ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** ARAAF01010
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Gopherus agassizii*
COMMON NAME: Desert Tortoise
SYNONYMS: *Xerobates agassizii*, *Scaptochelys agassizii*
FAMILY: Testudines: Testudinidae

AUTHOR, PLACE OF PUBLICATION: Cooper. 1863. Proceedings of the Californian Academy of Natural Science 2:118-123.

TYPE LOCALITY: "Mountains of California, near Fort Mojave" (Cooper 1863). Cotype: "Juv. Utah Basin, Mojave River" (catalog carries "Solado Valley, California") (Cochran 1961: 236 in Auffenberg and Franz 1978).

TYPE SPECIMEN: Type and collector not stated by Cooper (1863). Cotype: US National Museum 7888, J.G. Cooper, March, 1861 (Cochran 1961: 236 in Auffenberg and Franz 1978).

TAXONOMIC UNIQUENESS: The genus *Gopherus* contains four extant species in the southern US and Mexico (Crumly 1994). Although not recognized as being taxonomically distinct, "Mojave" and "Sonoran" populations of the desert tortoise differ genetically (Jennings 1985; Lamb et al. 1989; Glenn et al. 1990) and morphologically (Germano 1993). These two populations are distinctly recognized under the Endangered Species Act (USDI, FWS 1990).

DESCRIPTION: Adults reach sizes of about 20-36 cm (8-15 in) and have a high domed shell, usually a brownish carapace, with definite pattern and prominent growth lines on both the plastron and carapace (Stebbins 1985). The plastron is yellowish without a hinge. The limbs are very stocky, including elephant-like rear limbs; the forelimbs are covered with large conical scales. The tail is short. Males have elongate gular (throat) shields, and chin glands on each side of the lower jaw are larger than that of the female.

AIDS TO IDENTIFICATION: Two populations occur in Arizona. Individuals from the Sonoran population tend to be more pear-shaped, with more narrow front ends, wider (flared) rear ends, and flatter carapaces. Mojave desert tortoises tend to be more oval and have a higher domed carapace (Germano 1993).

ILLUSTRATIONS:
Black and white drawing (Stebbins 1966: plate 15)

Color photo (Behler and King 1979: plate 328)
Black and white photos (Bury and Germano 1994: pp. vi, 56, 72, 94, 108)

TOTAL RANGE: The distribution of the desert tortoise covers the broadest range of latitude, climate, habitats, and biotic regions of any North American tortoise (Germano et al. 1994). The tortoise ranges from northern Sinaloa north to southern Nevada and southwestern Utah, and from south central California east to southeastern Arizona. The desert tortoise is divided into 2 populations for purposes of the Endangered Species Act: the threatened Mojave population occurs north and west of the Colorado River, and the Candidate designated Sonoran population occurs south and east of the Colorado River (USDI, FWS 1990, 1996, 2010).

RANGE WITHIN ARIZONA: The Mojave population includes all tortoises north and west of the Colorado River, west of the Beaver Dam Mountains, north of the Virgin Mountains, and in the Pakoon Basin in extreme northwest Mojave County. The Sonoran population includes those tortoises south and east of the Colorado River, from locations near Pearce Ferry in Mojave County, to the south beyond the International Boundary, and at many scattered locations in between (Arizona Interagency Desert Tortoise Team [AIDTT] 2000). The northeastern-most tortoise records in Arizona occur along the Salt River near Roosevelt Lake in Gila County, although populations here have not been confirmed with recent observations. The middle San Pedro River drainage in Cochise County harbors the eastern-most substantial tortoise populations. Desert tortoise observations have been confirmed in extreme southeastern Cochise County, but most probably represent released captives (pets). Tortoises have been found as far southwest as the Barry M. Goldwater Range, Yuma Proving Ground, and the Cabeza Prieta National Wildlife Refuge.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: *Sonoran Population* - Adequate shelter is one of the most important habitat features of tortoises in the Sonoran Desert (Averill-Murray et al., *in press* a). Tortoises escape extreme temperatures in burrows, which stay cooler in the summer and warmer in winter than outside temperatures. Tortoises require loose soil to excavate (usually shallow) burrows below rocks and boulders, but they may also use rock crevices, which they may or may not be able to modify. Tortoises occasionally burrow under vegetation, less often dig soil burrows on more or less open slopes, and use caliche caves in incised wash banks. They will also rest directly under live or dead vegetation without constructing a burrow.

Activity begins in the spring as temperatures warm, then decreases as the season moves into the summer drought in May and June (Averill-Murray et al., *in press* a). Much more time is spent in burrows where they conserve water and energy. The onset of the summer monsoon season signals the beginning of peak tortoise activity, dramatically rising in early August and peaking during August-September (Averill-Murray et al., *in press* a). Activity decreases sharply after mid-October, as tortoises withdraw to winter hibernacula, which are similar shelters to those they use during activity seasons (Averill-Murray et al., *in press* a). Even

during the winter, some individuals may bask, move, or even forage on warm winter days. Females may terminate hibernation as early as late February, while some males may remain inactive through the entire spring (Bailey 1992; Martin 1995; Vaughan 1984).

Tortoises grow relatively rapidly early in life and reach about 1/2 their maximum size at 5-10 years of age (Murray and Klug 1996). The growth rate tapers off as individuals slowly approach their maximum size. After 10-20 years of age, tortoises reach sexual maturity at about 220 mm (8.7 in) carapace length. Males reach larger sizes than females in some populations but not in others.

Some hatchlings emerge in late summer, but some may overwinter in the nest before emerging in the spring (Averill-Murray et al., *in press* b). Little information exists on survivorship of young tortoises, but given adult longevity and their capacity to produce more offspring than necessary to replace mortalities in the population, juvenile survivorship is probably very low (Averill-Murray et al., *in press* b). The Adult tortoise carapace provides protection against potential predators, contributing to their high survivorship. Mountain lions appear to be the primary natural predator on adult tortoises in the Sonoran Desert, but lions usually have not contributed to elevated rates of mortality in population studies so far (Averill-Murray et al., *in press* b).

Mojave Population - Mojave desert tortoise biology differs from that of Sonoran tortoises in various ways (Averill-Murray et al., *in press* a, b). Burrows are excavated below vegetation more often than below rocks and boulders and may reach depths of 10 meters (Woodbury and Hardy 1948; Burge 1978; Luckenbach 1982). Caves in washes and shallow pallets are also commonly used. Peak activity occurs in spring rather than summer (Luckenbach 1982), but mating occurs during both spring and summer (Black 1976; Rostal et al. 1994; Goodlett et al. 1996). Mojave tortoises do respond to summer rains to rehydrate and establish positive moisture and energy balances (Minnich 1977; Nagy and Medica 1986; Peterson 1996a, b; Nagy et al. 1997) as their counterparts do in the Sonoran Desert. Males typically reach larger sizes than females throughout the Mojave Desert (Germano 1994a), and sexual maturity is attained at sizes as small as 176 mm (Germano 1994b). Various carnivores, including coyote (*Canus latrans*; Hohman and Ohmart 1980), kit fox (*Vulpes macrotis*; Coombs 1977), and bobcat (*Felis rufus*; Woodbury and Hardy 1948), may prey on hatchlings, juveniles, or eggs, or kill adults by chewing exposed limbs. Other potential predators of smaller tortoises include golden eagle (*Aquila chrysaetos*; Luckenbach 1982) and the common raven (*Corvus corax*), which has contributed to the decline of some Mojave tortoise populations through increased predation on hatchling and juvenile tortoises near urban areas and along power lines crossing (USDI, FWS 1994a).

REPRODUCTION: *Sonoran Population* - Mating occurs during the summer monsoon season. Females begin laying eggs, which are fertilized by sperm stored from the previous summer's mating, just before or during the onset of the summer rains in late June or early July (Averill-Murray and Klug 2000). They lay only one clutch of about six eggs, although larger clutch sizes have been reported. The proportion of females reproducing is related to the amount of recent rainfall and vegetation available for forage. Females usually lay their eggs inside

burrows with adequate soil development, and many remain at and defend their nests against predators.

Mojave Population - Mojave tortoises may lay as many as 3 clutches in a year. Average annual reproductive output varies from about 5 to 9 eggs/female/year depending on the environment, and most females usually lay at least some eggs each year, although the numbers of clutches is related to rainfall (Karl 1998; Mueller et al. 1998; Turner et al. 1986; Wallis et al. 1999). In addition, tortoises lay their eggs earlier in the Mojave Desert than in the Sonoran, from late April through mid-July (Karl 1998; Turner et al. 1986; Wallis et al. 1999).

FOOD HABITS: Both Mojave and Sonoran desert tortoises eat a variety of annual and perennial grasses, forbs, and succulents (see references in Grover and DeFalco 1995). Sonoran tortoise forage includes (in order of relative abundance in scat fragment analysis) dicot annuals, grasses, herbaceous perennials, trees and shrubs, subshrubs/woody vines, and succulents (Van Devender and Schwalbe 1999). The most common food items in microhistological analyses included the woody vine *Janusia gracilis* and various mallows (Malvaceae) (Van Devender and Schwalbe 1999).

HABITAT: *Sonoran Population* - The Sonoran population of the desert tortoise occurs primarily on rocky slopes and bajadas of Mojave and Sonoran desertscrub (see references in AIDTT 2000). In the Lower Colorado River Valley subdivision, caliche caves in cut banks of washes (arroyos) are also used for shelter sites. Shelter sites are rarely found in shallow soils.

Mojave Population - The Mojave population occurs on sandy loam to rocky soils in valleys, bajadas, and hills in Mojave desertscrub and the Lower Colorado River Valley subdivision of the Sonoran Desert (Germano et al. 1994).

ELEVATION: *Sonoran Population* - The Sonoran population occurs at elevations ranging from about 155 m (510 ft) in Mojave desertscrub to semidesert grassland and interior chaparral at about 1615 m (5300 ft; AGFD unpubl. data).

Mojave Population - The Mojave population occurs at elevations below sea level at Death Valley, California (Luckenbach 1982) to above 1500 m (5000 ft) at Yucca Mountain, Nevada Test Site (Collins et al. 1983). On the Arizona Strip the tortoise occurs at elevations between 300-1200 m (1000-4000 ft; AGFD unpubl. data).

PLANT COMMUNITY: *Sonoran Population* - The Sonoran population is found within Sonoran and Mojave desertscrub, including a variety of biotic communities within or extending from the Sonoran Desert but most often in paloverde-mixed cacti associations. Tortoises are found in the Arizona Upland and Lower Colorado River subdivision of the Sonoran Desert, desert grassland, and ecotonal areas consisting of Sonoran desertscub with elements of Mojave desertscrub and juniper woodland, interior chaparral, and desert grassland (Averill-Murray and Klug 2000).

Mojave Population - The Mojave population occurs in plant communities dominated by creosotebush and other sclerophyll shrubs with small cacti and in some areas abundant Joshua trees (Germano et al. 1994).

POPULATION TRENDS: *Sonoran Population* - Population density varies greatly among 18 tortoise plots surveyed in Arizona, ranging from about 15 to over 150 adult tortoises per square mile (Averill-Murray and Klug 2000). Abundance at 17 of these sites appears to be stable or increasing; only one (Maricopa Mountains) has been observed to decrease radically in size. A localized die-off also apparently occurred in the late 1990s at Ragged Top Mountain on the Ironwood Forest National Monument (R. Repp, *pers. comm*. 1999).

Mojave Population - Declining populations led to the listing of the Mojave population as threatened (USDI, FWS 1990). Upper Respiratory Tract Disease (URTD) is epidemic at some localities in the Mojave Desert (USDI, FWS 1994a).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
Mohave Desert pop. LT (USDI, FWS 1990)
Sonoran Desert pop. C (USDI, FWS 2010)
[Sonoran Desert pop. C (USDI, FWS 2011)]
[Sonoran Desert pop. None (USDI, FWS 1996)]
[Sonoran Desert pop. C2 USDI, FWS 1991, 1994]
[Both populations C2 USDI, FWS 1985, 1989]

STATE LIST STATUS:
WSC (AGFD, WSCA in prep)
[State Candidate AGFD, TNW 1988]

OTHER STATUS:
Not Bureau of Land Management Sensitive – Sonoran Pop. (USDI, BLM AZ 2010)
[Bureau of Land Management Sensitive – Sonoran Pop. (USDI, BLM AZ 2008)]
Forest Service Sensitive for Sonoran Desert pop. (USDA, FS Region 3 2007; Coronado, Prescott & Tonto National Forests)
Determined Threatened (Secretaria de Medio Ambiente 2000)
[Determined Threatened, Secretaria de Desarrollo Social 1994]

MANAGEMENT FACTORS: *Sonoran Population* - The *Management Plan for the Sonoran Desert Population of the Desert Tortoise in Arizona* provides a list of

recommendations from which managers may choose when developing management prescriptions for specific areas (AIDTT 1996). These recommendations include options for species management (including collecting; reintroduction, repatriation, and translocation; and predator control) and habitat management (including forage and surface management and spatial considerations).

Mojave Population - The *Desert Tortoise (Mojave Population) Recovery Plan* provides detailed objectives, strategies, and criteria for achieving recovery of the Mojave population (USDI, FWS 1994a). Delisting criteria and the recovery strategy follow several biological principles, including the maintenance of distinct population segments, genetic and demographic considerations in population viability, other comprehensive considerations in population viability, reserve architecture, and ecosystem protection.

PROTECTIVE MEASURES TAKEN: Desert tortoises may not be collected from the wild in Arizona (Arizona Game and Fish Commission Order 43). Desert tortoises possessed with out a special license prior to April 28, 1989, may be possessed, transported, and given away (Arizona Game and Fish Commission Rule R12-4-407.A.1). Desert tortoises possessed pursuant to R12-4-407.A.1 may be propagated, progeny may be held in captivity for 24 months from the date of hatching, when they shall be disposed of by gift or as directed by the Arizona Game and Fish Department. The person receiving a desert tortoise given away pursuant to this rule is also exempt from special license requirements.

SUGGESTED PROJECTS: A continuing state-wide monitoring program is of primary importance in collecting the data necessary for effective desert tortoise management in Arizona (AIDTT 1996). Additional research is also necessary to develop a more complete understanding of tortoise populations and how they respond to different land management actions, including research on population dynamics (reproductive ecology, life tables, population viability, population genetics), habitat (effects of exotic vegetation, fire, and grazing), disease (URTD, cutaneous dyskeratosis), and effectiveness of mitigation measures (AIDTT 1996). The extent of desert tortoise distribution in extreme northwest, southwest, southeast Arizona is needs extensive survey efforts and monitoring.

LAND MANAGEMENT/OWNERSHIP: **Bureau of Indian Affairs**: Fort McDowell Reservation, Gila River Reservation, Salt River Pima Reservation, San Carlos Apache Reservation, San Xavier Reservation, Tohono O'Odham Nation. **Bureau of Land Management**: Kingman Field Office, Lake Havasu Field Office, Phoenix Field Office, Tucson Field Office, Safford Field Office, Tucson Field Office, Yuma Field Office. **Department of Defense**: Barry M. Goldwater Range, Yuma Proving Ground. **US Forest Service**: Coronado National Forest, Prescott National Forest, Tonto National Forest. **US Fish and Wildlife Service**: Buenos Aires National Wildlife Refuge, Cabeza Prieta National Wildlife Refuge, Cibola National Wildlife Refuge, Havasu National Wildlife Refuge, Imperial National Wildlife Refuge, Kofa National Wildlife Refuge. **National Park Service**: Organ Pipe Cactus National Monument, Saguaro National Park, Lake Mead National Recreation Area. **State Land Department**. **Arizona Game and Fish Department:** Powers Butte Wildlife Area. **Arizona State Parks Department**: Picacho Peak State Park. **Private**

land. **Other lands**: McDowell Mountain Regional Park, Phoenix South Mountain Park, White Tank Regional Park.

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ADDITIONAL INFORMATION:

The genus *Gopherus* is said to derive from gaufre (French)-a honeycomb-due to the many holes made by members of the genus (Gotch, A.F. 1995. Latin Names Explained: A Guide to the Scientific Classification of Reptiles, Birds, and Mammals. Facts on File, New York. p. 56.). The specific name *agassizii* is in honor of the Swiss zoologist J.L.R. Agassiz (1807-1873).

Revised: 1991-04-02 ( )
1993-05-25 (LAJ)
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