

Natural Occurrence Of Shell Abnormalities In Hatchling Red-Footed Tortoises (*Geochelone carbonaria*)

The characteristic arrangement of the scutes covering the carapace and plastron of turtles is of wide use in the taxonomy of the order (Lovich and Ernst 1989; Lovich et al. 1991; Pritchard 1979). Abnormalities in the carapace and plastron scutes, however, are frequently reported for different species of turtles (Pritchard 1979; Zangerl 1969). Experimental studies have shown that such abnormalities can be related to inadequate temperature or humidity levels in which the embryo has developed (Lynn and Ullrich 1950; Packard et al. 1987). Nevertheless, the frequency of abnormalities in turtles, and even reptiles, in nature is poorly known.

A group of hatchling red-footed tortoises, *Geochelone carbonaria*, was confiscated from poachers by federal forest police during transportation to southeastern Brazil. The tortoises were caught in northeastern Brazil to be sold in the pet trade. Examination of the 163 hatchlings revealed that 19% had shell abnormalities on either the carapace or plastron. The presence of one or two supernumerary scutes was present in 9.2% of the individuals, and was by far the most common abnormality. In 6.1% of tortoises, the carapace was deformed; 3.1% had the scute partially or completely fused, and 2.4% showed irregular arrangement of the scutes. The scutes most affected were vertebrals (37.9%), pleurals (31%), marginals (24%), and supracaudal (3.4%). Table 1 depicts the frequency of scute abnormalities observed in our sample.

Geochelone carbonaria has a wide geographic distribution throughout South America (Pritchard and Trebbau 1984). The female produces 2-7 eggs, measuring ca. 4.9 x 4.2 cm, each reproductive season (Medem et al. 1979; Pritchard and Trebbau 1984). The eggs are buried in a shallow hole at an approximate depth of 6-10 cm (Pritchard and Trebbau 1984). The incubation time ranges from 105 to 202 days (Medem et al. 1979). *G. carbonaria* is often found in temporary habitats (Pritchard and Trebbau 1984), such as the "caatinga," a thorn shrub vegetation found in most of northeastern Brazil, where the hatchling tortoises were obtained. In such an environment, with eggs buried in a shallow nest, and having long incubation periods, embryos are often exposed to harsh seasonal conditions. Under these circumstances it is reasonable to suppose that, as in other chelonian species so far reported (cf. Lynn and Ullrich 1950; Packard et al. 1987), environmental conditions during incubation may result in embryonic deformities in *G. carbonaria*.

TABLE 1. Frequency of carapace scute abnormalities in a sample of 163 hatchling *Geochelone carbonaria*. Abbreviations: vert. = vertebrals; pleur. = pleurals; marg. = marginals; s.c. = supra-caudals; nc = normal count for the species.

N	vert.	pleur.	marg.	s.c.
1	7	9	nc	nc
1	6	nc	23	nc
1	nc	nc	23	nc
1	nc	nc	24	nc
1	4	9	nc	nc
1	nc	nc	nc	2
1	nc	7	nc	nc
1	4	nc	nc	nc
2	6	9	nc	nc
2	6	nc	nc	nc
2	4	nc	20	nc
2	nc	nc	20	nc
4	nc	9	nc	nc
nc	5	8	22	1

The abnormalities observed in hatchling *G. carbonaria* are similar to those reported for experimental studies in which the eggs of other species were exposed to temperature or humidity stress (Lynn and Ullrich 1950). The experimental results suggest that the abnormalities we observed may be caused by environmental stress during incubation. However, severe deformities like those reported by Lynn and Ullrich (1950) were not seen in our sample of *G. carbonaria*. However, Lynn and Ullrich (1950) dissected the eggs at the end of the incubation period, and removed embryos with gross deformities. If such severe deformities occurred in *G. carbonaria*, the young turtles may fail to emerge from the egg or the nest, or may be discarded by poachers. Therefore, the incidence of abnormalities in *G. carbonaria* may be even higher than here reported.

Shell abnormalities were observed in one fifth of the sample of hatchling *G. carbonaria* studied. However, scute abnormalities like those here reported are also frequently observed in adult tortoises (Pritchard 1979; pers. observ.). This finding may suggest that these scute abnormalities do not affect the fitness of the red-footed tortoise.

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