

CHELONIAN ADVISORY GROUP

Association of Zoos and Aquariums (AZA)

Chelonian Advisory Group

Regional Collection Plan

5th Edition

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Editor

Chelonian TAG Steering Committee

**ASSOCIATION
OF ZOOS &
AQUARIUMS**

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AZA CHELONIAN ADVISORY GROUP REGIONAL COLLECTION PLAN

TAG Mission— The mission of the Chelonian TAG is to support the sustainable management of freshwater turtles and tortoise populations in partnership with AZA facilities, advance husbandry and welfare programs for these species, and support conservation & education efforts related to these taxa.

ChAG Operating Context- Freshwater turtles and tortoises (“turtles”) remain highly popular in AZA institutions for a variety of reasons. Turtles have a unique evolutionary history as the only group of animals to develop a modified ribcage into a shell. Current phylogenetic research shows that turtles are more closely related to birds and crocodilians than to snakes, lizards, and tuatara. Although fossil evidence shows that turtles have been roaming the planet for over 200 million years, many groups are now threatened with extinction due to habitat alterations, climate change, consumption for food/medicinal trade, and the pet trade. Historically our TAG has focused on the more endangered species to manage in human care. AZA members have an interest in maintaining a variety of species for exhibit, off exhibit breeding, rehab, head-starting, as well as from confiscated animals. Meeting the needs of our members to assist with those projects along with making sure they have other species for exhibit purposes is our primary responsibility.

In general, turtles are a long-lived group of animals, and management that considers their long-term needs is a vital part of the challenges and successes that we deal with in our TAG. The primary challenge factoring in their life history is space, something that is an issue for many other groups as well. Working with our members to consider their long-term needs as well as those of the animals is vital to sustainability, and in some instances from losing a species entirely in human care. The ChAG attempts to work closely with all our members to plan accordingly about space. Out of the ~360 species/subspecies of turtles, AZA members have shown a real interest in over 50 species. To continue to meet member needs we all need to work together on the space/breeding to ensure our long-term success. Several species (Fly River turtle, matamoras, and alligator snapping turtle for example) are very popular display species in AZA, but at this time little effort has been made in captive breeding and rearing to make sure these animals are available into the future. During this five-year period of the regional collection plan, we are going to make every effort to work with our members to begin to develop a plan on breeding these species to be sure they are available in the future.

Table 1a: Current ChAG TAG Officers, Steering Committee, Advisors

Name	Position	Facility	Email	Phone
Michael Ogle	Chair	Zoo Knoxville	mogle@zooknoxville.org	865-637-5331 x 1210
Andy Daneault	Vice Chair – Tortoises	Disney’s Animal Kingdom	andre.j.daneault@disney.com	407-938-2368
Bill Hughes	Vice Chair – Freshwater Turtles	Tennessee Aquarium	bhh@tnaqua.org	423-785-4126
Tommy Owens	Secretary	Dallas Zoo	tommv.owensdallaszoo.com	469-554-7252
Dave Collins	Treasurer	Turtle Survival Alliance	dcollins@turtlesurvival.org	423-903-9540
Jeff Dawson	Steering Committee	Saint Louis Zoo	jdawson@stlzoo.org	314-646-4655
Ryan Dumas	Steering Committee	Cincinnati Zoo	ryan.dumas@cincinnati.org	513-559-8355
Kim Gray	Steering Committee	San Diego Zoo Wildlife Alliance	kgray@sdzwa.org	619-557-3984
Lauren Gruny	Steering Committee	Saint Augustine Alligator Farm	laureng@alligatorfarm.com	904-824-3337
Nate Nelson	Steering Committee	Sedgwick County Zoo	nnelson@scz.org	316-266-8265
Ashley Ortega	Steering Committee	Glady’s Porter Zoo	aortega@gpz.org	956-546-7187
Craig Pelke	Steering Committee	San Antonio Zoo	Craig.Pelke@sazoo.org	210-734-7184 x 1340
Christine Schmitz	Education Advisor	Utah’s Hogle Zoo	cschmitz@hoglezoo.org	801-584-1714
Rick Hudson	Field Advisor	Turtle Survival Alliance	rhudson@turtlesurvival.org	817-759-7177
Dwight Lawson	General Advisor	Oklahoma City Zoo	dlawson@okczoo.org	405-425-0230
Joe Flanagan, DVM	Veterinary Advisor	Houston Zoo	jflanagan@houstonzoo.org	713-533-6628
Gina Ferri	SPMAG Advisor	Disney’s Animal Kingdom	Gina.M.Ferrie@disney.com	407-222-0124
Rachel Bladow	SPMAG Advisor	Lincoln Park Zoo	rbladow@lpzoo.org	312-742-7745
Drew Foster	APM Liason	Phoenix Zoo	dfoster@phoenixzoo.org	602-914-4369

Table 1b: Current ChAG TAG Program Leaders

Name	Position	Facility	Email	Phone
Lauren Augustine	Indochinese Box Turtle SSP Coordinator/Studbook Keeper Bourret's Box Turtle and Southern Vietnamese Box Turtle Studbook Keeper	Philadelphia Zoo	augustine.lauren@phillyzoo.org	215-243-5206
Trent Barnhart	Coahulian Box Turtle SSP Coordinator and Studbook Keeper	Santa Barbara Zoo	TBarnhart@sbzoo.org	805-962-5339 x178
Jeff Bocek	Painted Terrapin Studbook Keeper	Brookfield Zoo	Jeff.Bocek@czs.org	847-212-6596
Jessie Bushell	Northwestern and Southwestern Pond Turtle Studbook Keeper	San Francisco Zoo	JessieB@sfzoo.org	415-753-7069
Dave Collins	Spotted Turtle SSP Coordinator and North American Turtle SAFE Coordinator	Turtle Survival Alliance	dcollins@turtlesurvival.org	423-903-9540
Andy Daneault	Burmese Black Mountain Tortoise, Burmese Brown Mountain Tortoise, and Pancake Tortoise SSP Coordinator and Studbook Keeper	Disney's Animal Kingdom	Andre.J.Daneault@disney.com	407-938-2368
Jeff Dawson	Black-breasted Leaf Turtle SSP Coordinator and Studbook Keeper and McCord's Box Turtle SSP Coordinator	Saint Louis Zoo	jdawson@stlzoo.org	314-646-4655
Matt Evans	Burmese Star Tortoise SSP Coordinator and Studbook Keeper	National Zoological Park	evansmj@si.edu	202-633-3252
Sarah Foote	Blanding's Turtle SSP Coordinator and Studbook Keeper	Potter Park Zoo	sfoote@ingham.org	517-342-2703
Lauren Gruny	Malaysian Giant River Turtle SSP Coordinator and Studbook Keeper	Saint Augustine Alligator Farm	laureng@alligatorfarm.com	904-824-3337
Cris Hagen	Pan's Box Turtle SSP Coordinator and Studbook Keeper	Turtle Survival Alliance	chagen@turtlesurvival.org	843-753-2159
Bill Hughes	Spiny Hill Turtle SSP Coordinator and Studbook Keeper, Arakan Forest Turtle Studbook Keeper and Four-eyed Turtle Studbook Keeper	Tennessee Aquarium	bhh@tnaqua.org	423-785-4126
Jeff Jundt	McCord's Box Turtle Studbook Keeper	Detroit Zoo	jjundt@dzs.org	248-336-5859
Rachel Myers	Yellow-headed Temple Turtle	NC Museum of Natural Sciences	Rachel.myers@naturalsciences.org	919-707-8094

Name	Position	Facility	Email	Phone
Matt Neff	Home's Hinge-back Tortoise SSP Coordinator and Studbook Keeper	National Zoological Park	<u>neffm@si.edu</u>	202-633-3075
Michael Ogle	Common Spider Tortoise, Madagascar Flat-tailed Tortoise, Northern Spider Tortoise SSP Coordinator and Studbook Keeper, Radiated Tortoise SSP Coordinator, and Bog Turtle Studbook Keeper	Zoo Knoxville	<u>mogle@zooknoxville.org</u>	865-637-5331 x 1210
Ashley Ortega	Volcan Darwin Giant Tortoise SSP Coordinator and Studbook Keeper, Volcan Wolf Giant Tortoise, and Galapagoes Hybrid Giant Tortoise Studbook Keeper	Glady's Porter Zoo	<u>aortega@gpz.org</u>	956-546-7187
Lou Perrotti	Wood Turtle Studbook Keeper	Roger Williams Park Zoo	<u>lperrotti@rwpzoo.org</u>	401-785-3510 x335
Avi Shuter	Rote Island Snake-necked Turtle	Bronx Zoo	<u>ashuter@wcs.org</u>	718-220-5042
Mackenzie Strickland	Yellow-blotched Map Turtle Studbook Keeper	Tennessee Aquarium	<u>mlm@tnaqua.org</u>	423-785-4083

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, 2021). Currently the ChAG does not include the superfamily Chelonoidea (sea turtles). The specific taxa considered in the Regional Collection Plan process focused on existing SSP programs currently at or near 15 AZA holding facilities along with any other non-sea turtle species that met the new SSP criteria. The list of species under consideration will be listed in the space survey below in Table 2. Appendix III lists the current taxonomy list of all non-marine Chelonians.

Table 2: Taxonomic Scope of Extant of non-marine Chelonians

Suborder	Family	Number of Species per Family
Cryptodira	Carettochelyidae (Fly River Turtles)	1
Cryptodira	Chelydridae (Snapping Turtles)	5
Cryptodira	Dermatemydidae (Central American River Turtles)	1
Cryptodira	Emydidae (Pond, Box, and Water Turtles)	57
Cryptodira	Geoemydidae (Pond and River Turtles)	71
Cryptodira	Kinosternidae (Mud and Musk Turtles)	31
Cryptodira	Platysternidae (Chinese Big-headed Turtles)	1
Cryptodira	Testudinidae (Tortoises)	53
Cryptodira	Trionychidae (Softshell Turtles)	34
Pleurodira	Chelidae (Austro-South American Side-necked Turtles)	61
Pleurodira	Pelomedusidae (African Side-necked Turtles)	27
Pleurodira	Podocnemididae (Side-necked Turtles)	8

Turtle Taxonomy Working Group. 2021. Turtles of the World, 9th edition: annotated checklist of taxonomy, synonymy, distribution with maps, and conservation status. In: Rhodin, A.G.J., Iverson, J.B., van Kijk, P.P., Stanford, C.B., Goode, E.V., Buhlmann, K.A., and Mittermeier, R.A. (Eds.). Conservation Biology of Freshwater Turtles and Tortoises: A compilation project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. Chelonian Research Monographs 8: 1-472. Doi:10.3854/crm.8.checklist.atlas.v9.2021

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. At the same time, the ChAG wants to

work in unision with individual members to help guarantee that species deemed important to the members are accounted for as well. Our space survey this cycle included all non-marine turtle species that are held at 15 or more member institutions to better understand what species we need to prioritize for management in human care. 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 fall of 2021. The survey asked how many individual turtles for each of the existing SSP programs (that met the 15-holding facility guideline) along with any other turtle that is also held at 15 or more AZA institutions. To better understand the needs of our members they were asked current holding size, whether they wanted to remain the same/increase/decrease over the next 1-5 years, as well as if the species is used for exhibit, education, and/or holding and breeding in reserve. Using this information helped us better prepare which species needed management versus those that do not at this time.

Results – 122 out of 148 AZA (82.4%) accredited institutions surveyed responded to the space survey through their institutional representative.

Table 3: Space Survey Results

Species List (SSP in Bold and AZA Popular)	Total Institutions	Total Specimens
Aldabra Giant Tortoise (<i>Aldabrachelys gigantea</i>)	49	172
Radiated Tortoise (<i>Astrochelys radiata</i>)	48	393
African Spurred Tortoise (<i>Centrochelys sulcata</i>)	42	101
Home's Hinge-back Tortoise (<i>Kinixys homeana</i>)	14	90
Pancake Tortoise (<i>Malacochersus tornieri</i>)	52	212
Common Spider Tortoise (<i>Pyxis a. arachnoides</i>)	24	136
Northern Spider Tortoise (<i>Pyxis a. brygooi</i>)	15	113
Madagascar Flat-tailed Tortoise (<i>Pyxis planicauda</i>)	14	104
Leopard Tortoise (<i>Stigmochelys pardalis</i>)	33	87
Egyptian Tortoise (<i>Testudo kleinmanni</i>)	24	83
Painted Terrapin (<i>Batagur borneoensis</i>)	13	78
Fly River Turtle (<i>Carettochelys insculpta</i>)	27	62
Rote Island Snake-necked Turtle (<i>Chelodina mccordi</i>)	19	241
Indochinese Box Turtle (<i>Cuora galbinifrons</i>)	11	108
McCord's Box Turtle (<i>Cuora mccordi</i>)	16	120
Pan's Box Turtle (<i>Cuora pani</i>)	16	110

Species List (SSP in Bold and AZA Popular)	Total Institutions	Total Specimens
Burmese Star Tortoise (<i>Geochelone platynota</i>)	21	150
Indian Spotted Turtle (<i>Geoclemys hamiltoni</i>)	12	51
Black-breasted Leaf Turtle (<i>Geoemyda spengleri</i>)	27	199
Spiny Hill Turtle (<i>Heosemys spinosa</i>)	11	74
Forsten's Tortoise (<i>Indotestudo forstenii</i>)	11	118
Burmese Brown Mountain Tortoise (<i>Manouria e. emys</i>)	21	78
Burmese Mountain Tortoise (<i>Manouria e. phayrei</i>)	13	96
Malaysia Giant River Turtle (<i>Orilitia borneensis</i>)	15	53
Northwestern Pond Turtle (<i>Actinemys marmorata</i>)	15	66
Southwestern Pond Turtle (<i>Actinemys pallida</i>)	3	22
Common Snapping Turtle (<i>Chelydra serpentina</i>)	20	24
Painted Turtle (<i>Chrysemys picta</i>)	24	93
Spotted Turtle (<i>Clemmys guttata</i>)	50	272
Blanding's Turtle (<i>Emydoidea blandingii</i>)	13	64
Wood Turtle (<i>Glyptemys insculpta</i>)	21	59
Desert Tortoise (<i>Gopherus agassizii</i>)	29	76
Texas Tortoise (<i>Gopherus berlandieri</i>)	16	37
Gopher Tortoise (<i>Gopherus polyphemus</i>)	28	62
Yellow-blotched Map Turtle (<i>Graptemys flavimaculata</i>)	12	63
Alligator Snapping Turtle (<i>Macrochelys temminckii</i>)	43	80
Diamondback Terrapin (<i>Malaclemys terrapin</i>)	33	155
River Cooter (<i>Pseudemys concinna</i>)	16	69
Stinkpot (<i>Sternotherus odoratus</i>)	13	32
Eastern Box Turtle (<i>Terrapene c. carolina</i>)	66	430
Florida Box Turtle (<i>Terrapene c. bauri</i>)	11	35
Three-toed Box Turtle (<i>Terrapene c. triunguis</i>)	31	72
Coahuila Box Turtle (<i>Terrapene coahuila</i>)	14	65
Ornate Box Turtle (<i>Terrapene o. ornata</i>)	29	121
Common Slider (<i>Trachemys scripta</i>)	40	272
Matamata (<i>Chelus fimbriatus</i>)	32	60
Volcan Wolf Giant Tortoise (<i>Chelonoidis becki</i>)	1	2

Species List (SSP in Bold and AZA Popular)	Total Institutions	Total Specimens
Yellow-footed Tortoise (<i>Chelonoidis denticulata</i>)	20	50
Volcan Darwin Giant Tortoise (<i>Chelonoidis microphyes</i>)	7	41
Galapagos Giant Tortoise Hybrid (<i>Chelonoidis nigra</i> hybrid)	15	39
Spot-bellied Side-necked Turtle (<i>Phrynops hilarii</i>)	13	33
Arrau (<i>Podocnemis expansa</i>)	13	47
Yellow-spotted Amazon River Turtle (<i>Podocnemis unifilis</i>)	28	135

Based on the data presented in Table 2 (p. 8), AZA facilities are willing to commit to many of our managed programs. Since our previous RCP, the Turtle Survival Alliance has become an AZA member, which has drastically increased holding space and breeding expertise for many programs. Holding space for confiscations, and head-starting for reintroduction projects has also increased. The management of large aquatic turtles remains a problem due to their size and water quality needs, and most of those programs have been downgraded to TAG monitored only. Historically, the ChAG has only considered species that were IUCN Endangered or Critically Endangered for management purposes, but now with the new criteria we have several other species to consider. Reviewing the surveys has shown a handful of species (Aldabra giant tortoise, alligator snapping turtle, Fly River turtle, and matamata) that will warrant potential management as we move forward over the next few years. The rationale for that is that these species are popular as adults but finding holding space and facilities interested in breeding them until the reach adulthood is problematic. The ChAG will work with our member institutions to see what the best course of action is to take to make sure we are helping to meet their needs.

Table 4: Species Capacity Assessment Table

Common Name (Scientific Name)	Current Pop. Size	Future Capacity Metric Value	Previous RCP Pop. Size (2016)	Previous RCP Projected Space (2016)	Previous RCP Pop. Size (2010)	Previous RCP Projected Space (2010)
Radiated Tortoise (<i>Astrochelys radiata</i>)	445	393***	368	500	205	100
Rote Island Snake-necked Turtle (<i>Chelodina mccordi</i>)	245	241	96	100	54	90
Volcan Darwin Giant Tortoise (<i>Chelonoidis microphyes</i>)	89	41***	61	80	132	80

Common Name (Scientific Name)	Current Pop. Size	Future Capacity Metric Value	Previous RCP Pop. Size (2016)	Previous RCP Projected Space (2016)	Previous RCP Pop. Size (2010)	Previous RCP Projected Space (2010)
Indochinese Box Turtle (<i>Cuora galbinifrons</i>)	100	108	67	90	N/A	N/A
McCord's Box Turtle (<i>Cuora mccordi</i>)	116	120	86	150	58	100
Pan's Box Turtle (<i>Cuora pani</i>)	90	110	74	100	22	100
Blanding's Turtle (<i>Emydoidea blandingii</i>)	376	64***	N/A	N/A	N/A	N/A
Burmese Star Tortoise (<i>Geochelone platynotan</i>)	250	150	102	150	Data was not recorded	Data was not recorded
Black-breasted Leaf Turtle (<i>Geoemyda spengleri</i>)	216	199	136	175	145	100
Spiny Hill Turtle (<i>Heosemys spinosa</i>)	76	74	64	100	N/A	N/A
Home's Hinge-back Tortoise (<i>Kinixys homeana</i>)	120	90	28	100	N/A	N/A
Pancake Tortoise (<i>Malacochersus tornieri</i>)	296	212	369	450	196	100
Burmese Brown Mountain Tortoise (<i>Manouria e. emys</i>)	139	78	120	90	45**	45**
Burmese Mountain Tortoise (<i>Manouria e. phayrei</i>)	87	96	78	90	45**	45**

Common Name (Scientific Name)	Current Pop. Size	Future Capacity Metric Value	Previous RCP Pop. Size (2016)	Previous RCP Projected Space (2016)	Previous RCP Pop. Size (2010)	Previous RCP Projected Space (2010)
Common Spider Tortoise (<i>Pyxis a. arachnoides</i>)	139	136	144	200	84**	50**
Northern Spider Tortoise (<i>Pyxis a. brygooi</i>)	110	113	106	150	84**	50**
Madagascar Flat-tailed Tortoise (<i>Pyxis planicauda</i>)	101	104	82	150	38	100
Coahuila Box Turtle (<i>Terrapene coahuila</i>)	62	65	66	75	86	90
Egyptian Tortoise (<i>Testudo kleinmanni</i>)	91	83***	127	140	109	90

*** These numbers are less than current population size, and we think that is because not all of their holders for those species participated in the survey.

** During the 2010 RCP cycle, although each subspecies was managed separately, they were lumped together when tallying numbers. For this table, we have divided the numbers evenly.

SPECIES SELECTION PROCESS

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

1. Species already listed as SSP's were considered along with any freshwater turtle or tortoise that is currently maintained by 15 or more AZA facilities.
2. Formal evaluation was confined to species in these categories as they were deemed the most likely to potentially benefit from captive management.
3. Certain species that are not currently managed by the ChAG but held at 15 or more AZA facilities that can be legally and ethically acquired from the private sector (through purchase, donations, confiscations, etc.) will be listed with a contact to help acquire them if needed.

The Chelonian TAG used the standardized AZA SSP Assessment Process to identify appropriate SSP designations for the species under its purview. The assessments were completed by the SSP coordinators over the summer and fall of 2021. They were then reviewed by Hollie Colahan (APM vice-chair for SSPs) and Megan Brown (AZA Director of Population Management Strategy). The Chelonian TAG had over 40 managed programs, but with the new requirements we did not submit all for consideration as we knew that several would not meet the criteria. Here is a list of species/subspecies that were not considered for evaluation: Arakan forest turtle (*Heosemys depressa*), Beal's-eyed turtle (*Sacalia bealei*), bog turtle (*Glyptemys muhlenbergii*), Bourret's box turtle (*Cuora bourreti*), Cerro Azul giant tortoise (*Chelonoidis vicina*), keeled box turtle (*Cuora mouhotti*), southwestern pond turtle, Vietnamese box turtle (*Cuora picturata*), Vietnamese pond turtle (*Mauremys annamensis*), Western Santa Cruz giant tortoise (*Chelonoidis porteri*), and yellow-headed temple turtle (*Heosemys annandalii*). The following species met several of the criteria such as being held at 15 or more facilities but were not assessed due to a lack of information (i.e., no studbook) needed to evaluate them. African spurred tortoise (*Centrochelys sulcata*), Aldabra giant tortoise (*Aldabrachelys gigantea*), alligator snapping turtle (*Macrochelys temin*), arrau (*Podocnemis expansa*), common slider (*Trachemys scripta*), common snapping turtle (*Chelydra serpentina*), desert tortoise (*Gopherus agassizi*), diamondback terrapin (*Malaclemys terrapin*), eastern box turtle (*Terrapene c. carolina*), Florida box turtle (*Terrapene c. bauri*), Fly River turtle (*Carettochelys insculpta*), gopher tortoise (*Gopherus polyphemus*), Indian spotted turtle (*Geoclemys hamiltoni*), leopard tortoise (*Stigmochelys pardalis*), matamora (*Chelus fimbriata*), ornate box turtle (*Terrapene ornata*), painted turtle (*Chrysemys picta*), red-bellied short-neck turtle (*Emydura subglobosa*), red-footed tortoise (*Chelonoidis carbonaria*), river cooter (*Pseudemys concinna*), spot-bellied side-necked turtle (*Phrynops hilarii*), stinkpot (*Sternotherus oderatus*), Texas tortoise (*Gopherus berlandieri*), yellow-footed tortoise (*Chelonoidis denticulata*), yellow-spotted Amazon River turtle (*Podocnemis unifilis*)

The results of the SSP assessment process are show in Table 5 below.

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

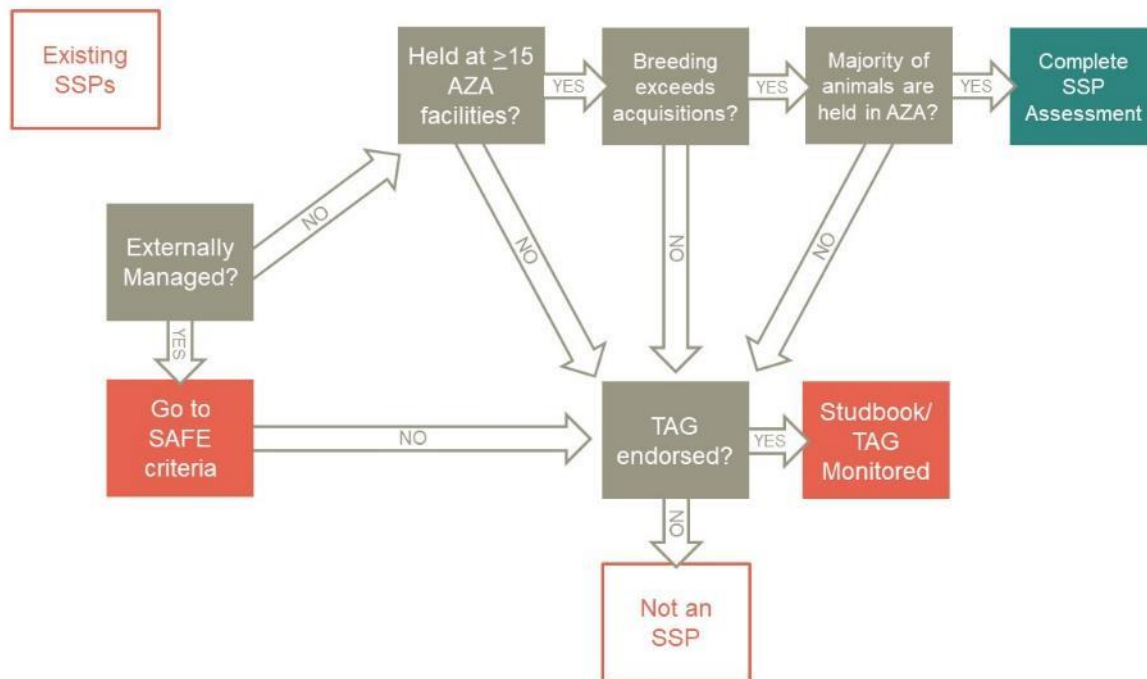


Figure 2. SSP Assessment Scoring Sheet

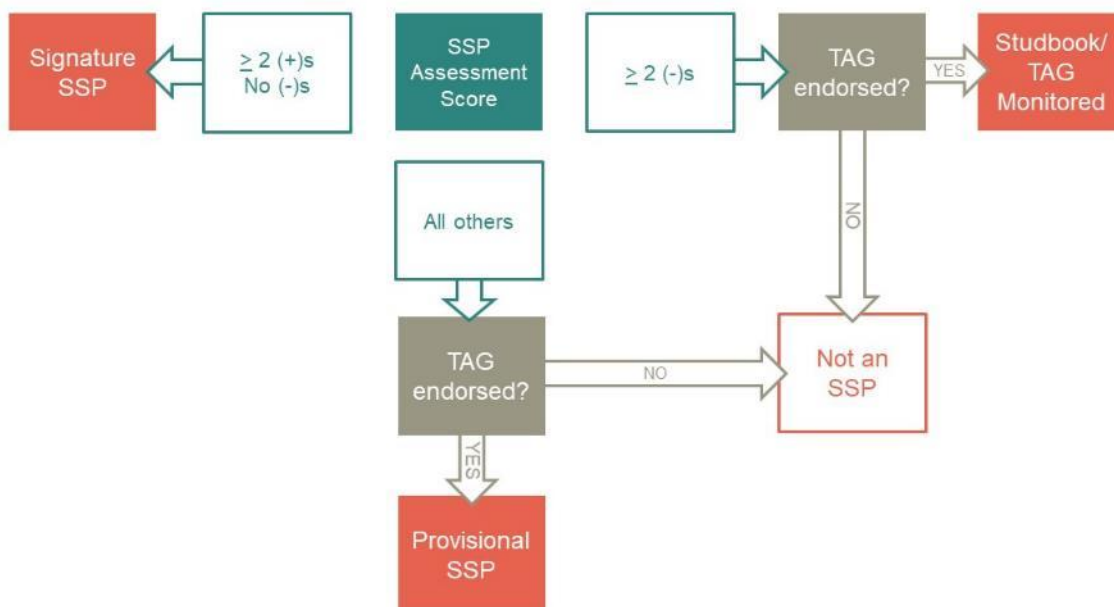


Table 5: SSP Assessment Results Summary Table

Species	Genetics	Demography	Space & Interest	Husbandry	Designation
Northwestern Pond Turtle (<i>Actinemys marmorata</i>)	+	Neutral	Neutral	Neutral	SAFE TAG Monitored – Studbook
Radiated tortoise (<i>Astrochelys radiata</i>)	+	-	+	+	Provisional SSP
Painted Terrapin (<i>Batagur borneoensis</i>)	+	+	-	-	TAG Monitored – Studbook
Rote Island Snake-necked Turtle (<i>Chelodina mccordi</i>)	+	+	Neutral	+	Signature SSP
Volcan Wolf Giant Tortoise (<i>Chelonoidis becki</i>)	-	-	-	-	TAG Monitored - Studbook
Malaysian Giant River Turtle (<i>Orlitia borneensis</i>)	+	Neutral	Neutral	-	Provisional SSP
Common Spider Tortoise (<i>Pyxis a. arachnoides</i>)	+	+	+	+	Signature SSP
Northern Spider Tortoise (<i>Pyxis a. brygooi</i>)	+	+	Neutral	+	Signature SSP
Madagascar Flat-tailed Tortoise (<i>Pyxis planicauda</i>)	+	+	Neutral	+	Signature SSP
Coahuila Box Turtle (<i>Terrapene coahuila</i>)	Neutral	-	+	-	Provisional SSP

Species	Genetics	Demography	Space & Interest	Husbandry	Designation
Volcan Darwin Giant Tortoise (<i>Chelonoidis microphyes</i>)	Neutral	+	+	+	Signature SSP
Spotted Turtle (<i>Clemmys guttata</i>)	+	+	+	+	Signature SSP
Bourret's Box Turtle (<i>Cuora bourreti</i>)	–	–	–	–	TAG Monitored - Studbook
Indochinese Box Turtle (<i>Cuora galbinifrons</i>)	Neutral	+	Neutral	+	Provisional SSP
McCord's Box Turtle (<i>Cuora mccordi</i>)	+	+	+	-	Provisional SSP
Pan's Box Turtle (<i>Cuora pani</i>)	Neutral	+	+	Neutral	Signature SSP
Blanding's Turtle (<i>Emydoidea blandingii</i>)	+	+	+	Neutral	Provisional SSP
Burmese Star Tortoise (<i>Geochelone platynota</i>)	+	+	Neutral	+	Signature SSP
Black-breasted Leaf Turtle (<i>Geoemyda spengleri</i>)	+	+	+	+	Signature SSP

Species	Genetics	Demography	Space & Interest	Husbandry	Designation
Wood Turtle (<i>Glyptemys insculpta</i>)	+	Neutral	–	–	SAFE TAG Monitored - Studbook
Yellow- blotched Map Turtle (<i>Graptemys flavimaculata</i>)	Neutral	Neutral	–	–	TAG Monitored – Studbook
Spiny Hill Turtle (<i>Heosemys spinosa</i>)	+	+	–	Neutral	Provisional SSP
Forsten's Tortoise (<i>Indotestudo forstenii</i>)	–	–	–	–	TAG Monitored - Studbook
Home's Hinge- back Tortoise (<i>Kinixys homeana</i>)	+	Neutral	+	+	Signature SSP
Sulawesi Forest Turtle (<i>Leucocephalon yuwonoi</i>)	+	+	Neutral	Neutral	TAG Monitored Studbook
Pancake Tortoise (<i>Malacochersus tornieri</i>)	+	+	Neutral	-	Provisional SSP
Burmese Brown Mountain Tortoise (<i>Manouria e. emys</i>)	+	+	+	+	Signature SSP
Burmese Black Mountain Tortoise (<i>Manouria e. phayrei</i>)	+	+	-	+	Provisional SSP
Egyptian Tortoise (<i>Testudo kleinmanni</i>)	+	Neutral	+	+	Signature SSP

Table 6: Animal Program Summary Table

Common Name (Scientific Name)	Program designation	Current Population Size	Current # Participating AZA facilities	5-Year Target Population Size	Space Needed (Current- Target Size)	5-Year Population Trend	Date of of most recent BTP
Radiated tortoise <i>(Astrochelys radiata)</i>	Provisional	445	62	350	-95	Stable	July 2019
Rote Island Snake- necked Turtle <i>(Chelodina mccordi)</i>	Signature	245	20	250	5	Increasing	July 2020
Volcan Darwin Giant Tortoise <i>(Chelonoidis microphyes)</i>	Signature	89	15	100	11	Increasing	Nov 2020
Spotted Turtle <i>(Clemmys guttata)</i>	Signature	352	75	350	-2	Increasing	Aug 2016
Indochinese Box Turtle <i>(Cuora galbinifrons)</i>	Provisional	100	14	105	5	Increasing	Mar 2022
McCord's Box Turtle <i>(Cuora mccordi)</i>	Provisional	116	16	125	9	Increasing	Apr 2022
Pan's Box Turtle <i>(Cuora pani)</i>	Provisional	90	16	100	10	Stable	Feb 2019
Blanding's Turtle <i>(Emydoidea blandingii)</i>	Provisional	376	28	375	-1	Stable	Nov 2020
Burmese Star Tortoise <i>(Geochelone platynota)</i>	Signature	250	18	250	0	Stable	Mar 2019
Black-breasted Leaf Turtle <i>(Geoemyda spengleri)</i>	Signature	216	30	225	9	Increasing	Apr 2022
Spiny Hill Turtle <i>(Heosemys spinosa)</i>	Provisional	76	14	80	4	Increasing	Dec 2021
Home's Hinge-back Tortoise <i>(Kinixys homeana)</i>	Signature	120	15	125	5	Increasing	Mar 2019

Common Name (Scientific Name)	Program designation	Current Population Size	Current # Participatin g AZA facilities	5-Year Target Population Size	Space Needed (Current- Target Size)	5-Year Population Trend	Date of of most recent BTP
Pancake Tortoise (<i>Malacochersus tornieri</i>)	Provisional	296	70	305	9	Stable	Aug 2019
Burmese Brown Mountain Tortoise (<i>Manouria e. emys</i>)	Signature	139	27	150	11	Increasing	May 2019
Burmese Black Mountain Tortoise (<i>Manouria e. phayrei</i>)	Provisional	87	21	100	13	Stable	Apr 2019
Malaysian Giant River Turtle (<i>Orlitia borneensis</i>)	Provisional	52	15	55	3	Stable	Mar 2020
Common Spider Tortoise (<i>Pyxis a. arachnoides</i>)	Signature	139	26	145	6	Increasing	Dec 2019
Northern Spider Tortoise (<i>Pyxis a. brygooi</i>)	Signature	110	15	120	10	Increasing	Dec 2019
Madagascar Flat- tailed Tortoise (<i>Pyxis planicauda</i>)	Signature	101	17	115	14	Increasing	Aug 2019
Coahuila Box Turtle (<i>Terrapene coahuila</i>)	Provisional	62	15	65	3	Stable	Mar 2022
Egyptian Tortoise (<i>Testudo kleinmanni</i>)	Signature	91	27	100	9	Stable	Apr 2021

Target Population sizes were determined for each species in consultation with program leaders, population biologists and by comparing space survey results throughout the winter and spring of 2022. In general, the ChAG aims to have slow population growth due to the long reproductive life as well as life spans in general. Several other factors contribute to our target population sizes that may or may not affect other TAGs, for example surplus of non-essential animals to the private sector (radiated tortoise), reintroduction programs (Rote Island snake-necked turtle, Blanding's turtle), and well as confiscations (spotted turtle, Home's hinge-backed tortoise).

Table 7: Animal Programs Summary and Goals Table

Common Name (Scientific Name)	Radiated Tortoise (<i>Astrochelys radiata</i>)
SSP Designation	Provisional
Program Leader, email	Michael Ogle, mogle@zooknoxville.org
Program Role	Education/Exhibit
SMAART Goal #1	Work with two AZA facilities by spring of 2023 to create closed chamber rearing enclosures for hatchling tortoises to allow shell growth to better mirror what is seen in wild tortoises.
SMAART Goal #2	Assist the Radiated Tortoise SAFE program with recruiting three AZA members to attend the spring 2023 annual health assessment at the TSA center in Madagascar.
SMAART Goal #3	Work with member facilities after the next SSP is published in fall of 2022 to increase breeding at a minimum of two institutions by fall of 2023 to increase growth and become a signature SSP program.

Common Name (Scientific Name)	Rote Island Snake-necked Turtle (<i>Chelodina mccordi</i>)
SSP Designation	Signature
Program Leader, email	Avi Schuter, ashuter@wcs.org
Program Role	Assurance/Exhibit
SMAART Goal #1	Begin sending turtles to Indonesia for release into the wild.
SMAART Goal #2	Establish additional bio-secure holding facilities for AZA-produced turtles to be raised prior to shipment for release.
SMAART Goal #3	Establish shipment schedule with European EEP in order to allow for alternating shipments year to year of turtles to Indonesia to build the new wild population from the broadest possible gene pool.

Common Name (Scientific Name)	Volcan Darwin Giant Tortoise (<i>Chelonoidis microphyes</i>)
SSP Designation	Signature
Program Leader, email	Ashley Ortega, aortega@gpz.org
Program Role	Education/Exhibit
SMAART Goal #1	Continue to supply zoos with young animals for exhibit/education purposes until we need them for breeding.
SMAART Goal #2	Genetically test recent offspring so that we know which founder and founder pairings to focus on by 2023.
SMAART Goal #3	Recruit 1-3 new institutions by 2023.

Common Name (Scientific Name)	Spotted Turtle (<i>Clemmys guttata</i>)
SSP Designation	Signature
Program Leader, email	Dave Collins, dcollins@turtlesurvival.org
Program Role	Education/Exhibit
SMAART Goal #1	<p>Goal: Determine provenance of spotted turtles from four confiscations.</p> <p>Action: Analysis of field collected, and confiscated turtle samples is being conducted by the Dyer Genetics lab at Virginia Commonwealth University. Field samples were collected as part of a CSWF-funded range-wide spotted survey initiated in 2019 and will be used to develop a genetic library for the species. Samples from confiscated turtles were collected and submitted in 2020-21 by SSP and American Turtle SAFE partners holding the confiscated turtles. Samples from confiscated turtles will be compared to the genetic library to determine provenance. The process was significantly delayed due to COVID-19. Results are now expected in spring 2022. Success will be realized when we are able to determine the provenance of these confiscated turtles.</p>
SMAART Goal #2	<p>Goal: Zoos interested in engaging in regional spotted turtle conservation efforts will have access to genetically appropriate animals.</p> <p>Action: Identify and provide spotted turtles to Cleveland Metroparks Zoo. They are working with a multi-agency consortium involved in regional spotted turtle population recovery and have been identified as a pilot for this effort. Their project needs turtles of appropriate provenance to serve as breeding stock to produce progeny for release or for direct release if established protocols are met. The group is targeting 2023 as the earliest release date. This project is identified as an Ecological Project of the American Turtle SAFE Program.</p>
SMAART Goal #3	<p>Goal: Expand populations of known provenance spotted turtles in SSP institutional collections.</p> <p>Action: Survey SSP partners during 2022 to identify founder animals of unknown origin in the AZA population. Sample those turtles during 2022-23 and submit for genetic analysis as funding permits. Incorporate this information into studbook to inform subsequent breeding and transfer plans and into relevant regional conservation efforts conducted through American Turtle SAFE.</p>

Common Name (Scientific Name)	Indochinese Box Turtle (<i>Cuora galbinifrons</i>)
SSP Designation	Provisional
Program Leader, email	Lauren Augustine, Augustine.lauren@phillyzoo.org
Program Role	Assurance
SMAART Goal #1	Incorporate at least 3 new institutions into the SSP by the end of 2022.
SMAART Goal #2	Write and submit paper on genetic evaluation by the end of 2022. With the goal of begin published and distributed to studbook participants in 2023. International collaborators are the challenge to completing this goal- genetics work was completed in 2019.
SMAART Goal #3	Develop a 3-year plan with the TSA and the ATP to utilize new WildCare program resources in the field by the end of 2023- develop field projects aimed at filling gaps in natural history and health of wild and captive populations, provide support staff to help with confiscations and animal care in Vietnam.

Common Name (Scientific Name)	McCord's Box Turtle (<i>Cuora mccordi</i>)
SSP Designation	Provisional
Program Leader, email	Jeff Dawson, jdawson@stlzoo.org
Program Role	Assurance
SMAART Goal #1	Increase the number of AZA facilities working with this species by at least one new facility by June of 2023.
SMAART Goal #2	When the Breeding and Transfer plan is completed, use the recommendations to provide breeding opportunities for at least one pair of turtles to produce a successful clutch by fall of 2023.
SMAART Goal #3	Establish a connection with Dr. Bill McCord, a private turtle keeper, by spring of 2023 for a bloodline swap. Dr. McCord maintains the largest founder population of this species outside of China and it would benefit our population to bring in unrelated animals.

Common Name (Scientific Name)	Pan's Box Turtle (<i>Cuora pani</i>)
SSP Designation	Provisional
Program Leader, email	Cris Hagen, chagen@turtlesurvival.org
Program Role	Assurance
SMAART Goal #1	Using connections through the Turtle Survival Alliance's network of private keepers, find at least one keeper that the SSP can swap bloodlines with the SSP to get additional bloodlines represented in the studbook.
SMAART Goal #2	Increase the number of AZA facilities working with this species by at least two new facilities by November of 2023.
SMAART Goal #3	Confirm that all of the hybrids that were created by accidental breedings with <i>Cuora aurocapitata</i> are identified in the studbook by spring of 2023.

Common Name (Scientific Name)	Blanding's Turtle (<i>Emydoidea blandingii</i>)
SSP Designation	Provisional
Program Leader, email	Sarah Foote, sfoote@ingham.org
Program Role	Education/Exhibit/Reintroduction
SMAART Goal #1	Complete the Blanding's turtle Sustainability Report by September 2022. Complete first draft by April 2022. Edits received by June 2022 (discuss with M. Ogle best resource for edits). Submitted to AZA by September 2022.
SMAART Goal #2	Develop a short survey to determine species compatible with Blanding's turtles. Survey written by March 2022 and sent to all current holders with a completion date of May 2022. This data will be included in the Sustainability report (Submitted by September 2022).
SMAART Goal #3	Continue to build relationships with regional researchers working with this species in-situ (non-head-start programs). Goal of contacting at least two other researchers by July 2022. Discuss any assistance the SSP could provide.

Common Name (Scientific Name)	Burmese Star Tortoise (<i>Geochelone platynota</i>)
SSP Designation	Signature
Program Leader, email	Matt Evans, evansmj@si.edu
Program Role	Education/Exhibit
SMAART Goal #1	Work with two AZA facilities by spring of 2023 to create closed chamber rearing enclosures for hatchling tortoises to allow shell growth to better mirror what is seen in wild tortoises.
SMAART Goal #2	Increase AZA interest in the species, including willingness to act as holding facilities for unsexed juveniles, increase holding by two institutions by fall of 2023.
SMAART Goal #3	Work with member vets and the AZA ChAG Vet advisor to establish guidelines for managing Mycoplasma + tortoises by spring of 2023.

Common Name (Scientific Name)	Black-breasted Leaf Turtle (<i>Geoemyda spengleri</i>)
SSP Designation	Signature
Program Leader, email	Jeff Dawson, jdawson@stlzoo.org
Program Role	Education/Exhibit
SMAART Goal #1	Increase the number of participating AZA-accredited facilities by adding at least 1 new facility by the end of December 2022.
SMAART Goal #2	When the Breeding & Transfer plan is completed, use the recommendations to provide breeding opportunities for at least one pair of turtles with the goal of getting at least one pair to successfully produce a hatchling before the end of December 2022.
SMAART Goal #3	Locate all of the Hainan form of spengleri in the studbook so we can manage that locality separately from the rest of the population by fall of 2022.

Common Name (Scientific Name)	Spiny Hill Turtle (<i>Heosemys spinosa</i>)
SSP Designation	Provisional
Program Leader, email	Bill Hughes, bhh@tnaqua.org
Program Role	Education
SMAART Goal #1	Increase the number of AZA facilities working with this species by at least two by the end of 2022. An email was sent to the AZA Chelonian listserv in late 2021; consequently, several institutions expressed interest. I plan to directly communicate with the potentially interested facilities (by the second quarter of 2022) and convince them to work with this species.
SMAART Goal #2	Dr. Daniel Gaillard of Dalton State College wants to perform genetic analysis for this species – spurred in part by earlier work done a decade ago that indicated the presence of different clades in the AZA population. The goal (to be finished by the end of 2022) is to work with him to formulate a comprehensive action plan to identify all the myriad pieces (such as but not limited to: Identify potential animals to sample and willingness of facilities to participate, look at funding sources (in-house or external, possibly a CGF, TCF, or ChTAG grant), identify reference specimens with known locality, etc.). This plan would be in the form of a document with as many actionable pieces (along with timeframes) as possible identified.
SMAART Goal #3	Following up on the previous goal, one of characteristics for this species that was noted during the earlier work was variability in iris color. By the end of 2022, generate a document with photos of various iris colors and send this out to facilities to generate a list for as many studbook animals as possible. Incorporate this information into the studbook using a UDF.

Common Name (Scientific Name)	Home's Hinge-back Tortoise (<i>Kinixys homeana</i>)
SSP Designation	Signature
Program Leader, email	Matt Neff, neffm@si.edu
Program Role	Education/Assurance
SMAART Goal #1	Compile incubation temperatures to determine Temperature Sex Determination parameters in participating facilities.
SMAART Goal #2	Increase AZA interest in the species, including willingness to act as holding facilities for unsexed juveniles, increase holding by two institutions by fall of 2023.
SMAART Goal #3	Find three institutions to create pairs of animals for better parental identification as opposed to MULT parent breeding groups

Common Name (Scientific Name)	Pancake Tortoise (<i>Malacochersus tornieri</i>)
SSP Designation	Provisional
Program Leader, email	Andy Daneault, andre.j.daneault@disney.com
Program Role	Education/Exhibit
SMAART Goal #1	Ensure six new TSA tortoise bloodlines are included in the 2022 SSP breeding and transfer plan. Continue throughout the year to partner with the TSA animal management committee to identify other tortoises for future plans.
SMAART Goal #2	During the draft 2022 SSP plan continue to work with AZA institutions to identify gender of genetically valuable tortoises that can be included into the final 2022 SSP plan.
SMAART Goal #3	Solicit institutions that have produced multiple offspring and gather information on artificial incubation techniques. Compile information in a shared document by year end.

Common Name (Scientific Name)	Burmese Brown Mountain Tortoise (<i>Manouria e. emys</i>)
SSP Designation	Signature
Program Leader, email	Andy Daneault, andre.j.daneault@disney.com
Program Role	Education/Exhibit
SMAART Goal #1	By fall of 2022, solicit the Turtle Survival Alliance and Turtle and Tortoise Preservation private members to identify genetically valuable tortoises for potential inclusion into AZA facilities.
SMAART Goal #2	Throughout the year solicit AZA institutions to participate in the SSP program. By year end identify two new AZA institutions to be added to the SSP program.
SMAART Goal #3	By year end develop plan for importing (overseas) new specimens into the SSP with partnering AZA institutions.

Common Name (Scientific Name)	Burmese Black Mountain Tortoise (<i>Manouria e. phayrei</i>)
SSP Designation	Provisional
Program Leader, email	Andy Daneault, andre.j.daneault@disney.com
Program Role	Assurance/Exhibit
SMAART Goal #1	By fall of 2022, solicit the Turtle Survival Alliance and Turtle and Tortoise Preservation private members to identify genetically valuable tortoises for potential inclusion into AZA facilities.
SMAART Goal #2	Throughout the year solicit AZA institutions to participate in the SSP program. By year end identify two new AZA institutions to be added to the SSP program.
SMAART Goal #3	By year end develop plan for importing (overseas) new specimens into the SSP with partnering AZA institutions.

Common Name (Scientific Name)	Malaysian Giant River Turtle (<i>Orlitia borneensis</i>)
SSP Designation	Provisional
Program Leader, email	Lauren Gruny, laureng@alligatorfarm.com
Program Role	Assurance
SMAART Goal #1	Work with a nutritionist to create a balanced diet for zoo housed turtles by summer of 2022
SMAART Goal #2	Assisting with the movement of surplus animals to EAZA by October 2023
SMAART Goal #3	Encourage some of the recommended breeding/hatching to take place in 2022

Common Name (Scientific Name)	Common Spider Tortoise (<i>Pyxis a. arachnoides</i>)
SSP Designation	Signature
Program Leader, email	Michael Ogle, mogle@zooknoxville.org
Program Role	Assurance/Exhibit
SMAART Goal #1	Add two private collections to the studbook by spring of 2024, so that we can work to swap bloodlines for increased diversity in the managed population. AZA maintains the only significant ex-situ population across the various regions outside of Madagascar.
SMAART Goal #2	As the Radiated Tortoise SAFE program works to add the two Pyxis species of tortoise to its program, we need to add one additional funder to support the work in Madagascar by fall of 2023.
SMAART Goal #3	Work with the Lizard TAG to create a mix exhibit list of Malagasy lizards that could include this species by fall of 2022. This would help breeding facilities lessen their holding capacity by freeing up space.

Common Name (Scientific Name)	Northern Spider Tortoise (<i>Pyxis a. brygooi</i>)
SSP Designation	Signature
Program Leader, email	Michael Ogle, mogle@zooknoxville.org
Program Role	Assurance/Exhibit
SMAART Goal #1	Add two private collections to the studbook by spring of 2024, so that we can work to swap bloodlines for increased diversity in the managed population. AZA maintains the only significant ex-situ population across the various regions outside of Madagascar.
SMAART Goal #2	Work with the Lizard TAG to create a mix exhibit list of Malagasy lizards that could include this species by fall of 2022. This would help breeding facilities lessen their holding capacity by freeing up space.
SMAART Goal #3	Add two private collections to the studbook by spring of 2024, so that we can work to swap bloodlines for increased diversity in the managed population. AZA maintains the only significant ex-situ population across the various regions outside of Madagascar.

Common Name (Scientific Name)	Madagascar Flat-tailed Tortoise (<i>Pyxis planicauda</i>)
SSP Designation	Signature
Program Leader, email	Michael Ogle, mogle@zooknoxville.org
Program Role	Assurance/Exhibit
SMAART Goal #1	Locate two new facilities to join the SSP by fall of 2023. Facilities that focus on holding juvenile tortoises are needed.
SMAART Goal #2	Work with two AZA facilities by spring of 2023 to create closed chamber rearing enclosures for hatchling tortoises to allow shell growth to better mirror what is seen in wild tortoises.
SMAART Goal #3	Add two private collections to the studbook by spring of 2024, so that we can work to swap bloodlines for increased diversity in the managed population. The situation in the wild is dire due to increased burning of the remaining habitat for corn production. AZA maintains on the only significant ex-situ population across the various regions outside of Madagascar.

Common Name (Scientific Name)	Coahuila Box Turtle (<i>Terrapene coahuila</i>)
SSP Designation	Provisional
Program Leader, email	Trent Barnhart, tbarnhart@sbzoo.org
Program Role	Assurance/Education
SMAART Goal #1	Survey institutions for husbandry practices especially in regard to breeding practices.
SMAART Goal #2	Continue to partner with SAFE North American Box Turtle program and establish SOG for any T. coahuila that become available through confiscation programs.
SMAART Goal #3	Find two new AZA facilities to add this species to their collection by spring of 2023

Common Name (Scientific Name)	Egyptian Tortoise (<i>Testudo kleinmanni</i>)
SSP Designation	Signature
Program Leader, email	Danielle Regan, Danielle.regan@marylandzoo.org
Program Role	Education
SMAART Goal #1	Perform exchange with EAZA for potential founders by spring of 2025.
SMAART Goal #2	Increase the number of institutions producing offspring by two by fall of 2023 with dedicated assistance from the SSP as well as by institutions have had previous success.
SMAART Goal #3	Identify in situ conservation partners for institutions to support by fall of 2022.

Table 8: Management Update Table

Common Name (Genus species)	Current RCP Program Designation	Previous RCP Pgm. Designation (2016)	Previous RCP Pgm. Designation (2011)
Radiated tortoise (<i>Astrochelys radiata</i>)	Provisional SSP	Green SSP	SSP
Rote Island Snake-necked Turtle (<i>Chelodina mccordi</i>)	Signature SSP	Yellow SSP	PMP
Volcan Darwin Giant Tortoise (<i>Chelonoidis microphyes</i>)	Signature SSP	Yellow SSP	PMP
Spotted Turtle (<i>Clemmys guttata</i>)	Signature SSP	Yellow SSP	N/A
Indochinese Box Turtle (<i>Cuora galbinifrons</i>)	Provisional SSP	Candidate	N/A
McCord's Box Turtle (<i>Cuora mccordi</i>)	Provisional SSP	Yellow SSP	PMP
Pan's Box Turtle (<i>Cuora pani</i>)	Signature SSP	Yellow SSP	PMP
Blanding's Turtle (<i>Emydoidea blandingii</i>)	Provisional SSP	Candidate	N/A
Burmese Star Tortoise (<i>Geochelone platynota</i>)	Signature SSP	Yellow SSP	SSP
Black-breasted Leaf Turtle (<i>Geoemyda spengleri</i>)	Signature SSP	Yellow SSP	SSP
Spiny Hill Turtle (<i>Heosemys spinosa</i>)	Provisional SSP	Yellow SSP	SSP
Home's Hinge-back Tortoise (<i>Kinixys homeana</i>)	Signature SSP	Yellow SSP	N/A

Common Name (Genus species)	Current RCP Program Designation	Previous RCP Pgm. Designation (2016)	Previous RCP Pgm. Designation (2011)
Pancake Tortoise (<i>Malacochersus tornieri</i>)	Provisional SSP	Yellow SSP	PMP
Burmese Brown Mountain Tortoise (<i>Manouria e. emys</i>)	Signature SSP	Yellow SSP	PMP
Burmese Black Mountain Tortoise (<i>Manouria e. phayrei</i>)	Provisional SSP	Yellow SSP	PMP
Malaysian Giant River Turtle (<i>Orlitia borneensis</i>)	Provisional SSP	Yellow SSP	PMP
Common Spider Tortoise (<i>Pyxis a. arachnoides</i>)	Signature SSP	Yellow SSP	SSP
Northern Spider Tortoise (<i>Pyxis a. brygooi</i>)	Signature SSP	Yellow SSP	SSP
Madagascar Flat-tailed Tortoise (<i>Pyxis planicauda</i>)	Signature SSP	Yellow SSP	SSP
Coahuila Box Turtle (<i>Terrapene coahuila</i>)	Provisional SSP	Yellow SSP	SSP
Egyptian Tortoise (<i>Testudo kleinmanni</i>)	Signature SSP	Yellow SSP	PMP

Table 9: Additional Animal Programs Summary Table

Common Name (Genus species)	Current Pop. Size	# AZA facility holders	Population Type	Growth Trend
Northwestern Pond Turtle (<i>Actinemys marmorata</i>)	66	15	TAG Monitored – Studbook SAFE	Stable
Aldabra Giant Tortoise (<i>Aldabrachelys gigantea</i>)	172	49	TAG Monitored	Stable
Painted Terrapin (<i>Batagur borneoensis</i>)	78	13	TAG Monitored - Studbook	Decrease
Fly River Turtle (<i>Carettochelys insculpta</i>)	62	27	TAG Monitored	Decrease
African Spurred Tortoise (<i>Centrochelys sulcata</i>)	101	42	15 + Facilities	Stable
Red-footed Tortoise (<i>Chelonoidis carbonaria</i>)	133	47	15 + Facilities	Stable
Yellow-footed Tortoise (<i>Chelonoidis denticulata</i>)	50	20	15 + Facilities	Stable
Galapagos Tortoise Hybrid (<i>Chelonoidis nigra</i> x)	39	15	TAG Monitored – Studbook	Stable
Western Santa Cruz Giant Tortoise (<i>Chelonoidis porteri</i>)	42	9	TAG Monitored – Studbook	Increasing
Cerro Azul Giant Tortoise (<i>Chelonoidis vincina</i>)	23	9	TAG Monitored – Studbook	Stable

Common Name (Genus species)	Current Pop. Size	# AZA facility holders	Population Type	Growth Trend
Matamata (<i>Chelus fimbriata</i>)	60	32	TAG Monitored	Increase
Common Snapping Turtle (<i>Chelydra serpentina</i>)	24	20	15 + Facilities	Stable
Painted Turtle (<i>Chrysemys picta</i>)	93	24	15 + Facilities	Stable
Bourret's Box Turtle (<i>Cuora bourreti</i>)	98	5	TAG Monitored – Studbook	Increasing
Southern Vietnamese Box Turtle (<i>Cuora picturata</i>)	55	3	TAG Monitored – Studbook	Increasing
Red-bellied Short-neck Turtle (<i>Emydura subglobosa</i>)	47	15	15 + Facilities	Stable
Indian Spotted Turtle (<i>Geoclemys hamiltoni</i>)	51	15	15 + Facilities	Stable
Wood Turtle (<i>Glyptemys insculpta</i>)	59	21	TAG Monitored – Studbook SAFE	Increase
Bog Turtle (<i>Glyptemys muhlenbergii</i>)	39	10	TAG Monitored – Studbook SAFE	Stable
Mojave Desert Tortoise (<i>Gopherus agassizi</i>)	76	29	TAG Monitored	Stable
Texas Tortoise (<i>Gopherus berlandieri</i>)	37	16	TAG Monitored	Stable

Common Name (Genus species)	Current Pop. Size	# AZA facility holders	Population Type	Growth Trend
Gopher Tortoise (<i>Gopherus polyphemus</i>)	62	28	TAG Monitored	Stable
Yellow-blotched Map Turtle (<i>Graptemys flavimaculata</i>)	63	12	TAG Monitored – Studbook	Stable
Yellow-headed Temple Turtle (<i>Heosemys annandalii</i>)	22	5	TAG Monitored – Studbook	Decreasing
Arakan Forest Turtle (<i>Heosemys depressa</i>)	34	8	TAG Monitored – Studbook	Stable
Forsten’s Tortoise (<i>Indotestudo forstenii</i>)	109	9	TAG Monitored – Studbook	Increasing
Sulawesi Forest Turtle (<i>Leucocephalon yuwonoi</i>)	102	11	TAG Monitored - Studbook	Increasing
Alligator Snapping Turtle (<i>Macrochelys temmincki</i>)	80	43	TAG Monitored	Stable
Diamondback Terrapin (<i>Malaclemys terrapin</i>)	155	33	TAG Monitored	Increasing
Spot-bellied Side-necked Turtle (<i>Phrynops hilarii</i>)	33	15	15 + Facilities	Stable
Arrau (<i>Podocnemis expansa</i>)	47	15	15 + Facilities	Stable

Common Name (Genus species)	Current Pop. Size	# AZA facility holders	Population Type	Growth Trend
Yellow-spotted Amazon River turtle (<i>Podocnemis unifilis</i>)	135	28	15 + Facilities	Increasing
River Cooter (<i>Pseudemys concinna</i>)	69	16	15 + Facilities	Stable
Four-eyed Turtle (<i>Sacalia quadriocellata</i>)	63	8	TAG Monitored – Studbook	Increasing
Stinkpot (<i>Sternotherus odoratus</i>)	32	15	15 + Facilities	Stable
Leopard Tortoise (<i>Stigmochelys pardalis</i>)	87	33	15 + Facilities	Stable
Florida Box Turtle (<i>Terrapene c. bauri</i>)	35	15	TAG Monitored SAFE	Stable
Eastern Box Turtle (<i>Terrapene c. carolina</i>)	430	66	TAG Monitored SAFE	Increasing
Ornate Box Turtle (<i>Terrapene ornata</i>)	121	29	TAG Monitored SAFE	Stable
Common Slider (<i>Trachemys scripta</i>)	272	40	15 + Facilities	Stable

Additional Animal Programs Summary Explanation

Species that are listed as TAG Monitored – Studbook were previous SSP programs, and because most of those species are listed as endangered or critically endangered by the IUCN, the ChAG wanted to continue to maintain a database for them. In all but two cases, the coordinator will remain as the studbook keeper moving forward. Once this edition of the RCP has been approved, we will look to fill the two vacancies (Sulawesi Forest Turtle and Forsten's Tortoise).

The Northwestern and Southwestern Pond Turtles will maintain a studbook as a component to their SAFE program. Because there is federal and/or state government oversight for a majority of both species, we decided it was best to potentially shift over to the new Wildlife Conservation Committee guidelines for externally managed SAFE programs.

The three native tortoise species (Mojave Desert, Gopher, and Texas) will become TAG monitored and we have contacts for zoos interested in acquiring these species. At this time, breeding is limited in AZA because most of these animals are acquired for education purposes from federal or state wildlife agencies. Those contacts are:

Drew Foster, Phoenix Zoo, dfoster@phoenixzoo.org for Mojave Desert Tortoise

Kelly Gorham, Disney's Animal Kingdom, Kelly.m.gorham@disney.com for Gopher Tortoises

Craig Pelke, San Antonio Zoo, craig.pelke@sazoo.org for Texas Tortoise

As mentioned previously, those species that are TAG monitored only will be a focus over the next few years to determine the best method to guarantee their long-term sustainability in our care. Captive breeding is rare for several of them and due to the time, it takes to reach adulthood could be problematic in finding facilities interested in long-term rearing.

Finally, those species mentioned as 15 + holding facilities are commonly available as surplus either from other AZA members, confiscations, or through legal means in the private sector. The ChAG steering committee will assist members if they need help locating any of those species.

AZA Saving Animals From Extinction (SAFE)

The Chelonian TAG supports a variety of conservation projects with our member institutions but has also been a support of the AZA SAFE program since it was first established over seven years ago. For more information about the program in general please visit:

<https://www.aza.org/aza-safe>

SAFE is a framework that:

Protects threatened animals.

Builds on established recovery plans and history of commitment.

Prioritizes collaboration among AZA member institutions.

Implements strategic conservation and stakeholder engagement activities.

Measures and reports conservation progress.

At this time, there are currently three SAFE programs involved with either freshwater turtles or tortoises. Links to their programs can be found below.

North American Turtle SAFE

The SAFE American turtle's program goal focuses on conservation efforts for turtle species including the bog turtle, spotted turtle, wood turtle, Blanding's turtle, eastern box turtle, and all Terrapene species.

<https://www.aza.org/safe-species#americanturtle>

Radiated Tortoise SAFE

The SAFE radiated tortoise's program goal is to prevent the extinction of the radiated tortoise by leveraging the collective expertise and resources of the AZA community and supporting field-based partners in implementing existing recovery plans through collaborative and strategic conservation and public engagement activities.

<https://www.aza.org/safe-species#radiatedtortoise>

Western Pond Turtle SAFE

The SAFE Western Pond turtle's program goal is to support the assessment of western pond turtle populations and their threats, engage the public, build public and combined stakeholder efforts, and support works that increase the number of turtles living in natural areas in the species range.

<https://www.aza.org/safe-species#westernpondturtle>



NORTH AMERICA SPECIES ACCOUNTS

Blanding's Turtle

Emydoidea blandingii



Photo by Robert Doherty

Species Summary:

Emydoidea blandingii is a medium-sized (26cm/10in) 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. These turtles are highly mobile, increasing their risk of road mortality

Program Purposes:

Blanding's turtle is listed as Endangered by IUCN TFTSG specialist group and is listed on CITES 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 allow 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 turtles 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.

2022 Program Goals:

Complete the Blanding's turtle Sustainability Report by September 2022. Complete first draft by April 2022. Edits received by June 2022 (discuss with M. Ogle best resource for edits). Submitted to AZA by September 2022.

Develop a short survey to determine species compatible with Blanding's turtles. Survey written by March 2022 and sent to all current holders with a completion date of May 2022. This data will be included in the Sustainability report (Submitted by September 2022).

Continue to build relationships with regional researchers working with this species in-situ (non-head-start programs). Goal of contacting at least two other researchers by July 2022. Discuss any assistance the SSP could provide.

Program Contact:

Sarah Foote
Potter Park Zoo
sfoote@ingham.org

NORTH AMERICA SPECIES ACCOUNTS

Coahuila Box Turtles

Terrapene coahuila



Photo: Dr. James Liu, The Turtle Conservancy. Coahuila Box Turtle in its native habitat in Cuatro Ciéngas, Mexico

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 classified as an Endangered species as listed by IUCN Red List of Threatened Species™. It is endemic to the marshlands 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.



Photo: Jeff Jundt, Detroit Zoo. An example of an indoor exhibit for *T. coahuila*



Photo: Jeff Jundt Detroit Zoo. Close up of *T. coahuila* on display in an indoor exhibit.



Photo: Gladys Porter Zoo. An example of how easily *T. coahuila* can be housed in a simple exhibit featuring shallow water and a haul out area.

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

Spotted Turtle

Clemmys guttata



Photo by: Joe Crowley

Species Summary:

A small turtle of diverse wetland habitats of the North American Northeast, Atlantic and upper Midwest, the Spotted Turtle (*Clemmys guttata*) is an attractive exhibit species suitable to spaces which would preclude larger turtles. They are an asset in a mixed species habitat exhibits. Spotted turtles exemplify the need for local conservation of endangered species and as such provide opportunity for strong conservation messages.

Program Purposes:

Spotted Turtles have declined more than 50% across their range and are listed as Endangered by the International Union for Conservation of Nature (IUCN). They are identified as Species of Greatest Conservation Need (SGCN) in all 21 states in which they occur and are under review for federal listing under the U.S. Endangered Species Act. *Clemmys guttata* is listed in CITES Appendix II. The primary cause of decline has been habitat loss, fragmentation and degradation. Remaining populations face continuing threats from the illegal wildlife trade, road mortality, predation and climate change.

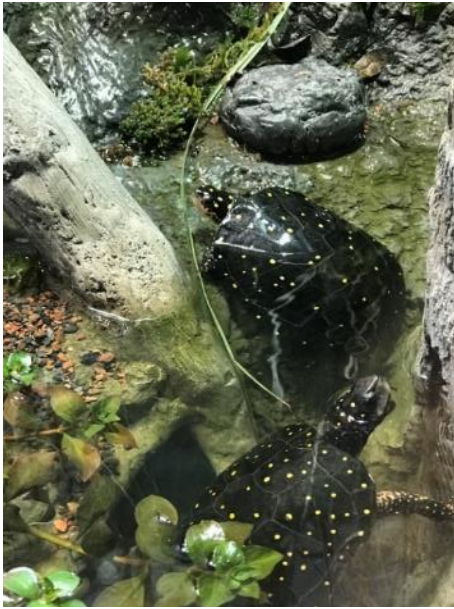
Spotted turtles are popular in zoological collections. At present, 348 (111.122.115) occur in 75 AZA institutions. From a genetic standpoint, this population has been managed as a single population. Current research is underway to develop a genetic library of free-ranging spotted turtles (as well as for a number of other North American freshwater turtles) that will enable the provenance of turtles of unknown origin to be determined. This is an important factor in recovery efforts of wild populations. In order for AZA institutions to become engaged in regional conservation efforts, a better understanding of the provenance of turtles in our managed collection will be essential.

The AZA SAFE American Turtle Program is presently involved in a project to determine the provenance of a large group of confiscated spotted turtles from several different seizures. With the completion of this project these turtles can be incorporated into known provenance populations within existing SSP partner collections, and we can begin confirming provenance of individuals within existing collections.

Exhibit Qualities:

The small size and attractive appearance of spotted turtles makes them charismatic to zoo and aquarium visitors. With an adult length of 10-15cm, spotted turtles can be exhibited in spaces which would be too small for many other turtle species. This aspect, together with their benign demeanor, makes them an excellent choice for many mixed species exhibits. A variety of other native turtles such as *Chrysemys*, *Glyptemys*, *Emydoidea*, *Terrapene* and some amphibians, such as adult anurans and *Ambystomid* salamander species could be compatible with this turtle species.





The “Pocket Fen” exhibit at the Tennessee Aquarium includes spotted, bog and young eastern box turtles.



Tennessee Aquarium

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

Wetland protection and habitat fragmentation

Illegal wildlife trade and any removal of animals from the wild

Climate change

Camouflage – aquatic plant pattern (duckweed)

Care and Facilities:

Spotted turtles are relatively easy to care for in captivity. Two adult *Clemmys* can be managed in a 40 gallon aquarium or small Waterland® tub with equal land and water areas. They also do well in larger, more complex multi-species exhibits. 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 65-70 °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 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 when sunlight when housed indoors.

Program Goals:

Update current studbook.

Incorporate known provenance confiscated turtles into the SSP.

Identify known provenance individuals within the present AZA population.

Manage the Program so as to encourage conservation efforts that will help sustain wild populations of Spotted turtles.

Program contact:

Dave Collins

SSP Coordinator

Turtle Survival Alliance

423-903-9540

SOUTH AMERICA SPECIES ACCOUNTS

Volcán Darwin Giant Tortoise

Chelonoidis microphyes



Photo by Patricia Scanlan, Gladys Porter Zoo

Species Summary:

The Volcán Darwin Giant Tortoise inhabits the area west of Volcán Darwin. Volcán 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 5,896 Volcán Darwin Giant Tortoises within 13 AZA accredited facilities and 1 AZA certified related facility 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- 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 yearround; 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 nail maintenance, 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 Giant 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 1900s, 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 1990s 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:

Ashley Ortega
SSP Coordinator and Studbook Keeper
Gladys Porter Zoo
aortega@gpz.org

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 2/3rds 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 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 topsoil 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 1210

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 *Uromastix*, 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 coconut fiber, mulch, dirt, and various combinations of all the above. The important thing to note is that while their substrate should remain fairly dry, these tortoises require short periods of high humidity. Usually running a cool mist humidifier for 30 minutes per day before the heat lamps turn on is enough humidity to keep their shells smooth and helps with their respiratory system. 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 breeding by two AZA institutions
Import animals from captive European stock
Increase the number of captive bred animals that have genetic value to the population

Program contact:

Danielle Regan
Studbook keeper and SSP Coordinator
Maryland Zoo in Baltimore
Danielle.Regan@marylandzoo.org

AFRICA SPECIES ACCOUNTS

Home's Hinged-back Tortoise

Kinixys homeana



Photo by John Lewis

Species Summary:

This West African tortoise belongs to a unique genus of chelonians that exhibits a rear hinged carapace. Generally not exceeding 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. In 2019 the IUCN Red List of Threatened Species™ upgraded the species classification 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 moderately represented in North American AZA facilities, with some of the institutions having good success with reproduction. Placement of unsexed juveniles has proven to be problematic and has limited breeding to an extent. 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 & 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:

Increase AZA facility interest in this species, especially for holding unsexed juveniles

Determine TSD parameters

Build an assurance colony of at least 200 individuals for optimal sustainability

Program Contact:

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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*).

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:

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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 an 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 topsoil, 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:

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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 Critically Endangered on the IUCN Red List of Threatened Species™ and Appendix I 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 102.93.101 individuals at 70 zoological institutions. 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:

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:

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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 locations 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, and 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 partner Utah's Hogle Zoo. 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 support 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, and 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, topsoil, peat moss or any combination of the above. A sand, topsoil, 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 offered 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:

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ASIA SPECIES ACCOUNTS

Black-breasted Leaf Turtle

Geoemyda spengleri



Photo credit: Jeffrey Dawson

Species Summary:

The Black-breasted Leaf Turtle is a small (<12.7cm) terrestrial species that is native to montane forests in southern China, northern Vietnam, and Laos. Currently, the species is listed as Endangered on the IUCN Red List of Threatened Species. Although deforestation is also a threat, over-collection for the wildlife trade is primarily responsible for the species' decline. Formerly, considerable numbers were exported to western countries for the pet trade. Now, international trade in the species is regulated under CITES Appendix II. Use as pets (and to a lesser extent, as food and traditional medicine) continues within range countries, particularly in China and Vietnam, however. Illegal smuggling between countries is also a problem. Turtles from Hainan Island, China, are especially sought after due to their beautiful head pattern and coloration. The unique appearance, small size, undemanding diet, and non-aggressive behavior of the Black-breasted Leaf Turtle make this species ideal for zoo exhibits, including multi-taxa exhibits.



Photo credit: Rick Haeffner



Photo credit: Jeffrey Dawson

Program Purposes:

This program is designated as an assurance population. The species has a low reproductive rate, with females laying 1-2 eggs per breeding season. Husbandry and reproduction techniques are relatively well established, and a number of institutions have been successful in breeding this species. Historically, captive bred males were rare in the population, as previous incubation parameters produced a higher ratio of females. This imbalance in sexes is improving, but one management goal is to continue promoting the incubation of eggs at lower temperatures to potentially hatch more males. Now that captive hatched animals are reaching maturity, another goal is to encourage reproduction of F1 specimens. Finally, the program aims to manage the morphologically different Hainan-locality turtles separate from the general population.



Photo credit: Jeffrey Dawson



Photo credit: 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 (but see care note below). The turtles are active during daylight hours, and many visitors find them to be “personable.”

Interpretive Messages:

- Over-collecting – threats of the trade in wildlife for human consumption, traditional medicine, and pets.
- Montane forest habitat – threats to Asian forests by deforestation
- Disjunct distribution – vulnerability of species with small and scattered subpopulations
- Low fecundity – vulnerability of species with low birth rates

Care and Facilities:

This species does not have complicated diet requirements. Crickets, earthworms, isopods, other small invertebrates, and pinky mice are readily taken. Most adults will also eat soft fruits (e.g., ripe banana, papaya, etc.), and some will accept moistened commercial foods (i.e., turtle pellets). Adequate exhibits for two specimens can be around 4-5 square feet, with shallow water areas, moist substrate, moderate summer-time ambient temperatures (around 24-26°C), and relative humidity levels around 70%. Ample humidity is especially important for the proper shell growth of hatchlings and juveniles (to avoid curling of the marginal scutes). Males may fight during the breeding season, and individuals of all sexes may form dominance hierarchies when kept in groups. Injuries and stress are rare but can occur, so provision of ample hides and visual barriers and monitoring of group dynamics is important. Groups of 2 males to 3-4 females housed together usually give good breeding and egg fertility results. The best success occurs when the turtles are provided with a period of winter cooling (to about 10°C).



Photo credit: Rick Haeffner

Program Goals:

- Increase the number of males and disperse them to increase reproduction.
- Move reproduction to F2 individuals.
- Manage Hainan-locality individuals separately from the general population.
- Continue collaborations with biologists working in range countries to gain information on wild biology and population status.

Program Contact:

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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 are 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:

Andy Daneault
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ASIA SPECIES ACCOUNTS

Burmese Black Mountain 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:

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ASIA SPECIES ACCOUNTS

Burmese Star Tortoise

Geochelone platynota



Species Summary:

The Burmese Star Tortoise (*Geochelone platynota*) is a beautiful and rare species of 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 grasses, with some mushrooms, fruit, and possibly insects and larvae. It is not known for burrowing behavior; instead, it hides under leaves and 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 as 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, wildfires and disease.

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 illegal international wildlife 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 leaves. 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. These tortoises should be soaked once weekly in a shallow pool of warm water for at least 20 minutes. Each tortoise could be lightly misted once a week as well. 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 and re-introduction efforts

Program Contact:

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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 25.49.25.

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, consistent and reliable reproductive output is limiting this 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:

A pair of adults can be kept in an enclosure measuring 1.2 x 1.5 m barring the pair is not aggressive towards each other. Enclosures should have smooth walls and be a minimum of 12 inches from the top of the substrate with an overhang or have a lid to prevent escapes. Soft deep substrate is recommended to maintain humidity and provide adequate nesting. A large water feature (8-15 cm deep), several hiding areas and a thick layer of leaf litter or a humid pile of leaves is essential for refugia and soaking. Hatchlings should be housed aquatically in enclosures around 30 x 38 cm slanted to allow for deep-water accumulation at one end. Leaf litter, moss and hide boxes should be offered. As they progress to the juvenile stages and their shells begin to increase in height (3-5 years) they can be housed more terrestrially but should be maintained in very humid conditions to promote proper shell growth. Animals should be provided with full spectrum lighting.

Adults should be fed three times a week in the spring/summer. A salad of ~40% mixed greens (a mix of romaine, kale, dandelion leaves, collards, and of other greens) and finely chopped vegetables (squash/zucchini, sweet potato, carrots, etc....) with a 60% protein portion (Mazuri® tortoise chow (Land O'Lakes Purina Feed LLC PMI Nutrition International, Richmond, IN 47374), Crickets, black worms, earth worms, mice, smelt, meal worms, roaches, etc...) is recommended. Whole prey items such as mice and fish are optimal as they provide additional nutrients with bone and organ content. Occasionally fruits and natural browse is also an important part of many turtle diets. Hatchlings should be offered live prey within the first two weeks out of the egg and feed four to five times per week for their first few months. As these hatchlings become juveniles, their diet should transition to a diet that includes more vegetable matter

Recommended seasonal cycles in temperature, light, humidity and diet are in Table 1. Prior to brumation, all turtles should be inspected to ensure they are healthy and without eggs before cooling down.

If housed individually, turtles can be introduced for breeding throughout the months of April through September. Breeding events are usually dependent upon the receptiveness of the females, and animals should be monitored for any aggressive interactions that may stress the female. Females can lay one to five eggs in a clutch (typically 1-3) and are known to double or triple clutch in captivity. Females are capable of retaining sperm for at least a year, possibly more, to fertilize eggs without mating. Eggs are usually laid from April through September (dependent on location and climate). Females will excavate very shallow divots in the substrate or enter piles of leaf litter for oviposition. Eggs are then carefully covered with leaf litter, mulch or other substrate with the rear legs. Eggs are large weighing approximately 25-30 grams. Incubation has not been perfected but successful institutions have used the following methods: Suspended Incubation Container by Squamata Concepts® (Staten Island, New York 10305, USA); 1:1 vermiculite: water by weight; 6:5 vermiculite: water by weight. Eggs typically take 77-84 days to hatch, depending on

incubation temperature. Eggs have been incubated anywhere from 24.4-30.5°C (76-86.9°F) successfully.

Table 1: Recommended seasonal environmental changes for *Cuora galbinifrons*.

	Brumation			Warm up			Active period			Cool down		
	December	January	February	March	April	May	June	July	August	September	October	November
Temperature Range	7-12 °C			Gradually increase to 18-26°C			22- 29.5°C			Gradually decrease to 18-26°C		
Humidity	Mist 1x a week			Mist 2-3xa week			Mist daily			Mist 2-3xa week		
Diet	Do not feed			Once active begin feeding 2x a week			Feed 3x a week, offer female supplemental protein			Reduce feeding to 2x a week		
Day Light Cycle	8 hours			Gradually increase to 12 hours			14 hours			Gradually decrease to 10 hours		

Program goals:

This program aims to develop a sustainable conservation breeding population within AZA by collecting and sharing information within the community, developing research initiatives that study the physiology and reproduction of this species, and increasing holding institutions. This program also aims to support *in-situ* conservation initiatives through the Asian Turtle Program of Indo-Myanmar Conservation. 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 efforts into *in-situ* conservation action is a primary goal of this program.

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ASIA SPECIES ACCOUNTS

Malaysian Giant Turtle

Orlitia borneensis



Photo by Lauren Grunty, St. Augustine Alligator Farm

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 15.18.19 *O. borneensis* in the AZA collection in North America. They are found at 15 institutions, and many of the founders of this population came into the country after a large confiscation in 2001. Zoo Miami had been very successful in breeding *O. borneensis* for several years until the group was separated due to management of breeding.

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 the location of populations 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 Gruny, 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 habitats, while others have them in deep moats. For exhibit purposes, having an underwater viewing area or shallow pool will make observing 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 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.



Photo by Lauren Gruny, St. Augustine Alligator Farm

Program Goals:

- Work with a nutritionist to create a balanced diet for zoo housed turtles
- Assisting with the movement of surplus animals to EAZA
- Encourage some of the recommended breeding/hatching to take place in 2022

Program Contact:

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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 (generally under 21 cm), semi-aquatic turtle native to a very limited area of southern China. This species is very hardy and easily maintained under a variety of conditions suitable for exhibit. It was first described in 1988 based on a handful of individuals that were obtained from a turtle dealer. The species was thought to be possibly extinct until it was re-discovered in the early 1990s in Chinese markets. Genetic research has supported that *C. mccordi* is a valid species and not a captive produced hybrid. Because of its extreme rarity, *C. mccordi* has a high trade value, resulting in intense collection pressure. Since the species' rediscovery in the markets, researchers have had little success finding wild individuals. Due to over-collection, the species is now likely extinct (or functionally so) in the wild.

Program Purposes:

The program is designated as an assurance population. As *C. mccordi* is quite likely extinct in the wild, reproduction under human care is critical to the continued survival of this species. Unfortunately, genetic diversity of much of the captive population is unknown. Some of the animals that 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 using good genetic data. Because *C. mccordi* has not been studied in the wild, keepers have largely had to rely upon trial and error to determine the care and breeding needs of the species.

Exhibit Qualities:

Based on discussions with locals in China, *C. mccordi* appear 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 Dawson/Saint Louis Zoo

Interpretive Messages:

- Over-collecting – threats of the trade in wildlife for human consumption, traditional medicine, and pets. This species is a prime example of the devastating impacts of the wildlife trade and how it can drive species extinctions.
- Extinction risk to the world's turtles – Today, turtles are one of the most threatened groups of vertebrates on the planet. McCord's Box Turtle could be considered the poster child for the "Asian Turtle Crisis," which heralded recognition of the significant threats that turtle species face in Asia and world-wide.



Photo credit: Jeffrey Dawson



Photo credit: Jeff Jundt/Detroit Zoological Society

Care and Facilities:

Individuals will eat a wide variety of foods: earthworms, crickets, other small invertebrates, pinky mice, turtle pellets, fruit, etc. Turtles will enter and swim in shallow water if provided. Because of the small founder size of the population, it is important to maintain individuals of this species in breeding pairs. 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 2000s. Cooling in the winter is not necessary to stimulate reproduction but is likely beneficial. Various facilities cool their animals down for several months out of the year to simulate seasonal changes. This can be done anytime or the entire time between November and April, and animals can be taken down to 8-12°C. During the active season, males may aggressively court and breed females, sometimes leading to injuries to the females. Therefore, females may benefit from periods of separation from males. Females can lay up to 4 eggs at a time and may produce multiple clutches per year. The species exhibits temperature-dependent sex determination (TSD), and eggs should be incubated at 76°F (24°C) for males and above 80°F (27°C) for females.

Other Notes:

Prior to being over-collected, *C. mccordi* was reportedly abundant in some areas. Local villagers reportedly would throw the turtles at their livestock to get them to move, since turtles were easier to find than stones.

Program Goals:

- Recommend 1 on 1 breeding pairs and discourage against breeding groups, which result in MULT parentages.
- Develop a method of genetically determining the parentage of the existing MULT offspring in the population.
- Annually increase the number of institutions holding this species by increasing the availability of individuals through improved breeding success at existing institutions.

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Asian Species Accounts

Pan's Box Turtle

Cuora pani



Species Summary:

The Pan's Box Turtle is a shy, highly 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 12-19.5 cm long, while the males are 10-14.5 cm in length. There are likely populations still in existence, but many wild turtles have been collected since the early 1980's for the wildlife trade in China, including the pet, medicinal, and food markets. The managed population in the United States is currently 18.38.102, housed at 19 institutions. One hundred thirty-two 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 sometimes 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 (and Global) 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 involves 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. In mild temperate climates, they can be maintained outdoors year round and allowed to go through a brumation period of up to 6 months. 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* sometimes can 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 variety of quality 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. Hatchlings should eat 5 to 7 times a week and as they get older can be reduced to 3-4 times a week, and finally 2-3 times a week as adults. 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

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ASIA SPECIES ACCOUNTS

Rote Island Snake-necked Turtle

Chelodina mccordi



Julie Larson Maher, Wildlife Conservation Society

Species Summary:

This relatively diminutive species, one of the smallest of the snake-necked turtles, only reaches a carapace length of about 21cm when full grown. Hailing only from the Indonesian Island of Rote, this diurnal turtle is a very active exhibit animal. Within its range, *C. mccordi* inhabits permanent and seasonal shallow eutrophic lakes, swamps, marshes, and even rice paddies and fields. It is currently considered one of the most endangered freshwater turtle and tortoise species in the world and represents the ongoing crisis facing many Asian chelids. Repatriation efforts are currently underway to re-establish the species within its former range, where it has not been seen in nearly two decades.



Historic habitat of *C. mccordi*. Lake Ledulu, Rote Island. (Photo by Avi Shuter)

Roti or Rote?

The common name for these turtles is often written out as “Roti Island Snake-necked Turtle.” However, the turtles are native to Pulau Rote (Rote Island), and the correct spelling of the island should be retained when writing the common name of *C. mccordi*.

Program Purposes:

Due to its status as a rare endemic species with unusual features, the Rote 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 both 2011 and 2018 IUCN reports and is currently classified as Critically Endangered. The species is currently listed as CITES Appendix II, though it has been suggested that the species be upgraded to Appendix I. There is currently a strong captive population within AZA facilities, and the SSP has made recommendations to reflect the need for turtles that will serve imminently as members of a new wild population on Rote Island.

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 signifera*), Weber’s Sailfin Lizards (*Hydrosaurus weberi*), Indian roofed turtles (*Pangshura tecta*), and Indian black turtles (*Melanochelys trijuga*) and various fish species (the fish must be large enough that the turtles don’t attempt to prey on them).



Julie Larson Maher, Wildlife Conservation Society

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. While these turtles spend much of their time in the water and seem ungainly walking on land, they do enjoy basking. Therefore, land areas and perching breaking the water’s surface should be provided along with accompanying hotspots (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:**

- Begin repatriation of turtles and reintroductions into the wild
- Make SSP recommendations with the goal of producing enough offspring to serve as foundation for a wild population
- Bring attention to the crisis currently facing this species and its relatives

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ASIA SPECIES ACCOUNTS

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 occasionally 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 to maintain a genetically viable population has become important. There are also at least 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 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 number of participating institutions by 2-3.
- Formulate a detailed plan for genetic analysis of founders and potential founders by Dalton State College faculty.
- Survey holding institutions about iris color in adults and add this information to the studbook as this color may be locale specific.

Program Contact:

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APPENDIX I. 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:

https://iucn-tftsg.org/wp-content/uploads/crm.8.checklist.atlas_v9.2021.e3.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
Tryonchiidae	<i>Amyda cartilaginea</i>	Asiatic softshell turtle	V	V	Asia
Tryonchiidae	<i>Apalone ferox</i>	Florida softshell turtle	LC		North America
Tryonchiidae	<i>Apalone mutica</i>	Smooth softshell turtle	LC		North America
Tryonchiidae	<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 auropunctata</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

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Tryonichiidae	<i>Cycloderma aubryi</i>	Aubry's flapshell turtle	NL	V	Africa
Tryonichiidae	<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
Tryonichiidae	<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 victoriae</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 dunni</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

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Geoemydidae	<i>Leucocephalon yuwonoi</i>	Sulawesi forest turtle	CR	CR	Asia
Tryonichiidae	<i>Lissemys ceylonensis</i>	Sri Lankan flapshell turtle	NE		Africa
Tryonichiidae	<i>Lissemys punctata</i>	Indian flapshell turtle	LC	LC	Asia
Tryonichiidae	<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>	Guyanese 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
Tryonichiidae	<i>Nilssonina formosa</i>	Burmese peacock softshell turtle	E	CR	Asia
Tryonichiidae	<i>Nilssonina leithii</i>	Leith's softshell turtle	V	CR	Asia
Tryonichiidae	<i>Nilssonina nigricans</i>	Black softshell turtle	Extinct in wild	CR	Asia
Tryonichiidae	<i>Nissonia gangetica</i>	Indian softshell turtle	V	E	Asia
Tryonichiidae	<i>Nissonia hurum</i>	Indian peacock softshell turtle	V	E	Asia

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Geoemydidae	<i>Notochelys platynota</i>	Malayan flat-shelled turtle	V	V	Asia
Geoemydidae	<i>Orlitia borneensis</i>	Malaysian giant turtle	E	CR	Asia
Tryonychiidae	<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
Tryonychiidae	<i>Pelochelys bibroni</i>	New Guinea giant softshell turtle	V	v	Asia
Tryonychiidae	<i>Pelochelys cantorii</i>	Asian giant softshell turtle	E	CR	Asia
Tryonychiidae	<i>Pelochelys signifera</i>	Northern New Guinea softshell turtle	NE	DD	Asia
Tryonychiidae	<i>Pelodiscus axenaria</i>	Hunan softshell turtle	NE	DD	Asia
Tryonychiidae	<i>Pelodiscus macckii</i>	Northern Chinese softshell turtle	NE	DD	Asia
Tryonychiidae	<i>Pelodiscus parviformis</i>	New Guinea giant softshell turtle	NE	DD	Asia
Tryonychiidae	<i>Pelodiscus sinensis</i>	Chinese softshell turtle	V	V or E	Asia
Pelomedusidae	<i>Pelomedusa subrufa</i>	Helemated 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-tubercled 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>Podonemis 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>Pseudemys 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>Rafetus 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 triporcatus</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	CR	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
Tryonichiidae	<i>Trionyx triunguis</i>	Nile softshell turtle	NL	V	Africa
Geoemydidae	<i>Vijayachelys silvatica</i>	Cochin forest turtle	E	E	Asia

APPENDIX II. Chelonian TAG Space Survey

Chelonian Taxon Advisory Group 2021 Space Survey

Name:

Institution:

Email Address:

The following questions will be used by the Chelonian TAG to update the current Regional Collection Plan. Please answer each question as accurately as possible.

1. ChAG Space Survey by Continent – Indicate the number of animals of each species your institution currently holds in your care (Please list numbers and sexes - e.g., 4.2.10. Use the dropdown in the Potential Holding column to indicate future collection plans for each species. Species that are programs are listed in bold; others are popular species in AZA institutions and meet the fifteen facility requirement for consideration as a program. We are including them to understand the needs of the community, and whether the ChAG needs to look at more formal management. No turtles from Europe met the fifteen facility requirement so they are excluded from current consideration.

Africa/Madagascar					
Species	Current Holding	Potential Holding (1-5 years)	Exhibit	Education	Holding / Breeding
Aldabra Giant Tortoise (<i>Aldabrachelys gigantea</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Tortoise (<i>Astrochelys radiata</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
African Spurred Tortoise (<i>Centrochelys sulcata</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Home's Hinge-back Tortoise (<i>Kinixys homeana</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pancake Tortoise (<i>Malacochersus tornieri</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Common Spider Tortoise (<i>Pyxis a. arachnoides</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Northern Spider Tortoise (<i>Pyxis a. brygooi</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Madagascar Flat-tailed Tortoise (<i>Pyxis planicauda</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leopard Tortoise (<i>Stigmochelys pardalis</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Egyptian Tortoise (<i>Testudo kleinmanni</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Asia/Australia

Species	Current Holding	Potential Holding (1-5 years)	Exhibit	Education	Holding / Breeding
Painted Terrapin (<i>Batagur borneoensis</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fly River Turtle (<i>Carettochelys insculpta</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rote Island Snake-necked Turtle (<i>Chelodina mccordi</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Indochinese Box Turtle (<i>Cuora galbinifrons</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
McCord's Box Turtle (<i>Cuora mccordi</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pan's Box Turtle (<i>Cuora pani</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Red-bellied Short-necked Turtle (<i>Emydura subglobosa</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Burmese Star Tortoise (<i>Geochelone platynota</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Indian Spotted Turtle (<i>Geoclemys hamiltoni</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Black-breasted Leaf Turtle (<i>Geoemyda spengleri</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spiny Hill Turtle (<i>Heosemys spinosa</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Forsten's Tortoise (<i>Indotestudo forstenii</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Burmese Brown Mountain Tortoise (<i>Manouria e. emys</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Burmese Mountain Tortoise (<i>Manouria e. phayrei</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Malaysia Giant River Turtle (<i>Orilitia borneensis</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

North America

Species	Current Holding	Potential Holding (1-5 years)	Exhibit	Education	Holding / Breeding
Northwestern Pond Turtle (<i>Actinemys marmorata</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Southwestern Pond Turtle (<i>Actinemys pallida</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Common Snapping Turtle (<i>Chelydra serpentina</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Painted Turtle (<i>Chrysemys picta</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spotted Turtle (<i>Clemmys guttata</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Blanding's Turtle (<i>Emydoidea blandingii</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wood Turtle (<i>Glyptemys insculpta</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Desert Tortoise (<i>Gopherus agassizii</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Texas Tortoise (<i>Gopherus berlandieri</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gopher Tortoise (<i>Gopherus polyphemus</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yellow-blotched Map Turtle (<i>Graptemys flavimaculata</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alligator Snapping Turtle (<i>Macrochelys temminckii</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diamondback Terrapin (<i>Malaclemys terrapin</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
River Cooter (<i>Pseudemys concinna</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stinkpot (<i>Sternotherus odoratus</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eastern Box Turtle (<i>Terrapene c. carolina</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Florida Box Turtle (<i>Terrapene c. bauri</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Three-toed Box Turtle (<i>Terrapene c. triunguis</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coahuila Box Turtle (<i>Terrapene coahuila</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ornate Box Turtle (<i>Terrapene o. ornata</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Common Slider (<i>Trachemys scripta</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

South America

Species	Current Holding	Potential Holding (1-5 years)	Exhibit	Education	Holding / Breeding
Matamata (<i>Chelus fimbriatus</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Volcan Wolf Giant Tortoise (<i>Chelonoidis becki</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Red-footed Tortoise (<i>Chelonoidis carbonarius</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yellow-footed Tortoise (<i>Chelonoidis denticulata</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Volcan Darwin Giant Tortoise (<i>Chelonoidis microphyes</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Galapagos Giant Tortoise Hybrid (<i>Chelonoidis nigra</i> hybrid)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spot-bellied Side-necked Turtle (<i>Phrynops hilarii</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Arrau (<i>Podocnemis expansa</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yellow-spotted Amazon River Turtle (<i>Podocnemis unifilis</i>)		---choose one---	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>