ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AAAAA01145
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Ambystoma mavortium stebbinsi*
COMMON NAME: Sonoran Tiger Salamander, Sonora Tiger Salamander, Huachuca Tiger Salamander
SYNONYMS: *Ambystoma tigrinum stebbinsi*
FAMILY: Caudata: Ambystomatidae

AUTHOR, PLACE OF PUBLICATION: Lowe. 1954. Proceedings of the Biological Society of Washington. 76:243-246.

TYPE LOCALITY: J.F. Jones Ranch stock tank, Parker Canyon, San Rafael Valley, Arizona. (Southwest side of Huachuca Mountains. About 5000 feet, Santa Cruz County)

TYPE SPECIMEN: Holotype, University of Arizona 665, collected by C.H. Lowe, 4 November 1950.

TAXONOMIC UNIQUENESS: *Ambystoma mavortium* is widespread, throughout North America (Stebbins 1985), and is the only native salamander in Arizona (Holycross et al. (2022). The species is considered to contain eight subspecies, only three of which are found in Arizona. The Arizona tiger salamander (*A.m. nebulosum*) is found above the Mogollon Rim, the barred tiger salamander (*A.m. mavortium*) is found in central and southeast Arizona, and *A.m. stebbinsi* is endemic to the south central part of Arizona. Tiger salamanders were first found in the San Rafael Valley, Arizona by Lowe (1954) and Reed (1951).

Previously considered to be a subspecies of *Ambystoma tigrinum*. Schaffer and McKnight (1996) suggested that eastern and western tiger salamanders should be regarded as distinct species base on molecular phylogenetic data and treated the western forms as subspecies of *A. mavortium*. This change was accepted by Collins (1997) and Crother (2008). Because of the taxonomic complexity of the species, there has been confusion in the past as to the status of this subspecies. *A.m. stebbinsi* is now considered a distinct subspecies based on allozyme, mitrochondrial DNA, and microsatellite DNA analyses, but hybridization with introduced *A.t. mavortium* is causing some populations of *A.m. stebbinsi* to become less distinct (Collins et al. 1988; Jones et al. 1988, 1995; Ziemba et al. 1998; USDI, FWS 1999).

DESCRIPTION: Tiger salamanders are large and stocky, 7.6-16.5 cm (3.0-6.5 in.), with small eyes, broad rounded snout, no parotid glands, and tubercles on the underside of front and hind feet. The dorsum has yellow to dark olive spots and blotches (reticulation), often with irregular edges between front and hind limbs (Stebbins 1985).

"Metamorphosed terrestrial Sonora tiger salamanders have a color pattern ranging from "a reticulate pattern with an irregular network of light coloration, often coupled with light spots, on a dark background color", to a pattern of large, well-defined light or yellow spots or transverse bars, some of which encroach on the dark venter (Jones et al. 1988). Metamorphosed Sonora tiger salamanders measure from about 45 to 150 mm snout to vent length (SVL). Branchiate adults are gray to olive on the dorsum, head, and tail, and off-white to yellow on the ventral side. They have three external gills on each side of their head, and measure between 65 and 165 mm SVL. Male and female adult salamanders can be distinguished by the presence of two black folds of tissue (cloacal folds) on the caudal side of a male's vent." (USDI, FWS 2003).

AIDS TO IDENTIFICATION: Old adults of all subspecies tend to darken and develop a less distinct pattern, making subspecies recognition difficult (Stebbins 1985:36). Metamorphosed *A.m. stebbinsi* have variable color pattern and are often similar to *A.m. mavortium* (Jones et al. 1998). *A.m. stebbinsi* have a color pattern ranging from "a reticulate pattern with an irregular network of light coloration, often coupled with light spots or transverse bars, some of which encroach on the dark venter" (Jones et al. 1988; USDI, FWS 1999). *A.m. nebulosum* is dark gray to olive colored and has dissimilar yellow to olive blotches. *A.m. mavortium* has rather large yellow bars and spots throughout its body with a dark background but are often indistinguishable from *A.m. stebbinsi* (Reptiles of Arizona 2013: https://reptilesofaz.org/turtle-amphibs-subpages/h-a-mavortium/).

ILLUSTRATIONS: B&W photos (Jones et al. 1988:621-635)
B&W dorsal pattern sketches (Stebbins 1985)

TOTAL RANGE: *A.m. stebbinsi* inhabits the San Rafael Valley (SRV) of Santa Cruz County, Arizona and Sonora, Mexico (Collins et al. 1988; USDI, FWS 1995; USDI, FWS 1999), and Cochise County, Arizona. The San Rafael Valley is bordered by the Canelo Hills to the north, the Huachuca Mountains to the east, and the Patagonia Mountains to the west.

RANGE WITHIN ARIZONA: Cochise and Santa Cruz counties. See "**Total Range**."

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Adult tiger salamanders spend much time under objects or underground, using old gopher, badger, and ground squirrel holes, and burrowing, often following plant roots (Stebbins 1985). In cold winters, larvae may overwinter. *A.m. stebbinsi* hatch from jelly-coated eggs laid in water, and grow as aquatic larvae with gills. They either mature as gilled aquatic adults called branchiate adults, neotenes, or paedomorphs, or metamorphose into terrestrial adults without gills (USDI, FWS 2003). Metamorphosed adults are 4.5-15.0 cm (1.8-5.9 in) snout-vent length and are terrestrial. Branchiate adults are aquatic and have three external gills on each side of the head. Branchiate adults measure 6.5-16.5 cm (2.6-6.5 in) in snout-vent length and have a gray to olive dorsum and an off white venter (USDI, FWS 1999). Branchiate adults are thought to occur when aquatic conditions are favorable over terrestrial (Whiteman 1994).

Sources of mortality for tiger salamander eggs include freezing, drying, predation by adult salamanders, introduced fish, and possibly crayfish. Sources of larvae mortality include pond drying, disease, predation by wading birds, introduced fish and bullfrogs, aquatic insects, and adult salamanders. Sources of mortality for branchiate adults include pond drying, disease, and predation by wading birds and larger introduced fish species. Sources of mortality for metamorphosed adults include extreme conditions in the terrestrial environment, disease, and predation by terrestrial predators and introduced fish and bullfrogs. (USDI, FWS 2003).

REPRODUCTION: Tiger salamanders in Arizona breed in spring and opportunistically in summer during periods of rainfall (Allison et al. 1994). Adults typically emerge from fossorial habitats and migrate to water for breeding. Branchiate adults remain aquatic and breed in the larval body form. Salamanders ready to breed have swollen, reddish vents. *A.m. stebbinsi* breeds from January to May and rarely after summer rains (USDI, FWS 1999,2003). Females lay from 200 to 2000 jelly-coated eggs laid in water. Eggs take from 2-4 weeks to hatch (USDI, FWS 1999). They breed in still or slow water in ponds, cattle tanks, backwaters. They breed in permanent and ephemeral wetlands but permanent waters often have predators which result in low recruitment (Reptiles of Arizona 2013).

FOOD HABITS: Adult tiger salamanders feed on worms, mollusks, arthropods, fish, other amphibians, and small mammals (Stebbins 1985). Larvae typically feed on zooplankton and macroinvertebrates (Collins and Holomuzki 1984), but larvae of some subspecies are cannibalistic (Lannoo et al. 1990). Cannibalism is rarely observed in the wild in *A.t. stebbinsi*, but has been demonstrated in the laboratory (Collins 1996).

HABITAT: Lakes, ponds and cattle tanks in desert grassland areas of southern Arizona and northern Mexico. The most important habitat characteristic is standing water from January through June (USDI, FWS 1999,2003). Found in the grasslands of the San Rafael Valley and nearby foothills within the Huachuca and Patagonia mountain ranges (Reptiles of Arizona 2013).

ELEVATION: Elevation range of entire species is near sea level to 3,660 m (12,000 ft) (Stebbins 1985). Elevation of the San Rafael Valley and surrounding mountain ranges is 1,554 - 2,865 m (5,100 - 9,400 ft). Based on records in the Heritage Data Management System, elevation of populations in Arizona ranges from 1,418 - 1,897 m (4,650 - 6,220 ft) (AGFD, unpublished data 2003).

PLANT COMMUNITY: Range of entire species is arid sagebrush plains and rolling grassland to mountain meadows and forests (Stebbins 1985). Habitat in the San Rafael Valley is primarily desert grasslands.

POPULATION TRENDS: It is difficult to assess the trend of *A.m. stebbinsi* (USDI, FWS 1999). By 1988, *A.m. stebbinsi* was extirpated from at least 3 of the 18 colonies described by Collins et al. (1988). However, from 1994 to 1999, half of the 53 populations now known were discovered (USDI, FWS 1999). Possible threats include disease, predation by introduced nonnative fish and bullfrogs, illegal collection for bait by anglers, habitat

destruction, reduced fitness due to inbreeding, and increased probability of random extirpation characteristic of small populations (USDI, FWS 1995; USDI, FWS 1999). Hybridization with other salamanders could reduce the number of populations of distinct *A.m. stebbinsi* (Ziemba et al. 1998; USDI, FWS 1999).

Concerning the present status of Sonora tiger salamanders, more data is needed to make definitive statements about their long-term viability in Arizona. About half of the 53 known populations have been discovered within the last five years, and only within the last five years were ponds with salamanders sampled consistently, making it difficult to determine trends in the proportion of ponds occupied by salamanders and suitability of those ponds for salamander breeding habitat. Additional data on the ecology of Sonora tiger salamanders (e.g., life-span, proportion of adults breeding each year, frequency and distance of dispersal events) are required to develop a suitable population viability analysis. (USDI, FWS 2003). A recovery plan was finished in 2002, threats noted then were non-native fish, crayfish, and bullfrogs, iridovirus, drought, and hybridization. Its historic habitat included natural cienegas, springs, and backwaters of the Santa Cruz River which are now full of non-native fish predators or no longer there (Reptiles of Arizona 2013). There is also a higher chance of small populations being extirpated because of random events.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1997)
[PE USDI, FWS 1995]
[UR (USDI, FWS 1993)]
[C1 USDI, FWS 1991, 1994]
[C2 USDI, FWS 1982, 1985, 1989]

STATE STATUS: 1 (AGFD AWCS 2022)
[1A (AGFD SWAP 2012)]
[WSC (AGFD, WSCA in prep)]
[Endangered (AGFD, TNW 1988)]

OTHER STATUS: Not Forest Service Sensitive (USDA, FS Region 3 1999, 2013)
[Forest Service Sensitive, USDA FS Region 3 1988]
None. (NORMA Oficial Mexicana NOM-059-SEMARNAT-2010)
[Determined Subject to Special Protection, Secretaria de Medio Ambiente 2000]
[Determined Subject to Special Protection, Secretaria de Desarrollo Social 1994]

MANAGEMENT FACTORS: Habitat preservation, control of exotic introductions. Preservation of pure stock in isolated tanks would be effective.

PROTECTIVE MEASURES TAKEN: Take, as defined by the Endangered Species Act of 1973, of *A.t. stebbinsi* was made illegal with the listing of the salamander as endangered (USDI, FWS 1997). Collection of tiger salamanders and introduction of tiger salamanders or bullfrogs in south central Arizona was made illegal because of the difficulty in identification of the three subspecies in Arizona and potential for genetic swamping of *A.t. stebbinsi* (Jones et al. 1995; USDI, FWS 1999).

SUGGESTED PROJECTS: Conduct research to acquire demographic and dispersal information and develop a population viability analysis, better understand salamander disease, conduct genetic analyses, investigate reports of low pH, and determine distribution of crayfish and methods of crayfish removal.

LAND MANAGEMENT/OWNERSHIP: DOD – Fort Huachuca Military Reservation; USFS - Coronado National Forest; Private.

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

James P. Collins - Arizona State University, Tempe, Arizona.
Thomas R. Jones - Arizona State University, Tempe, Arizona.
Cecil Schwalbe - University of Arizona, Tucson, Arizona.
Tom Van Devender - Arizona-Sonora Desert Museum, Tucson, Arizona.

ADDITIONAL INFORMATION:

Reasons for listing based on the seven threats described in the October 2002 Recovery Plan (in USDI, FWS 2003), include:

1) Sonora tiger salamanders have a restricted distribution and a limited number of breeding habitats, making them vulnerable to stochastic events, such as flooding or drought.
2) Most cienegas and standing water habitat presumably used historically by Sonoran tiger salamanders in SRV (San Rafael Valley) are found almost exclusively in human-constructed cattle ponds or tanks that are small and often very dynamic habitats.
3) Many of the salamander's breeding ponds have been invaded by non-native fish and/or bullfrogs, which prey on salamanders and their larvae. Several salamander populations have been extirpated by fish introductions.
4) Sonora tiger salamanders are subject to frequent die-offs as a result of disease caused by an iridovirus that kills almost all salamanders and larvae in the pond at the time.
5) Low genetic heterozygosity for the subspecies might result in reduced fitness.
6) Barred tiger salamanders (*A. t. mavortium*) have apparently been introduced to the SRV and might interbreed with Sonora tiger salamanders, swamping out characteristics that differentiate the two subspecies.
7) Collecting Sonora tiger salamanders for bait or translocation by anglers might reduce population sizes, spread disease, and disperse non-native tiger salamanders.

Revised: 1992-12-17 (SSS)
1993-03-02 (DBI)
1997-01-07 (SMS)
2001-05-14 (SMB)
2003-02-06 (SMS)
2013-04-16 (CFP)
2022-12-14 (MBL)

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