

TECHNIQUES

"TAPPING": A TECHNIQUE FOR CAPTURING TORTOISES

Capturing and recapturing tortoises without excavating or disturbing the burrow system has been considered important. Woodbury and Hardy (1948) describe using a half-inch metal pipe with a hook to pull desert tortoises from their burrows. Carpenter (1955) used sticks and blunt rods made of aluminum tubing to locate turtles under leaves, debris, or soil by sounding. Carpenter stated that a stick striking the carapace made a hollow sound easily distinguishable from that of a piece of wood or stone. R. C. Stebbins (pers. comm.) stated that naturalists have used the tapping technique to get desert tortoises out of burrows. One of us (Medica) first tried tapping in Coahuila, Mexico, in June 1959. Using a flashlight, he observed a Texas tortoise (*Gopherus berlandieri*) about 2 m within a burrow under a large boulder. He tapped on the carapace of the tortoise with a 2 m bamboo pole to see if the tortoise would move. Within a few minutes, two tortoises (male and female) emerged from the burrow.

We have used the tapping technique with desert tortoises (*Gopherus agassizii*) since 1967 in southern Nevada and in southeastern California. In Ivanpah Valley, San Bernardino Co., California, we recaptured and weighed tortoises with radiotransmitters regularly during 1980 and 1981 (Turner et al. 1984). The tapping technique enhanced this effort significantly. Of 440 captures and recaptures of tortoises in Ivanpah Valley in 1980, 103 (23%) were the result of successfully tapping and capturing animals in burrows. Of 1,111 captures and recaptures in 1981, 219 (19.7%) were recaptured by tapping.

A tortoise deep in its burrow should be tapped 3-4 times on the carapace with a stick (we used surveyor's laths). The observer should then remove the stick and move away from the burrow entrance. If the burrow is too deep (or turns) and the tortoise cannot be tapped directly, striking the roof or the floor of the burrow, or pounding on the mound at the entrance to the burrow may produce results. If the tapping is successful the tortoise will turn in its burrow and emerge rapidly, usually to the burrow entrance. If tapping does not result in an immediate reac-

tion, it should be repeated several times. Unless movement is heard from within the burrow within a few minutes, further tapping is fruitless. The above procedure is particularly useful after normal aboveground activity of tortoises has ceased (ca. 0930 h in June and 0830-0900 h in July).

Male and female tortoises responded similarly to tapping. During two seasons in Ivanpah Valley, 119 of 144 males tapped (82.6%) and 203 of 249 females (81.5%) emerged from burrows. Chi-squared totals computed for 1980, 1981 and both years combined were statistically insignificant. Response increased as the season progressed and the weather became warmer and drier (Table 1). The significant seasonal effect may have been associated with higher tortoise body temperatures. Tortoises with high body temperatures may respond more readily to stimulation. Chi-squared tests showed that tortoises were significantly more responsive to tapping in 1981 than in 1980. March-April results were from 1981 only, and 1981 was the year in which tortoises were apparently more prone to emerge. Hence, there is an apparent reluctance to emerge early in the season.

Many tortoises were tapped and captured more than once (Table 2). The χ^2 0.05 value (with 3 d.f.) is 7.82 indicating a significant difference in emergence due to frequency of tapping.

Why do tortoises react to tapping and emerge from burrows? Emergence may be an aggressive response to presumed interference by another tortoise. The response may be associated with courtship or mating behavior (e.g., see Harless 1979). The more frequent response in 1981 and the data in Table 2 suggest that some type of conditioning may result from tapping. However, no "reward" was ever given to captured individuals. Tortoises were simply weighed, measured, and released at burrow entrances.

Tapping is a simple, practical method of increasing the number of captures and recaptures of desert tortoises. The technique may also be successful with other burrow-inhabiting tortoises.

Table 1. Tortoise tapping success during spring and summer of 1980 and 1981 in Ivanpah Valley, California.

Month	Number tapped		Number captured		Percent success	
	1980	1981	1980	1981	1980	1981
March	—	11	—	5	—	45.5
April	—	35	—	25	—	71.4
May	14	60	5	53	35.7	88.3
June	74	143	47	136	63.5	95.1
July	56	—	51	—	91.1	—
Totals	144	249	103	219	71.5	88.0

Table 2. Response to tapping and frequencies with which individual tortoises were tapped in Ivanpah Valley in 1981. Figures in parentheses are expected values assuming an equal response at all frequencies.

Number of times tapped	Number emerged	Number that did not emerge	Total cases	Percent emergence
1-2	36 (39.2)	9 (5.8)	45	80.0
3-4	84 (86.3)	15 (12.7)	99	84.9
5-6	61 (60.1)	8 (8.9)	69	88.4
7-8	36 (31.4)	0 (4.6)	36	100.0

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