

***Apalone spinifera atra* (Webb and Legler 1960) –
Black Spiny Softshell Turtle, Cuatrociénegas Softshell,
Tortuga Concha Blanda, Tortuga Negra de Cuatrociénegas**

**ADRIÁN CERDÁ-ARDURA¹, FRANCISCO SOBERÓN-MOBARAK²,
SUZANNE E. MCGAUGH³, AND RICHARD C. VOGT⁴**

¹Romero 93 Col. Niños Heroes, C.P. 03440, Mexico D.F. Mexico [mayaquen@cablevision.net.mx];

²Xavier Sorondo 210 Col. Iztaccihuatl, C.P. 03520, Mexico D.F. Mexico [francisco.soberon@sabio.com.mx];

³Department of Ecology, Evolution, and Organismal Biology,
Iowa State University, Ames, Iowa 50011 USA [smcgaugh@iastate.edu];

⁴CPBA/INPA, Caixa Postal 478, Petropolis,
Manaus, Amazonas 69011-970 Brazil [vogt@inpa.gov.br]

SUMMARY. – *Apalone spinifera atra* (Family Trionychidae), endemic to the Cuatrociénegas Basin of Coahuila, Mexico, is an enigmatic and severely threatened softshell turtle. On the basis of morphology, it has been regarded as a full species (*Apalone ater*), but by phylogenetic molecular analyses it is currently considered a subspecies of *A. spinifera*. The discovery of color morphs correlated to substrate coloration in different localities and the recognition of hybridization between *A. s. atra* and *A. s. emoryi* have led to additional taxonomic uncertainty. In addition, *A. s. atra* has a very restricted distribution with an apparently small population size that is also being affected by genetic introgression from *A. s. emoryi*. These factors, combined with recent anthropogenic draining and alteration of its limited freshwater habitats, have placed *A. s. atra* at very high risk for extinction in the near future, if careful conservation actions are not taken immediately. In addition, a lack of information about its ecology has made its relationships and survival prospects more difficult to discern. It is listed as Critically Endangered by the IUCN Red List, included on Appendix I of CITES, listed as Endangered by US ESA, and as a Species of Special Concern by the Mexican Secretaría de Medio Ambiente y Recursos Naturales.

DISTRIBUTION. – Mexico. Restricted to the Cuatrociénegas Basin, Coahuila.

SYNONYMY. – *Trionyx ater* Webb and Legler 1960, *Trionyx spinifer ater*, *Trionyx spiniferus ater*, *Apalone spinifera ater*, *Apalone ater*, *Apalone spiniferus ater*, *Apalone spinifera atra*, *Apalone atra*.

STATUS. – IUCN 2007 Red List: Critically Endangered (CRA1ace, B1+2c) (assessed 1996, needs updating); CITES: Appendix I; US ESA: Endangered; Mexico: Species of Special Concern.

Taxonomy. – *Apalone spinifera atra* was described as a full species, *Trionyx ater*, by Webb and Legler (1960), from Tío Cándido (type locality), 16 km southwest of Cuatrociénegas de Carranza, central Coahuila, México. Webb (1962) continued to follow this designation, as did Winokur (1968), whose field and morphological study also considered *T. ater* to warrant species designation. However, Morafka (1977) empirically considered *T. ater* to be a subspecies of *Trionyx spiniferus*, and Smith and Smith (1980) concluded that the taxon should be considered a subspecies of *spiniferus* because *T. spiniferus emoryi* had apparently invaded the Cuatrociénegas Basin through drainage canals constructed in the late 1800s and was hybridizing extensively with *T. ater*.

In this regard, it was postulated that *A. s. atra* and *A. s. emoryi* had lived allopatrically for thousands of years, with *atra* inhabiting some small, isolated spring-fed ponds, lakes and pools, maintaining very small populations, and *emoryi*, with a wide distribution in northern Mexico and southwestern United States, living in close proximity to *atra*, but in different hydrologic systems. It was assumed that this situation changed dramatically about 100 years ago

when cattle ranchers began to construct channels to extract water, thereby connecting turtle habitats that were previously isolated. As a consequence, *A. s. emoryi* was postulated to have dispersed through these channels and to invade habitats previously occupied solely by *atra*, and to have begun to hybridize.

As a result of this postulated scenario, Smith and Smith (1980) hypothesized that the characteristics of *atra* were being swamped by *emoryi*, and concluded that *ater* was already an extinct subspecies by 1979. However, in 1983, a collecting trip by K. Darnell, G. Grall, and A. Wisnieski produced several pure *atra* (Ernst and Barbour 1992). Another pure female *atra* was collected in a trammel net together with an *A. s. emoryi* in July 1986, confirming the continued existence of *atra* (Cerdá-Ardura, Soberón-Mobarak, and Vogt, unpubl. data). More recently, extensive collections from all major drainages in the Cuatrociénegas Basin by McGaugh during 2003 and 2004 with subsequent morphologic and genetic analyses defined one morphologically pure population at the type locality of Tío Cándido and several other populations (Antiguos Mineros, El Mojarral Este, Anteojo,



Figure 1. *Apalone spinifera atra* from Tío Cándido, Cuatrociénegas Basin, Coahuila, Mexico. Photo by Suzanne E. McGaugh.

and Rio Cañon) which contained *A. s. emoryi* and *A. s. atra* intermediate morphs.

One mitochondrial marker known to show strong resolving power in *Apalone*, cytochrome *b* (Weisrock and Janzen 2000; McGaugh et al. 2008) and three nuclear loci known to show species resolution power in Testudines (Engstrom et al. 2004; Krenz et al. 2004; Le et al. 2006) showed little to no divergence between *A. s. atra* collected from the type locality and *A. s. emoryi* collected from the Rio Grande (McGaugh and Janzen 2008). As such, McGaugh and Janzen (2008) agreed with the designation by Fritz and Havas (2007) of *A. s. atra* as a subspecies of *A. spinifera*. Furthermore, strong correlations exist between substrate color and dorsal shell coloration of *Apalone* within the basin (McGaugh 2008), indicating that the dark coloration of *A. s. atra* may be affected by the environment and possibly be a plastic trait (Bartley 1971).

Description. — The black spiny softshell is a medium-sized aquatic turtle reaching 282 mm in carapace length. The ovoid carapace is low with fine longitudinal corrugations along the posterior border (often ragged or notched) and



Figure 2. *Apalone spinifera atra* from Tío Cándido, Cuatrociénegas Basin, Coahuila, Mexico. Photo by Suzanne E. McGaugh.

lacks a pale border. Males have reduced septal ridges and are smaller than females. Neither sex has tubercles on the anterior edge of the carapace when adults. *Apalone spinifera atra* has a uniform, sometimes lichen-like, black, dark gray, or slate colored carapace. The dorsal surfaces of the limbs, neck, and head are uniform in coloration, sometimes with obscure patterns.

Distribution. — *Apalone spinifera atra* is endemic to permanent warm water ponds in the Cuatrociénegas Basin of Coahuila, Mexico. These ponds are confined to an area near the northernmost extension of the Sierra de San Marcos. This includes the following localities: Poza del Tío Cándido (type locality), El Mojarral Este, Rio Chiquito, Saca del Fuente Canal, Rio Puente Chiquito, La Angostura Canal, Rio Cañon, Anteojo, and Antiguos Mineros Grande (Winokur 1968).

Habitat and Ecology. — *Apalone spinifera atra* occurs only in permanent, spring-fed and clearwater ponds in the Cuatrociénegas Basin. Morphologically identified specimens are found in deep lagunas and are, to our knowledge, absent from rivers and playa lakes (Winokur 1968; McGaugh and Janzen 2008). *Apalone spinifera emoryi* is found more often in rivers and playa lakes (Winokur 1968; McGaugh and Janzen 2008) Nothing is known about the ecology, population dynamics, reproduction, or behavior of these two taxa in the Cuatrociénegas Basin,



Figure 3. *Apalone spinifera atra* from Tío Cándido, Cuatrociénegas Basin, Coahuila, Mexico. Photo by Suzanne E. McGaugh.

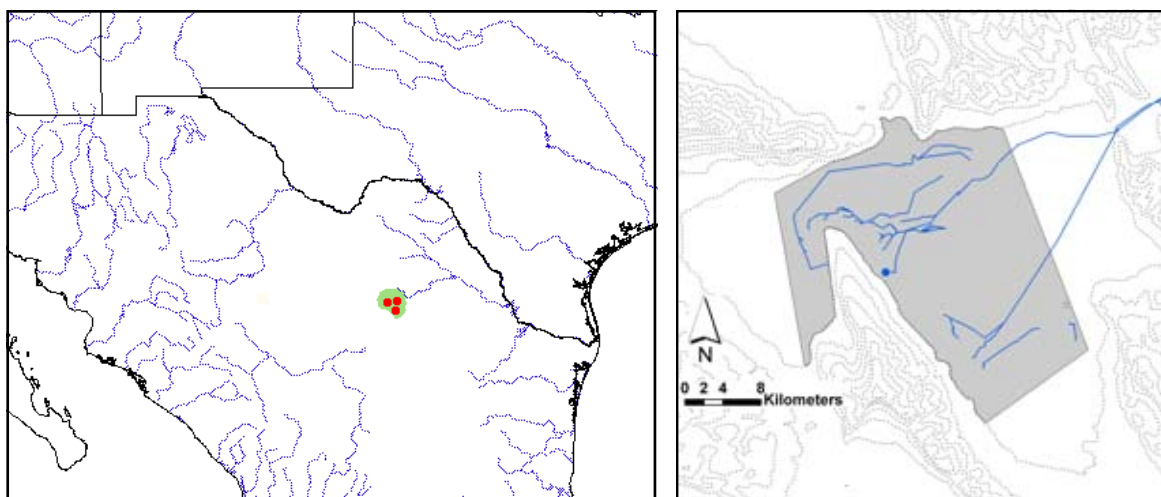


Figure 4. **Left:** Distribution of *Apalone spinifera atra* in northeastern Mexico, restricted to the Cuatrociénegas Basin in Coahuila. Red points = museum and literature occurrence records of *atra* and *atra-emoryi* intergrades based on published records and authors' data; green shading = projected distribution based on authors' data for *atra* and *atra-emoryi* intergrades. **Right:** Close-up view of Cuatrociénegas Basin showing distribution of *atra* and *atra-emoryi* intergrades; the blue dot marks the type locality at Poza del Tío Cándido where the only known pure population of *A. s. atra* occurs.

In terms of potential ecological competition between *A. s. atra* and *A. s. emoryi* in the basin, we hypothesize that there may be only partial displacement of *atra* by *emoryi*, and that *emoryi* appears to occupy different ecological niches from those of *atra* (Cerdá-Ardura and Soberón-Mobarak, unpubl. data).

Population Status. — Webb and Legler (1960) described the species from nine specimens and pointed out that it was relatively abundant at Tío Cándido. They also mentioned the possibility of

interspecific matings between *atra* and *emoryi* at some localities. Winokur (1968) confirmed the existence of intermediates, but he concluded that hybridization was restricted and that *atra* was keeping its genetic integrity as a full species.

Populations of *A. s. atra* are dangerously low, but the taxon is not yet extinct. However, without adequate protection for the water resources of the valley, *A. s. atra* could be extinct soon. A population survey consisting of nine sites spanning all of the known drainages of the basin was conducted by McGaugh in 2003 and 2004. This survey indicated that *A. s. atra* is most abundant at Tío Cándido and Antiguos Mineros Grande, although no estimates of effective population size have been attempted from this data.

Threats to Survival. — The main threats for *A. s. atra* are: 1) a naturally reduced and relictual distribution; 2) an apparent introgression from *emoryi*; 3) current destruction and drainage of the ponds and surrounding nesting sites; and 4) inadequate conservation measures. Some of the conservation measures established for some localities must be reviewed. Because of the fencing of Tío Cándido and other localities to avoid grazing and soil erosion by horses and cattle, vegetation has grown to completely cover the margins of the ponds. This may be blocking suitable nesting sites and may have other unknown but negative consequences for the turtles. In addition, there is a certain amount of disturbance by tourism, especially swimmers.

Conservation Measures Taken. — In 2007 the original 84,000 ha Cuatrociénegas Protected Area for Flora and Fauna, initially declared in 1994 as a Natural Protected Area, was expanded to 10 times that size. The site is also currently designated as an international RAMSAR wetland, included in The Nature Conservancy's Parks in Peril program, and in 2006 it became a UNESCO Man and the Biosphere Reserve.

Apalone spinifera atra is listed as Critically Endangered by the IUCN Red List (as *Apalone atra*), Endangered by the US ESA, on CITES Appendix I, and a Species of Special



Figure 5. Habitat of *Apalone spinifera atra* in Cuatrociénegas Basin. **Top:** Poza del Tío Cándido, type locality. **Bottom:** Anteojo. Photos by Suzanne E. McGaugh.

Concern by the Mexican government (NORMA Oficial Mexicana NOM-059-ECOL-2001).

Conservation Measures Proposed. — First and foremost, major efforts should be expended towards achieving efficient implementation of water management for the entire valley of Cuatrociénegas. Additional surveys across the basin must be undertaken to document if other morphologically pure populations of *A. s. atra* still exist. In light of the few pure individuals and populations found in 1983, 1986, and 2003–04 trapping efforts, the designation of *Apalone spinifera atra* as a Species of Special Concern by the Mexican government should be elevated to Endangered. A complete study of the habitat requirements, including nesting habitats, is necessary as well. An urgent management program is necessary to protect and augment the habitat where *atra* populations still exist. Monitoring of morphologically pure *atra* populations and removal of *A. s. emoryi* morphs from critical populations of *atra*, should be considered for immediate implementation.

Although no detectable genetic differences from *A. s. emoryi* were found for *A. s. atra* at the loci examined, substantial morphological diversity across the basin does exist and studies are needed to address this genetic-morphological incongruence. Failure to detect genetic differentiation does not exclude the possibility that *A. s. atra* may have valuable morphological uniqueness and ecological importance.

Also, as part of basic research, it is necessary to evaluate whether the morphological diversity is a product of genetic differences or plasticity due to different environments. A more thorough genetic evaluation using a genome-wide scan such as AFLPs and common garden experiments need to be done. A thorough population genetic study across the basin is needed to determine areas of high genetic diversity and/or differentiation.

Captive Husbandry. — Nothing is known about the breeding and maintenance of *A. s. atra* in captivity.

Current Research. — Cerdá-Ardura and Soberón-Mobarak have recently proposed a long-term conservation and basic research program for the chelonian community of Cuatrociénegas. McGaugh is in the process of doing a more thorough evaluation of the genetic signature and population genetics of *A. s. atra* to be used in a comparative analysis with population genetics of the other two species of turtle in the basin.

Remarks. — Despite the lack of currently demonstrable genetic differentiation, *A. s. atra* constitutes an interesting and unique morphologic, genetic, taxonomic, and ecologic entity with high paleoecological and biogeographic value. Whether *atra* is conspecific with *emoryi*, a divergent morph, a color variant, a subspecies, or a full species, it appears to possess a unique history and genetic pool that should be preserved to allow long-term evolution. It is perilously close to extinction due to severe demographic reduction, drainage and loss of its habitats, and introgression with *emoryi*. Detailed studies on the ecology and natural history of both taxa are urgently needed to answer crucial questions and to aid in the design of a successful long-term conservation program for *atra*.

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