Geological Note

Fossil Tadpole Nests—A Rarity

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An unusual pock-marked bedding surface, exposed in a Cretaceous Glen Rose outcrop (**Figure 1**), is thought to be a very rare fossil tadpole nest site. **Figures 2-5** are photos of the outcrop which is located along a bank of South Onion Creek in Hays County, Texas.

Figure 1. Photograph of South Onion Creek exposure of fossil tadpole nests. Photos in Figures 1-5 by Les and Travis White.

Figure 2.

Figure 3.

Figure 4.

Figure 5.

The identification of this pitted surface as a fossil tadpole nest was first made by Dr. James R. Underwood, a former member of the Austin Geological Society. Underwood had noticed modern, active tadpole nests in West Texas, Oklahoma, and Libya. He authored "Tadpole Nests in Libya" in the Geological Society of America Abstracts with Papers (Underwood and Grover, 1977). In the abstract he describes placing tadpoles in an aquarium with a muddy bottom and observing the development of typical nests within a few days. **Figures 6 and 7** are examples of Underwood's photos of nest sites in the field.

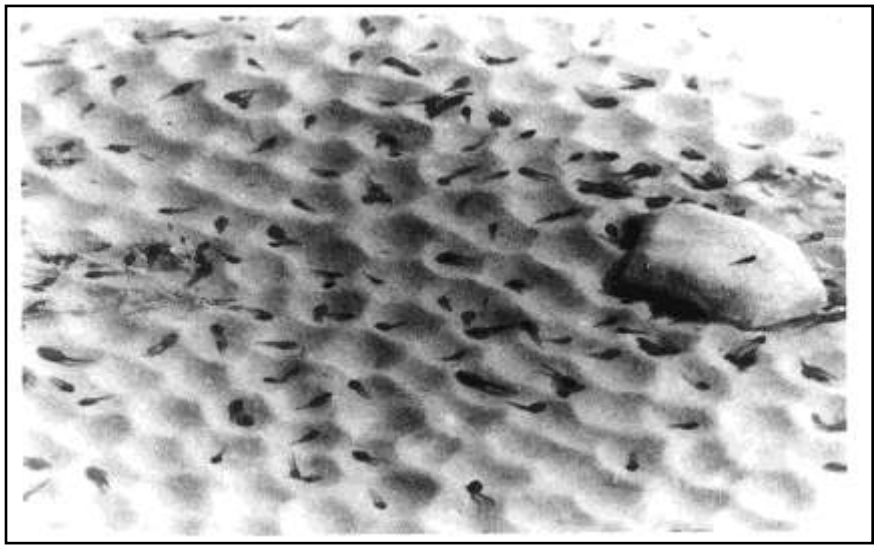


Figure 6. Field photograph of tadpole nests in the field by James R. Underwood.

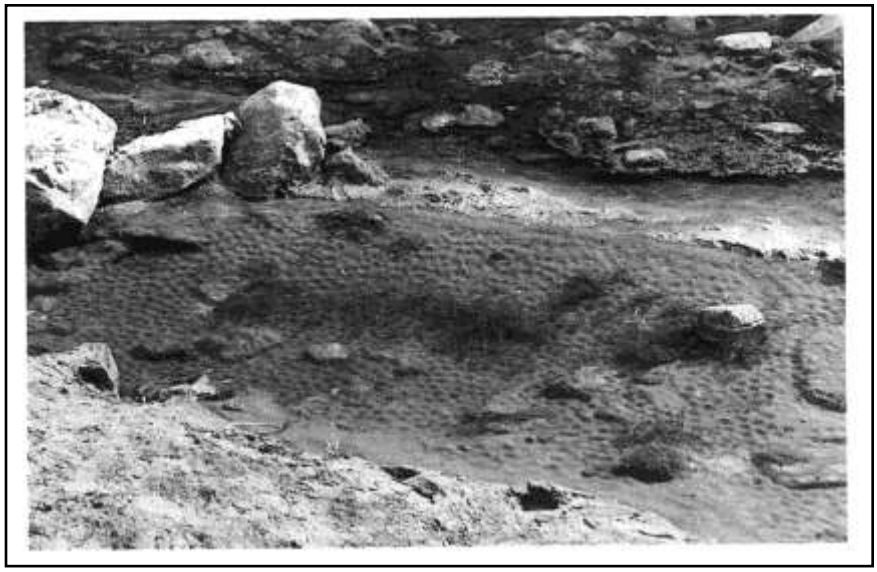


Figure 7. Field photograph of tadpole nests in the field by James R. Underwood.

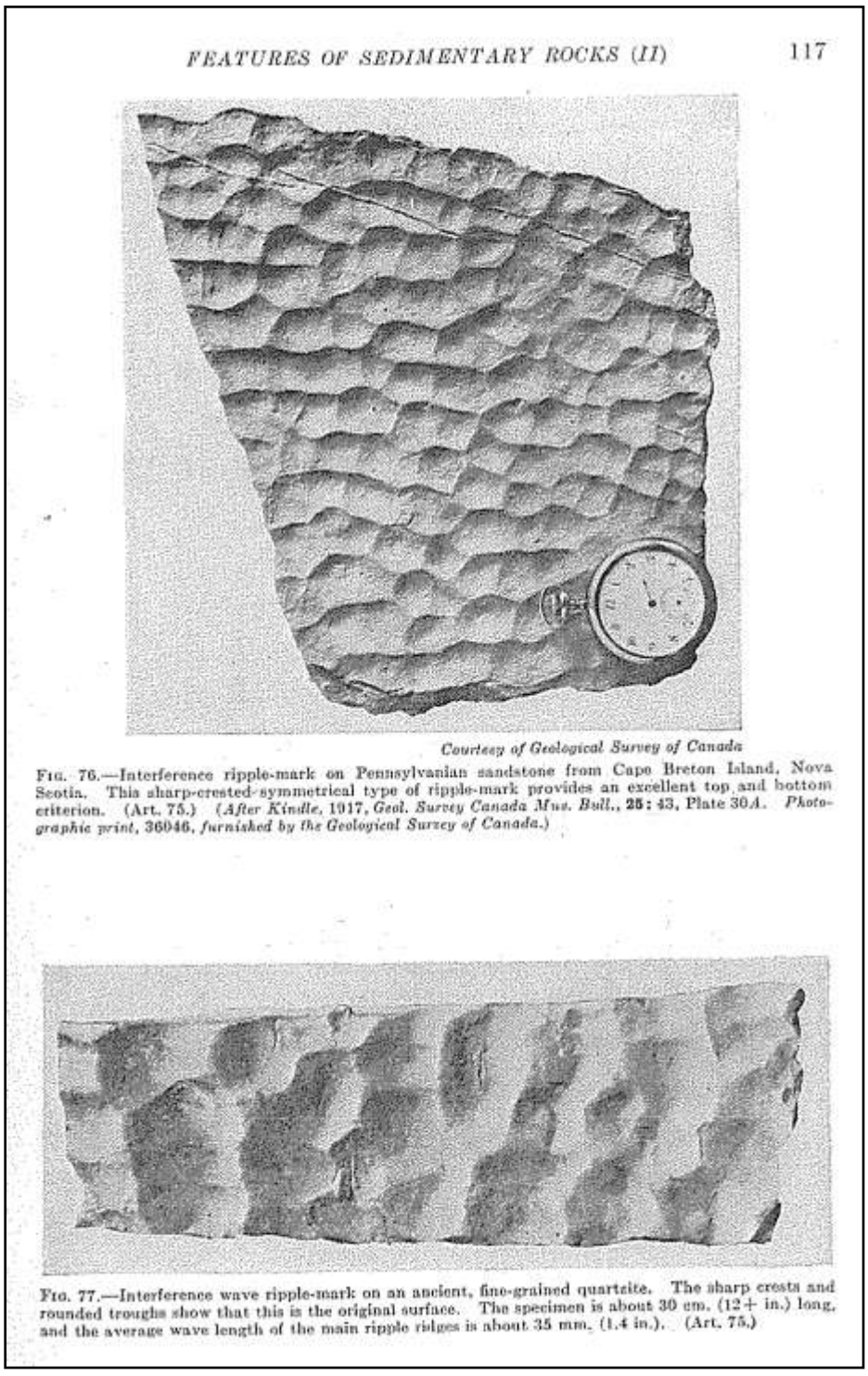
Figure 8 is a photo of "supposed tadpole nests" from Twenhofel's (1939) "Principles of Sedimentation". Upon careful examination, live tadpoles can be seen in each of the three photos.

Figure 8. "Supposed tadpole nests" from Twenhofel (1939).

The Glen Rose is famous for its Dinosaur tracks, but it is likely that tadpole nests are a much rarer trace fossil. On the other hand, fossil tadpole nests are likely to be overlooked because of their obscurity. Preservation of tadpole nests is improbable. They are formed in small, shallow and ephemeral streams, ponds and fresh-water lagoons. They are formed in unconsolidated sediment in a terrestrial environment more subject to erosion and destruction than to burial and preservation. There is an additional obstacle to the formation and preservation of tadpole nests at this particular locality. The Glen Rose is a broad, thick deposit of marine limestone. There being no known marine species of frogs, the occurrence of tadpoles nests in this rock sequence requires a period of emergence. Such an event is entirely plausible because the Glen Rose reflects shallow water deposition over a vast shelf.

Fossil tadpole nests, in spite of their meager importance, seem to incite debate. In Hitchcock's (1885) "Ichnology of New England", he describes tadpole nests from a Triassic red shale in Massachusetts. And, Shepard (1867) in The American Journal of Science asserts that these features in the red shale are, instead, interference ripples. Cameron and Estes (1971) write in the Journal of Sedimentary Petrology: "Tadpole nests are a true biogenic structure known only from the Recent. All known occurrences of supposed fossil forms have been disputed and are considered to be interference ripple marks of inorganic rather than of organic origin."

Interference ripple marks are illustrated in **figure 9** from R. R. Shrock's (1948) "Sequence in Layered Rocks". **Figure 10** is a photo of interference ripple marks from the Glen Rose Sisterdale Ripplestone.



FEATURES OF SEDIMENTARY ROCKS (II) 117

Courtesy of Geological Survey of Canada

FIG. 76.—Interference ripple-mark on Pennsylvanian sandstone from Cape Breton Island, Nova Scotia. This sharp-crested symmetrical type of ripple-mark provides an excellent top and bottom criterion. (Art. 75.) *(After Kindle, 1917, Geol. Survey Canada Mus. Bull., 25: 43, Plate 30A. Photographic print, 36046, furnished by the Geological Survey of Canada.)*

FIG. 77.—Interference wave ripple-mark on an ancient, fine-grained quartzite. The sharp crests and rounded troughs show that this is the original surface. The specimen is about 30 cm. (12+ in.) long, and the average wave length of the main ripple ridges is about 35 mm. (1.4 in.). (Art. 75.)

Figure 9. Interference ripple marks from Shrock (1948).

Figure 10. Photo of interference ripple marks from the Glen Rose Sisterdale Ripplestone. Photo by Les and Travis White.

Shrock writes that the lee slope of ripple marks never exceeds 43 degrees (Shrock, 1948). It can be seen in the photos above that tadpole nests, when fully formed, are steep-sided, far exceeding 43 degrees. The question arises as to how the steep sides are built and maintained in unconsolidated grains. It is conceivable that tadpoles, like Ophiomorpha, produce a substance that binds the free standing grains.

The persistent argument that apparent fossil tadpole nests are in fact interference ripple marks is somewhat irrational. As can be seen in the photos above there is little, if any, similarity between tadpole nests and interference ripple marks. However consideration should be given to the possibility that the trace fossil shown here is a better, clearer preservation than those whose identity has been questioned.

It has been proposed, from photos alone, that these depressions are some sort of boring. The pock-marked bed is only about 3 cm thick and the underlying bed is undisturbed. Further, the bottoms of the depressions are bowl-shaped, suggesting a terminus.

Given the similarity between the pock-marked surface and the active tadpole nest sites, and given the dissimilarity between this surface and interference ripple marks and borings; it is reasonable to believe that a rare fossil tadpole nest site has been found in a Glen Rose outcrop along a bank of South Onion Creek in Hays County, Texas (**Figure 11**).

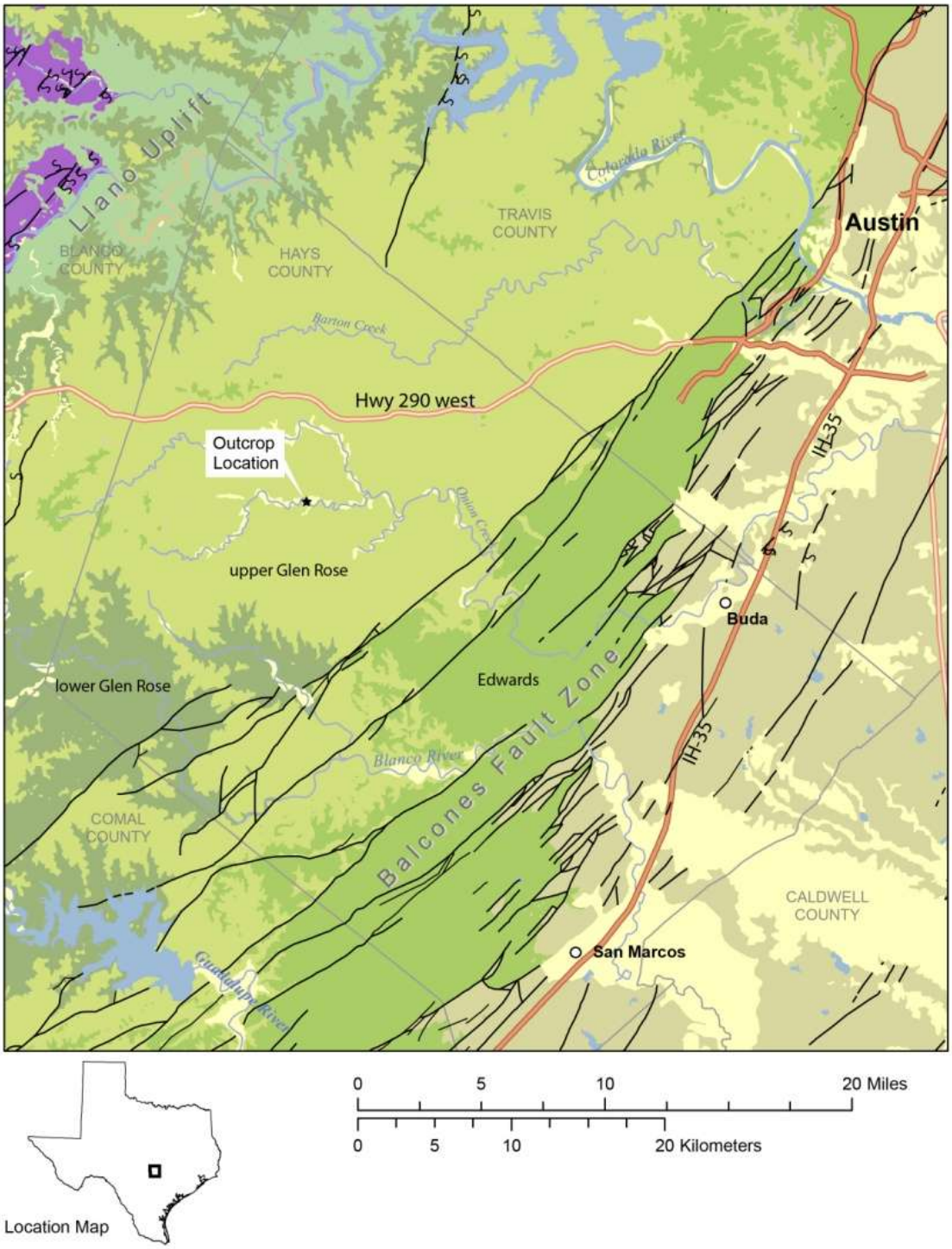


Figure 11. Location and Geologic Map. The outcrop is located along South Onion Creek in Hays County.

References Cited

Cameron, B. and R. Estes, 1971, Fossil and recent “tadpole nests”: a discussion: Jounral of Seidmentary Petrology, v. 41, no. 1, p. 171-178.

Hitchcock, E. 1885, Ichnology of New England, Boston, 2 vols, 220 p.

Shrock, R., 1948, Sequence in layered rocks, McGraw-Hill: New York, Toronto, London, 507 p.

Shepard, C., 1867, On the supposed tadpole nests, or imprints made by *Batracoides nidificans* (Hitchcock) in the red shale of the New Red Sandstone of South Hadley, Mass: American Journal of Science, 2nd Ser., v. 43 (whole number 93), p. 99-104.

Twenhofel, W., 1939, Principles of sedimentation, McGraw-Hill: New York, 609 p.

Underwood, J. and J. Grover, 1977, Tadpole nests in Libya, Geological Society of America, Abstracts with Programs for 1977, v. 9, no. 1, p. 79