Distribution and Density of Desert Tortoises at Ironwood Forest National Monument

Roy C. Averill-Murray
and
Annalaura Averill-Murray

In 2001 the U.S. Bureau of Land Management (BLM) funded a study by the Arizona Game and Fish Department (AGFD) on desert tortoises at Ironwood Forest National Monument (IFNM). IFNM, located northwest of Tucson in Pima and Pinal counties was created on 9 June 2000 by presidential proclamation to protect an area with one of the highest densities of ironwood *Olneya tesota* trees in the Sonoran Desert (Clinton 2000). Designation of this area as a National Monument evolved from Pima County's Sonoran Desert Conservation Plan and efforts to balance continued urban development and the habitat requirements of sensitive species. For this project, we primarily sought to 1) estimate density and abundance of desert tortoises across IFNM and 2) determine distribution of tortoises across IFNM. In addition to these objectives we also attempted to: 3) determine the extent of a population decline observed at Ragged Top, while searching for signs of disease; 4) record the distribution and density of litter at IFNM, such as wind-blown trash (balloons); and 5) list and record distribution information of other diurnal vertebrates. This brief article summarizes the results of objectives 1-4. A future article will provide a list of diurnal vertebrates for the monument.

Tortoise Density and Distribution

We surveyed 108.25 km of transects across IFNM between 16 July and 11 October 2001. Most transects completed were 1 km squares (i.e., 250 m/side). We observed 36 subadult-adult (≥180 mm midline carapace length [MCL]) and 6 juvenile (<180 mm MCL) tortoises on 23 transects. We observed 19 males and 15 females, excluding juveniles and 2 individuals that we could not extract from burrows. Carapace length ranged from 115 to 265 mm; 39 tortoises had a MCL >150 mm and were subsequently used to estimate tortoise density (smaller tortoises were excluded due to differences in detectability). We found tortoise sign on 31 transects on which we did not find live tortoises. We estimated a density of 0.23 tortoises/ha, which results in an estimate of 17,997 tortoises across the monument.

We found tortoises on all major mountain ranges and hill complexes on the monument with the exception of Malpais Hill and the Roskruge Mountains, although we did find tortoise sign on 7 transects in the Roskruges (Table). We encountered tortoises with greater frequency in the Sawtooth, West Silverbell, and Silverbell mountains and less often in the Samaniego Hills, Waterman Mountains, and Pan Quemado (Table).

Tortoise density at IFNM in areas containing incised washes was similar to bouldery habitat, and tortoises also occur at very low density – but are not absent – in the valley floor, outside of areas with boulders or washes. Sonoran Desert tortoises are not limited exclusively to rock-pile habitat; they also construct burrows in the banks of washes (Germano and others 1994). Desert tortoises at the Florence Military Reservation, Pinal County, extend well away from rocky hillsides into the lower bajada and valley floor, where they also appear to be most concentrated near incised washes and caliche caves (Averill-Murray and Klug 2001). In the initial year of study at that site, tortoise activity was centered around washes with caliche caves, but individuals also spent substantial time in the bursage-dominated flats. Tortoises have also been observed making long-distance movements across non-typical tortoise habitat (Averill-Murray and Klug 2000; D. Swann, personal communication 2001). Tortoises making such movements or occupying valley-floor habitat may provide connections between adjacent, otherwise disjunct, rock-pile populations.

Tortoise Health and Mortality

None of the live tortoises we examined showed clinical signs of upper respiratory tract disease (URTD). We found 12 full or partial tortoise carcasses on 8 transects scattered throughout IFNM: Ragged Top, West Silverbell Mountains, Sawtooth Mountains, Waterman Mountains, and Pan Quemado. Six of these transects also had live tortoises. Additionally, we found 22 carcasses off transects, with the majority (73%) of these on Ragged Top. We also added another carcass to the southeastern edge of IFNM near the Roskruge Mountains and the northwestern edge near the Sawtooth Mountains.

Observations prior to this survey of numerous tortoise carcasses raised concern that the tortoise population at IFNM may be in decline. Many carcasses had been noted at Ragged Top beginning in 1996 (R. Repp, personal communication 2001), and another observer reported several others in the Sawtooth Mountains in 2001 (K. Simms, personal communication 2001). We documented 20 carcasses at Ragged Top during our transect and telemetry surveys, but we only found 8 carcasses on 106.25 km of transects outside of Ragged Top. We only found 6 carcasses across IFNM incidental to transect surveys outside of Ragged Top. Most of the carcasses we found were not particularly recent deaths.

One cause of concern at Ragged Top is the discovery of disease in the population. Health sampling conducted independently of this project in 2000-2001 revealed that 2 out of 11 (18%) tortoises sampled tested positive for *Mycoplasma* antibodies, the causative agent of URTD (AGFD, unpublished data). We do not know whether URTD played a role in the decline. The only other Sonoran Desert population known to have a significant proportion of tortoises testing positive for *Mycoplasma* antibodies occurs at Saguaro National Park (AGFD, unpublished data), where people have been stopped when attempting to release captives (D. Swann, personal communication 2001). The release of pet tortoises has been implicated as a potential vector for the introduction of URTD into multiple sites in the Mojave Desert (Jacobson 1993).

Litter

We found 36 balloons on 27 transects scattered throughout IFNM. The highest concentration of balloons was in or near the Silverbell Mountains east to Red Hill and north to the Samaniego Hills. Balloons consisted of rubber and mylar party balloons, as well as one U.S. Government weather balloon. Our analyses produced an estimate of 0.15 balloons/ha, with total estimate of 11,207 balloons on the monument.

The high density of balloons is not surprising considering the proximity of the monument to a major urban area. Researchers found 130 balloons on a square-mile study plot in the Lucerne Valley, California, in 1990, which is about 9 miles from the nearest town (FWS 1994). Balloons probably do not cause population-level impacts to desert tortoises or other animals, but individual animals could accidentally consume or become entangled in such trash (A. Averill-Murray, personal observation; FWS 1994).

Conclusion

This brief article only summarizes the highlights of an extremely intensive survey. Complete details of the study can be found in Averill-Murray and Averill-Murray (2002), which is available from AGFD.

Acknowledgments

We thank Cathy Arnold (ASARCO/Silverbell Mine), Richard Oxford (State Lands Department), Chris Schahn (AGFD), and Karen Simms (BLM) for logistical support and with helping us access specific areas of the monument. This extensive project would not have been possible without the field support of Daniel Bell and Philip Fenberg, as well as the many people who volunteered or worked on the project: Yvonne Anderson, Sherry Barrett, Joe Beals, Bill Cable, Taylor Edwards, Amy Gibbons, Michal Glines, Andrew Hay, Cristina Jones, Coral Keip, Hans Koenig, Scott Kozma, Gretchen Lopez, Martin and Kitty Pokurny, Michael Racy, Daren Riedle, Roger Repp, Debra Scheff, Eric Stitt, Don Swann, Dale Turner, Mike Ward, and Jessie Young. Funding for this project was provided through: AGFD's Heritage Fund; voluntary contributions to Arizona's Nongame Wildlife Checkoff; the BLM; and the U.S. Fish and Wildlife Service.

Literature Cited

Averill-Murray, A., and R.C. Averill-Murray. 2002. Distribution and density of desert tortoises at Ironwood Forest National Monument, with notes on other vertebrates. Nongame and Endangered Wildlife Program Technical Report 193. Arizona Game and Fish Department, Phoenix, Arizona. 53p.

Averill-Murray, R.C., and C.M. Klug. 2000. Monitoring and ecology of Sonoran desert tortoises in Arizona. Nongame and Endangered Wildlife Program Technical Report 161. Arizona Game and Fish Department, Phoenix. 104p.

Averill-Murray, R.C., and C.M. Klug. 2001. Desert tortoise habitat use and home range size on the Florence Military Reservation: a pilot study. Nongame and Endangered Wildlife Program Technical Report 174. Arizona Game and Fish Department, Phoenix. 24p.

Clinton, W.J. 2000. Establishment of the Ironwood Forest National Monument. Federal Register 65:37259-37262.

[FWS] U.S. Fish and Wildlife Service. 1994. Desert tortoise (Mojave population) recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 73p plus appendices.

Germano, D.J., R.B. Bury, T.C. Esque, T.H. Fritts, and P.A. Medica. 1994. Range and habitats of the desert tortoise. 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, Washington, D.C.

Jacobson, E.R. 1993. Implications of infectious diseases for captive propagation and introduction programs of threatened/endangered reptiles. Journal of Zoo and Wildlife Medicine 24:245-255.

Table. Tortoises and tortoise sign by mountain range on Ironwood Forest National Monument, 16 July – 11 October 2001.

Mountain Range[1]	Transect With: Tortoises (n)	Tortoise Sign	Encounter Rate[2]	Incidentals[3]
West Silverbell Mountains				
29.50 km	10 (20)	17	0.68	6
Sawtooth Mountains				
5.00 km	2 (3)	5	0.60	1
Silverbell Mountains				
18.75 km	5 (10)	10	0.53	7 (45)*
Samaniego Hills				
11.00 km	2 (4)	4	0.36	1
Waterman Mountains				
17.00 km	3 (5)	9	0.29	0
Pan Quemado				
6.00 km	1 (1)	4	0.17	2
Roskruge Mountains				
19.00 km	0	6	0.00	2
Malpais Hill				
2.00 km	0	0	0.00	0
Total	23 (43)	55	——-	——-

[1]Including surrounding valleys.
[2]Number of tortoises per transect km. One individual tortoise in the West Silverbells was encountered twice.
[3]Number of times tortoises were seen incidental to transect surveys. The same tortoise may have been seen on more than one occasion. *In the Silverbell Mountains, the number in parentheses represents encounters of tortoises incidental to radio telemetry at Ragged Top.