia variegata*), brown lemurs (*Eulemur fulvus*), ring-tailed lemurs (*Lemur catta*), collared brown lemurs (*Eulemur collaris*), red ruffed lemur (*Varecia rubra*), and Coquerel’s sifaka (*Propithecus coquereli*).

Educational Qualities:

Given that Radiated Tortoises have a real threat of going extinct within the next century, educational components can include species and ecosystem conservation, direct (human consumption) and indirect (slash and burn agriculture) threats, endemism.

Interpretive Messages:

- Endangered species conservation
- Unsustainable human consumption
- Endemism

Care and Facilities:

Most facilities should be able to maintain this species successfully given that they have the required space. Enclosures for a single adult should be >6’ long x 2’ wide x 2’ tall. Pairs should be kept in enclosures >8’ long x 3’ wide x 3’ tall. Substrate can be sand, cypress mulch, top soil, peat moss or any combination of the above. A sand, top soil, and peat moss mix (approximately 30%, 20%, 50% respectively) seems to work well for nesting females. This species should be maintained outdoors at least seasonally if weather conditions are suitable. While indoors, a basking spot or two of around 95°F should be offered, with ambient temperatures in the high 70s to low 80s, along with exposure to UVB.

Food should be offer 4-6x weekly, depending on time of year (~5x weekly from March-October and ~3x weekly from November-February) and previous food item offered (browse vs. prepared diet). Tortoises have been maintained on a prepared diet (chopped collard greens, kale, endive lettuce, carrots, sweet potato, bell peppers, squash) offered twice a week, chopped greens offered once a week, and browse offered twice a week.

Browse can be whole mushrooms, honey suckle leaves, grape vine leaves, hibiscus flowers, various sedum species, tulip poplar leaves, opuntia cactus pads and fruit, mulberry leaves, and other similar items. Rotation of offered food should be done in a way to maximize the number of days in between feeding the prepared diet. Hatchlings and young tortoises are fed the same items and rotation with the exception that the “prepared” diet is first finely chopped in a food processor and offered on a collard green “plate”.

Tortoises are misted ~5x weekly from March-October and 1x weekly from November-February. All tortoises are soaked in individual containers once weekly.

Program Goals:

- Breed other potential founders
- Find additional holding institutions
- Establish rearing guidelines for juvenile tortoises

Program Contacts:

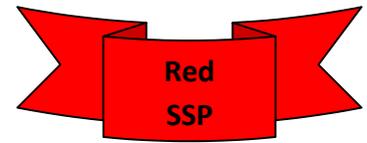
Michael Ogle
SSP Coordinator
Zoo Knoxville
865-637-5331 x1201
mogle@zooknoxville.org

Stephen Nelson
Studbook Keeper
Zoo Knoxville
865-637-5331 x1206
snelson@zooknoxville.org

AFRICA SPECIES ACCOUNTS

Southern Spider Tortoise

Pyxis a. oblonga



Species Summary:

This subspecies has remained rare in AZA institutions ever since first arriving in an AZA facility back in 1975. Captive breeding has also remained rare and sporadic at best. Of the three subspecies, the southern form is the rarest in the United States, and unfortunately in Madagascar as well.

Program Purposes:

Pyxis a. oblongai is listed as a CITES Appendix I species as well as Critically Endangered by the IUCN Red List of Threatened Species™. This particular subspecies has the smallest range of the three subspecies in southwestern Madagascar. Much of their habitat has been altered by slash and burn agriculture and collection for the black market pet trade in Asia.

The first reproduction in an AZA institution occurred in 1999, much earlier than the other two subspecies. Since then reproduction has remained stagnant at best, even though we believe we understand what is needed to initiate development in the eggs. Similar to many chelonian eggs, Southern Spider Tortoise eggs require a cooler period before development will begin. Eggs are typically cooled to 65F (18C) for one month before being placed back in a warm incubator where the embryo will begin to develop.

At this time, a declining population exists within AZA institutions and select private participants. The importation of additional potential founders needs to occur if we are to expect this species to be available in years to come. Establishing this population as an assurance colony in AZA institutions and the private sector is the primary goal of this program.

Exhibit Qualities:

Like all *Pyxis*, this subspecies is only active for approximately 2/3rds of the year during their warm season (temps ranging from upper 80's to 100F). They require a slightly cooler and drier period (mid 70's F with no water except for soaking once per week) for a minimum of two months out of the year. But because they can be mixed with several other species, they are good candidates for mixed species exhibits. Commonly mixed species are Standing's Day Geckos (*Phelsuma standingii*), Panther Chameleons (*Furcifer pardalis*), Oustalet Chameleon's (*Furcifer oustaleti*), as well as Madagascar Spiny-tailed Iguanas (*Oplurus cuvieri*). Although it has not been tried, they would also probably exhibit well with some of the Mouse Lemur (*Microcebus* sp.) species from southwestern Madagascar too.

Educational Qualities:

The unique Spiny Forests of southwestern Madagascar are under severe threat from slash and burn agriculture practices, mining, and collection for the international pet trade. This subspecies and many others are found nowhere else in the world and need to be preserved for future generations. Working with the local communities in Madagascar would be the best way to assure that. Educating guests and offering donation opportunities to assist the Turtle Survival Alliance with their work in the region will be key to saving this area of Madagascar.

Husbandry:

As mentioned above, this species has adapted its life history to the seasonal patterns of the Spiny Forest. Replicating those conditions will lead to the best opportunities to successfully breeding this critically endangered subspecies. From a population management perspective, the SSP recommends that adults be maintained in pair breeding situations. Pairs can be maintained in a 8-10' square foot enclosure year round, although it appears to stimulate better breeding results if the sexes are separated during the non-breeding season (November-April in the western hemisphere). Offering a deep substrate of sand and top soil, with leaf litter and various hides, allows the tortoises to feel comfortable on exhibit or off. They consume a traditional tortoise diet during their active period of the year, but must be allowed to go dormant during the winter months.

Program Goals:

- Increase captive breeding
- Continue to recruit founders/potential founders in the SSP
- Import potential founders when possible

Program contact:

Michael Ogle
Studbook Keeper and SSP Coordinator
Zoo Knoxville
mogle@zooknoxvilleorg
865-637-5331 x 1201

ASIA SPECIES ACCOUNTS

Arakan Forest Turtle *Heosemys depressa*



Species Summary:

The Arakan Forest Turtle (*Heosemys depressa*) is found in the Arakan Hills of western Myanmar. This species has also been recently found in Bandarban District, Bangladesh. This turtle lives in evergreen, deciduous, and bamboo forests. Adults can reach carapace lengths of slightly more than 25cm.

Program Purposes:

Arakan Forest Turtles are classified as Critically Endangered on the IUCN Red List of Threatened Species™. Arakan Forest Turtles were once considered extinct, as no live specimens had been observed since 1908. In 1994, the species was found in a Chinese food market. They were not observed in the wild by biologists until the year 2000. The small range of this species combined with its relatively slow reproductive output make it vulnerable to overexploitation. The species is still found in food markets, and it is also consumed by native people in its range. The captive population is small, but the species is being bred with increasing frequency.

**Exhibit Qualities:**

This species can be quite active, particularly if rained upon. Even though it does spend considerable time burrowing into substrate, it does tend to leave its head exposed so that it is usually visible. Arakan Forest Turtles are omnivorous, so they may avail themselves of plants in an exhibit. Bamboo is a good plant for an Arakan Forest Turtle exhibit, as the species is found in bamboo forests, and it is less likely to be eaten by the turtles.

Interpretive Messages:

- Once thought to be extinct
- Threatened by food trade and use in traditional medicine. Also potentially threatened by habitat loss and degradation.

Care and Facilities:

This species is omnivorous and will eat a variety of food items. However, high protein diets can cause irregular shell growth and are also implicated in reproductive issues with adult females. Salad mixes with occasional fruit, and commercial pelleted turtle food are preferred. High humidity is required for juveniles. Adults also require high humidity most of the year, but a seasonal dry period will help with reproduction. Adults can tolerate temperatures as low as the mid-40's. Keeping them outside for at least part of the year is beneficial, but whether this is feasible depends upon an institution's location.

Program Goals:

- Increase founder representation
- Increase number of holding institutions

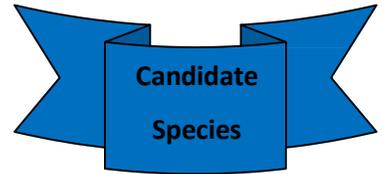


Program Contact:
Bill Hughes
Studbook Keeper and SSP Coordinator
Tennessee Aquarium
bhh@tnaqua.org
423.785.4126

ASIA SPECIES ACCOUNT

Beal's Four-eyed Turtle

Sacalia bealei



Species Summary:

Beal's Four-eyed Turtles are a small aquatic species found in China and Hong Kong. The adults can reach shell lengths of 15cm. Like the closely related Four-Eyed Turtle, this species exhibits interesting sexual dimorphism: males and females have different patterns of ocelli on the back of their head.

Program Purposes:

Beal's Four-eyed Turtles are classified as Critically Endangered on the IUCN Red List of Threatened Species™. This species is threatened by habitat loss and over-exploitation by humans. This species has temperature-determined sex but the specific parameters are not known.

Exhibit Qualities:

Beal's Four-eyed Turtles are active and engaging display specimens. They do well in both shallow and deeper water tanks. They are not aggressive to each other or other species and can be displayed with various species of Southeast Asian fish and turtles.

Husbandry:

A pair of adults can be kept in an enclosure as small as 75 gallons. Water temperatures between 65 and 75 are ideal, but this species will remain active even when temperatures are as low as 50. They can develop shell-rot if kept in water that is not clean. Beal's four-eyed turtles will bask if given the opportunity. A diet of commercial turtle pellets supplemented with occasional fruit is

sufficient for their long-term maintenance.

Interpretive Messages:

- Sexual dimorphism (different eye-spots)
- Threatened by loss of habitat, food trade, use in traditional Chinese medicine

Program Goals:

- Appoint Program Leader
- Publish studbook
- Locate more potential founders

Program Contact:

Vacant (New Program)

ASIA SPECIES ACCOUNTS

Black-breasted Leaf Turtle

Geoemyda spengleri



Photo by Rick Haeffner

Species Summary:

Black-breasted Leaf Turtles are small (< 12.7cm), semi-aquatic forest turtles. This turtle has been expatriated to a large degree from its China range and now exists only in border countries of China, where it continues to be over-collected for Chinese food markets. Pet trade collection also exists. It is an ideal species for multi-taxa exhibits, and its small size, undemanding diet, and non-aggressive behavior make it an ideal exhibit species.



Photo by Rick Haeffner

Program Purposes:

This species continues to be heavily collected for the food trade in China and has a very low reproductive rate of 1-2 eggs per breeding season. Currently a number of institutions have had success in breeding this species, but this is due to a few successful pairs, or groups that have multiple males. Unfortunately, the captive population is low on males, and incubation parameters have produced a higher ratio of females. One goal is to maintain a practice of incubating eggs at lower temperatures to potentially hatch more males. Now that captive hatched animals are reaching maturity, another goal is encourage reproduction of F1 specimens to get to the second generation of captive turtles.



Photo by Rick Haeffner

Exhibit Qualities:

This small species lends itself to smaller exhibits or breeding containers. It can be housed with other lizard, amphibian, and even snake species in mixed species exhibits. Groups of mixed sexes or even same-sex specimens can be housed together, as aggression is minimal. The turtles are active during daylight hours, and many visitors find them “personable”.

Interpretive Messages:

- Over-collecting – for pet trade and human consumption
- Low fecundity – how impacts to populations affect species with low birth rates
- Rain forest ecosystem – semi-aquatic turtle wild biology in Asian rain forests

Care and Facilities:

This species does not have complicated diet requirements. Crickets, other small invertebrates, and pinky mice are readily taken. Adequate exhibits for two specimens can be around 4-5 square feet, with shallow water areas, moist substrate, and humidity levels around 70% RH. There is male breeding season combat, but injuries are extremely rare. Groups of 2 males to 3-4 females housed together usually give good breeding and egg fertility results.



Photo by Rick Haeffner

Program Goals:

- Increase the number of males and disperse them to increase reproduction.
- Move reproduction to F2's
- Identify and collaborate with wildlife biologists working in host countries to gain information on wild biology and population status.

Program Contact:

Rick Haeffner
Studbook Keeper and SSP Coordinator
Denver Zoo
Rhaeffner@denverzoo.org
720-337-1526

ASIA SPECIES ACCOUNTS

Brown Forest Tortoise

Manouria emys emys



Species Summary:

The Brown Forest Tortoise (*Manouria emys emys*) is the largest species of tortoise in Asia, and is known to be the 4th largest species in the world. The Brown Forest Tortoise is the smaller of the two subspecies. This genus of tortoise is considered to be the oldest of all known living tortoises, and interestingly, they create nest mounds when depositing eggs.

Program Purposes:

Brown Forest Tortoises (and the subspecies the Burmese black tortoise, *M. e. phayrei*) are currently listed on the IUCN Red List of Threatened Species™ as Endangered, and they are listed as a CITES Appendix II species. Due to the highly inaccessible natural range in which they are found, detailed information is quite elusive. In its range, this tortoise is heavily exploited by humans for food and medicinal/cultural purposes, and combined with habitat loss the populations are becoming increasingly rare. Exploitation through the pet trade has been problematic as well.

Exhibit Qualities:

Brown Forest Tortoises can be maintained in large harmonious groups regardless of gender. Their large size and outgoing behavior make for an active exhibit, especially during breeding/nesting season. Mixed species exhibits with mammal and bird taxa have been displayed with success dependent upon individual animal temperament and feeding strategies for the mixed species.

Educational Qualities:

Smaller individuals of Brown Forest Tortoises create great educational opportunities for chelonian nesting strategies, chelonian conservation topics, chelonian species diversity, and reptilian and/or forest niches.

Interpretive Messages:

- Chelonian conservation
- Chelonian nesting strategies
- Forest niche (mushroom and fruit consumer)
- Unique genus of tortoise

**Care and Facilities:**

Brown Forest Tortoises are fairly easy to accommodate with space and care. The size of the enclosure depends on the number of individuals an institution intends to house, but if breeding is a goal, space must be incorporated for nesting (nesting female tortoises will collect leaves and other debris within a 10m radius from the eventual egg location).

Enclosure areas do not need to be flat, and areas with some topography are preferred to help maintain the health and fitness of the tortoises. Proper barriers are essential as this species of tortoise is an excellent climber. Ideally, solid/smooth barriers should be used because chain-link can be easily climbed regardless of height.

Outside housing is preferred to meet their UV needs, but they can be housed inside with appropriate artificial UV lighting. This species is a forest dweller, and while they enjoy basking to thermoregulate, they prefer a dappled or completely shaded area. Shallow water basins and/or mud wallows for soaking and cooling are important as well.

While tropical in origin, they can take brief stints of cooler temperatures that can provide a longer outdoor season in northern zoos & aquariums. The general cut off temperature is 45 F, but temperatures as low as 40 F can be easily endured if the time spent at this temperature

is brief and adequate cover (landscaping, fabricated shelters) is available. Once temperatures get over 90 F, it is important to provide shelter for shading as well as misters, sprinklers, etc. during the heat of the day. Due to their high home base/shelter fidelity, appropriate fabricated shelters installed in enclosures that provide heat during cold months and/or shade during hot months can make for year-round exhibits or enclosures alleviating the need to move individual tortoises off exhibit to other areas.

Captive diets are similar to other quality forest tortoise diets. Dark leafy greens accompanied by squashes (or similar) and fruits are great base diet items. Mushrooms are very important as a base food item as well, and obvious preference for them over other items is noticeable and could be a training tool. Other miscellaneous items consumed are grasses (exotic and lawn varieties), invertebrates (sow bugs, earthworms, caterpillars), and flowers such as hibiscus.

Other Notes:

Brown Forest Tortoises are large, active, charismatic species that can be maintained in large groups or in mixed taxa exhibits. They can become very popular with both zoo visitors as well as staff.

Recommendations:

- It is essential that institutions holding this species identify their specimens for subspecies and gender, and report to the program manager. Instructions for identification are available from the program manager.
- It is essential that institutions holding this species communicate with the program manager before and after making transfers to maintain optimal pairings and meet the needs of institutional wants and needs.

Program Contact:

Craig Pelke
Studbook Keeper and SSP Coordinator
San Antonio Zoo
cpelke@sazoo.org
(210) 734-7184 x1340

ASIA SPECIES ACCOUNTS

Burmese Black Tortoise *Manouria emys phayrei*



Species Summary:

The Burmese Black Tortoise (*Manouria emys phayrei*) is the largest species of tortoise in Asia and the 4th largest species in the world. This genus of tortoise is considered to be the oldest of known living tortoises, and of their numerous qualities, the most interesting might be their habit of creating nest mounds for egg deposition.

Program Purposes:

The Burmese Black Tortoise (and its related subspecies, the Brown Forest Tortoise, *M. e. emys*) is currently listed on the IUCN Red List of Threatened Species™ as Endangered, and it is listed as a CITES Appendix II species. Due to the highly inaccessible natural range in which they are found, detailed information is quite elusive. This tortoise is heavily exploited by humans throughout its range for food and medicinal/cultural purposes, and combined with habitat loss, this species is becoming increasingly rare. Exploitation through the pet trade has been problematic as well.

Exhibit Qualities:

Burmese Black Tortoises can be maintained in large, harmonious groups, regardless of gender. Their large size and outgoing behavior make for an active exhibit, especially during breeding/nesting season. Mixed species exhibits with mammal and bird taxa have been displayed with success, dependent upon individual animal temperament and feeding strategies for the mixed species.

Educational Qualities:

Smaller individuals of Burmese Black Tortoises create great educational opportunities for chelonian nesting strategies, conservation topics, species diversity, and reptilian and/or forest niches.

Interpretive Messages:

- Chelonian conservation
- Chelonian nesting strategies
- Forest niche (mushroom and fruit consumer)
- Unique genus of tortoise

Care and Facilities:

Burmese Black Tortoises are fairly easy to accommodate with space and care. Size of enclosure is dependent upon the number of individuals an institution intends to house, but if breeding is a goal, space must be incorporated for nesting (nesting female tortoises will collect leaves and other debris within a 10m radius from the eventual nest site).

Enclosure areas do not need to be flat, and areas with some topography are preferred to help maintain the health and fitness of the tortoises. Proper barriers are essential, as animals of this species are excellent climbers. Ideally, solid/smooth barriers are used; chain-link can be easily climbed regardless of height.

Ideally, they will be housed outside for adequate UV needs, but they can be housed inside with appropriate artificial UV lighting. This species is a forest dweller, and while these animals enjoy basking to thermoregulate, they prefer a dappled or completely shaded area. Shallow water basins and/or mud wallows for soaking and cooling are important as well.

While tropical in origin, they can take brief stints of cooler temperatures that can provide a longer outdoor season in northern zoos & aquariums. General cut off temperature is 45 F, but temperatures as low as 40 F can be tolerated for brief periods if adequate cover (landscaping, fabricated shelters) is available. Once temperatures get over 90 F, it is important to provide shelter for shading as well as misters, sprinklers, etc. during the heat of the day. Due to their high home base/shelter fidelity, appropriate fabricated shelters installed in enclosures that provide heat during cold months and/or shade during hot months can make for year-round exhibits or enclosures, alleviating the need to move individual tortoises off exhibit to other areas.

Captive diets are similar to other quality forest tortoise diets. Dark leafy greens accompanied by squashes (or similar) and fruits are great base diet items. Mushrooms are very important as a base food item as well, and obvious preference for them over other items is noticeable and could be used as a training tool. Other miscellaneous items consumed are grasses (exotic and lawn varieties), invertebrates (sow bugs, earthworms, caterpillars), and flowers such as hibiscus.

Other Notes:

The Burmese Black Tortoise is a large, active, charismatic species that can be maintained in large groups or in mixed taxa exhibits. They can become very popular with both zoo visitors as well as staff.

Recommendations:

- It is essential that institutions holding this species identify their specimens for subspecies and gender, and report to the program manager. Instructions for identification are available from the program manager.
- It is essential that institutions holding this species communicate with the program manager before and after making transfers to maintain optimal pairings and to meet the needs of institutional wants and needs.

Program Contact:

Craig Pelke
Studbook Keeper and SSP Coordinator
San Antonio Zoo
cpelke@sazoo.org
(210) 734-7184 x1340

ASIA SPECIES ACCOUNTS

Burmese Star Tortoise

Geochelone platynota



Species Summary:

The Burmese Star Tortoise (*Geochelone platynota*) is an increasingly rare starred tortoise found only in central Myanmar. It is a medium-sized tortoise, averaging about 26 centimeters in carapace length. This tortoise is renowned for its beautiful coloring and geometric-patterned carapace: each scute has up to six yellow stripes radiating from the center. The plastron is usually a yellow or tan with a dark brown or black “notch” on every scute. Skin on the head, limbs, and tail ranges from yellow to tan. Forelimbs are fronted with large, pointed or rounded scales, and the tail is tipped with a large, horny scale. Males are distinguishable from females by their longer, thicker tails and slightly concave plastrons. This species is diurnal and actively spends its days searching for food. It feeds on a range of vegetation, predominantly grass, with some mushrooms, fruit, and possibly insects and larvae. It is not known for burrowing behavior; instead it hides under short vegetation to escape the heat and any possible threats. While it is illegal to remove Burmese Star Tortoises from the wild, legislative action and wildlife reserves have little power to protect this species from the increasing black market demand. International recognition and resources may be the only hope to save this species in the wild.

Program Purposes:

Thanks to its star-patterned shell, this tortoise was previously protected from human interference due to local superstitions. However, its famous shell is no longer a source of protection. Increasing demands for the Burmese Star Tortoise as food, medicine, and predominantly pets have caused its value to skyrocket on the Asian and international markets. Its rarity makes it an even more valuable commodity to poachers. Additional threats include habitat destruction via deforestation, and wildfires.

The IUCN Red List of Threatened Species™ lists *Geochelone platynota* as Critically Endangered, and this species has been listed as CITES Appendix I since April, 2013. There are three reserves in Myanmar for the Burmese Star Tortoise: Shwe Settaw Wildlife Sanctuary, Minzontaung Wildlife Sanctuary, and Myaleik Taung. The Burmese Star Tortoise is fully protected by law, but it is problematic for the Myanmar government due to the instability of the government.

Exhibit Qualities:

The Burmese Star Tortoise is a phenomenal species for exhibition. It is an incredibly handsome tortoise, with its starry carapace and striking coloring. This tortoise is also predominantly diurnal, and its daylight activities make it fascinating to observers. It is not usually shy and will actively wander around an exhibit, looking for food and interacting with other tortoises. Although Burmese Star Tortoises tend to do well in

groups, it is not advised to mix this species with other species of tortoise.

Interpretive Message:

- Pressure on wild population due to poaching for the Asian market and the international pet trade
- Difficulty of conservation efforts in countries with extreme poverty, government corruption, and civil unrest
- Recent successes with head starting *in situ* with support from the Turtle Survival Alliance and other conservation groups.

Care and Facilities:

This species usually fares very well in captivity with proper care. The exhibit should be kept dry and warm, anywhere between 75-85 °F (25-30 °C), and include a basking area kept at 95 °F (35 °C) or higher. Housing outdoors is preferable to indoors, so long as the temperature stays adequate. A source of UV lighting must be provided if the tortoise is housed indoors. A minimum exhibit size of 14' by 14' for three adult tortoises is recommended. An exhibit should include an open shelter and have a soft soil substrate as well as fresh hay. Small shrubs and grasses may be incorporated into an exhibit for enrichment and aesthetic benefits.

The Burmese Star Tortoise lives in the dry zones in Myanmar. Substrate should be soaked weekly, and each tortoise should be lightly misted once a week. It is an herbivorous species, and may be fed a diet of mixed greens (collards, bok choy, dandelion greens, mustard, romaine, kale, Swiss chard), Bermuda hay. Mazuri® tortoise biscuits or Zoomed Grassland tortoise diet are good sources of nutrients without the undesirable moisture that fresh produce provides.

Program Goals:

- Enhance sustainability of captive population
- Raise awareness of illegal international turtle trade
- Support Myanmar wildlife reserves

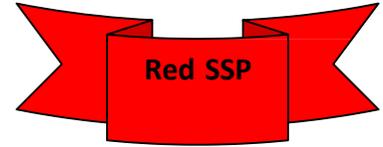
Program Contact:

Thomas Owens
Studbook Keeper and SSP Coordinator
San Diego Zoo Global
TOwens@SanDiegoZoo.org
(619) 557-3987

ASIA SPECIES ACCOUNTS

Flowerback Box Turtle

Cuora galbinifrons



Species summary:

The Flowerback Box Turtle, *Cuora galbinifrons*, is a terrestrial geoemydid turtle found in forested uplands of Vietnam, Laos, and Hainan Island, China. This species is extremely beautiful, making it an ideal species to represent Asian chelonians and the Asian Turtle crisis. The current population size is 21.30.16.

Program purposes:

Cuora galbinifrons is listed as CITES appendix II and as Critically Endangered by the IUCN Red List of Threatened Species™. This species inhabits woodland and evergreen forests at mid to high elevations within their range. In addition to habitat loss, the major threats to this species are the over-harvest for local consumption, as well as over-collection for national and international food and pet trades.

Although once common in captive collections, this species is now in dire need of conservation action. Currently, a sustainable captive population of this species does not exist. This species needs to be managed for several reasons: to increase what is known about the natural history, reproductive biology and ecology of this species, which is vital to conserving wild populations; to provide animals for exhibits and education programs to promote Asian turtle conservation; and to produce individuals with the potential of reintroduction into protected areas

Exhibit qualities:

Turtles in the genus *Cuora* are semi-aquatic box turtles. Although *Cuora galbinifrons* is one of the most terrestrial species, exhibits need to be equipped with large, shallow water features for soaking. A forest floor habitat is the best exhibit design for demonstrating this species' natural habitat.

Education qualities:

Cuora galbinifrons is the perfect species to discuss the Asian turtle crisis, over harvesting of wildlife, and wildlife trafficking.

Interpretive messages:

- Deforestation
- Over-harvesting/poaching
- Cultural uses/beliefs
- Life history strategies
- Speciation
- Asian turtle crisis

Care and facilities:

Although *C. galbinifrons* is not for beginners, most AZA facilities should be able to properly care for this species. Once acclimated, this species can be easily kept. To accommodate a group (4) of Flowerback Box Turtles a 4'x6' exhibit with a large, shallow water feature, deep soft substrate and several refugia are needed. Off exhibit holding should be available in case animals need to be separated. Often males can overly stress females and should be removed if oviposition is expected. Soft substrate should be offered, as eggs are often broken during oviposition if hard surfaces or mulch are solely offered. May eat live plants, so non-toxic plants for ground cover can be used. Leaf litter should be used to form a humid hiding space as well as nesting material. This species typically lays one to three eggs in a shallow nest covered with leaf litter. These large eggs, approximately 30 grams each, can frequently be seen on the surface of the enclosure, partially buried. Females can double clutch.

The main diet consists of 80% greens (kale, collard greens, dandelion greens, romaine, chicory, bok choy, etc.), with veggies (carrot, sweet potatoes, zucchini, squash, etc.) and 20% protein (crickets, earthworms, mealworms, bird of prey diet, blackworms, fish, mice, etc.). Animals can also be offered Mazuri tortoise chow or a similar diet in a bowl *ad lib*. Reproductive females should be offered cuttlebone to augment calcium intake and prevent calcium deficiencies.

Program goals:

A sustainable captive population, potential reintroductions in the future, genetic and health evaluation, and to develop relationships and funding to support field work through an AZA dedicated fund. Even though this species is listed as critically endangered and CITES appendix II, individuals are still frequently encountered in Asian markets. Translating *ex situ* conservation efforts into *in situ* conservation action is a primary goal of this program.

Program contact:

Lauren Augustine
Studbook Keeper and SSP Coordinator
National Zoological Park
(202) 633.3577office
AugustineL@si.edu

ASIA SPECIES ACCOUNT

Four-eyed Turtle

Sacalia quadriocellata



Species Summary:

Four-eyed Turtles are a small aquatic species found in southern China, Hainan, Laos, and Vietnam. The adults can reach shell lengths of 15-18cm. This species exhibits interesting sexual dimorphism: males and females have different patterns of ocelli on the back of their head. This is the reason for their common name.

Program Purposes:

Four-eyed Turtles are classified as Endangered on the IUCN Red List of Threatened Species™. This species is threatened for the same reasons as many other species of Asian chelonians; habitat loss and over-exploitation by humans. This species seems to have temperature-determined sex, but the incubation parameters are not yet known.

Exhibit Qualities:

Four-eyed Turtles are active and engaging display specimens. They do well in both shallow and deeper water tanks. They are not aggressive to each other or other species and can be displayed with various species of Southeast Asian fish and turtles.



Sexual dimorphism in Four-eyed turtles: female (left) and male

Husbandry:

A pair of adults can be kept in an enclosure as small as 75 gallons. Water temperatures between 65 and 75 are ideal, but this species will remain active even when temperatures are as low as 50. They can develop shell-rot if kept in water that is not clean. Four-eyed Turtles will bask if given the opportunity. A diet of commercial turtle pellets supplemented with occasional fruit is sufficient for their long-term maintenance.

Interpretive Messages:

- Sexual dimorphism (different eye-spots)
- Threatened by loss of habitat, food trade, use in traditional Chinese medicine



Program Goals:

- Increase founder representation
- Increase number of holding institutions
- Determine temperature-determined sex parameters

Program Contact:

Bill Hughes, SSP Coordinator & Studbook Keeper
Tennessee Aquarium
423.785.4126
bhh@tnaqua.org

ASIA SPECIES ACCOUNT

Forsten's Tortoise *Indotestudo forstenii*



Species Summary:

The Forsten's Tortoise (*Indotestudo forstenii*) could be considered one of the world's rarest tortoises. Although described in the 1840s, the species was synonymized with the Travancore Tortoise (*Indotestudo travancorica*) from the Western Ghats of India and was not recognized as a separate species until 2000. It is one of only two endemic chelonians, the other being the Sulawesi Forest Turtle (*Leucocephalon yuwonoi*), to the island of Sulawesi in Indonesia. Its current range is restricted to the northern peninsula and was approximated via local resident surveys, and through specimens found in captivity.

Unfortunately, the wild population remains elusive, and no field researcher has observed the species in its natural habitat in many years.



Program Purposes:

Indotestudo forstenii is listed as Endangered on the IUCN Red List of Threatened Species™ and in Appendix II of CITES. Although the last IUCN assessment was in 2000 and at that time Indonesia had an annual export quota of 450. The main threats to the wild population include habitat destruction due to increased agriculture and logging, and poaching for the international pet trade, bush meat, and food markets. Given the fact that there have been no known recent field surveys and there are no known conservation programs in place for this species, it is unlikely that reintroduction will be an option at this time. Therefore, captive breeding to build assurance colonies is essential to protect the species from extinction, making *I. forstenii* an ideal SSP species. Since the publication of the 2013 Studbook, the population has increased by about 40%, with the majority being adult animals, bringing the total to just under 100 individuals. Unfortunately, the number of institutions currently holding the species has remained low over the last few years. The main objectives would be to continue to increase the population size through captive breeding, and to generate more interest in the species among AZA institutions.



Exhibit Qualities:

I. forstenii is an interesting and unique-looking tortoise that would be a great species for a new reptile exhibit. They could also fit nicely into an already existing exhibit and could potentially be housed with other Indonesian species like small mammals, birds, or other reptiles.

Although usually considered to be more of a crepuscular species, in captivity they are quite active during the day, which makes for a more engaging exhibit. They can frequently be observed basking and even when in their sheltered retreats or buried under leaf litter, they will often just have their heads exposed, which allows people to have fun searching for them. They will also feed and exhibit their unique breeding rituals during the day. They can often be observed swiftly moving around and exploring their surroundings, especially after misting.

Educational Qualities:

Exhibiting *I. forstenii* affords an institution the opportunity to educate the public on a species that could be close to extinction in the wild and an opportunity to highlight the importance of reptile conservation. This species would be more suited as an exhibit animal than an education animal, as they don't do well with too much handling.



Interpretive Messages:

- Island Endemism
- Reptile Conservation
- Endangered Species Conservation
- Illegal Wildlife Trade/Poaching
- Habitat Destruction/Deforestation

Care and Facilities:

I. forstenii is a medium-sized tortoise, reaching about 8-10 inches. They do require a good amount of space, as they can be quite active. It is also best to house them in pairs or harems, as they do engage in fascinating courtship behaviors. For example, an ideal exhibit size would be about 10' x 10' for 2-3 individuals. The species does well in environments with sufficient basking areas provided either by the use of a mercury vapor lamp, which provides both UVB as well as heat, or ideally, through dappled sunlight. They should also have access to numerous sheltered retreats for cooling down, including large branches, logs, and cork bark, with at least one retreat per animal. The enclosure should be comprised of moist soil, with an area covered by a thick layer of leaf litter as they will bury, especially at night. They should also be provided with a dry nesting area, herbaceous plants, and water features that are large enough to immerse their body to soak. They do best in year-round daytime temperatures of approximately 80-90F/27-32C with nighttime lows between 70-75F/21-24C and consistent humidity of 50-70%.

They are a primarily herbivorous species, but could be considered opportunistic omnivores. They feed primarily on leafy greens, squash, carrots and mushrooms, as well as natural browse, including sedums, grasses, hay, mulberry, grape leaves, and various araceae. They will also eat snails, earthworms and various bugs, which should be offered sparingly.



Other Notes:

As mentioned, *I. forstenii* could be considered one of the rarest tortoises in the world. The possibility that this species is extinct in the wild is high, which increases the need to sustain a healthy and thriving captive population. If you are looking to enhance your current collection and would like participate in building much needed assurance colonies to help promote species sustainability, as well as educate the public, the Forsten's Tortoise would be a great addition.

Program Goals:

- Work toward increasing interest within AZA institutions to assist in building much needed assurance colonies.
- Raise awareness within the conservation community about the plight of the species and work with IUCN and related organizations to determine validity of current status and identify ways to increase protection.
- Travel to Sulawesi to learn more about the species natural habitat and to possibly establish *in situ* conservation programs.

Program contact:

Christine Light
Studbook Keeper and SSP
Coordinator Turtle Conservancy
christine@turtleconservancy.org
303-476-0152

ASIA SPECIES ACCOUNTS

Impressed Tortoise *Manouria impressa*



Species Summary:

Impressed Tortoises are a poorly understood forest tortoise found in humid montane bamboo and evergreen forests across Southeast Asia, from Myanmar to Malaysia. *Manouria impressa* are beautiful, golden-colored, mid-size tortoises, with adults weighing approximately ten pounds. They are considered one of the most primitive tortoises, specialize in eating mushrooms, and are one of only two chelonian species that build their nests above ground with vegetative material. The population size is 12.17.32 (61 total).

Program Purposes:

Manouria impressa is listed on CITES Appendix II and was evaluated in 2000 as Vulnerable by the IUCN Red List of Threatened Species™, yet is noted as “update needed” and has been recommended to be elevated to endangered.

Impressed Tortoises are an iconic example of a species severely affected by the Asian Turtle Crisis, and conservation action is needed to ensure their survival. Impressed Tortoises have also proven to be difficult to maintain in captivity, with only a handful of institutions having reproductive success. This program will bring the individual animals in the country into a cohesive population for optimal reproductive success and genetic diversity. As reproductive success becomes more common, sharing successful husbandry techniques among program participants will help strengthen the population as a conservation tool for the species.

Exhibit Qualities:

Impressed Tortoises can make for a great exhibit if designed correctly. They are relatively sedentary animals and will hide motionless for hours on end. If hiding spots are strategically placed near and towards the viewing area, then *M. impressa* can be observed readily. Impressed Tortoises need a shaded area with minimal direct sunlight.

Interpretive Messages:

- Asian Turtle Crisis
- Illegal wildlife trade
- Fungivore
- Primitive tortoise genus *Manouria*
- Above ground nests

**Care and Facilities:**

Impressed Tortoise husbandry has more in common with that of a box turtle than a typical tortoise, such as a leopard or radiated tortoise. They are forest tortoises that prefer humid conditions (60-100% humidity). They are kept at temperatures between 50 - 90°F with dappled sunlight. Indoors, *M. impressa* can thrive without a hot spot but will bask under locations around 85 °F. Adults can be housed individually in a minimal enclosure of 3-5'. They should be kept on a substrate of mulch, soil, or a coconut fiber/leaf mix. A favorite pastime of *M. impressa* is hiding in humid piles of leaves with only their head exposed. Shady microenvironments are required if keeping *M. impressa* outdoors. Misting twice a week to daily is recommended to ensure high humidity and usually induces activity such as eating and breeding. A shallow water bowl that is big enough for the individual tortoise is needed for soaking, which Impressed Tortoises occasionally do for days on end.

An *in situ* field study conducted by a Thai graduate student, Pratyaporn Wanchai, in 2011 has shed some light on Impressed Tortoise habitat preferences, natural history, ecology, and seasonal activity. These insights have been used to increase *ex situ* survivorship and reproductive success. Management techniques inspired from the work in Thailand revolve around annual seasonal change, which is classified by a wet season (monsoon)

and a dry season. Husbandry techniques developed include limited food resources in the winter, and profuse misting in the summer. Diet was one of the biggest challenges early on for Impressed Tortoise survivorship in captivity. Impressed Tortoises are mushroom specialists in the wild, and mushrooms are their favorite food in captivity. Oyster mushrooms are most commonly the mushroom fed. Though it is thought that mushrooms are what *M. impressa* eat exclusively in the wild, they are given a more balanced diet in captivity consisting of: greens (bok choy, collards, romaine, and kale), fresh produce (sweet potato, zucchini, squash, carrot, and tomato), sparing amounts of fruit (cantaloupe, banana, apple, kiwi, and orange), soaked Mazuri tortoise diet, and oyster mushrooms.

Maybe the most interesting behavior of *M. impressa* is their nesting, where they build a nest above ground with available vegetative material. Gravid females will construct their nests by pulling material with their forearms as they move backwards. This behavior is called “backswEEPing.” As they construct their nests they will step in and out of it, pressing and shaping with their limbs. Oviposition is indicated when the nest is suddenly twice as big and the female is on top of, rather than in, the nest. She will spend the next couple of day’s obsessively adding material on top of the nest, even if the eggs have been pulled for the incubator. It is important to offer Impressed Tortoises ample amounts of vegetative material, such as leaves, to allow them to construct a proper nest. Temperature Sex Determination for Impressed Tortoise has been identified as 80

°F producing males and 85 °F producing females. Husbandry of hatchlings is very similar to that of adults. Hatchlings usually start eating a week or two after hatching and start on oyster mushrooms.

Another key aspect of Impressed Tortoises in captivity is their apparently sensitive immune systems. Many wild caught *M. impressa* come into the country close to death from stress, anemia, parasites, starvation, dehydration, and disease. Healthy, established adults have also been known to crash with little to no symptoms and die within a week or two. To this effect, it is suggested to work Impressed Tortoises first before other taxa.

Program Goals:

- Produce husbandry manuscript/guidelines to improve breeding success and survivorship
- Find more private institutions to expand and strengthen population
- Create breeding recommendations.

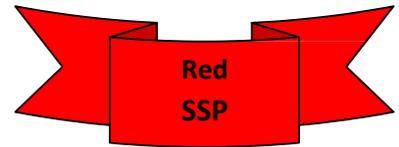
Program Contact:

Robert Hill, SSP Coordinator
and Studbook Keeper
Zoo Atlanta
800 Cherokee Ave.
Atlanta, GA, 30315
404-624-5619
rhill@zooatlanta.org

ASIA SPECIES ACCOUNTS

Indochinese Box Turtle

Cuora bourreti



Species summary:

The Indochinese Box Turtle, *Cuora bourreti*, is a terrestrial geoemydid turtle found in forested uplands of Central Vietnam. This species is extremely beautiful, making it an ideal species to represent Asian chelonians and the Asian Turtle crisis. The current population size is 12.13.0.

Program purposes:

Cuora bourreti is listed as CITES appendix II and as Critically Endangered by the IUCN Red List of Threatened Species™. The species inhabits woodland and evergreen forests at mid to high elevations within their range. In addition to habitat loss, the major threats to this species are the over-harvest for local consumption, as well as over collection for national and international food and pet trade.

Although once common in captive collections, this species is now in dire need of conservation action. Currently a sustainable captive population of this species does not exist. This species needs to be managed for several reasons; first, to increase what is known about the natural history, reproductive biology and ecology of this species which is vital to conserving wild populations; second, to provide animals for exhibits and education programs to promote Asian turtle conservation; third, to produce individuals for potential for reintroduction into protected areas.

Exhibit qualities:

Turtles in the genus *Cuora* are semi-aquatic box turtles. Although, *Cuora bourreti* is one of the most terrestrial species, exhibits need to be equipped with large, shallow water features for soaking. A forest floor habitat is the best exhibit design for demonstrating this species natural habitat.

Education qualities:

Cuora bourreti is the perfect species to discuss the Asian turtle crisis, over harvesting of wildlife, and wildlife trafficking.

Interpretive messages:

- Deforestation
- Over-harvesting/poaching
- Cultural uses/beliefs
- Life history strategies
- Speciation
- Asian turtle crisis

Care and facilities:

Although *C. bourreti* is not for beginners, most AZA facilities should be able to properly care for this species. Once acclimated, this species can be easily kept. To accommodate a group (4) of Indochinese box turtles, a 4'x6' exhibit with a large, shallow water feature, deep soft substrate and several refugia are needed. Off exhibit holding should be available in case animals need to be separated. Often males can overly stress females and should be removed if oviposition is expected. Soft substrate should be offered as eggs are often broken during oviposition if hard surfaces or mulch are solely offered. These animals may eat live plants, so non-toxic plants for ground cover can be used. Leaf litter should be used to form a humid hiding space, as well as nesting material. This species typically lays one to three eggs in a shallow nest covered with leaf litter. These large eggs, approximately 30 grams each, can frequently be seen on the surface of the enclosure, partially buried. Females can double clutch.

The main diet consists of 80% greens (Kale, Collard greens, Dandelion greens, Romaine, Chicory, Bok Choy, ect...), with veggies (Carrot, Sweet potatoes, Zucchini, Squash, ect..) and 20% protein (Crickets, Earthworms, Mealworms, Bird of Prey Diet, Blackworms, Fish, Mice, ect...). Animals can also be offered Mazuri tortoise chow or a similar diet in a bowl *ad lib*. Reproductive females should be offered cuttlebone to augment calcium intake and prevent calcium deficiencies.

Program goals:

A sustainable captive population, potential reintroductions in the future, genetic and health evaluation, and to develop relationships and funding to support field work through an AZA dedicated fund. Even though this species is listed at critically endangered and CITES appendix II, individuals are still frequently encountered in Asian markets. Translating ex situ conservation into in situ conservation action is a primary goal of this program.

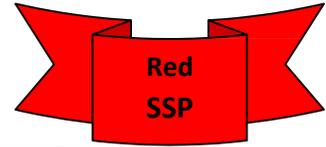
Program contact:

Lauren Augustine
Studbook Keeper and SSP Coordinator
National Zoological Park
(202) 633.3577
AugustineL@si.edu

ASIA SPECIES ACCOUNTS

Keeled Box Turtle

Cuora mouhotii



Species Summary:

The Keeled Box Turtle (also known as the Jagged-shelled turtle) is a small species native to China, Laos, Cambodia, Myanmar, Vietnam, and India. The origin of many captive specimens is unknown. There are two subspecies, *C. m. mouhotii* and *C. m. obsti*, and they can be differentiated by examining the plastral pattern. This turtle reaches a straight-line carapace length of 15-18cm. Keeled Box Turtles are primarily terrestrial and are often found near caves and rocky areas.

Program Purposes:

Keeled Box Turtles are classified as Endangered on the IUCN Red List of Threatened Species™. Threats include overexploitation for the food and pet trades and habitat loss. Many of these turtles have been imported from Vietnam in the past several years, but they have been difficult to acclimate, and it is uncertain how many are still alive.



Exhibit Qualities:

Keeled Box Turtles do well in fairly small exhibits. Providing a shallow water area as well as a land area with ample humidity is important. Some Keeled Box Turtles prefer to spend a lot of time sitting in shallow water, while others will only go there long enough to drink. This species will get along well with other semi-aquatic Asian turtles, such as other *Cuora* species or Spiny Turtles.

Care and Facilities:

Keeled Box Turtles are omnivorous but seem to prefer an animal-based diet. Foods such as pinky mice or *Zoophobas* larvae are preferred, but this species will also eat some salad mixes and occasional fruit. Adequate hiding spots and clean shallow water are important. A winter cool-down seems to help with reproductive success. High humidity is important for this species and seems to make it more active.

Interpretive Messages:

- Threatened by loss of habitat, pet trade, food trade
- Zoo population is very small, so captive breeding is important.

Program Goals:

- Recruit more founders
- Increase number of holding institutions
- Increase reproductive success

Program Contact:

Bill Hughes, SSP Coordinator & Studbook Keeper
Tennessee Aquarium
423.785.4126
bhh@tnaqua.org

ASIA SPECIES ACCOUNTS

Malaysian Giant Turtle

Orlitia borneensis

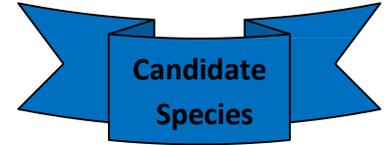


Photo by Lori Lawson, VA aquarium

Species summary:

The Malaysian Giant Turtle is the largest freshwater turtle in Southeast Asia, found primarily in Indonesia and Malaysia. They have the potential to weigh over 50kg and have a shell length of 80cm. They are dark in coloration and have a smooth oval carapace.

There are currently 13.19.46 *O. borneensis* in the AZA collection in North America. They are found at 12 institutions, and many of the founders of this population came into the country after a large confiscation in 2001. Zoo Miami has been very successful in breeding *O. borneensis* the past several years.

Program Purposes:

Orlitia borneensis is listed as Endangered in the IUCN Red List of Threatened Species™ and as CITES Appendix II, but very little is actually known about these animals and their wild population. Although they are protected, they are still being illegally caught and sold to the Asian meat market, where many species of turtles are sought after and considered a delicacy. Having an assurance colony established in zoos that is genetically distinct will help with making sure this species doesn't go extinct. Getting more data on these animals in the wild and where populations are can be vitally important in their survival.

Exhibit Qualities:

This animal is great for multispecies enclosures with some species of crocodilians and aquatic turtles. Their large size is quite impressive, and they can be housed in many different ways. They spend a lot of time sitting on the bottom of pools or ponds, but they will also sit at the edges and bask.



Photo by Lauren Cashman, St. Augustine Alligator Farm

Care and Facilities:

Since there isn't much known on their natural habitats, facilities have been housing them with different set ups. Overall the species seems to be doing fine as long as they can swim under water and can stay submerged. Some facilities exhibit them in underwater viewing enclosures, while others have them in deep moats. For exhibit purposes, having an underwater viewing area or shallow pool will make viewing them much easier. They have been known to be aggressive towards cage mates, but this issue can be resolved by giving them places to hide or moving the individual out. Their diets are varied, but they seem to be mainly herbivores. They have been known to eat fish and even crocodilian food too. Water should be kept at moderate temperatures from the 70's- 80's. If kept indoors, having a heat lamp for them to bask under is helpful.

Reproduction of this species is something else that isn't well known. It is believed that females lay clutches once a year and lay them on the banks of rivers and lakes in piles of debris. No wild nests have ever been documented, and incubation techniques are not known. Hatchlings are about 6cm long, but again, not much is known on their growth and development.



Photo by Nicole Atteberry, Zoo Miami

Other notes:

Some individuals can be shy, but training can be done with them. They can be target and stationed trained and will even take food from keepers. Although the population in captivity seems to be stable, it is important that research be done to try to understand how this species lives in the wild and hopefully get a rough idea of their wild population.

Program Goals:

- Develop studbook
- Find additional institutions for this species
- Divide up group at Zoo Miami for better tracking

Program Contact:

Lauren Cashman
Studbook Keeper
St. Augustine Alligator Farm
LaurenC@alligatorfarm.com
904-824-3337 x 15

ASIA SPECIES ACCOUNTS

McCord's Box Turtle

Cuora mccordi



Photo credit: Jeff Jundt/Detroit Zoological Society

Species Summary:

The McCord's Box Turtle is a relatively small, semi-aquatic turtle native to a very limited area of southern China. It is a very hardy species and easily maintained under a variety of conditions suitable for exhibit.

Program Purposes:

This species was first described in 1988 based on 12 individuals that were collected in the early 1980's from a turtle dealer. It was thought to be extinct until re-discovered in the early 1990's in a Chinese food market. Since the turtle's discovery in the markets, researchers have had limited success finding them in the wild.

Only a few scattered individuals are thought to remain in the wild (Horne et. al. 2012). Genetic research confirms that *C. mccordi* is a "good" species, and not a captive produced hybrid.

The genetic diversity of much of the captive population is unknown because some of the animals we consider as founders may indeed be captive bred and related to other founders. With a captive population descending from fewer than 20 founders, it is critical that this species is managed carefully and with good genetic background information.

Because this species has not been studied in the wild, captive managers are left with trial and error scenarios to estimate their captive habitat requirements.

Exhibit Qualities:

Based on discussions with locals in China, *Cuora mccordi* are described to inhabit semi-aquatic stands of bamboo and broadleaf forests. Unlike other more aquatic *Cuora* species, *C. mccordi* prefer to be hidden by digging into the soil or below plants where they remain camouflaged. In zoos, they can be kept in natural environments with a dirt/sand mix, allowing them to bury themselves. However, this creates an environment where the animals are often buried and not visible at all times to guests. If visibility is a factor, they can successfully be kept in a semi-aquatic habitat that still allows them the space to breed and lay eggs.



Natural habitat exhibit; Photo credit: Jeff Jundt/Detroit Zoological Society



Aquatic habitat exhibit; Photo credit: Jeffrey E. Dawson/Saint Louis Zoo

Interpretive Messages:

- The McCord's Box Turtle could be considered the poster child for the Asian Turtle Crisis, where turtles are being wiped out just as they are being described to science, and lost from nature before we have the opportunity to study them in the wild.
- This species is a prime example of the devastating impacts of the wildlife trade and how it can drive species extinctions.
- Locals call it the “yellow bamboo turtle,” as they report finding it where bamboo is common.



Photo credit: Jeff Jundt/Detroit Zoological Society

Care and Facilities:

Because of the small founder size of the population, it is important to maintain breeding pairs of this species. Initially it was thought that they would only breed in groups, but this set up produced offspring of multiple parentage. Captive husbandry shifted from group breeding to pair breeding in facilities in the late 2000's.

Various facilities cool their animals down for several months out of the year to simulate the cold season. This can be done anytime or the entire time between November and April, and animals can be taken down to mid-40 to mid-50 degrees Fahrenheit. It is not uncommon for eggs to develop during this cool down period. Upon their exit of the cool down period, females can lay up to 4 eggs at a time and may produce multiple clutches per year. They display TSD, and eggs should be incubated at 76°F (24°C) for males and above 80°F (27°C) for females.

Other Notes:

Before their discovery by science, local villagers used these turtles as stones to throw at their livestock to get them to move, since the turtles were easier to find than stones.

Program Goals:

- Create more 1 on 1 breeding pairs and get away from breeding groups which result in MULT parentages.
- Develop a method of genetically determining existing parents of many of the MULT offspring currently in the population.
- Increase annually the number of institutions holding this species through increased breeding success by existing institutions.

Program Contact:

Jeff Jundt
Studbook Keeper and SSP Coordinator
Detroit Zoological Society
jjundt@dzs.org
248-336-5859

ASIA SPECIES ACCOUNTS

Painted Terrapin

Batagur borneoensis



Photo by Diane Barber, Fort Worth Zoo

Species Summary:

The Painted terrapin is a medium-sized to large turtle species inhabiting the rivers in Southeast Asia from Southern Thailand to Borneo. Adults are sexually dimorphic, and during the breeding season male painted terrapins' heads undergo a beautiful color transformation from olive, grey, or brown to pure white, prominently interrupted by a red stripe running between their eyes. In addition, the color of the males' shells lightens, emphasizing the three prominent black stripes that run parallel down the length of the shell.

Program Purposes:

Batagur borneoensis was upgraded from Endangered to Critically Endangered in 1996 by the IUCN Red List of Threatened Species™ and is listed in Appendix II by CITES. Considering the current rate of exploitation of all Asian turtle species from habitat loss and human consumption, it is likely to see increasingly low numbers for all populations. As exhibit species they make beautiful ambassadors for the plight of Asian turtles, as they are threatened by international trade of live specimens for the pet trade and food consumption, local consumption of eggs, and habitat loss due to sand mining. Due to erratic breeding and low representation of founder animals in captive hatched specimens, the captive population should be managed for increase genetic diversity of hatchlings and to ensure future exhibit availability. Our population serves as a genetic reservoir for this species in the wild, should reintroduction be needed. There are current in-situ programs head-starting and raising local awareness, such as the Satucita Foundation, which our populations can be used to help support.



Exhibit Qualities:

This is an aquatic turtle requiring large pools that spends most of the time in the water. They will spend time out of the water for basking. The best exhibits have underwater viewing where the turtles can be seen actively foraging and moving throughout the day. Multiple animals can be housed together. Many institutions display them in multi-species exhibits with Gharial (*Gavialis gangeticus*), fish species, and other turtle species such as the River terrapin (*Batagur baska*) and Southern river terrapin (*Batagur affinis*).

Educational Qualities:

As adults, this species is too large to be used as a program animal. However, babies and juveniles not housed in large exhibits, which can be easily accessed, can be used for outreach when available.



Photo by Jeff Bocek, Fort Worth Zoo Batagur exhibit

Interpretive Messages:

- Color change during breeding season/sexual dimorphism
- Estuary species
- Asian food market and traditional medicine threat
- Habitat loss

Care and Facilities:

Painted terrapins can tolerate a large range of outdoor temperatures as long as their pool remains at more optimal temperatures. Most facilities that keep this species house them in heated outdoor pools, have natural well water with constant temperatures year round, and are located in very southern localities that do not receive extended cold periods. The Fort Worth Zoo has an outdoor exhibit with water temperatures that range from 20-27°C depending on season, while air temperatures range from -9-37°C. Most Northern institutions that maintain this species house them indoors. The Toronto Zoo has an indoor exhibit with water temperatures maintained at 28°C. To maintain proper water quality, life support systems that consist of a filtration system (many zoos use sand filters), heater, and chiller are recommended. Current institutions' life support systems range from a simple circulation pump and heater at the Houston Zoo with no underwater viewing, to the Fort Worth Zoo which has sand filters, ozone, chiller, and heater with underwater viewing.

The size of the space needed depends on the number of turtles and if the intention of breeding is desired. Large multi-species exhibits with Gharial, painted terrapins, and fish require pools as large as 96,000 gallons, such as at the Fort Worth Zoo. Other zoos, such as the Toronto Zoo, have a smaller exhibit of about 10,000 gallons and a land nesting area of 32 square feet. Typically, adult turtles are housed on exhibit due to their large size requirements, while juveniles are housed off exhibit. They can be housed in smaller tubs, depending on the size of the turtle. Painted terrapin diet consists of kale, bok choy, mustard greens, collard greens, sliced apples, and sliced sweet potatoes. At the Fort Worth Zoo, painted terrapins can also be observed eating thawed trout fed to the gharials. Typically, food is offered three times per week.

Access to direct sunlight is important. Basking sites are needed to allow turtles to climb out of the water to thermoregulate and acquire UV light, typically logs and branches sticking out of the water. Depending on the size of the group, visual barriers are also needed to reduce stress among individuals, typically vegetation, branches, root systems, and pool shape. Shallow slopes out of the water to a sand nesting area are also recommended for females to lay their eggs. Painted terrapins require sand substrate for breeding. Multiple test holes may be dug before laying finally occurs.

Other Notes:

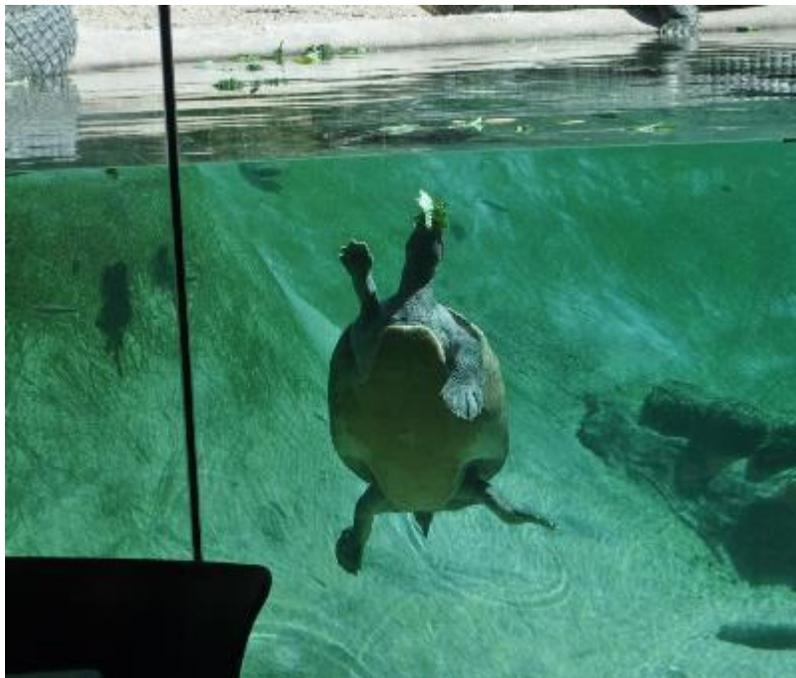
"Gas bubble disease" has occurred in this species when the dissolved oxygen and gas pressure in the pool has been wrong. Some institutions currently are also having issues with skin lesions. The cause and cure are currently being investigated.

Recommendations:

Additional interest is needed to house non-breeding groups of adults and sub-adults to maintain genetic diversity and to accommodate recommended breeding transfers. Increasing efforts to fundraise and support established in-situ field work is also highly desirable.

Program Goals:

- Increase offspring production from potential founders
- Increase space for rearing of juvenile and non-breeding groups
- Identify and resolve skin issues



Program Contact:

Jeffrey J. Bocek
Studbook Keeper and SSP Coordinator
Brookfield Zoo
847-212-6596
Jeff.bocek@czs.org



Pan's Box Turtle
Cuora pani



Species Summary:

The Pan's Box Turtle is a shy, semi-aquatic turtle originally inhabiting slow, shallow watercourses in the Shaanxi province of central China. The turtle's carapace is brown and the plastron is yellow with black triangular markings, while the head is bamboo green. Females are larger than males, their carapace measuring 12-15cm long, while the males are 10-12cm in length. There are some populations still in existence, but most of the wild turtles have been collected for food markets in China. The managed population in the United States is currently 10.18.53, housed at 12 institutions. Sixty-five of these are F¹ juveniles.

Program Purpose:

Cuora pani is listed in CITES Appendix II and as a Critically Endangered species in the IUCN Red List of Threatened Species™. The founders for this species need to be managed for reproduction as distinct pairs, with the goal of maximizing the captive population's genetic diversity. Generally, management of breeding pairs is best done in off-exhibit enclosures. However, once pairs start reproducing, they then produce eggs on a yearly basis. The F¹ generation is therefore abundant and they would make effective small aquatic exhibits. Data should be collected to expand our knowledge of the optimal husbandry and captive life history of this species.

Longevity, growth rate, age or size at sexual maturity and the incubation parameters for temperature dependent sex determination all need to be determined.

Exhibit Qualities:

The F¹ generation of *Cuora pani* is relatively large since founder pairs produce eggs quite regularly, once they get started. These slow-growing juveniles are a little less reclusive than the wild caught adults and would do well on exhibit. Young turtles are appealing to most visitors, since people make the connection with the native turtles they have seen on their own, or are able to compare them to pet turtles they have kept. Exhibits should be set up with shallow water and a variety of rock or wood shelters for the turtles to take refuge in, but still be visible to the visitor. Plant cover is also used readily by the young turtles. Exhibits in which the visitor can peer into the hidden underwater world of an animal are both pleasing and intriguing.

**Education Qualities:**

Cuora pani fits into programs which discuss extinction, the Asian turtle crisis and protection of species, both native and exotic, from exploitation. Box turtles, with their hinged plastron, are good examples of physical characteristics used for defense. It is usually surprising to the zoo visitor that their own familiar native box turtle is actually quite specialized. *Cuora pani* would not be a candidate for education programs which involved handling.

Interpretive Messages:

- Asian turtle crisis
- Extinction
- Physical defense mechanisms

Care and Facilities:

A small aquatic exhibit of two or three square feet could house several juvenile *Cuora pani*. The substrate should be sand or small pebbles. Wood or rock shelters should be provided to allow the turtle to hide underwater or to haul out for basking. Floating vegetation or low leafy branches also provide the desired safe refuge. Water depth needs to at least equal the width of the turtle's carapace, but can be slightly deeper. Water should be changed daily for optimal skin, shell and eye health. Water temperature should range from 78 to 85 degrees F. These turtles are quite cold hardy, but their appetite will drop off as the temperature drops. Juveniles do not need a land area as long as they have rocks or branches to climb out on. A basking light should be provided which provides a basking spot of around 90 degrees. The size of the tank might demand that the basking light comes on and off intermittently, so as not to overheat the water. A UVB light should also be provided. *Cuora pani* grow quite slowly, but as they approach adult size, they will, of course, need more space. Two adults would require an area of approximately 12 square feet, one third land and two thirds water.

The diet should be highly varied, including a manufactured turtle diet such as Herptivite at least once a week. Other food items readily accepted are earthworms, beetle larvae, moth larvae, crickets, small roaches, beef liver and krill. This list is not exhaustive, and as long as the diet stays variable, it would do no harm to try new food items. Juveniles should eat 5 to 7 times a week. Their shyness makes it best to feed at the end of the day, then clean the water first thing in the morning. Food items should be dusted with a multivitamin and a calcium supplement. Indoor turtles should have food dusted with a vitamin D3 supplement one time per week. The turtles should be weighed regularly to be sure none of them are being intimidated into poor food consumption.

Program Goals:

- Breed potential founders
- Arrange founders and potential founders as distinct pairs in order to maximize genetic diversity
- Explore a variety of exhibit options, looking for ways to provide a feeling of security for this shy species while keeping it visible to the zoo visitor
- Collect life history data
- Establish and/ or confirm the incubation parameters for temperature dependent sex determination

Program Contact:

Kathy Vause
Riverbanks Zoo and Garden
(803)-602-0785
kvause@riverbanks.org

ASIA SPECIES ACCOUNTS

Roti Island Snake-necked Turtle *Chelodina mccordi*



All photos by Julie Larson Maher, Wildlife Conservation Society

Species Summary:

This relatively diminutive species, one of the smallest of the Snake-neck Turtles, only reaches a carapace length of about 21 cm when full grown. Hailing only from the Indonesian Island of Roti, this diurnal turtle is a very active exhibit animal. It is currently considered to be one of the most endangered freshwater turtle and tortoise species in the world, and represents the ongoing crisis facing many Asian chelids.

Program Purposes:

Due to its status as a rare endemic species with unusual features, the Roti Island Snake-neck Turtle was heavily collected for the pet trade. This aggressive harvesting led to the species being considered “commercially extinct” by Indonesian traders, and it is no longer found in its natural range. *C. mccordi* was included in the Top 25 most endangered tortoises and freshwater turtles in a 2011 IUCN report, and is currently classified as Critically Endangered. The species is currently listed as CITES Appendix II, though it was recently suggested that the species be upgraded to Appendix I. Habitat destruction is also a major threat to the species, and future protection will be required before any reintroduction programs can be considered. There is currently a strong captive population within AZA facilities, though given the hopes for eventual reintroduction into the wild for this rare turtle, proper management is paramount.

Exhibit Qualities:

Due to its small size as compared to other species in the genus *Chelodina*, *C. mccordi* is well suited for exhibits too small to house its larger relatives. The members of this genus are visually intriguing, as their extremely long necks are an unusual trait. This species is very charismatic, and spends the majority of its time actively swimming. They can be kept together in small groups, and have also been kept successfully with other species including: Northern New Guinea giant softshell turtles (*Peleochelys signifiera*), Weber's Sailfin Lizards (*Hydrosaurus weberi*), and various fish species.

**Interpretive Messages:**

- Endangered Asian turtles and tortoises and their need for protection
- Island endemism
- Dangers of over-collection for the pet trade
- Species Survival Program animals in zoos
- Interesting and/or unusual physiological adaptations

Care and Facilities:

As a primarily aquatic species, water quality and temperature are the most important aspects of keeping this species in captivity. Adequate filtration is preferable, though “drop and fill” enclosures can be utilized if water changes are done frequently. Without clean water, skin and shell problems may arise. This is also the case if appropriate temperatures are not provided. A water temperature range of 23.8°-27.7°C (75°-82°F) should be offered. A land area should also be made available, with a hot spot of 32°-38°C (95°-105°F). Lighting that produces UVA and UVB should also be made available.

C. mccordi is an opportunistic carnivore and insectivore and will eat earthworms, mealworms, waxworms, crickets, pinky mice, fish, and other small invertebrate prey. However, due to the varying nutrient levels in live/frozen prey items, it is also suggested that their diet be supplemented with commercially available turtle foods like Zeigler, Mazuri, or diet gels.



Program Goals:

- Ascertain and retain the genetic diversity of the captive population
- Eventual establishment of a reintroduction program on Roti Island
- Bring attention to the crisis currently facing this species and its relatives

Program Contact:

Avishai Shuter
Studbook Keeper and SSP Coordinator
WCS Bronx Zoo, Department of Herpetology
(718)-220-5042
AShuter@wcs.org



Spiny Turtle
Heosemys spinosa



Species Summary:

Spiny Turtles are a medium-sized species of semi-aquatic turtle native to Southern Myanmar through Thailand, and Peninsular Malaysia and Singapore to the islands of Sumatra, Borneo, and the Natunas to the Sulu Archipelago and Mindanao (Philippines). The adults can reach shell lengths of 20"-25cm. Males tend to be larger than females and also have a slightly more elongated shell. Unlike the adults, hatchlings and juveniles have a highly serrated shell and are quite distinctive looking.

Program Purposes:

Spiny Turtles are classified as Endangered on the IUCN Red List of Threatened Species™. Despite that, animals are still regularly imported for the pet trade. Many of these are claimed to be captive-hatched specimens from farms.

However, the low reproductive rate of this species and its inconsistent breeding in captivity make that claim doubtful. Successful breeding in zoos and the private sector has increased in the past decade, so keeping track of parentage in order to maintain a genetically viable population has become important. There are also two distinct clades present in the North American population. This species has a discontinuous range, with populations separated by bodies of water; there is a possibility of races or even distinct species, but more work needs to be done. This species probably has temperature-dependent sex determination but the parameters are still unknown.

**Exhibit Qualities:**

Spiny Turtles are interesting exhibit animals. Juveniles in particular are popular with guests because of their appearance. They can be kept with other semi-aquatic Asian species, such as Keeled box turtles (*Cuora mouhotii*), as well as other species of *Cuora*. Spiny Turtles are fairly sedentary and tend not to rearrange enclosures or destroy plants.

Interpretive Messages:

- Youngsters have a distinctive appearance
- Threatened by loss of habitat, pet trade, food trade

Care and Facilities:

Spiny Turtles of all age classes require access to shallow water (slightly less than the height of the carapace) along with a land area. Temperatures in the upper 70's to low 80's are sufficient, and humidity should be fairly high. They will become active if they are rained upon. This species seems to prefer lower light levels, so they rarely if ever bask. Providing hiding spots is recommended.

Program Goals:

- Increase founder representation
- Increase number of holding institutions
- Determine temperature-determined sex parameters
- Resolve genetic issues

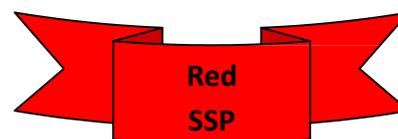
Program Contact:

Bill Hughes
SSP Coordinator & Studbook Keeper
Tennessee Aquarium
423.785.4126
bhh@tnaqua.org

ASIA SPECIES ACCOUNTS

Southern Vietnamese Flowerback Box Turtle

Cuora picturata



Species summary:

The Southern Vietnamese Flowerback Box Turtle, *Cuora picturata*, is a terrestrial geoemydid turtle found in forested uplands of Southern Vietnam. This species is extremely beautiful, making it an ideal species to represent Asian chelonians and the Asian Turtle crisis. This species was described from a market specimen in 1998, and wild populations were not identified until 2011. The current population size is 3.8.0.

Program purposes:

Cuora picturata is listed as CITES appendix II and as Critically Endangered by the IUCN Red List of Threatened Species™. The species inhabits woodland and evergreen forests at mid to high elevations within their range. In addition to habitat loss, the major threats to this species are the over-harvest for local consumption, as well as over collection for national and international food and pet trade.

Although once common in captive collections, this species is now in dire need of conservation action. Currently, a sustainable captive population of this species does not exist. This species needs to be managed for several reasons; first, to increase what is known about the natural history, reproductive biology and ecology of this species which is vital to conserving wild populations; second, to provide animals for exhibits and education programs to promote Asian turtle conservation; third, to produce individuals for potential for reintroduction into protected areas.

Exhibit qualities:

Turtles in the genus *Cuora* are semi-aquatic box turtles. Although, *Cuora picturata* is one of the most terrestrial species, exhibits need to be equipped with large, shallow water features for soaking. A forest floor habitat is the best exhibit design for demonstrating this species natural habitat.

Education qualities:

Cuora picturata is the perfect species to discuss the Asian turtle crisis, over harvesting of wildlife, and wildlife trafficking.

Interpretive messages:

- Deforestation
- Over-harvesting/poaching
- Cultural uses/beliefs
- Life history strategies
- Speciation
- Asian turtle crisis

Care and facilities:

Although *C. picturata* is not for beginners, most AZA facilities should be able to properly care for this species. Once acclimated, this species can be easily kept. To accommodate a group (4) of Indochinese box turtles a 4'x6' exhibit with a large water feature, deep soft substrate and several refugia are needed. Off exhibit holding should be available in case animals need to be separated. Often males can overly stress females and should be removed if oviposition is expected. Soft substrate should be offered as often eggs are broken during oviposition if hard surfaces or mulch are solely offered. May eat live plants, so non-toxic plants for ground cover can be used. Leaf litter should be used to form a humid hiding space as well as nesting material. This species typically lays one to three eggs in a shallow nest covered with leaf litter.

These large eggs, approximately 30 grams each, can frequently be seen on the surface of the enclosure partially buried. Females can double clutch.

The main diet consists of 80% greens (Kale, Collard greens, Dandelion greens, Romaine, Chicory, Bok Choy, ect...), with veggies (Carrot, Sweet potatoes, Zucchini, Squash, ect..) and 20% protein (Crickets, Earthworms, Mealworms, Bird of Prey Diet, Blackworms, Fish, Mice, ect...). Animals can also be offered Mazuri tortoise chow or a similar diet in a bowl *ad lib*. Reproductive females should be offered cuttlebone to augment calcium intake and prevent calcium deficiencies.

Program goals:

A sustainable captive population, potential reintroductions in the future, genetic and health evaluation, and to develop relationships and funding to support field work through an AZA dedicated fund. Even though this species is listed at critically endangered and CITES appendix II, individuals are still frequently encountered in Asian markets. Translating ex situ conservation into in situ conservation action is a primary goal of this program.

Program contact:

Lauren Augustine
Studbook Keeper and SSP Coordinator
National Zoological Park
(202) 633.3577
AugustineL@si.edu

ASIA SPECIES ACCOUNTS

Sulawesi Forest Turtle *Leucocephalon yuwonoi*



Photos by Rick Haeffner

Species Summary:

Sulawesi Forest Turtles are large, semiaquatic turtles that are found in densely vegetated rocky habitats. This turtle has been researched little in the wild, and good census data is lacking. It is rare in U.S. collections and has proven difficult to reproduce.

Program Purposes:

This turtle provides a food resource for local farmers and has been heavily collected for that purpose. They exist in very restricted areas, and in combination with low fecundity and a small endemic range, this species could be in serious decline. In 2000 IUCN Red List of Threatened Species™ designated them Critically Endangered. Unfortunately, little work on wild animals has been conducted, and population estimates are unreliable. Little is known of its wild biology. A self-sustaining captive population to act as an assurance population is the goal.

Exhibit Qualities:

This species is very secretive and nervous in captivity, so only large, heavily planted semi-aquatic exhibit habitats are recommended. Although untested, it seems likely that other turtle species could be housed with Sulawesi Forest Turtles. Arboreal lizards and amphibians could also work in a large exhibit.



Interpretive Messages:

- Endemism – small range
- Deforestation – severe impact in this country
- Human over collecting – for pet trade and human consumption

Care & Facilities:

Single animals can be adequately housed in spaces of 25 square feet, but due to aggression, multiple specimens require far larger areas. Pairs or trios should have exhibits or holding spaces that are at least 180 square feet with shallow pools approximately 40% of the total space. Males rarely tolerate other males and even females are aggressive with other females and sometimes males. Confining mixed sexed specimens in small spaces will result in biting and injuries. Small rodents, giant meal worms, salad mixes, and some fruit are all readily consumed. Plantings to provide hiding spots and soil to a depth of at least 12” are needed for egg laying and to reduce nervousness. Juveniles grow very quickly, so a commitment for adequate rearing containers is required.



Other Notes:

Only institutions that can devote adequate space to allow individuals to live together without aggression and those with adequate holding space for very fast growing juveniles should agree to participate in this SSP.

Program Goals:

- Increase number of participating institutions holding and breeding the species
- Data collection on behaviors, successful reproduction and juvenile rearing
- Increase U.S. population

Program Contact:

Rick Haeffner
Studbook Keeper and SSP Coordinator
Denver Zoo
Rhaeffner@denverzoo.org
720-337-1526

ASIA SPECIES ACCOUNTS



Three-striped Box Turtle

Cuora trifasciata



Species Summary:

The Chinese Three-striped Box Turtle, also known as the Golden Coin Turtle, inhabits areas of southern China including Guangdong, Hainan, Fujian, Guangxi, and Hong Kong. They can also be found in northern Vietnam and northern Laos.

This species has disappeared from much of its range due to over collection for the pet trade and its use in traditional Chinese medicine. The high demand for the Chinese Three-striped Box Turtle for medicinal purposes has brought this species close to extinction.

Cuora trifasciata have a uniquely hinged plastron that allows them to completely seal their shell after withdrawing their head and limbs inside, providing total protection when threatened by predators.

Program Purposes:

Cuora trifasciata is currently listed in CITES Appendix II and classified as Critically Endangered on the IUCN Red List of Threatened Species™. They are a semi-aquatic box turtle thought to be found in China, Laos, and Vietnam; however sightings in the field are rare. Most Asian box turtles have been collected from markets throughout Asian range countries.

Significant molecular phylogenetic analyses of this species complex have been completed using both mitochondrial and nuclear genes, however taxonomic uncertainty within the genus *Cuora* remains. There is evidence for introgression of genes of other *Cuora* species into *Cuora trifasciata*

At this time, this population is being managed by separate lineages, or clades, based on the work of Spinks et al. (2012) until additional genetic analyses aimed at understanding this potential introgression are completed. Populations of these clades of *C. trifasciata* also exist in European managed programs.

The current AZA population is 25.44.34 (current to 2014).

Exhibit Qualities:

The Chinese Three-striped Box Turtle is one of 13 species of *Cuora*. 12 of these species have been given status by the IUCN as critically endangered. The can be housed in mixed species exhibits.

A very attractive turtle species, the carapace is brown with three keels marked with black. Plastron is black with a yellow border. The underside of the marginal scutes are pinkish-orange in color. The underside of the legs and the leg sockets display the same bright pinkish-orange. The upper sides of the legs are brown to olive. The head is also olive in color, with a distinctive stripe from the nose to the side of the head.

The plastron is hinged, providing the turtle with the ability to protect its legs, head and tail by closing them inside the shell when disturbed.

Interpretive Messages:

- Critically Endangered
- Population decline due to exploitation in Asian markets for meat and medicinal purposes, plastron believe to possess cancer curing properties.
- Defensive mechanism: plastron hinged to provide protection of soft body parts.
- Semi-aquatic, terrestrial turtle.



Care and Facilities:

This species is semi-aquatic, spending roughly equal time in water and on land. They should be provided a large enclosure with enough water to allow for swimming, and deep enough for complete submersion, but not so deep that the animal is unable to reach the surface to breathe. They are omnivorous and eat vegetation, fruits, worms, insects, fish, frogs, etc.

Their temperature range is 68 - 82°F (20 - 28°C), and they require a basking spot of 85 - 95°F (29 - 35°C). They should be provided a substrate of soil mix or mulch, with ground cover in the form of plants, leaf litter, tree bark, etc. The substrate should be deep enough for animals to burrow.

Full spectrum lighting including UVB is beneficial to the species. Where location permits, a large outdoor enclosure would be beneficial, providing a natural temperature gradient and exposure to sunlight. These turtles can be maintained outdoors year round in subtropical climates with brief exposure to cold weather. During cold periods, this species will become dormant, awakening when warmer temperatures return.

Reproduction is more successful if the turtles are kept in outdoor enclosures where they can experience a dormant period during cold weather. With the return of warm temperatures, males will begin courtship of the females. The male will pursue and repeatedly bite at the female's head and neck. Eventually the male will mount the female, maintaining a grip on the female's neck. A single clutch may produce up to six eggs with two eggs laid at a time. The incubation period is 80 – 90 days.



Program Goals:

- Breed animals from same genetic clade/lineage as determined by Spinks et al (2012).
- Maintain breeding groups or pairs based on clade.
- Offspring of mixed lineages maintained as exhibit/display only.

Program Contact:

Jeff Dawson
SSP Coordinator and Studbook Keeper
Saint Louis Zoo
jdawson@stlzoo.org
314-646-4655

ASIA SPECIES ACCOUNTS

Vietnamese Pond Turtle

Mauremys annamensis



Species Summary:

Historically occurring in the lowland marshes, wetlands, swamps, slow moving waterways of the Annamese mountains in central Vietnam, *Mauremys annamensis* faces threats in its native range from habitat development, as well as being culturally desired as a food item. Habitat preservation and in-situ protection are also challenging for this medium-sized Asian freshwater turtle, but fortunately this species breeds well in captivity and is part of breeding programs in several countries, making an ex-situ population possible.

Program Purposes:

Mauremys annamensis was listed as Critically Endangered in 2000 by the IUCN Red List of Threatened Species™, as an Appendix II species by CITES in 2003, and has been categorized as a Yellow SSP by AZA. In the past few years, very few wild individuals have been found in Vietnam. Part of this decline is due to agricultural development of the fertile plains at the base of the Annamese mountains. Collection for the Asian food markets also impacts this species. A population of *M. annamensis* consisting of AZA- and Turtle Survival Alliance- held animals is maintained in the United States, and an unknown number of individuals are held in the private sector by breeders and hobbyists. A possible reintroduction program that would take place at the Turtle Conservation Center in Cuc Phuong National Park is in the early stages of discussion, although ensuring the availability of adequate resources required to make this effort a success faces many complexities.

Exhibit Qualities:

Often known to be a shy turtle species, *M. annamensis* generally does not exhibit well. However, some individuals can be responsive to feedings, or can be seen occasionally foraging or basking.

**Educational Qualities:**

Easily raised in a classroom setting, *M. annamensis* can be used in educational programs as an example of a Critically Endangered species and as a species impacted by habitat loss and over-harvesting. Captive *M. annamensis* also provide students with experience in animal husbandry of an aquatic turtle and can be used to demonstrate cultural differences in how wildlife is regarded.

Interpretive Messages:

- Imperiled species protection
- Landscape level ecological conservation
- Sustainable management practices
- Wildlife appreciation

Care and Facilities:

Adult and juvenile *M. annamensis* are omnivorous and will consume a great variety of food items, including invertebrates (earthworms, waxworms, mealworms), shrimp, fish, and pelleted or stick food. Fruits, vegetables and greens (especially romaine lettuce) are also readily accepted.

When natural sunlight is available, *M. annamensis* require bright sunlight, with some areas of full sun. Indoor enclosures are similar to those used for many aquatic turtles: a full spectrum bulb that produces heat is adequate; if the full spectrum bulb does not produce heat, then an additional basking light or radiant heat emitter is needed.

Ideal housing for *M. annamensis* is an outdoor enclosure with a water area that allows for full submersion. At least several appropriately sized, underwater hide spots should

be given and can be constructed of palm leaves, logs, plants, or any man-made structure. An available dry surface that is no smaller than 25% of the combined shell size of all individuals contained within the enclosure is also necessary, and adult females should have access to a nesting area. If a pond setting is not available, a wide range of enclosures can be used for adults including hoofstock watering troughs, small pools, or vats. Hatchlings can be kept in small trays inclined on a gentle slope that allows for easy access to a dry area where a full spectrum light and heat source can be placed. Older juveniles can be housed in glass aquaria, so long as adequate swimming and basking space is available.

Other Notes:

This species has been raised in captivity and cohabitates well with other turtle species. 1.1 *M. annamensis* can be bred in a 300 gallon Rubbermaid vat with a dry nesting site; clutches seem to average from 5-13 eggs, and females often lay multiple clutches per year. Eggs average 44 mm long by 26 mm wide. Average incubation time is between 100 to 140 days, depending on temperature when incubated at 80 to 82 degrees Fahrenheit.

Program Goals:

- Encourage institutional holdings and breeding
- Increase founder stock
- Increase awareness

Program Contact:

Adam G. Stern
Studbook Keeper and SSP Coordinator
Zoo Miami
305-251-0400
astern@miamidade.gov

ASIA SPECIES ACCOUNTS

Yellow-headed Temple Turtle *Heosemys annandalii*



Species Summary:

This is a large, aquatic turtle from Southeast Asia that gets its name from the ponds and canals around Buddhist temples where it is often found, along with the yellow markings that decorate its head. It is a communal species that does well with other aquatic turtle species in large aquatic exhibits.

Program Purposes:

Heosemys annandalii is listed in CITES Appendix II with a zero quota for wild specimens and as an endangered species in the IUCN Red List of Threatened Species™. Used for their meat and eggs, as traditional medicine, as pets, along with the continued fragmentation of habitat, the Yellow-headed Temple Turtle is facing many different factors negatively affecting this species' survivability in nature.

Historically ranging throughout Cambodia, Lao People's Democratic Republic, Vietnam, Thailand and Malaysia, it is now found only in fragmented sections with little protection being provided in the way of nature preserves and their presence in proximity with the Buddhist temples. Virtually non-existent in North American Collections until the early 2000's, one large confiscation boosted the population to a level that warranted management within the AZA community. Currently being bred by two AZA institutions, more institutions are needed to ensure the long term sustainability within North American collections. At this time, there are no known conservation projects targeting this species.

**Exhibit Qualities:**

Yellow-headed Temple Turtles are quite an interactive species that often will greet their keepers during feeding time. Being an herbivorous species, they co-habitat well with other aquatic chelonian species and have been used in southern climates to help keep aquatic vegetation low and to add interest in aquatic moats around exhibits, such as that of orangutans. Being a subtropical species, they do need adequate water temperatures of the mid 70's year round, but given that parameter can thrive and reproduce readily. With shell lengths of up to 60 cm (23.6 inches), this large turtle is sure to grab the attention of anyone lucky enough to view it.

Educational Qualities:

Heosemys annandalii allow for a great educational opportunity talking about the importance of animals in human culture. Temple turtles were thought to be nearly extinct until they were discovered in ponds surrounding Buddhist temples. Fed an unnatural diet and having no nesting areas, they were not set up for reproductive success. Native people would find the turtles in the wild and bring them to the temple ponds where they would release them. It was believed that this would bring them good luck.

Temple turtles also make impressive ambassadors for discussing the Asian turtle crisis and the impact it is having on turtle populations across the globe. With more than 2/3 of Asian turtles being classified as Threatened or Endangered, there is a great story to tell. As well, this particular species is believed to be very important in the maintenance of vegetative growth in the native waters in which it lives. Without herbivorous aquatic species of turtles, plant growth often gets out of control and can have a huge impact on the aquatic ecosystems.

Educational Messaging:

- Importance in native culture
- Asian Turtle Crisis
- Ecosystem maintenance

Care and Facilities:

Temple turtles are a sub-tropical species that require water temperature in the mid to upper 70's year round. They are an herbivorous species that will eat most any plant material that they are fed and thrive on a diet of mixed greens, sliced sweet potato and limited fruit. They will occasionally take in some protein matter in the form of fish or insects, but it should not be made a normal staple of their diet. They co-habitat well with other aquatic turtle species, birds, small mammals and primates.

Being one of the largest freshwater turtles at over 20" shell length, they can make an impressive addition to most aquatic turtle collections. That said, however, they do require a fairly large pool. They are a basking species and do spend quite a bit of time out of the water on basking beaches, partially submerged logs, or rocks.

Program Goals:

- Increase the number of institutions working with the species by 5
- Create smaller breeding groups of 3-4 turtles where genetics can be maintained
- Produce 20 genetically valuable hatchlings per year for the next 5 years

Program Contact:

Barry Downer
Studbook Keeper and SSP Coordinator
Oklahoma City Zoo
bdowner@okc zoo.com
(405) 425-0671

Appendix I. ChAG Program Summary

Common Name (Genus species)	Date Program Initiated	Date of Last PVA/ Breeding and Transfer Plan	Current Population Size (N)	Current Number of Participating AZA Member Institutions	SSP Program Designation	5 year Target Population Size	Space Needed (target population size - current space)	Recent 5 Year Population Trend (increasing, decreasing, or stable)	USFWS IUCN* CITES
Painted Terrapin <i>Batagur borneoensis</i>	Oct 2002	May 2013	23.33.23	13	Yellow	100	1	Increasing	CR App. II
Flowerback box turtle <i>Cuora galbinifrons</i>	Apr 2011	February 2015	21.30.16	10	Red	90	23	Stable	CR App. II
Burmese Black Tortoise <i>Manouria emys phayrei</i>	Apr 1993	July 2012	20.31.27	17	Yellow	90	12	Increasing	E App. II
Brown Forest Tortoise <i>Manouria emys emys</i>	Apr 1993	June 2012	29.48.43	27	Yellow	90	30	Increasing	E App. II
Burmese Star Tortoise <i>Geochelone platynota</i>	Oct 2002	NA	41.26.35	9	Yellow	150	48	Stable	CR App. I
Egyptian Tortoise <i>Testudo kleinmanni</i>	Feb 1997	March 2014	40.66.21	18	Yellow	140	13	Increasing	Under Review CR App. I
Flat-tailed Tortoise <i>Pyxis planicauda</i>	May 2002	Oct 2013	30.25.27	12	Yellow	150	68	Stable	Under Review CR App. I
Arakan Forest Turtle <i>Heosemys depressa</i>	Apr 2011	June 2014	13.15.17	7	Yellow	100	55	Increasing	CR App. II
Forsten's Tortoise <i>Indotestudo forsteni</i>	Oct 2002	June 2013	33.43.19	10	Yellow	200	105	Increasing	CR App. II

* Due to delays in publishing IUCN Species Specialist Group Recommendations we have included those published by the Tortoise and Freshwater Turtle Specialist Group (TFTSG) and used those recommendations as our reference point in determining IUCN status, at this link: http://www.iucn-tftsg.org/wp-content/uploads/file/Accounts/crm_5_000_checklist_v7_2014.pdf

Common Name (<i>Genus species</i>)	Date Program Initiated	Date of Last PVA/ Breeding and Transfer Plan	Current Population Size (N)	Current Number of Participating AZA Member Institutions	SSP Program Designation	5 year Target Population Size	Space Needed (target population size - current space)	Recent 5 Year Population Trend (increasing, decreasing, or stable)	USFWS IUCN* CITES
Bog Turtle <i>Glyptemys muhlenbergii</i>	Apr 2011	NA	10.11.8	13	Red	100	71	Stable	Threatened CR App. I
Impressed Tortoise <i>Manouria impressa</i>	May 2011	NA	20.29.36	15	Yellow	90	5	Stable	E App. II
Common Spider Tortoise <i>Pyxis a. arachnoides</i>	May 2002	October 2013	44.33.77	25	Yellow	200	56	Increasing	Under Review CR App. I
Northern Spider Tortoise <i>Pyxis a. brygooi</i>	May 2002	October 2013	23.19.64	8	Yellow	150	44	Increasing	Under Review CR App. I
Southern Spider Tortoise <i>Pyxis a. oblonga</i>	May 2002	October 2013	10.7.13	5	Red	100	70	Decreasing	Under Review CR App. I
Pancake Tortoise <i>Malacochersus tornieri</i>	Jan 1992	June 2014	127.120.122	88	Yellow	450	81	Increasing	CR App. II
Ploughshare Tortoise <i>Astrochelys yniphora</i>	Nov 2011	NA	1.3.27	4	Red	100	69	Increasing	Endangered CR App. I
Roti Island Snake-neck Turtle <i>Chelodina mccordi</i>	Dec 2002	April 2012	20.23.53	20	Yellow	100	4	Stable	CR App. II
Spiny Turtle <i>Heosemys spinosa</i>	Apr 2011	June 2014	16.16.32	12	Yellow	100	36	Increasing	E App. II
Spotted Turtle <i>Clemmys guttata</i>	Jan 2012	NA	53.85.168	64	Yellow	350	44	Stable	E App. II

Common Name (<i>Genus species</i>)	Date Program Initiated	Date of Last PVA/ Breeding and Transfer Plan	Current Population Size (N)	Current Number of Participating AZA Member Institutions	SSP Program Designation	5 year Target Population Size	Space Needed (target population size - current space)	Recent 5 Year Population Trend (increasing, decreasing, or stable)	USFWS IUCN* CITES
Sulawesi Forest Turtle <i>Leucocephalon yuwonoi</i>	May 2013	NA	14.23.26	9	Yellow	100	37	Increasing	CR App. II
Yellow-headed Temple Turtle <i>Heosemys annandalii</i>	Jan 2012	NA	17.20.70	7	Yellow	150	46	Stable	E App. II
Wood Turtle <i>Glyptemys insculpta</i>	Apr 2011	NA	22.31.20	38	Yellow	100	27	Stable	Under Review E App. II
Yellow- blotched Map Turtle <i>Graptemys flavimaculata</i>	Apr 2011	1 June 2015	14.47.25	11	Yellow	100	13	Increasing	Threatened E App. III
Forest Hinge-back Tortoise <i>Kinixys erosa</i>	Apr 2014	NA	4.7.4	6	Candidate	100	85	Stable	CR App. II
Home's Hinge-back Tortoise <i>Kinixys homeana</i>	Apr 2014	NA	13.9.7	12	Candidate	100	72	Increasing	CR App. II
Radiated Tortoise <i>Astrochelys radiata</i>	Dec 1985	March 2013	125.126.117	58	Green	500	132	Stable	Endangered CR App. I
Black-breasted leaf Turtle <i>Geoemyda spengleri</i>	May 1993	Sept 2015	43.71.22	22	Green	175	39	Increasing	E App. II
Chinese 3-striped Box Turtle <i>Cuora trifasciata</i>	Dec 2000	May 2013	25.44.34	16	Yellow	130	27	Stable	CR App. II

Common Name (Genus species)	Date Program Initiated	Date of Last PVA/ Breeding and Transfer Plan	Current Population Size (N)	Current Number of Participating AZA Member Institutions	SSP Program Designation	5 year Target Population Size	Space Needed (target population size - current space)	Recent 5 Year Population Trend (increasing, decreasing, or stable)	USFWS IUCN* CITES
Pan's Box Turtle <i>Cuora pani</i>	Sept 2006	1 July 2014	11.16.47	11	Yellow	100	26	Increasing	CR App II
Coahuilan Box Turtle <i>Terrapene coahuila</i>	Oct 2002	Oct 2015	18.30.18	12	Yellow	75	9	Stable	CR App. I
Keeled Box Turtle <i>Cuora mouhotii</i>	May 2013	NA	4.6.7	6	Red	50	33	Stable	CR App. II
Northern Western Pond Turtle <i>Emys marmorata</i>	Apr 2011	Dec 2015	35.22.135	12	Yellow	175	27	Stable	VU App. II
Southern Western Pond Turtle <i>Emys pallida</i>	Apr 2011	Dec 2015	11.5.30	5	Yellow	100	54	Stable	VU App. II
Vietnamese Pond Turtle <i>Mauremys annamensis</i>	Dec 2013	Draft Jan 2016	15.25.30	12	Yellow	100	30	Stable	CR App II
McCord's Box Turtle <i>Cuora mccordi</i>	Dec 2000	May 2013	15.23.48	9	Yellow	150	64	Increasing	CR App. II
Volcan Wolf Galapagos Tortoise <i>Chelonoidis nigra becki</i>	Oct 2002	Draft Feb 2016	3.3.2	3	Candidate	50	42	Stable	Endangered V App. I
Volcan Darwin Galapagos Tortoise <i>Chelonoidis n. microphyes.</i>	Oct 2002	Draft Feb 2016	6.8.47	13	Yellow	80	19	Increasing	Endangered V App. I
Santa Cruz Galapagos Tortoise <i>Chelonoidis n. nigrita</i>	Oct 2002	Draft Feb 2016	9.13.5	13	Red	50	23	Increasing	Endangered V App. I

Common Name (<i>Genus species</i>)	Date Program Initiated	Date of Last PVA/ Breeding and Transfer Plan	Current Population Size (N)	Current Number of Participating AZA Member Institutions	SSP Program Designation	5 year Target Population Size	Space Needed (target population size - current space)	Recent 5 Year Population Trend (increasing, decreasing, or stable)	USFWS IUCN* CITES
Volcan Alcedo Galapagos Tortoise <i>Chelonoidis n. vandenburghi</i>	Oct 2002	Draft Feb 2016	7.4.1	8	Red	50	38	Stable	Endangered V App. I
Albermarle Island Galapagos Tortoise <i>Chelonoidis n. vicina</i>	Oct 2002	Draft Feb 2016	4.2.0	3	Red	50	44	Stable	Endangered V App. I
Ringed Map Turtle <i>Graptemys oculifera</i>	Apr 2011	NA	16.6.2	5	Red	100	76	Decreasing	Threatened EN App. III
Indochinese box turtle <i>Cuora bourreti</i>	Apr 2011	NA	12.13.0	2	Red	90	65	Decreasing	CR App. II
Southern Vietnamese flowerback box turtle <i>Cuora picturata</i>	Apr 2011	NA	3.8.0	1	Red	90	79	Decreasing	CR App. II
Malaysian Giant Turtle <i>Orlitia borneensis</i>	Apr 2011	NA	16.22.45	13	Candidate	80	+3	Stable	E App. II
Ringed Map Turtle <i>Graptemys oculifera</i>	Apr 2011	NA	16.6.2	5	Red	100	76	Decreasing	Threatened EN App. III
River Terrapin <i>Batagur affinis</i>	Oct 2002	NA	10.5.38	5	Red	80	27	Decreasing	CR App. II
Four-eyed Turtle <i>Sacalia quadriocellata</i>	Apr 2011	June 2014	15.10.16	7	Yellow	100	59	Increasing	E App. II

Appendix II. ChAG Animal Program Summary Roles, Goals, and Essential Actions Table

<p>English Name / Taxon Program Designation Primary Role</p>	<p>Painted Terrapin (<i>Batagur borneoensis</i>) Yellow SSP Education/Exhibit Needs</p>
<p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Increase offspring production from potential founders. Increase institutional space for rearing of juvenile groups. Identify and resolve skin issues seen in zoo population</p>
<p>English Name / Taxon Program Designation Primary Role</p>	<p>Bog Turtle (<i>Glyptemys muhlenbergii</i>) Red SSP Conservation Action</p>
<p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Population planning. Increase breeding at more institutions. Increase institutional interest in housing these turtles outdoors as a means to increase breeding success.</p>
<p>English Name / Taxon Program Designation Primary Role</p>	<p>Burmese Black Tortoise (<i>Manoria emys phayrei</i>) Yellow SSP Assurance Population</p>
<p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Better participation in the submission of records and activities. Improve pairings at institutions for breeding. Initiate husbandry guidelines. Start field component to program..</p>
<p>English Name / Taxon Program Designation Primary Role</p>	<p>Brown Forest Tortoise (<i>Manouria emys emys</i>) Yellow SSP Assurance Population</p>
<p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Better participation in submission of records and activities. Improve pairings in institutions for breeding. Increase holding at AZA institutions.</p>
<p>English Name / Taxon Program Designation Primary Role</p>	<p>Burmese Star Tortoise (<i>Geochelone platynota</i>) Yellow SSP Conservation Action</p>
<p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Population planning. Improve reproduction at AZA facilities. Identify and resolve skin issues seen in zoo population</p>
<p>English Name / Taxon Program Designation Primary Role</p>	<p>Flat-tailed Tortoise (<i>Pyxis planicauda</i>) Yellow SSP Assurance Population</p>
<p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Improve breeding. Determine incubation parameters for Temperature-dependent sex determination. Increase interest among AZA institutions.</p>
<p>English Name / Taxon Program Designation Primary Role</p>	<p>Forsten's Tortoise (<i>Indotestudo forstenii</i>) Yellow SSP Assurance Population</p>
<p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Better participation in the submission of records and activities. Increase breeding at more institutions. Increase institutional interest in house these turtles outdoors as a means to increase breeding success.</p>

<p>English Name / Taxon Program Designation Primary Role</p>	<p>Egyptian Tortoise (<i>Testudo kleimanni</i>) Yellow SSP Assurance Population</p>
<p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Increase breeding of non-represented founders. Bring in unrelated founders. Maintain genetic diversity at >90% for 100 years.</p>
<p>English Name / Taxon Program Designation Primary Role</p>	<p>Yellow-headed Temple Turtle (<i>Heosemys annandalii</i>) Yellow SSP Assurance Population</p>
<p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Find more space and interest within AZA institutions. Determine if program is viable. Pull Turtle Survival Alliance from South Florida and set up managed breeding groups in AZA.</p>
<p>English Name / Taxon Program Designation Primary Role</p>	<p>Impressed Tortoise (<i>Manouria impressa</i>) Yellow SSP Assurance Population</p>
<p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Publish studbook by end of year. Produce husbandry guidelines. Increase private participation in studbook.</p>
<p>English Name / Taxon Program Designation Primary Role</p>	<p>Common Spider Tortoise (<i>Pyxis arachnoides arachnoides</i>) Yellow SSP Assurance Population</p>
<p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Recruit additional founders. Find additional holding institutions. Import potential founders.</p>
<p>English Name / Taxon Program Designation Primary Role</p>	<p>Northern Spider Tortoise (<i>Pyxis arachnoides brygooi</i>) Yellow SSP Assurance Population</p>
<p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Recruit additional founders. Find additional holding institutions. Import potential founders when possible.</p>
<p>English Name / Taxon Program Designation Primary Role</p>	<p>Southern Spider Tortoise (<i>Pyxis arachnoides oblonga</i>) Red SSP Assurance Population</p>
<p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Recruit additional founders. Improve breeding success. Import potential founders when possible.</p>
<p>English Name / Taxon Program Designation Primary Role</p>	<p>Pancake Tortoise (<i>Malacochersus tornieri</i>) Yellow SSP Assurance Population</p>
<p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Complete the 2014 breeding transfer plans. Confirm sexes on non-sexed individuals report to the SSP coordinator for size-appropriate tortoises (24 months of age or more). Continue to facilitate placement of confiscated pancake tortoises and ensure they are managed through the SSP.</p>

<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Ploughshare Tortoise (<i>Astrochelys yniphora</i>) Red SSP Conservation Action</p> <p>Create breeding and transfer plan with PMC. Create species sustainability report. Get Studbook Participation Guidelines approved by the Chelonian TAG and WCMC.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Radiated Tortoise (<i>Astrochelys radiata</i>) Green SSP Conservation Action</p> <p>Breed other potential founders. Work with AZA lemur SSPs to increase multi-species exhibits and holding. Establish guidelines for rearing non-pyramided offspring.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Pan's Box Turtle (<i>Cuora pani</i>) Yellow SSP Conservation Action</p> <p>Publish studbook. Find additional AZA holding facilities. Determine parameters for year-round outdoor rearing.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Indochinese Box Turtle (<i>Cuora bourreti</i>) Red SSP Conservation Action</p> <p>Recruit new founders. Increase offspring production from potential founders. Genetic and health analysis of SSP population.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>McCord's Box Turtle (<i>Cuora mccordi</i>) Yellow SSP Conservation Action</p> <p>Create one on one breeding pairs to better determine parentage. Develop method to genetically determine parentage with MULT offspring. Increase number of institutions working with this species.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Keeled Box Turtle (<i>Cuora mouhotii</i>) Red SSP Assurance Population</p> <p>Recruit more founders into population. Increase interest in AZA institutions. Increase reproductive success.</p>

<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Malaysian Giant Turtle (<i>Orlitia borneensis</i>) Candidate SSP Assurance Population</p> <p>Develop studbook. Find additional holding institutions. Divide up group at Zoo Miami for better tracking.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Blanding's Turtle (<i>Emydoidea blandingii</i>) Candidate SSP Education/Education Needs</p> <p>Designate Program Leader. Publish Studbook. Create Breeding and Transfer Plan with PMC.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Northern Western Pond Turtle (<i>Emys marmorata</i>) Yellow SSP Conservation Action</p> <p>Get a better idea of population in AZA and related institutions. Collaborate on SAFE program. Increase number of potential holding or exhibit facilities in AZA.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Southern Western Pond Turtle (<i>Emys pallida</i>) Yellow SSP Conservation Action</p> <p>Get a better idea of population in AZA and related institutions. Collaborate on SAFE program. Increase number of potential holding or exhibit facilities in AZA.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Spiny Turtle (<i>Heosemys spinosa</i>) Yellow SSP Assurance Population</p> <p>Increase number of participating institutions. Additional genetic testing to determine clades. Determine reasons for inconsistent reproduction.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Spotted Turtle (<i>Clemmys guttata</i>) Yellow SSP Education/Exhibit needs</p> <p>Population planning. Survey institutions to better determine space available. Increase number of potential holding facilities in AZA.</p>

<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Sulawesi Forest Turtle (<i>Leucocephalon yuwonoi</i>) Yellow SSP Assurance Population</p> <p>Increase reproduction. Increase participating institutions. Work out husbandry and reproductive parameters.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Roti Island Snake-neck Turtle (<i>Chelodina mccordi</i>) Yellow SSP Conservation Action</p> <p>Resolve group genetic issues. Produce new studbook. Work with lab in Germany to better understand subspecies.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Ringed Map Turtle (<i>Graptemys oculifera</i>) Yellow SSP Education/Exhibit Needs</p> <p>Hatch anything. Grow population. Resolve unknown parentage issues.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Yellow-blotched Map Turtle (<i>Graptemys flavimaculata</i>) Yellow SSP Education/Exhibit Needs</p> <p>Publish breeding and transfer plan June 2015. Resolve unknown parentage issues. Increase institutions breeding this species.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Wood Turtle (<i>Glyptemys insculpta</i>) Yellow SSP Education/Exhibit Needs</p> <p>Identify pedigrees in studbook. Resolve unknown parentage issues. Increase institutions breeding this species.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Vietnamese Pond Turtle (<i>Mauremys annamensis</i>) Yellow SSP Conservation Action</p> <p>Develop breeding and transfer plan. Locate additional potential founders. Increase AZA and private participation in the studbook.</p>

English Name / Taxon Program Designation Primary Role Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action	Forest Hinge-back Tortoise (<i>Kinixys erosa</i>) Candidate SSP Assurance Population Develop studbook. Locate additional potential founders. Increase AZA holding institutions.
English Name / Taxon Program Designation Primary Role Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action	Home's Hinge-back Tortoise (<i>Kinixys homeana</i>) Candidate SSP Assurance Population Develop studbook. Locate additional potential founders. Increase AZA holding institutions.
English Name / Taxon Program Designation Primary Role Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action	Volcan Wolf Galapagos Tortoise (<i>Chelonoides nigra becki</i>) Candidate SSP Education/Exhibit Needs Create SSP masterplan. Implement breeding transfers between AZA facilities. Increase breeding among potential founders and founders.
English Name / Taxon Program Designation Primary Role Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action	Volcan Darwin Galapagos Tortoise (<i>Chelonoides nigra microphyes</i>) Yellow SSP Education/Exhibit Needs Create SSP masterplan. Implement breeding transfers between AZA facilities. Increase breeding among potential founders and founders.
English Name / Taxon Program Designation Primary Role Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action	Giant Galapagos Tortoise (<i>Chelonoides nigra nigrita</i>) Red SSP Education/Exhibit Needs Create SSP masterplan. Implement breeding transfers between AZA facilities. Increase breeding among potential founders and founders.
English Name / Taxon Program Designation Primary Role Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action	Volcan Alcedo Galapagos Tortoise (<i>Chelonoides nigra vandenburghi</i>) Red SSP Education/Exhibit Needs Create SSP masterplan. Implement breeding transfers between AZA facilities. Increase breeding among potential founders and founders.

<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Iguana Cove Galapagos Tortoise (<i>Chelonoides nigra vicina</i>) Red SSP Education/Exhibit Needs</p> <p>Create SSP masterplan. Implement breeding transfers between AZA facilities. Increase breeding among potential founders and founders.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Cagle's Map Turtle (<i>Graptemys caglei</i>) Candidate - Phase In Assurance Population</p> <p>Designate Program Leader. Work with Texas Parks & Wildlife Department on collecting turtles. Expand captive assurance and determine husbandry parameters.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Chinese Three-striped Box Turtle (<i>Cuora trifasciata</i>) Yellow SSP Assurance Population</p> <p>Clarify systematics. Increase breeding once systematics has been clarified. Increase number of institutions working with this species.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Coahuilan Turtle (<i>Terrapene coahuilae</i>) Yellow SSP Assurance Population</p> <p>Clarify systematics. Increase breeding once systematics has been clarified. Increase number of institutions working with this species.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Pascagoula River Map Turtle (<i>Graptemys gibbonsi</i>) Candidate – Phase In Assurance Population</p> <p>Designate Program Leader. Work with Mississippi Department of Wildlife on collecting turtles. Increase number of institutions working with this species.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Beal's Four-eyed Turtle (<i>Sacalia bealei</i>) Candidate SSP Assurance Population</p> <p>Designate Program Leader. Publish Studbook. Create Breeding and Transfer Plan with PMC.</p>

<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Four-eyed turtle (<i>Sacalia quadriocellata</i>) Yellow SSP Assurance Population</p> <p>Determine temperature-dependent sex determination parameters. Increase number of holding institutions. Locate more potential founders for population.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Arakan Forest Turtle (<i>Heosemys depressa</i>) Yellow SSP Assurance Population</p> <p>Increase founder representation. Increase number of holding institutions. Increase partnership with private sector.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Black-breasted Leaf Turtle (<i>Geoemyda spengleri</i>) Green SSP Assurance Population</p> <p>Produce more F2s. Produce more males. Send males to institutions with only one male or no males.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Southern Vietnamese Flowerback Box Turtle (<i>Cuora picturata</i>) Red SSP Assurance Population</p> <p>Recruit new founders. Increase offspring production. Genetic and health analysis.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Flowerback Box Turtle (<i>Cuora galbinifrons</i>) Red SSP Assurance Population</p> <p>Recruit new founders. Increase offspring production. Genetic and health analysis.</p>
<p>English Name / Taxon Program Designation Primary Role</p> <p>Goal #1 / Essential Action Goal #2 / Essential Action Goal #3 / Essential Action</p>	<p>Pearl River Map Turtle (<i>Graptemys pearlensis</i>) Candidate – Phase In Assurance Population</p> <p>Designate Program Leader. Work with Mississippi Department of Wildlife on collecting turtles. Increase number of institutions working with this species.</p>

Appendix III. Management Update Table

Common and Scientific Name	Date Animal Program Initiated	Previous RCP Designation	Current RCP Designation	SSP Coordinator/Studbook Keeper/Candidate Program Leader
<i>Astrochelys radiata</i> (Radiated tortoise)	Dec 1985	SSP	Green SSP	Michael Ogle, SSP Coordinator, Zoo Knoxville mogle@zooknoxville.org 865-637-5331 x 1201 Stephen Nelson, Studbook Keeper, Zoo Knoxville snelson@zooknoxville.org 865-637-5331 x 1206
<i>Astrochelys yniphora</i> (Ploughshare tortoise)	Nov 2011	N/A	Red SSP	Paul Gibbons, Studbook Keeper and SSP Coordinator Turtle Conservancy paul@turtleconservancy.org 212-353-5060 x 17
<i>Batagur affinis</i> (Southern River Terrapin)	Oct 2002	PMP	TAG Monitored	
<i>Batagur borneoensis</i> (Painted terrapin)	Oct 2002	PMP	Yellow SSP	Jeff Bocek, Studbook Keeper and SSP Coordinator Brookfield Zoo Jeff.bocek@czs.org 847-212-6596
<i>Chelodina mccordi</i> (Roti Island snake-necked turtle)	Dec 2002	PMP	Yellow SSP	Avishai Shuter, Studbook Keeper and SSP Coordinator WCS Bronx Zoo Ashuter@wcs.org 718-220-5042
<i>Chelonoidis n. becki</i> (Volcan Wolf giant tortoise)	Oct 2002	PMP	Candidate	Edward Louis, Studbook Keeper and SSP Coordinator Omaha's Henry Doorly Zoo edlo@omahazoo.com
<i>Chelonoidis n. microphyes</i> (Volcan Darwin giant tortoise)	Oct 2002	PMP	Yellow SSP	Edward Louis, Studbook Keeper and SSP Coordinator Omaha's Henry Doorly Zoo edlo@omahazoo.com
<i>Chelonoidis n. nigrita</i> (Santa Cruz giant tortoise)	Oct 2002	PMP	Red SSP	Edward Louis, Studbook Keeper and SSP Coordinator Omaha's Henry Doorly Zoo edlo@omahazoo.com
<i>Chelonoidis n. vandenburghi</i> (Volcan Alcedo giant tortoise)	Oct 2002	PMP	Red SSP	Edward Louis, Studbook Keeper and SSP Coordinator Omaha's Henry Doorly Zoo edlo@omahazoo.com
<i>Chelonoidis n. vicina</i> (Cerro Azul giant tortoise)	Oct 2002	PMP	Red SSP	Edward Louis, Studbook Keeper and SSP Coordinator Omaha's Henry Doorly Zoo edlo@omahazoo.com
<i>Clemmys guttata</i> (Spotted turtle)	Jan 2012	N/A	Yellow SSP	Rich Rosevear, Studbook Keeper and SSP Coordinator LeHigh Valley Zoo rosevear@lvzoo.org 610-799-4171 x 230
<i>Cuora bourretii</i> (Bourret's box turtle)	Apr 2011	N/A	Red SSP	Lauren Augustine, Studbook Keeper and SSP Coordinator National Zoological Park AugustineL@si.edu 202-633-3577

Common and Scientific Name	Date Animal Program Initiated	Previous RCP Designation	Current RCP Designation	SSP Coordinator/Studbook Keeper/Candidate Program Leader
<i>Cuora galbinifrons</i> (Flowerback box turtle)	Apr 2011	Red SSP	Red SSP	Lauren Augustine, Studbook Keeper and SSP Coordinator National Zoological Park AugustineL@si.edu 202-633-3577
<i>Cuora mccordi</i> (McCord's box turtle)	Dec 2000	PMP	Yellow SSP	Jeff Jundt, Studbook Keeper and SSP Coordinator Detroit Zoo jjundt@dzs.org , 248-336-5859
<i>Cuora mouhotii</i> (Keel'd box turtle)	May 2013	N/A	Red SSP	Bill Hughes, Studbook Keeper and SSP Coordinator Tennessee Aquarium bhh@tnaqua.org 423.785.4126
<i>Cuora pani</i> (Pan's box turtle)	Sept 2006	PMP	Yellow SSP	Kathy Vause, Studbook Keeper and SSP Coordinator Riverbanks Zoo and Garden kvause@riverbanks.org 803-602-0785
<i>Cuora picturata</i> (Southern Flowerback Box Turtle)	Apr 2011	N/A	Red SSP	Lauren Augustine, Studbook Keeper and SSP Coordinator National Zoological Park AugustineL@si.edu 202-633-3577
<i>Cuora trifasciata</i> (Three-striped box turtle)	Dec 200	PMP	Yellow SSP	Jeff Dawson, Studbook Keeper and SSP Coordinator Saint Louis Zoo jdawson@stlzoo.org 314-646-4655
<i>Dermatemys mawii</i> (Central American river turtle)	Oct 2011	N/A	TAG Monitored	
<i>Emydoidea blandingii</i> (Blanding's turtle)	Jun 2016	N/A	Candidate	Vacant (New Program)
<i>Emys marmorata</i> (Western pond turtle)	Apr 2011	N/A	Yellow SSP	Jessie Bushell Studbook Keeper and SSP Coordinator San Francisco Zoo and Gardens jessieb@sfzoo.org 415.753.7080 x7079
<i>Emys pallida</i> (Southwestern pond turtle)	Apr 2011	N/A	Yellow SSP	Jessie Bushell Studbook Keeper and SSP Coordinator San Francisco Zoo and Gardens jessieb@sfzoo.org 415.753.7080 x7079
<i>Geochelone platynota</i> (Burmese Star Tortoise)	Oct 2002	PMP	Yellow SSP	Thomas Owens, Studbook Keeper and SSP Coordinator San Diego Zoo Global TOwens@SanDiegoZoo.org (619) 557-3987
<i>Geoemyda spengleri</i> (Black-breasted Leaf Turtle)	May 1993	PMP	Green SSP	Rick Haeffner, Studbook Keeper and SSP Coordinator Denver Zoo Rhaeffner@denverzoo.org 720-337-1526

Common and Scientific Name	Date Animal Program Initiated	Previous RCP Designation	Current RCP Designation	SSP Coordinator/Studbook Keeper/Candidate Program Leader
<i>Glyptemys insculpta</i> (Wood turtle)	Apr 2011	PMP	Yellow SSP	Megan Baumer, Studbook Keeper and SSP Coordinator Fort Worth Zoo mbaumer@fortworthzoo.org 817-759-7555
<i>Glyptemys muhlenbergii</i> (Bog turtle)	Apr 2011	PMP	Red SSP	Michael Ogle, Studbook Keeper and SSP Coordinator Zoo Knoxville mogle@zooknoxville.org 865-637-5331 x 1201
<i>Graptemys caglei</i> (Cagle's map turtle)	Dec 2015	N/A	Candidate	Vacant (New Program)
<i>Graptemys flavimaculata</i> (Yellow-blotched map turtle)	Apr 2011	PMP	Yellow SSP	Sara Plesuk Studbook Keeper and SSP Coordinator Omaha's Henry Doorly Zoo reptiles@omahazoo.com
<i>Graptemys gibbonsi</i> (Pascagacoula map turtle)	Jun 2016	N/A	Candidate	Vacant (New Program)
<i>Graptemys oculifera</i> (Ringed map turtle)	Apr 2011	N/A	Red SSP	Sara Plesuk Studbook Keeper and SSP Coordinator Omaha's Henry Doorly Zoo reptiles@omahazoo.com
<i>Graptemys pearlensis</i> (Pearl river map turtle)	Jun 2016	N/A	Candidate	Vacant (New Program)
<i>Heosemys annandalii</i> (Yellow-headed temple turtle)	Jan 2012	N/A	Yellow SSP	Barry Downer Studbook keeper and SSP Coordinator Oklahoma City Zoo bdowner@okczoo.com (405) 425-0671
<i>Heosemys depressa</i> (Arakan forest turtle)	Apr 2011	PMP	Yellow SSP	Bill Hughes, Studbook Keeper and SSP Coordinator Tennessee Aquarium bhh@tnaqua.org 423.785.4126
<i>Heosemys spinosa</i> (Spiny hill turtle)	Apr 2011	PMP	Yellow SSP	Bill Hughes, Studbook Keeper and SSP Coordinator Tennessee Aquarium bhh@tnaqua.org 423.785.4126
<i>Indotestudo forsteni</i> (Forsten's tortoise)	Oct 2002	PMP	Yellow SSP	Christine Light, Studbook Keeper and SSP Coordinator Scubagirl2001@hotmail.com
<i>Kinixys erosa</i> (Serrated hinge-back tortoise)	Apr 2014	N/A	Candidate	Brenda Gunder, Studbook Keeper Rolling Hills Zoo Brenda@rollinghillszoo.org 785-827-9488 x 143

Common and Scientific Name	Date Animal Program Initiated	Previous RCP Designation	Current RCP Designation	SSP Coordinator/Studbook Keeper/Candidate Program Leader
<i>Kinixys homeana</i> (Home's hinge-back tortoise)	Apr 2014	N/A	Candidate	Kim Boyer, Studbook Keeper Audubon Zoo kinixysh@gmail.com 504-212-5343
<i>Leucocephalon yuwonoi</i> (Sulawesi forest turtle)	May 2013	N/A	Yellow SSP	Rick Haeffner, Studbook Keeper and SSP Coordinator Denver Zoo Rhaeffner@denverzoo.org 720-337-1526
<i>Malacochersus tornieri</i> (Pancake tortoise)	Jan 1992	PMP	Yellow SSP	Andy Daneault, Studbook Keeper and SSP Coordinator Disney's Animal Kingdom andre.j.daneault@disney.com 407-938-2368
<i>Manouria emys emys</i> (Burmese mountain tortoise)	Apr 1993	PMP	Yellow SSP	Craig Pelke, Studbook Keeper and SSP Coordinator San Antonio Zoo cpelke@sazoo.org 210-734-7184 x 1340
<i>Manouria emys phayrei</i> (Burmese brown tortoise)	Apr 1993	PMP	Yellow SSP	Craig Pelke, Studbook Keeper and SSP Coordinator San Antonio Zoo cpelke@sazoo.org 210-734-7184 x 1340
<i>Manouria impressa</i> (Impressed tortoise)	May 2011	PMP	Yellow SSP	Robert Hill, Studbook Keeper and SSP Coordinator Zoo Atlanta rhill@zooatlanta.org 404-624-5619
<i>Mauremys annamensis</i> (Vietnamese pond turtle)	Dec 2013	N/A	Yellow SSP	Adam Stern, Studbook Keeper and SSP Coordinator Zoo Miami astern@miamidade.gov 305-251-0400
<i>Orlitia borneensis</i> (Bornean river turtle)	Apr 2011	N/A	Candidate	Lauren Cashman, Studbook Keeper St. Augustine Alligator Farm LaurenC@alligatorfarm.com 904-824-3337 x 15
<i>Pyxis arachnoides arachnoides</i> (Common Spider Tortoise)	May 2002	PMP	Yellow SSP	Michael Ogle Studbook Keeper and SSP Coordinator Zoo Knoxville mogle@zooknoxville.org 865-637-5331 x 1201
<i>Pyxis arachnoides brygooi</i> (Northern Spider Tortoise)	May 2002	PMP	Yellow SSP	Michael Ogle Studbook Keeper and SSP Coordinator Zoo Knoxville mogle@zooknoxville.org 865-637-5331 x 1201
<i>Pyxis arachnoides oblonga</i> (Southern Spider Tortoise)	May 2002	PMP	Yellow SSP	Michael Ogle Studbook Keeper and SSP Coordinator Zoo Knoxville mogle@zooknoxville.org 865-637-5331 x 1201

Common and Scientific Name	Date Animal Program Initiated	Previous RCP Designation	Current RCP Designation	SSP Coordinator/Studbook Keeper/Candidate Program Leader
<i>Pyxis planicauda</i> (Madagascar flat-tailed tortoise)	May 2002	PMP	Yellow SSP	Michael Ogle Studbook Keeper and SSP Coordinator Zoo Knoxville mogle@zooknoxville.org 865-637-5331 x 1201
<i>Sacalia bealei</i> (Beal's four-eyed turtle)	Jun 2016	N/A	Candidate	Vacant (New Program)
<i>Sacalia quadriocellata</i> (Four-eyed turtle)	Apr 2011	N/A	Yellow SSP	Bill Hughes, Studbook Keeper and SSP Coordinator Tennessee Aquarium bhh@tnaqua.org 423.785.4126
<i>Terrapene coahuila</i> (Coahuila box turtle)	Oct 2002	PMP	Yellow SSP	Trent Barnhart, Studbook Keeper and SSP Coordinator Santa Barbara Zoo tbarnhart@sbzoo.org 805-962-5339 x 178
<i>Terrapene c. mexicana</i> (Mexican Box Turtle)	Apr 2011	N/A	TAG Monitored	
<i>Testudo kleinmanni</i> (Egyptian tortoise)	Feb 1997	PMP	Yellow SSP	Barry Downer Studbook keeper and SSP Coordinator Oklahoma City Zoo bdowner@okczoo.com (405) 425-0671

APPENDIX IV. Alphabetical listing of all terrestrial and freshwater Chelonian species. Range is by continent. IUCN threat status designations are EX (Extinct), EW (Extinct in the wild), CR (Critically Endangered), E (Endangered), V (Vulnerable), NT (Near Threatened), LC (Least Concerned), CD (Conservation Dependant), DD (Data Deficient), and NL (Not Listed). Due to delays in publishing IUCN Species Specialist Group Recommendations we have also included those published by the Tortoise and Freshwater Turtle Specialist Group: at this link: http://www.iucn-tftsg.org/wp-content/uploads/file/Accounts/crm_5_000_checklist_v7_2014.pdf

Family	Species	Common Name	IUCN	TFTSG	Range
Chelidae	<i>Acanthochelys macrocephala</i>	Pantanal swamp turtle	NT	NT or LC	South America
Chelidae	<i>Acanthochelys pallidipectoris</i>	Chaco side-necked turtle	V	E	South America
Chelidae	<i>Acanthochelys radiolata</i>	Brazilian radiolated swamp turtle	NT	DD	South America
Chelidae	<i>Acanthochelys spixii</i>	Black spiny-necked turtle	NT	NT	South America
Emydidae	<i>Actinemys marmorata</i>	Western pond turtle	V	V	North America
Emydidae	<i>Actinemys pallida</i>	Western pond turtle	V	V	North America
Testudinidae	<i>Aldabrachelys gigantea</i>	Aldabra giant tortoise	V		Africa
Tryonychidae	<i>Amyda cartilaginea</i>	Asiatic softshell turtle	V	V	Asia
Tryonychidae	<i>Apalone ferox</i>	Florida softshell turtle	LC		North America
Tryonychidae	<i>Apalone mutica</i>	Smooth softshell turtle	LC		North America
Tryonychidae	<i>Apalone spinifera</i>	Spiny softshell turtle	LC		North America
Testudinidae	<i>Astrochelys yniphora</i>	Ploughshare tortoise	CR		Africa
Testudinidae	<i>Atsrochelys radiata</i>	Radiated tortoise	CR		Africa
Geoemydidae	<i>Batagur affinis</i>	Southern river terrapin	NE	CR	Asia
Geoemydidae	<i>Batagur baska</i>	Northern river terrapin	CR	CR	Asia
Geoemydidae	<i>Batagur borneoensis</i>	Painted terrapin	CR	CR	Asia
Geoemydidae	<i>Batagur dhongoka</i>	Three-striped roofed turtle	E	E	Asia
Geoemydidae	<i>Batagur kachuga</i>	Red-crowned roof turtle	CR	CR	Asia
Geoemydidae	<i>Batagur trivittata</i>	Burmese roofed turtle	E	CR	Asia
Carrotochelyidae	<i>Carrotochelys insculpta</i>	Pig-nosed turtle	V	E	Asia & Australia
Testudinidae	<i>Centrochelys sulcata</i>	African spurred tortoise	V	E	Africa
Chelidae	<i>Chelodina burrungandjii</i>	Arnhem snake-necked turtle	NE	LC	Australia
Chelidae	<i>Chelodina canni</i>	Cann's snake-necked turtle	NE	NT	Australia
Chelidae	<i>Chelodina colliei</i>	Southwestern snake-necked turtle	NT	NT	Australia
Chelidae	<i>Chelodina expansa</i>	Broad-shelled snake-necked turtle	NL	NT	Australia
Chelidae	<i>Chelodina gunaleni</i>	Gunalen's snake-necked turtle	NE	DD	Australia
Chelidae	<i>Chelodina kuchlingi</i>	Kuchling's snake-necked turtle	NE		Australia
Chelidae	<i>Chelodina longicollis</i>	Eastern snake-necked turtle	NL	LC	Australia
Chelidae	<i>Chelodina mccordi</i>	Roti Island snake-necked turtle	CR	CR	Asia
Chelidae	<i>Chelodina novaeguineae</i>	New Guinea snake-necked turtle	LC	LC	Australia
Chelidae	<i>Chelodina oblonga</i>	Northern snake-necked turtle	NL	NT	Australia
Chelidae	<i>Chelodina parkeri</i>	Parker's snake-necked turtle	V	NT	Australia
Chelidae	<i>Chelodina pritchardi</i>	Pritchard's snake-necked turtle	E	E	Australia
Chelidae	<i>Chelodina reimanni</i>	Reimann's snake-necked turtle	NT	DD	Australia
Chelidae	<i>Chelodina steindachneri</i>	Steindachner's snake-necked turtle	NL	DD	Australia
Chelidae	<i>Chelodina walloyarrina</i>	Kimberley snake-necked turtle	NE	DD	Australia
Testudinidae	<i>Chelonoidis becki</i>	Volcan Wolf giant tortoise	V	V	South America

Family	Species	Common Name	IUCN	TFTSG	Range
Testudinidae	<i>Chelonoidis carbonaria</i>	Red-footed tortoise	NL	V	South America
Testudinidae	<i>Chelonoidis chatamensis</i>	San Cristobal giant tortoise	V	E	South America
Testudinidae	<i>Chelonoidis chilensis</i>	Chaco tortoise	V	V	South America
Testudinidae	<i>Chelonoidis darwini</i>	Santiago giant tortoise	E	E	South America
Testudinidae	<i>Chelonoidis denticulata</i>	Yellow-footed tortoise	V	NT	South America
Testudinidae	<i>Chelonoidis duncanensis</i>	Pinzon giant tortoise	Extinct in wild	V	South America
Testudinidae	<i>Chelonoidis hoodensis</i>	Espanola giant tortoise	CR	E	South America
Testudinidae	<i>Chelonoidis porteri</i>	Santa Cruz giant tortoise	E	E	South America
Testudinidae	<i>Chelonoidis vincina</i>	Southern Isabel giant tortoise	E	E	South America
Chelidae	<i>Chelus fimbriata</i>	Mata mata	NL	LC	South America
Chelydridae	<i>Chelydra acutirostris</i>	South American snapping turtle	NE	NT	Central & South America
Chelydridae	<i>Chelydra rossignonii</i>	Central American snapping turtle	V		Central America
Chelydridae	<i>Chelydra serpentina</i>	North American snapping turtle	LC		North America
Testudinidae	<i>Chersina angulata</i>	Bowsprit tortoise	NL	LC	Africa
Tryonychidae	<i>Chitra chitra</i>	Asian narrow-headed softshell turtle	CR	CR	Asia
Tryonychidae	<i>Chitra indica</i>	Indian narrow-headed softshell turtle	E	E	Asia
Tryonychidae	<i>Chitra vandijki</i>	Burmese narrow-headed softshell turtle	NE	CR	Asia
Emydidae	<i>Chrysemys dorsalis</i>	Southern painted turtle	LC		North America
Emydidae	<i>Chrysemys picta</i>	Painted turtle	LC		North America
Kinosternidae	<i>Claudius angustatus</i>	Narrow-bridged musk turtle	NT		Central America
Emydidae	<i>Clemmys guttata</i>	Spotted turtle	E		North America
Geoemydidae	<i>Cuora amboinensis</i>	Southeast Asian box turtle	V	V	Asia
Geoemydidae	<i>Cuora aurocapitata</i>	Yellow-headed box turtle	CR	CR	Asia
Geoemydidae	<i>Cuora bourreti</i>	Bourret's box turtle	NE	CR	Asia
Geoemydidae	<i>Cuora flavomarginata</i>	Yellow-margined box turtle	E	CR	Asia
Geoemydidae	<i>Cuora galbinifrons</i>	Indochinese box turtle	CR	CR	Asia
Geoemydidae	<i>Cuora mccordi</i>	McCord's box turtle	CR	CR	Asia
Geoemydidae	<i>Cuora mouhotii</i>	Keeled box turtle	E	CR	Asia
Geoemydidae	<i>Cuora pani</i>	Pan's box turtle	CR	CR	Asia
Geoemydidae	<i>Cuora picturata</i>	Southern Vietnamese box turtle	NE	CR	Asia
Geoemydidae	<i>Cuora trifasciata</i>	Chinese three-lined box turtle	CR	CR	Asia
Geoemydidae	<i>Cuora yunnanensis</i>	Yunnan box turtle	CR		Asia
Geoemydidae	<i>Cuora zhoui</i>	Zhou's box turtle	CR	CR	Asia
Tryonychidae	<i>Cyclanorbis senegalensis</i>	Senegal flapshell turtle	NT	V	Africa
Tryonychidae	<i>Cyclanorbis elegans</i>	Nubian flapshell turtle	NT	CR	Africa
Geoemydidae	<i>Cyclemys atripons</i>	Western black-bridged leaf turtle	NE	NT	Asia
Geoemydidae	<i>Cyclemys dentata</i>	Asian leaf turtle	NT	DD	Asia
Geoemydidae	<i>Cyclemys enigmata</i>	Enigmatic leaf turtle	NE	DD	Asia
Geoemydidae	<i>Cyclemys fusca</i>	Myanmar brown leaf turtle	NE	DD	Asia
Geoemydidae	<i>Cyclemys gemeli</i>	Assam leaf turtle	NE	DD	Asia
Geoemydidae	<i>Cyclemys oldhamii</i>	Southeast Asian leaf turtle	NE	DD	Asia
Geoemydidae	<i>Cyclemys pulchristriata</i>	Eastern black-bridged leaf turtle	NE	DD	Asia

Family	Species	Common Name	IUCN	TFTSG	Range
Tryonychidae	<i>Cycloderma aubryi</i>	Aubry's flapshell turtle	NL	V	Africa
Tryonychidae	<i>Cycloderma frenatum</i>	Zambezi flapshell turtle	NT		Africa
Dermatemydidae	<i>Dermatemys mawii</i>	Central American river turtle	CR		Central America
Emydidae	<i>Deirochelys reticularia</i>	Chicken turtle	NL	NT	North America
Tryonychidae	<i>Dogania subplana</i>	Malayan softshell turtle	LC	LC	Asia
Chelidae	<i>Elseya albagula</i>	White-throated snapping turtle	NE	V	Australia
Chelidae	<i>Elseya branderhorstii</i>	White-bellied snapping turtle	V	V	Australia
Chelidae	<i>Elseya dentata</i>	Northern snapping turtle	NL	LC	Australia
Chelidae	<i>Elseya irwini</i>	Irwin's snapping turtle	NE	DD	Australia
Chelidae	<i>Elseya lavarackorum</i>	Riversleigh snapping turtle	NE	DD	Australia
Chelidae	<i>Elseya novaeguineae</i>	New Guinea snapping turtle	LC	LC	Australia
Chelidae	<i>Elseya schultzei</i>	Schultze's snapping turtle	NE		Australia
Chelidae	<i>Elusor macrurus</i>	Mary River turtle	E	E	Australia
Emydidae	<i>Emydoidea blandingii</i>	Blanding's turtle	E		North America
Chelidae	<i>Emydura macquarii</i>	Eastern short-necked turtle	NL	LC	Australia
Chelidae	<i>Emydura subglobosa</i>	Red-bellied short-necked turtle	LC	LC	Australia
Chelidae	<i>Emydura tanybaraga</i>	Northern yellow-faced turtle	NE	DD	Australia
Chelidae	<i>Emydura victoriana</i>	Northern red-faced turtle	NL	LC	Australia
Emydidae	<i>Emys obicularis</i>	European pond turtle	NT		Europe
Podocnemididae	<i>Erymnochelys madagacariensis</i>	Madagascar big-headed turtle	CR		Africa
Chelidae	<i>Flaviemys purvisi</i>	Manning River saw-shelled turtle	DD	NT	Australia
Testudinidae	<i>Geochelone elegans</i>	Indian star tortoise	LC	V	Asia
Testudinidae	<i>Geochelone platynota</i>	Burmese star tortoise	CR	CR	Asia
Geoemydidae	<i>Geoclemys hamiltonii</i>	Spotted pond turtle	V	E	Asia
Geoemydidae	<i>Geoemyda japonica</i>	Ryukyu black-breasted leaf turtle	E		Asia
Geoemydidae	<i>Geoemyda spengleri</i>	Black-breasted leaf turtle	E	E	Asia
Emydidae	<i>Glyptemys insculpta</i>	Wood turtle	E		North America
Emydidae	<i>Glyptemys muhlenbergii</i>	Bog turtle	CR		North America
Testudinidae	<i>Gopherus agassizii</i>	Mojave Desert tortoise	V	CR	North America
Testudinidae	<i>Gopherus berlandieri</i>	Texas tortoise	LC	NT	North America
Testudinidae	<i>Gopherus flavomarginata</i>	Bolson tortoise	V	CR	North America
Testudinidae	<i>Gopherus morakai</i>	Sonoran Desert tortoise	NE	V	North America
Testudinidae	<i>Gopherus polyphemus</i>	Gopher tortoise	V	E	North America
Emydidae	<i>Graptemys barbouri</i>	Barbour's map turtle	V		North America
Emydidae	<i>Graptemys caglei</i>	Cagle's map turtle	E		North America
Emydidae	<i>Graptemys ernsti</i>	Escambia map turtle	NT		North America
Emydidae	<i>Graptemys flavimaculata</i>	Yellow-blotched map turtle	V		North America
Emydidae	<i>Graptemys geographica</i>	Northern map turtle	LC		North America
Emydidae	<i>Graptemys gibbonsi</i>	Pascagoula map turtle	E		North America
Emydidae	<i>Graptemys nigrinoda</i>	Black-knobbed map turtle	LC		North America
Emydidae	<i>Graptemys oculifera</i>	Ringed map turtle	V		North America
Emydidae	<i>Graptemys ouachitensis</i>	Ouachita map turtle	LC		North America

Family	Species	Common Name	IUCN	TFTSG	Range
Emydidae	<i>Graptemys pearlensis</i>	Pearl River map turtle	E		North America
Emydidae	<i>Graptemys pseudogeographica</i>	False map turtle	LC		North America
Emydidae	<i>Graptemys pulchra</i>	Alabama map turtle	NT		North America
Emydidae	<i>Graptemys sabinensis</i>	Sabine map turtle	LC		North America
Emydidae	<i>Graptemys versa</i>	Texas map turtle	LC		North America
Geoemydidae	<i>Hardella thurjii</i>	Crowned roof turtle	V	E	Asia
Geoemydidae	<i>Heosemys annandalii</i>	Yellow-headed temple turtle	E	CR	Asia
Geoemydidae	<i>Heosemys depressa</i>	Arakan forest turtle	CR	CR	Asia
Geoemydidae	<i>Heosemys grandis</i>	Giant Asian pond turtle	V	E	Asia
Geoemydidae	<i>Heosemys spinosa</i>	Spiny turtle	E	E	Asia
Testudinidae	<i>Homopus areolatus</i>	Parrot-beaked tortoise	LC	LC	Africa
Testudinidae	<i>Homopus boulengeri</i>	Karoo dwarf tortoise	NT	V	Africa
Testudinidae	<i>Homopus femoralis</i>	Greater dwarf tortoise	NL	LC	Africa
Testudinidae	<i>Homopus solus</i>	Nama tortise	V	E	Africa
Testudinidae	<i>Hompous signatus</i>	Speckled padloper	NT	V	Africa
Chelidae	<i>Hydromedusa maximiliani</i>	Brazilian snake-necked turtle	V	NT	South America
Chelidae	<i>Hydromedusa tectifera</i>	South American snake-necked turtle	NL	LC	South America
Testudinidae	<i>Indotestudo elongata</i>	Elongated tortoise	E	E	Asia
Testudinidae	<i>Indotestudo forstenii</i>	Forsten's tortoise	E	E	Asia
Testudinidae	<i>Indotestudo travancorica</i>	Travancore tortoise	V	E	Asia
Testudinidae	<i>Kinixys belliana</i>	Bell's hingeback tortoise	NL	V	Africa
Testudinidae	<i>Kinixys erosa</i>	Forest hingeback tortoise	DD	E	Africa
Testudinidae	<i>Kinixys homeana</i>	Home's hingeback tortoise	V	CR	Africa
Testudinidae	<i>Kinixys lobatsiana</i>	Lobatse hingeback tortoise	NE	V	Africa
Testudinidae	<i>Kinixys natalensis</i>	Natal hingeback tortoise	NT	V	Africa
Testudinidae	<i>Kinixys nogueyi</i>	Western hingeback tortoise	NE	V	Africa
Testudinidae	<i>Kinixys spekii</i>	Speke's hingeback tortoise	NE	V	Africa
Testudinidae	<i>Kinixys zombensis</i>	Southeastern hingeback tortoise	NE	V	Africa
Kinosternidae	<i>Kinosternon acutum</i>	Tabasco mud turtle	NT		Central America
Kinosternidae	<i>Kinosternon alamosae</i>	Alamos mud turtle	DD		North America
Kinosternidae	<i>Kinosternon angustipons</i>	Narrow-bridged mud turtle	V		Central America
Kinosternidae	<i>Kinosternon arizonense</i>	Arizon mud turtle	LC		North America
Kinosternidae	<i>Kinosternon baurii</i>	Striped mud turtle	LC		North America
Kinosternidae	<i>Kinosternon chimalhuaca</i>	Jalisco mud turtle	LC		North America
Kinosternidae	<i>Kinosternon creasei</i>	Creaser's mud turtle	LC		North America
Kinosternidae	<i>Kinosternon dumni</i>	Dunn's mud turtle	V		South America
Kinosternidae	<i>Kinosternon durangoense</i>	Durango mud turtle	DD		North America
Kinosternidae	<i>Kinosternon flavescens</i>	Yellow mud turtle	LC		North America
Kinosternidae	<i>Kinosternon leucostomum</i>	White-lipped mud turtle	NL	LC	Central & South America
Kinosternidae	<i>Kinosternon scorpioides</i>	Scorpion mud turtle	NL	LC	Central & South America
Kinosternidae	<i>Kinosternon sonoriense</i>	Sonora mud turtle	NT		North America
Kinosternidae	<i>Kinosternon subrubrum</i>	Eastern mud turtle	LC		North America

Family	Species	Common Name	IUCN	TFTSG	Range
Geoemydidae	<i>Leucocephalon yuwonoi</i>	Sulawesi forest turtle	CR	CR	Asia
Tryonychiidae	<i>Lissemys ceylonensis</i>	Sri Lankan flapshell turtle	NE		Africa
Tryonychiidae	<i>Lissemys punctata</i>	Indian flapshell turtle	LC	LC	Asia
Tryonychiidae	<i>Lissemys scutata</i>	Burmese flapshell turtle	DD	NT	Asia
Chelydridae	<i>Macrochelys temminckii</i>	Alligator snapping turtle	V	V	North America
Emydidae	<i>Malaclemys terrapin</i>	Diamondback terrapin	NT	V	North America
Testudinidae	<i>Malacochersus tornieri</i>	Pancake tortoise	V	CR	Africa
Geoemydidae	<i>Malayemys macrocephala</i>	Malayan snail-eating turtle	NE	V	Asia
Geoemydidae	<i>Malayemys subtrijuga</i>	Mekong snail-eating turtle	V	V	Asia
Testudinidae	<i>Manouria emys</i>	Asian giant tortoise	E	CR	Asia
Testudinidae	<i>Manouria impressa</i>	Impressed tortoise	V	E	Asia
Geoemydidae	<i>Mauremys annamensis</i>	Vietnamese pond turtle	CR	CR	Asia
Geoemydidae	<i>Mauremys caspica</i>	Caspian turtle	NL	LC	Asia
Geoemydidae	<i>Mauremys japonica</i>	Japanese pond turtle	NT		Asia
Geoemydidae	<i>Mauremys leprosa</i>	Mediterranean pond turtle	NL	V	Africa, Europe
Geoemydidae	<i>Mauremys mutica</i>	Yellow pond turtle	E	CR	Asia
Geoemydidae	<i>Mauremys nigricans</i>	Chinese red-necked pond turtle	E	CR	Asia
Geoemydidae	<i>Mauremys reevesii</i>	Reeve's turtle	E		Asia
Geoemydidae	<i>Mauremys rivulata</i>	Western Caspian Turtle	NE	LC	Europe
Geoemydidae	<i>Mauremys sinensis</i>	Chinese stripe-necked turtle	E	E	Asia
Geoemydidae	<i>Melanochelys tricarinata</i>	Tricarinate hill turtle	V	V	Asia
Geoemydidae	<i>Melanochelys trijuga</i>	Indian black turtle	NT	NT	Asia
Chelidae	<i>Mesoclemmys dahli</i>	Dahl's toad-headed turtle	CR	E	South America
Chelidae	<i>Mesoclemmys gibba</i>	Gibba turtle	NL	LC	South America
Chelidae	<i>Mesoclemmys heliostemma</i>	Yellow-crowned toad-headed turtle	NE	DD	South America
Chelidae	<i>Mesoclemmys hogeii</i>	Hoge's side-necked turtle	E	CR	South America
Chelidae	<i>Mesoclemmys nasuta</i>	Guyanana toad-headed turtle	NL	DD	South America
Chelidae	<i>Mesoclemmys perplexa</i>	Cerrado side-necked turtle	NE	DD	South America
Chelidae	<i>Mesoclemmys raniceps</i>	Amazon toad-headed turtle	NL	DD	South America
Chelidae	<i>Mesoclemmys tuberculata</i>	Tuberculate toad-headed turtle	NL	DD	South America
Chelidae	<i>Mesoclemmys vanderhaegei</i>	Vanderhaege's toad-headed turtle	NT	DD	South America
Chelidae	<i>Mesoclemmys zuliae</i>	Zulia toad-headed turtle	V	V	South America
Geoemydidae	<i>Morenia ocellata</i>	Burmese eyed turtle	V	V	Asia
Geoemydidae	<i>Morenia petersi</i>	Indian eyed turtle	V	V	Asia
Chelidae	<i>Myuchelys bellii</i>	Bell's saw-shelled turtle	E	E	Australia
Chelidae	<i>Myuchelys georgesi</i>	Bellinger River saw-shelled turtle	DD	V	Australia
Chelidae	<i>Myuchelys latisternum</i>	Saw-shelled turtle	LC	LC	Australia
Tryonychiidae	<i>Nilssonina formosa</i>	Burmese peacock softshell turtle	E	CR	Asia
Tryonychiidae	<i>Nilssonina leithii</i>	Leith's softshell turtle	V	CR	Asia
Tryonychiidae	<i>Nilssonina nigricans</i>	Black softshell turtle	Extinct in wild	CR	Asia
Tryonychiidae	<i>Nissonia gangetica</i>	Indian softshell turtle	V	E	Asia
Tryonychiidae	<i>Nissonia hurum</i>	Indian peacock softshell turtle	V	E	Asia

Family	Species	Common Name	IUCN	TFTSG	Range
Geoemydidae	<i>Notochelys platynota</i>	Malayan flat-shelled turtle	V	V	Asia
Geoemydidae	<i>Orlitia borneensis</i>	Malaysian giant turtle	E	CR	Asia
Tryonychidae	<i>Palea steindachneri</i>	Wattle-necked softshell turtle	E	E	Asia
Geoemydidae	<i>Pangshura smithii</i>	Brown roofed turtle	NT	LC	Asia
Geoemydidae	<i>Pangshura sylhetensis</i>	Assam roofed turtle	E	E	Asia
Geoemydidae	<i>Pangshura tecta</i>	Indian roofed turtle	LC	NT	Asia
Geoemydidae	<i>Pangshura tentoria</i>	Indian tent turtle	LC	LC	Asia
Tryonychidae	<i>Pelochelys bibroni</i>	New Guinea giant softshell turtle	V	v	Asia
Tryonychidae	<i>Pelochelys cantorii</i>	Asian giant softshell turtle	E	CR	Asia
Tryonychidae	<i>Pelochelys signifera</i>	Northern New Guinea softshell turtle	NE	DD	Asia
Tryonychidae	<i>Pelodiscus axenaria</i>	Hunan softshell turtle	NE	DD	Asia
Tryonychidae	<i>Pelodiscus macckii</i>	Northern Chinese softshell turtle	NE	DD	Asia
Tryonychidae	<i>Pelodiscus parviformis</i>	New Guinea giant softshell turtle	NE	DD	Asia
Tryonychidae	<i>Pelodiscus sinensis</i>	Chinese softshell turtle	V	V or E	Asia
Pelomedusidae	<i>Pelomedusa subrufa</i>	Helemeted turtle	NL	LC	Africa
Podocnemididae	<i>Peltocephalus dumerilianus</i>	Big-headed side-necked turtle	V	V	South America
Pelomedusidae	<i>Pelusios adansonii</i>	Adanson's mud turtle	NL	LC	Africa
Pelomedusidae	<i>Pelusios bechuanicus</i>	Okavango mud turtle	NL	LC	Africa
Pelomedusidae	<i>Pelusios broadleyi</i>	Turkana mud turtle	V	E	Africa
Pelomedusidae	<i>Pelusios carinatus</i>	African keeled mud turtle	NL	LC	Africa
Pelomedusidae	<i>Pelusios casaneus</i>	West African mud turtle	NL	LC	Africa
Pelomedusidae	<i>Pelusios castanoides</i>	Yellow-bellied mud turtle	LC	LC	Africa
Pelomedusidae	<i>Pelusios chapini</i>	Central African mud turtle	NL	LC	Africa
Pelomedusidae	<i>Pelusios cupulatta</i>	Ivory Coast mud turtle	NE	LC	Africa
Pelomedusidae	<i>Pelusios gabonensis</i>	African forest turtle	NL	LC	Africa
Pelomedusidae	<i>Pelusios marani</i>	Gabon mud turtle	NE	DD	Africa
Pelomedusidae	<i>Pelusios nanus</i>	African dwarf mud turtle	NL	DD	Africa
Pelomedusidae	<i>Pelusios niger</i>	West African black mud turtle	NL	NT	Africa
Pelomedusidae	<i>Pelusios rhodesianus</i>	Variable mud turtle	LC	V	Africa
Pelomedusidae	<i>Pelusios sinuatus</i>	Serrated hinged terrapin	NL	LC	Africa
Pelomedusidae	<i>Pelusios subniger</i>	East African black mud turtle	LC	LC	Africa
Pelomedusidae	<i>Pelusios upembae</i>	Upemba mud turtle	DD	DD	Africa
Pelomedusidae	<i>Pelusios williamsi</i>	Williams' mud turtle	NL	LC	Africa
Chelidae	<i>Phrynops geoffroanus</i>	Geoffroy's side-necked turtle	NL	LC	South America
Chelidae	<i>Phrynops hilarii</i>	Hilaire's side-necked Turtle	NL	LC	South America
Chelidae	<i>Phrynops tuberosus</i>	Guianan Shield side-necked turtle	NE	LC	South America
Chelidae	<i>Phrynops williamsi</i>	Williams' side-necked turtle	NL	V	South America
Chelidae	<i>Platemys platycephala</i>	Twist-necked turtle	NL	LC	South America
Platysternidae	<i>Platysternon megacephalum</i>	Big-headed turtle	E	CR	Asia
Podocnemididae	<i>Podocnemis erythrocephala</i>	Red-headed Amazon River turtle	V	V	South America
Podocnemididae	<i>Podocnemis lewyana</i>	Magdalena River turtle	E	CR	South America
Podocnemididae	<i>Podocnemis sextuberculata</i>	Six-tuberculed Amazon River turtle	V	V	South America

Family	Species	Common Name	IUCN	TFTSG	Range
Podocnemididae	<i>Podocnemis unifilis</i>	Yellow-spotted river turtle	V	E	South America
Podocnemididae	<i>Podocnemis vogli</i>	Savannah sideneck turtle	NL	V	South America
Podocnemididae	<i>Podocnemis expansa</i>	Giant South American river turtle	LR	CR	South America
Testudinidae	<i>Psammobates geometricus</i>	Geometric tortoise	CR	CR	Africa
Testudinidae	<i>Psammobates oculifer</i>	Serrated tent tortoise	LC	LC	Africa
Testudinidae	<i>Psammobates tentorius</i>	Tent tortoise	NL	LC	Africa
Chelidae	<i>Pseudemydura umbrina</i>	Western swamp turtle	CR	CR	Australia
Emydidae	<i>Pseudemys alabamensis</i>	Alabama red-bellied cooter	E	E	North America
Emydidae	<i>Pseudemys concinna</i>	River cooter	LC		North America
Emydidae	<i>Pseudemys gorzugi</i>	Rio Grande cooter	NT		North America
Emydidae	<i>Pseudemys nelsoni</i>	Florida red-bellied cooter	LC		North America
Emydidae	<i>Pseudemys peninsularis</i>	Peninsula cooter	LC		North America
Emydidae	<i>Pseudemys rubriventris</i>	Northern red-bellied cooter	NT		North America
Emydidae	<i>Pseudemys texana</i>	Texas cooter	LC		North America
Testudinidae	<i>Pyxis arachnoides</i>	Spider tortoise	CR		Africa
Testudinidae	<i>Pyxis planicauda</i>	Flat-tailed tortoise	CR		Africa
Tryonchiidae	<i>Rafetes euphraticus</i>	Euphrates softshell turtle	E	E	Asia
Tryonchiidae	<i>Rafetes swinhoei</i>	Swinhoe's softshell turtle	CR	CR	Asia
Chelidae	<i>Rheodytes leukops</i>	Fitzroy River turtle	V	V	Australia
Chelidae	<i>Rhinemys rufipes</i>	Red side-necked turtle	NT	LC	South America
Geoemydidae	<i>Rhinoclemmys annulata</i>	Brown wood turtle	NT	DD	Central & South America
Geoemydidae	<i>Rhinoclemmys areolata</i>	Furrowed wood turtle	NT	DD	Central America
Geoemydidae	<i>Rhinoclemmys diademata</i>	Maracaibo wood turtle	NL	V	South America
Geoemydidae	<i>Rhinoclemmys funerea</i>	Black wood turtle	NT		Central America
Geoemydidae	<i>Rhinoclemmys melanosterna</i>	Columbian wood turtle	NL	LC	Central & South America
Geoemydidae	<i>Rhinoclemmys nasuta</i>	Large-nosed wood turtle	NT	NT	South America
Geoemydidae	<i>Rhinoclemmys pulcherimma</i>	Painted wood turtle	NL		Central & North America
Geoemydidae	<i>Rhinoclemmys punctularia</i>	Spot-legged turtle	NL	LC	South America
Geoemydidae	<i>Rhinoclemmys rubida</i>	Mexican spotted wood turtle	NT		North America
Geoemydidae	<i>Sacala bealei</i>	Beale's eyed turtle	E	CR	Asia
Geoemydidae	<i>Sacalia quadriocellata</i>	Four-eyed turtle	E	E	Asia
Geoemydidae	<i>Siebenrockiella crassicollis</i>	Black marsh turtle	V	E	Asia
Geoemydidae	<i>Siebenrockiella leytenis</i>	Palawan forest turtle	CR		Asia
Kinosternidae	<i>Staurotypus salvinii</i>	Pacific Coast giant musk turtle	NT		Central America
Kinosternidae	<i>Staurotypus triporcartus</i>	Northern giant musk turtle	NT		Central America
Kinosternidae	<i>Sternotherus carinatus</i>	Razor-backed musk turtle	LC		North America
Kinosternidae	<i>Sternotherus depressus</i>	Flatened musk turtle	CR		North America
Kinosternidae	<i>Sternotherus minor</i>	Loggerhead musk turtle	LC		North America
Kinosternidae	<i>Sternotherus odoratus</i>	Common musk turtle	LC		North America
Testudinidae	<i>Stigmochelys pardalis</i>	Leopard tortoise	NL	LC	Africa
Emydidae	<i>Terrapene carolina</i>	Eastern box turtle	V		North America
Emydidae	<i>Terrapene carolina mexicana</i>	Mexican box turtle	V		North America

Family	Species	Common Name	IUCN	TFTSG	Range
Emydidae	<i>Terrapene coahuila</i>	Coahuilan box turtle	E		North America
Emydidae	<i>Terrapene nelsoni</i>	Spotted box turtle	DD	DD	North America
Emydidae	<i>Terrapene ornata</i>	Ornate box turtle	NT		North America
Testudinidae	<i>Testudo graeca</i>	Greek tortoise	V		Europe
Testudinidae	<i>Testudo hermanni</i>	Hermann's tortoise	NT		Europe
Testudinidae	<i>Testudo horsfieldii</i>	Central Asian tortoise	V		Asia
Testudinidae	<i>Testudo kleinmanni</i>	Egyptian tortoise	CR		Africa
Testudinidae	<i>Testudo marginata</i>	Marginated tortoise	LC		Europe
Emydidae	<i>Trachemys adiutrix</i>	Maranhao slider	NT		South America
Emydidae	<i>Trachemys callirostris</i>	Colombian slider	NE	V	South America
Emydidae	<i>Trachemys decorata</i>	Hispaniolan slider	V		Caribbean
Emydidae	<i>Trachemys decussata</i>	Cuban slider	NL		Caribbean
Emydidae	<i>Trachemys dorbigni</i>	D'Orbigny's slider	NL	LC	South America
Emydidae	<i>Trachemys emolli</i>	Nicaraguan slider	NE		Central America
Emydidae	<i>Trachemys gageae</i>	Big Bend slider	V		North America
Emydidae	<i>Trachemys grayi</i>	Gray's slider	NE		Central America
Emydidae	<i>Trachemys nebulosa</i>	Baja California slider	NE		North America
Emydidae	<i>Trachemys ornata</i>	Ornate slider	V		North America
Emydidae	<i>Trachemys scripta</i>	Common slider	LC		North America
Emydidae	<i>Trachemys stejnegeri</i>	Central Antillean slider	NT	NT	Caribbean
Emydidae	<i>Trachemys taylori</i>	Cuatro Cienegas slider	E		North America
Emydidae	<i>Trachemys terrapen</i>	Jamaican slider	V		Caribbean
Emydidae	<i>Trachemys venusta</i>	Meso-American slider	NE	DD	Central America
Emydidae	<i>Trachemys yaquia</i>	Yaqui slider	V		North America
Tryonchiidae	<i>Trionyx triunguis</i>	Nile softshell turtle	NL	V	Africa
Geoemydidae	<i>Vijayachelys silvatica</i>	Cochin forest turtle	E	E	Asia

Appendix V. Chelonian Steering Committee - Pet Policy Recommendation

The AZA Chelonian Taxon Advisory Group Steering Committee is open to and supportive of institutions working with the private sector in the acquisition and disposition of chelonian species under the guidelines of their respective individual institutional policies for acquisition/disposition. Animal transactions with private sector holders of chelonian species can be a productive method of population planning and management of critical species populations as long as transactions are carried out and maintained with the highest degree of ethical and legal integrity.

The ChAG Steering Committee is open to and supportive of institutional policies that transition to the private sector offspring of chelonian species that are produced in surplus of the population management needs of Species Survival Plans and professionally managed species recovery programs for the purpose of generating funds that directly support *in situ* conservation.

Appendix VI. Chelonian Steering Committee – Red-eared Slider Turtle Policy Statement

Red-eared slider (*Trachemys scripta elegans*) populations in zoos and aquariums are problematic due to the high volume of the subspecies in the private sector and their subsequent release into non-range localities. Outside of their natural range, released red-eared sliders are documented as invasive, outcompeting native turtle species and hybridizing with fellow subspecies such as the yellow-bellied slider (*T. s. scripta*). Non-range institutions with red-eared slider population problems are encouraged to explore institutional policy regarding managerial culling to avoid local ecological consequences and inefficient space use within the institutions. With the exception of in-range institutions and/or locality themed exhibits, zoos and aquariums that are planning to exhibit or already are exhibiting red-eared sliders are highly recommended to avoid dedicating space to this species. The ChAG Steering Committee strongly recommends dedicating this valuable aquatic turtle space to program species with a higher need. ChAG members are willing and available to assist institutions with questions about type of programs species and their availability.