Range and Habitats of the Desert Tortoise

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Abstract. We determined the current range of the desert tortoise (*Gopherus agassizii*) based on the available latest data from government agencies, the literature, and our experience. We developed the first detailed range map of this species and summarized information about habitat preferences. New records of occurrences were incorporated, and some peripheral localities of questionable authenticity were deleted. The distribution of *G. agassizii* covers the broadest range of latitude, climatic regimes, habitats, and biotic regions of any North American tortoise. The northern portion of its range is in the Mojave

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1994. Pp. 73-84 *in* R. B. Bury and D. J. Germano (eds.), Biology of North American tortoises. National Biological Survey, Fish and Wildlife Research 13.

Desert of southeastern California, southern Nevada, southwestern Utah, and northwestern Arizona. The central portion of the range consists of several subdivisions of the Sonoran Desert in southeastern California, western and southern Arizona, and western Sonora, Mexico. The southern edge of its range is in the semitropical Sinaloan thornscrub and Sinaloan deciduous forest of eastern Sonora and northern Sinaloa, Mexico. This species has marked geographic differences but seems to construct burrows throughout its range.

Key words: Climates, distribution, ecology, *Gopherus agassizii*, Mojave Desert, Sinaloan deciduous woodland, Sinaloan thornscrub, Sonoran Desert, tortoise.

Accurate depiction is important for the description of the range of a species. Details of habitat can provide valuable insights into a species' environmental tolerance and means of survival in various environments. Of the four North American tortoise species, the desert tortoise (*Gopherus agassizii*) has the broadest range of latitude and habitats (Auffenberg and Franz 1978; Bury 1982; Patterson 1982; Stebbins 1985; Lowe 1990; Bury et al. 1994a; Germano 1994). However, the complexity of these habitats has not been well documented.

The earliest comprehensive study of *G. agassizii* was conducted in the northeastern portion of its range (Woodbury and Hardy 1948), and the most recent studies were done in various parts of the Mojave Desert (Luckenbach 1982; Berry 1986; Corn 1994). We believe that this emphasis on only one part of the range biased the understanding of the habitats and general biology of *G. agassizii*. We examined *G. agassizii* across its range and habitats, summarized information about its habitats and its ecology, and constructed the first detailed map of its range.

Methods

We gathered data on range and habitats from the literature, government records, and our many years of field work across the range of the desert tortoise. We constructed the range map from evaluations of published distributions (Smith and Smith 1979; Patterson 1982; Stebbins 1985; Taubert and Johnson 1987; Berry 1989), unpublished maps by state and federal agencies (Arizona Department of Game and Fish; U.S. Bureau of Land Management; U.S. Fish and Wildlife Service), and maps on portions of the range published elsewhere in this volume (Bury et al. 1994b; Fritts and Jennings 1994). We refined the map and summarized habitat use based on our knowledge of the species in various habitats (Medica et al. 1975; Bury 1982; Esque and Duncan 1989; Germano 1989, 1994; Bury et al. 1994a).

Moisture Gradient and Plant Associations in the Range of *Gopherus agassizii*

The following is a composite description of climate in the range of *G. agassizii* (Lowe 1964, 1990; Brown 1982; Turner 1982; Turner and Brown 1982; MacMahon and Wagner 1985; Germano 1989, 1994). Moisture is on a gradient from north to south; rain is least abundant in the north and increases greatly to the south (Table 1). The timing of rainfall also differs along this gradient. Precipitation is limited to winter storms and unpredictable summer thunderstorms in the northwestern portion of the range but increases in summer in the southern portion. Summer rainfall is less than 10% of the total precipitation in the western Mojave Desert but can be as much as 70% of the yearly precipitation in the Sinaloan thornscrub and deciduous forest.

The vegetation types and physiognomy are concordant with the rainfall gradient (Table 2). The northern portion of the range has a relatively sparse cover of low-growing shrubs (MacMahon and Wagner 1985). Plant cover increases to the south, and at the extreme southern portion of the range in Sinaloan deciduous forest, tall shrubs and trees form a dense, closed canopy (Table 2). Summer temperatures are uniformly hot throughout

Table 1. Climatic characteristics of the range of *Gopherus agassizii*. Precipitation and temperature values are 20-year averages (Germano 1989). Each value in a column is from a different weather station.

	Subregion of range and habitat feature				
	Western Mojave Desert	Eastern Mojave Desert	Sonoran Desert	Sinaloan thorn-scrub	Sinaloan deciduous forest
Average precipitation (mm)	102	110	140[a]	278	621
	169	173	183	534	664
	143	101	290		628
	129	209	324		
	105	108	309		
Percent precipitation (June–August)	<10	~30	35–70	~60	67–78[b]
Percent precipitation (November–March)	>75	~50	21–50	~25	~15
Mean high temperatures (° C—July)	39.1	40.4	42.3[a]	30.4[c]	29.1[c]
	36.5	36.7	41.8	32.6[c]	31.5[c]
	37.1	40.8	36.7		32.2[c]
	36.8	39.3			
	39.8	42.7			
Mean low temperatures (° C—January)	−0.4	0.5	0.8[a]	13.6[c]	16.4[c]
	−0.4	1.6	0.7	15.7[c]	17.4[c]
	2.1	1.7	3.3		18.2[c]
	−2.1	3.2			
	−1.9	4.9			

[a] North to south gradient.
[b] July–September.
[c] Average daily temperatures, lows and highs not recorded.

the range of *G. agassizii*, but winter temperatures are mild in the south and increasingly colder toward the north; most of the Mojave Desert portion of the range has subfreezing temperatures during portions of winter (Turner 1982; MacMahon and Wagner 1985; Germano 1989).

Habitats

Mojave Desert

The distribution of *G. agassizii* in the northern part of its range is approximately defined by the boundaries of the Mojave Desert (Fig. 1). The Mojave Desert is a high desert at elevations between 600 and 1,200 m (Luckenbach 1982; MacMahon and Wagner 1985). The most widespread plant is creosotebush (*Larrea tridentata*). Several other sclerophyll shrubs are either codominants or dominants, and cacti of short stature are well represented (Shreve 1942; Turner 1982; MacMahon and Wagner 1985). In many parts of the Mojave Desert, creosotebush and white bursage (*Ambrosia dumosa*) dominate as much as 70% of the landscape (Shreve 1942) and *G. agassizii* often occurs in this habitat type. Where the Joshua-tree (*Yucca brevifolia*) and the Mojave yucca (*Y. schidigera*) are conspicuous in the Mojave Desert, the abundance of *G. agassizii* is usually low to moderate (Luckenbach 1982).

The Mojave Desert is especially rich in ephemeral plants, most of which are winter annuals (Turner 1982). Winter annuals are important foods, but *G. agassizii* also eats perennial grasses (Woodbury and Hardy 1948; Burge and Bradley 1976; Hansen et al. 1976; Berry 1978; Luckenbach 1982).

Table 2. Habitat characteristics of *Gopherus agassizii* in subregions of its range.

Habitat features	Subregion of range and habitat feature				
	Western Mojave Desert	Eastern Mojave Desert	Sonoran Desert	Sinaloan thorn-scrub	Sinaloan deciduous forest
Occupied habitat	Valleys, bajadas hills?	Valleys, bajadas hills	Valleys?, bajadas hills	Hills, mtn. slopes	Hills, mtn. slopes
Substrate	Sandy loam to rocky	Sandy loam to rocky	Rocky	?	?
Vegetation	Low-growing sclerophyll scrub	Low-growing sclerophyll scrub	Low-growing to arborescent sclerophyll scrub	Dense arborescent sclerophyll scrub	Drought-deciduous woodland, closed canopy
Annual plants	Mostly winter germination	Mostly fall germination, some summer germination	Mostly summer germination	Mostly summer germination	Mostly summer germination

Winter annuals include a variety of broad-leaved plants and grasses. Most of the Mojave Desert has been invaded by introduced winter annuals such as *Bromus rubens*, *B. tectorum*, *Schismus barbatus*, and *Erodium cicutarium* that dominate cover and biomass in some years (Hunter 1992; Oldemeyer 1994). Recent studies revealed that *G. agassizii* eats a large variety of plant species, including woody perennials and cacti. Woody perennials and cacti are a minor portion of the diet of *G. agassizii* in spring (Esque, unpublished data) but seem to be important as a late-season food and during drought (Turner et al. 1984).

Gopherus agassizii supplements its herbaceous diet with minerals from either the soil (Marlow and Tollestrup 1982) or weathered bone (Esque and Peters 1994). Based on stomach contents, supplemental mineral ingestion seems to be common in parts of the range in Mexico (Fritts, unpublished data).

Rainfall in the Mojave Desert is low and lower than in other parts of the range of *G. agassizii* (Turner 1982; Germano 1989, 1994). The average yearly precipitation ranged from 102 to 169 mm at five weather stations in the western Mojave Desert and from 101 to 223 mm in the eastern Mojave Desert (Table 1). In the western Mojave Desert, most precipitation is in winter, and less than 10% is in summer (Table 1). Some of this precipitation is in the form of snow, yearly amounts of which are highly variable (Germano 1989).

When the annual precipitation is average or above average, precipitation in fall leads to germination of broad-leaved annuals and annual grasses that cover the ground between shrubs (Beatley 1969; Hunter 1992). In the eastern Mojave Desert, the greatest amount of precipitation is received in fall and winter; summer thunderstorms in the eastern Mojave Desert contribute a greater percentage of the total precipitation than those in the western Mojave (Table 1). The monthly precipitation in the range of *G. agassizii* is least predictable and also most variable among years in the eastern Mojave Desert (Germano 1989, 1994). In the western and eastern Mojave Desert, temperatures are hot in summer and near or below freezing in winter. Throughout the Mojave Desert, *G. agassizii* is often found on valley bottoms and on bajadas (Figs. 2A and 2B), suggesting that this is the preferred habitat (Woodbury and Hardy 1948; Stebbins 1985; Berry 1989). However, tortoises may occur on rocky hillsides and (albeit rarely) at elevations above 1,400 m (Luckenbach 1982). Recently, *G. agassizii* was found on rocky hillsides at an elevation of 1,500–1,600 m in the northern parts of the Mojave Desert in Nevada (Collins et al. 1986). Tortoises occur in

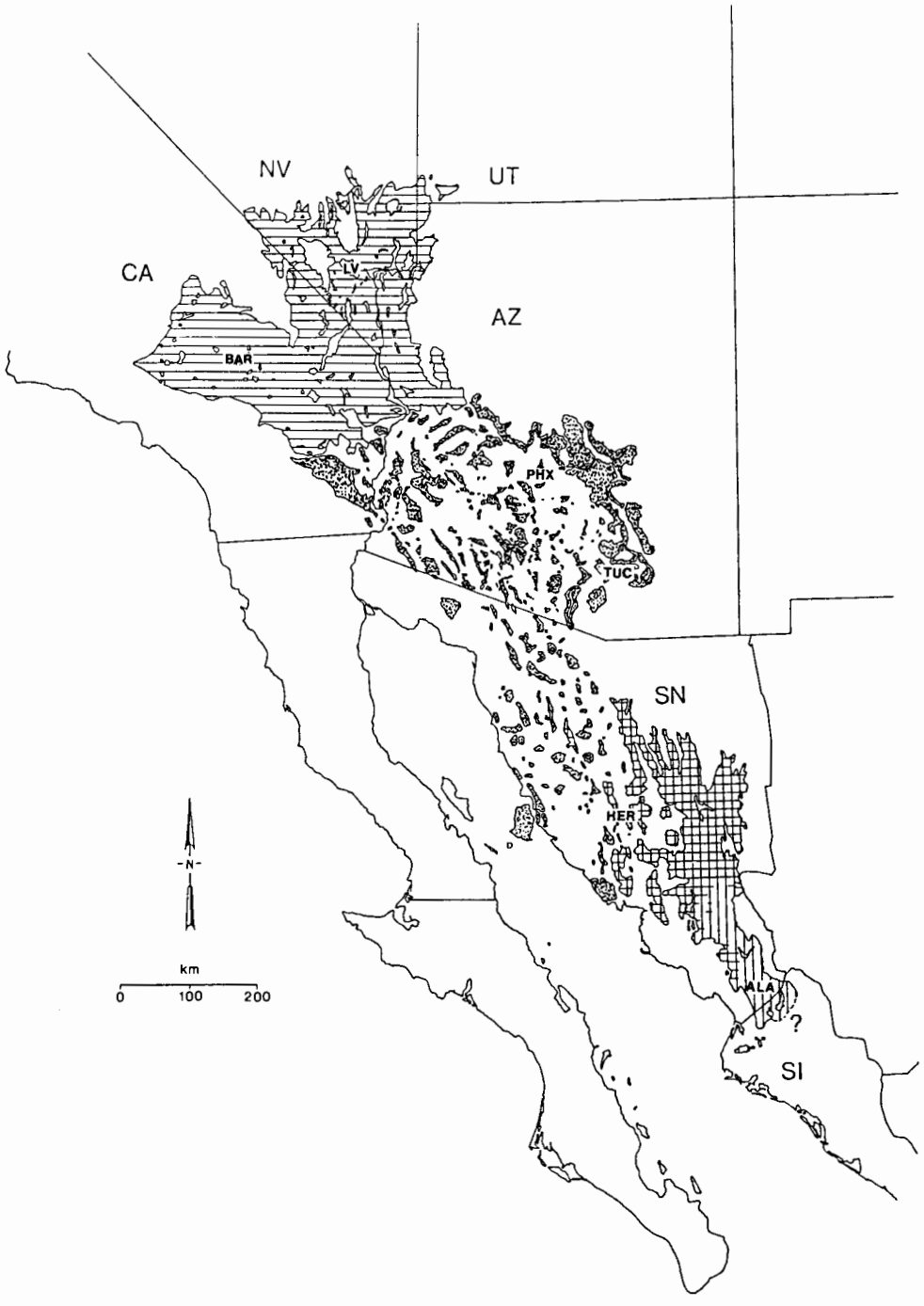

Fig. 1. Distribution of *Gopherus agassizii* in the southwestern United States and northwestern Mexico. This species occurs in three distinct habitat types: Mojave Desert (*horizontal lines*), Sonoran Desert (*shaded*), and Sinaloan deciduous forest (*vertical lines*). Sinaloan thornscrub (*hatching*) is a transitional habitat between the Sonoran Desert and the Sinaloan deciduous forest. States: AZ—Arizona; CA—California; NV—Nevada; SI—Sinaloa; SN—Sonora; UT—Utah. Cities: ALA—Alamos; BAR—Barstow; HER—Hermasillo; LV—Las Vegas; PHX—Phoenix; TUC—Tucson.

sandstone formations (Fig. 2C) in Utah (Bury et al. 1994b; Esque, unpublished data).

The construction and occupancy of burrows seem to be obligatory in *G. agassizii* in the Mojave Desert (Woodbury and Hardy 1948; Luckenbach 1982), perhaps because of frequent freezing temperatures in winter. Burrows can be long and complex. On the Beaver Dam Slope, Utah, the length of dens (long winter burrows) are 2–5 m and can be 10 m (Woodbury and Hardy 1940, 1948). These dens may be occupied by many individuals in winter. On the Nevada test site, some burrows are larger than 7.5 m and under caliche overhangs or in the sides of washes (Fig. 2D; Bury et al. 1994b). In the western Mojave Desert, dens are shallower (usually as long as 2.4 m; Berry 1978) and seem to be less common (Luckenbach 1982). The length of most burrows in the western Mojave is 1–3 m and averages about 1 m (Marlow 1979; Luckenbach 1982). These shorter burrows are at lower elevations or in valleys in the eastern Mojave Desert in southern Nevada (Burge 1978).

The highest densities of *G. agassizii* seem to be in the western Mojave Desert (Luckenbach 1982; Berry 1986, 1989). The estimated densities based on tortoise sign in California range from fewer than 8 tortoises/km^2 to more than 97 tortoises/km^2 and, based on counts of individuals on 2.6 km^2 plots, may be as high as 184 tortoises/km^2 (Berry 1986). The estimated density in one area of the western Mojave Desert was 347–540 tortoises/km^2 (Luckenbach 1982), but the accuracy of this estimate and the area with such a density are not certain. Higher reported estimates (Berry 1989) are questionable (Corn 1994). Densities of more than 150 tortoises/km^2 may occur in parts of the eastern Mojave Desert (Bury et al. 1994b).

The distribution of *G. agassizii* in the eastern Mojave Desert includes populations in the Dixie Valley (St. George area) of Utah (Bury et al.

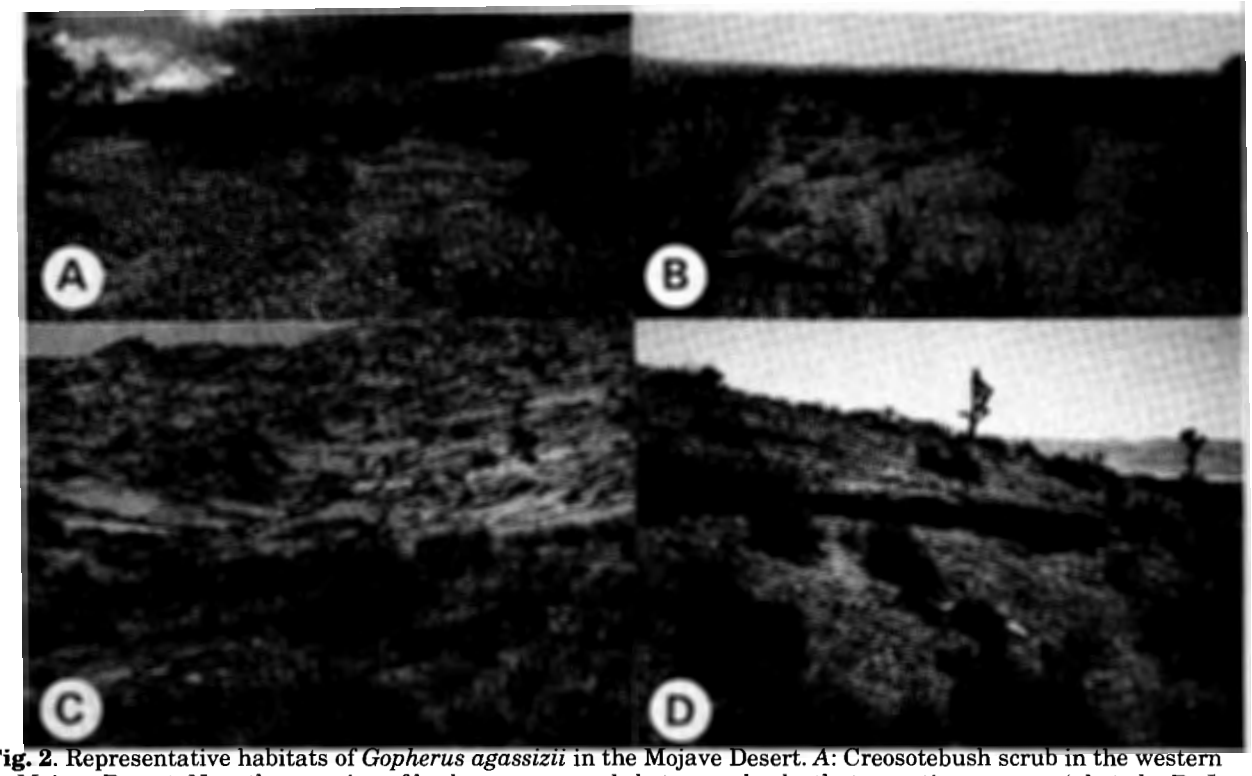

Fig. 2. Representative habitats of *Gopherus agassizii* in the Mojave Desert. *A*: Creosotebush scrub in the western Mojave Desert. Note the covering of herbaceous annuals between shrubs that sometimes occurs (photo by D. J. Germano). *B*: Creosotebush scrub with Mojave yucca (*Yucca schidigera*) in the eastern Mojave Desert (photo by D. J. Germano). *C*: Rocky sandstone habitat at City Creek, Utah, in the extreme northeastern portion of the range of *G. agassizii* (photo by D. J. Germano). *D*: Caliche overhangs and burrows of *G. agassizii* at the Nevada test site (photo by P. A. Medica).

1994b). Previously these populations were either unknown (e.g., a large tortoise population at City Creek north of St. George) or inappropriately considered to be captive releases (e.g., in the Paradise Canyon northwest of St. George; Beck and Coombs 1987; Bury et al. 1994b). We believe that the large population sizes and all age groups in these populations justify the recognition of these populations as important stock. Several passes over the presumed natural barrier of the Beaver Dam Mountains between the Dixie Valley populations and the better known population on the Beaver Dam slope may have been routes of dispersal. Almost all reptiles of the Mojave Desert occur in the Dixie Valley and, based on this biogeographic evidence, desert tortoises also seem to be native there (Bury et al. 1994b).

Sonoran Desert

The Sonoran Desert has been divided into six subunits of recognizable vegetational differences (Shreve 1951; Brown and Lowe 1980), and *G. agassizii* is found in portions of four of them: the lower Colorado River valley, Arizona uplands, plains of Sonora, and central Gulf Coast. *Gopherus agassizii* occurs in the lower Colorado River valley in southeastern California, southwestern Arizona, and western Sonora, but it does not occur in northeastern Baja California (Fig. 1). The mean summer precipitation is less than 20 mm in seven of eight climate stations in the lower Colorado River valley subdivision in Baja California, and the mean summer temperature is greater than 30° C in six of the eight stations (Turner and Brown 1982). This is in marked contrast to other localities in the lower Colorado River valley and other subunits of the Sonoran Desert where the tortoise occurs. *Gopherus agassizii* is also known only from the extreme eastern edge of the Imperial Valley of California (Dimmitt 1977; Luckenbach 1982). It can be found throughout the Arizona uplands and plains of Sonora and on the eastern portion of the central Gulf Coast subdivision in Sonora, Mexico.

The lower Colorado River valley is the driest of the subdivisions of the Sonoran Desert and is vegetated mainly by shrubs in the valleys and bajadas and by various small trees and shrubs in drainageways (Turner and Brown 1982). As in the Mojave Desert, creosotebush is a dominant plant throughout most of the Sonoran Desert, although its importance in the south is reduced. Unlike the Mojave Desert, the Sonoran Desert has a high abundance of tree species (Turner and Brown 1982). In the Lower Colorado River, *G. agassizii* seems to occur mainly on the bajada and rocky slopes of hillsides and in the upper portions of arroyos (Fig. 3A) but not in valleys that constitute most of this subdivision.

In the Sonoran Desert, *G. agassizii* may be most abundant in the Arizona uplands subdivision where tortoises occur on slopes, hills, and multidissected sloping plains (Fig. 3B). The vegetation is scrubland or low woodland of leguminous trees with several layers of shrubs and perennial succulents (Turner and Brown 1982). The central Gulf Coast and plains of Sonora subdivisions are the southernmost portions of the Sonoran Desert on the mainland. Vegetation on the central Gulf Coast is similar to that of the Arizona uplands subdivision. The Sonora plain is predominantly a woodland subdivision and grades into Sinaloan thornscrub on mountains and hillsides and especially at higher elevations (Turner and Brown 1982).

Precipitation is greater in the Sonoran Desert than in the Mojave Desert, and its amount and timing are on a gradient from north to south (Brown 1982; MacMahon and Wagner 1985; Germano 1994). The annual precipitation ranges from 140 mm in the north to 324 mm in the south (Table 1). As the frequency of precipitation increases to the south, the amount in summer also increases (Table 1). Temperatures are hot in summer and cold in winter in the northern part of the Sonoran Desert but more moderate in winter in the southern part (Table 1).

Little information has been gathered on annual plant productivity in the Sonoran Desert, and information on the abundance and season of the production of forage of tortoises is lacking. The Sonoran Desert produces many broad-leaved annual plants in summer (Mulroy and Rundel 1977) that may be the bulk of the diet of *G. agassizii*. The variation in production and the importance of winter annuals to *G. agassizii* in the Sonoran Desert are unknown, but winter annuals are probably less important food there than in the Mojave Desert.

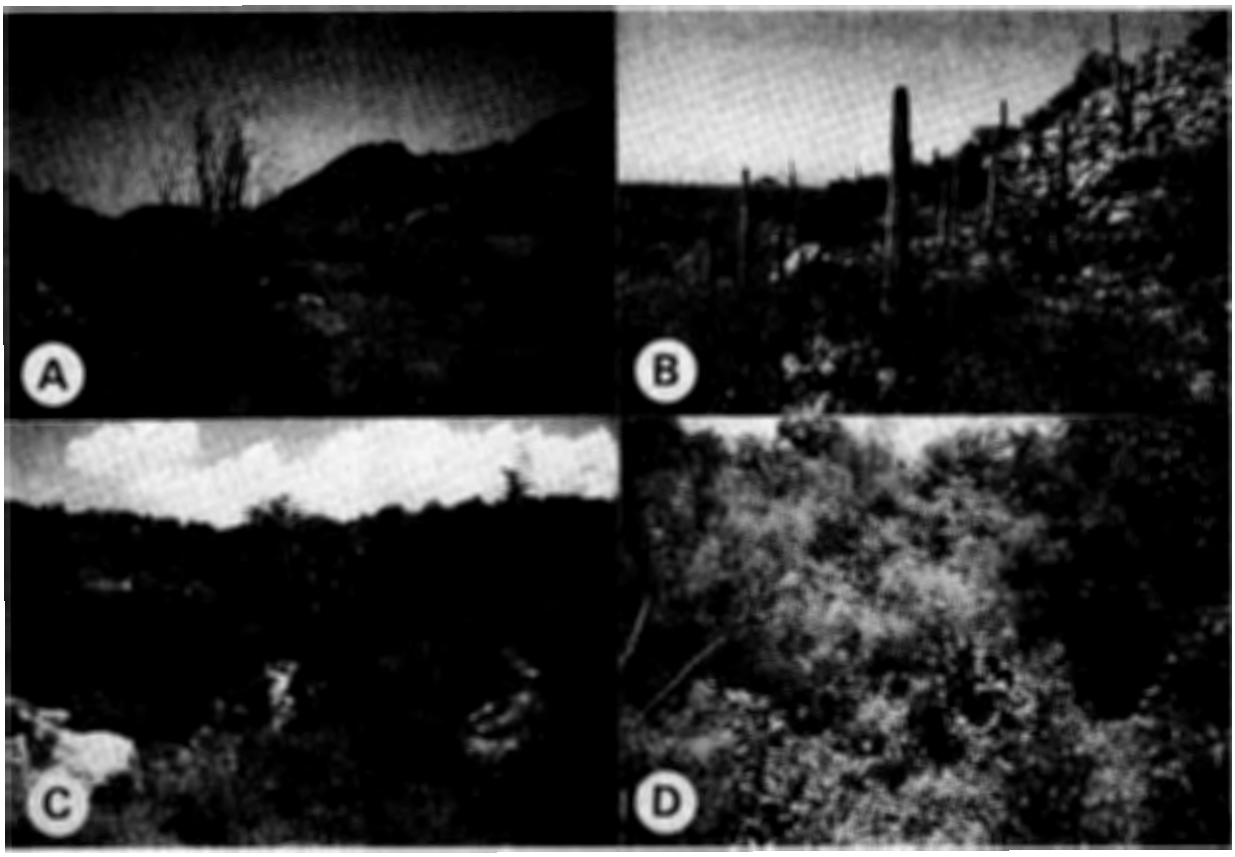

Fig. 3. Representative habitats of *Gopherus agassizii* in the Sonoran Desert, Sinaloan thornscrub, and Sinaloan deciduous forest. *A*: Wash and slope habitat of the lower Colorado River subdivision of the Sonoran Desert (photo by P. A. Medica). *B*: Rocky slopes of the Arizona upland subdivision of the Sonoran Desert (photo by D. J. Germano). *C*: Dense vegetation on hillsides in the Sinaloan thornscrub (photo by D. J. Germano). *D*: Closed canopy of the Sinaloan deciduous forest (photo by D. J. Germano).

Gopherus agassizii seems to be absent from intermountain valley floors in the Sonoran Desert. *Gopherus agassizii* are found on small contiguous tracts of habitat like isolated low hills (Fig. 3). In these areas, rainfall and air circulation are greater and plant cover is markedly different from adjacent valley floors. *Gopherus agassizii* often occurs on steep and rocky terrain. Usually, tortoises construct shallow burrows under boulders and in the banks of washes. Temperatures in winter sometimes dip below freezing but usually not for as long as in the Mojave Desert (Germano 1989). Tortoises on Isla Tiburon in the Sea of Cortez construct burrows that are less than 1.5 m in length in arroyo walls and shallow burrows on flats, and two or more adults (48% of burrows) regularly occupy one burrow (Reyes Osorio and Bury 1982).

The apparent absence or low density of tortoises on valley bottoms in the Sonoran Desert is unexpected because *G. agassizii* occupy similar creosotebush habitat in the Mojave Desert. Past coexistence with *G. flavomarginatus* limited *G. agassizii* to upland habitats because *G. flavomarginatus*, which once may have existed in the Sonoran Desert, seems to be better adapted than *G. agassizii* to valley floor habitat (Morafka 1988). However, few data exist to support or disprove this hypothesis. At present, the habitat limits of *G. agassizii* in the Sonoran Desert do not seem to be due to human influences, but agricultural activity on valley floors may displace or eliminate tortoises (Fritts and Jennings 1994).

In southeastern Arizona, reported locations of *G. agassizii* outside of habitat in the Sonoran

Desert include the Sulfur Spring Valley northeast of Tombstone, Cochise County (Miller 1932); Fort Grant, Graham County (Grant 1946); and several localities near the Arizona–New Mexico border in extreme eastern Cochise County (Hulse and Middendorf 1979). These seem to be in error for the following reasons: These records place *G. agassizii* in transitional desert grassland between Sonoran and Chihuahuan desert habitats. Southeastern Arizona is in the range of the desert box turtle (*Terrapene ornata luteola*), and residents in these areas, including a wildlife manager who regularly searched this habitat, invariably described box turtles (D. J. Germano, unpublished data). The record of tortoises at Fort Grant is secondhand. It was originally from an army officer stationed there (Grant 1946); these animals may have been released captives. Contrary to Hulse and Middendorf (1979), we were told of a resident who released *G. agassizii* regularly in a canyon across the border in New Mexico. We found neither tortoises or signs of tortoises in these areas. Thus, we are unaware of any established populations of tortoises in southeastern Arizona.

Sinaloan Thornscrub

As in the Sonoran Desert, *G. agassizii* has only been found on hillsides in the Sinaloan thornscrub and may be limited to this habitat (Fritts and Jennings 1994). Sinaloan thornscrub is a transitional habitat between the southern Sonoran Desert and the Sinaloan deciduous forest (Fig. 1; Brown 1982; Turner and Brown 1982), and many of the hillsides and mountain slopes in the Sonoran Desert in Mexico are covered by thornscrub vegetation. Vegetation consists of drought-resistant, 2.0–7.5-m-high deciduous trees and shrubs. Many are tropical and subtropical plants with thorns (Brown 1982). The vegetation is often dense but does not form a canopy (Fig. 3C). Precipitation is high, and most rain falls in summer (Table 1).

Although the density of the tortoises in the Sinaloan thornscrub habitat has not been estimated, the greatest relative abundances of *G. agassizii* are between 200- and 500-m elevations; tortoises do not seem to be above 800 m (Fritts and Jennings 1994). In this habitat, tortoises construct burrows that may not be deep and are hard to find because of the dense vegetation. Populations of *G. agassizii* may occur in isolated patches because of the discontinuous distribution of suitable albeit currently undefined habitat and because tortoises in accessible areas are sometimes eaten by humans (Fritts and Jennings 1994). However, human predation on tortoises seems to be opportunistic and may not be a serious threat to tortoises in Mexico because thornscrub is usually impassable to people (Fritts and Jennings 1994).

Sinaloan Deciduous Forest

Sinaloan deciduous forest is similar to thornscrub but distinguished by its greater plant height, larger leafage, a greater proportion of mesomorphic and hydromorphic plants, and the relative infrequency of thorny and succulent plants (Gentry 1982). The Sinaloan deciduous forest (Fig. 3D) is composed of deciduous trees on the slopes and includes evergreen trees on the canyon bottoms and arroyo margins (Gentry 1982). This habitat has the highest yearly rainfall in the range of *G. agassizii*, and most rain falls in summer (Table 1). Freezing temperatures are rare at any time, but spring drought from February to May causes leaves of deciduous plants to drop (Brown 1982). Activity patterns have not been studied; however, tortoises may be active through winter and quiescent during the dry spring. The timing of precipitation in the Sinaloan thornscrub and Sinaloan deciduous forest is essentially a complete reversal of precipitation patterns in tortoise habitat in the western Mojave Desert.

Gopherus agassizii construct burrows in the Sinaloan deciduous forest. However, these burrows are not as conspicuous or as large as those in the Mojave Desert. The dense vegetation conceals many burrows. The apparent lack of deep burrows may be related to the mild winters in these southern habitats.

The southern limit of the range of *G. agassizii* is presently thought to be near El Fuerte and Los Mochis, Sinaloa. However, the Sinaloan deciduous forest extends farther south, where no searches have been conducted (Fritts and Jennings 1994). Tortoises are difficult to find in this wooded

habitat, and the southern limit of the range of *G. agassizii* is equivocal.

Rangewide Comparisons of Habitat Use

Several patterns seem to describe the ecology of *G. agassizii* across its range. In the northern part of its range, *G. agassizii* was thought to chiefly occur on bajadas and valley bottoms of the Mojave Desert and in fewer numbers only a short distance up the sides of mountains (Woodbury and Hardy 1948; Berry 1986). However, we now know that at least in certain portions of the Mojave Desert, tortoises frequent cactus–scrub habitat on rocky substrates (Luckenbach 1982) and rocky, hilly terrain (Bury et al. 1994b). The lack of sightings of tortoises on hillsides might be from insufficient searches outside of valleys in the Mojave Desert. In the Sonoran Desert portion of the range, desert tortoises are generally absent in the valleys and instead occupy mostly rocky hillsides (Lowe 1964, 1990; Burge 1980; Walchuk and deVos 1985). This propensity for dwelling on hillsides continues through the Sinaloan thornscrub and deciduous forest (Fritts and Jennings 1994).

The highest known densities of *G. agassizii* are in the Mojave Desert, particularly in the western Mojave Desert, but recent evidence suggests dense populations north of St. George, Utah, and elsewhere in the eastern Mojave Desert (Bury et al. 1994a, 1994b). Populations may reach 65 tortoises/km^2 on Isla Tiburon (Reyes Osorio and Bury 1982), and tortoises may occur in disjunct pockets in rocky habitats at middle elevations on the mainland of northwestern Mexico (Fritts and Jennings 1994). However, published accounts of densities of the desert tortoise on the mainland of Mexico are not available.

The construction and use of burrows also seem to be variable, but burrow construction or the use of caves or dens seem obligatory by tortoises in the Mojave Desert. Some burrows are deep (>2 m long), and large burrows may be used by many individuals in winter. Often, these deep burrows are constructed under caliche overhangs. In many parts of the Mojave Desert, however, shorter burrows are dug into the soft alluvial soil, usually at the base of bushes or in wash banks.

Contrary to earlier statements (Auffenberg 1969), *G. agassizii* constructs burrows throughout its range. We found that *G. agassizii* commonly constructs short burrows throughout the Sonoran Desert, including Isla Tiburon and the Sinaloan thornscrub and Sinaloan deciduous forest. The recognition of the construction of burrows by *G. agassizii* throughout its range is lacking, probably because the southern habitats are either rocky or densely vegetated and make detection of burrows difficult. Tortoises also may use rocky overhangs and caves more often in southern latitudes, perhaps because of the greater occurrence of tortoises on hillsides and rocky substrates.

Acknowledgments

We thank the Arizona Department of Game and Fish, the U.S. Bureau of Land Management, and the U.S. Fish and Wildlife Service for providing us with unpublished maps with information on the distribution of *G. agassizii*. We also thank G. Rhodda and C. Schwalbe for reviews and helpful suggestions.

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