

Spadefoot Toad Adapts to Desert's Aridity

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The potholes and intermittent streams on the Colorado Plateau hold a variety of surprises. Tadpole shrimp and fairy shrimp appear the day after it rains and pollywogs appear in some pools.

Pollywogs or tadpoles are the tailed larvae of frogs, toads and salamanders. I have seen tadpoles in pools in two slot canyons in Utah: Little Wild Horse Canyon on the eastern edge of the San Rafael Swell and Tunnel Slot in the Grand Staircase of the Escalante. I was surprised to find them because the life cycle of amphibians is tied to water, which is scarce and ephemeral in the desert.



Tunnel Slot, in the Grand Staircase of the Escalante National Monument. Photo by Jeff Mitton

The tadpoles that I found in slot canyons were spadefoot toads, for the pupils in their eyes were vertical slits. Species that hunt at night, such as spadefoot toads, cats and sharks tend to have pupils that reduce to vertical slits.

I did not see any adults, so my diagnosis is uncertain. They were probably Great Basin spadefoot toads, *Spea intermontana*, but they might have been Mexican spadefoot toads, *Spea multiplicata*.

The first warm spring rains arouse spadefoot toads from their burrows in sand and soft earth. They journey at night and converge on a nearby pool to feed voraciously on detritus, algae, fairy shrimp and tadpole shrimp. Given the opportunity, a toad can consume half of its body weight in a single night. Then they mate, lay eggs and return to the safety of their burrows.

Spadefoot toads, fairy shrimp and tadpole shrimp face a common, looming threat: their pool will dry, probably sooner rather than later. Their shared adaptation to the uncertainty of ephemeral pools is an accelerated life cycle. Spadefoot toad eggs hatch in about two days, and the tadpoles can transform into adults in as little as 14 days.

Even if the pool is not in danger of drying, the tadpoles need to hurry through this stage of life, for wriggling tadpoles are as susceptible to predation as sitting ducks. Raccoons, coyotes, garter snakes, ravens and crows all eat tadpoles.

Tadpoles feed on the detritus and algae lining the pool and all the shrimp and insects that they encounter. As they grow, their back legs appear first, followed by their front legs. Finally, they resorb their tails and venture onto land, where they dig their burrows. On the inner toe of each back foot they have a dark, sickle-shaped callus that they use to dig backwards into the soil. This structure is the spade for which they are named.

A whole new dynamic is triggered if the pool begins to dry while the tadpoles are still developing. Some of the tadpoles turn on the smallest among them, cannibalizing their neighbors and kin. Swimming amongst a rich and abundant source of food, the cannibals grow faster and larger and develop a stronger jaw and wider head.

At first glance, cannibalism seems detrimental, for it reduces the number of offspring. But it is not the number of tadpoles wriggling in the pool that ultimately counts, but the number of toads that emerge before the pool evaporates. Cannibals are the first to transform and in some years they are the only ones to escape.



Spadefoot toad tadpole. Photo by Jeff Mitton