

## Tarahumara frog (*Rana tarahumarae*) monitoring report: 26-27 June 2004

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On the morning of 26 June 2004, 47 adult, 138 juvenile, and 229 tadpole Tarahumara frogs (*Rana tarahumarae*) were released at four sites in Big Casa Blanca Canyon, Santa Rita Mountains, Arizona. The four sites, from high to low elevation, are String of Pools, Long Pool, Ledge Pool, and Bathtubs. Numbers of animals released at each site are presented in Table 1.

### 26 June

I made a base camp just above the upper end of String of Pools on a bench above and to the south of the canyon bottom. This is the camp that Steve Hale used in the 70s and 80s. In the evening I monitored numbers of frogs and tadpoles at String of Pools, Long Pool, and Ledge Pool. I started out from camp at 1915 to hike to Ledge Pool, from which I would monitor frogs after dark back to String of Pools. On my trip to Ledge Pool, I made the following observations. A small juvenile *Rana tarahumarae* was photographed at String of Pools (Figure 1). A dead *Hyla arenicolor* was observed in a small pool not far downstream from String of Pools. Long Pool is a complex of 4 pools, including the

**Table 1:** Numbers of *Rana tarahumarae* released by site in Big Casa Blanca Canyon, 26 June 2004

Release Site	# Adults	# Juveniles	# Tadpoles
String of Pools	3	24	29
Long Pool, pool #2	5	21	60
Long Pool, pool #3	0	2	0
Long Pool, pool #4	0	2	0
Ledge Pool	5	32	48
Bathtubs	34	57	92

largest (second) pool where most of the *Rana tarahumarae* were placed, a pool above there (the first pool, which is above the flagging marking the beginning of Long Pool), as well as two pools below the main pool (pools 3 and 4). At the second pool, I observed one dead, small (20-25 mm SUL) juvenile *Rana tarahumarae*, probably predated by a Belostomatid. In the third pool I observed a dead *Hyla arenicolor*. This pool is loaded with Belostomatids, although the two 40-50 mm juvenile *Rana tarahumarae* placed there appeared fine. In the fourth pool, which also supports many Belostomatids, the two 40-50 mm *Rana tarahumarae* placed there also were alive and well.

I arrived at Ledge Pool at about 1945 as it was getting dark. A ~0.5 m *Thamnophis cyrtopsis* emerged from a rock crevice and appeared to be heading to the pool. I captured and translocated it a few hundred meters downstream. *Hyla arenicolor* were common

and called from the rocks around dusk. Three dead, small *Rana tarahumarae* were apparent in Ledge Pool. Another 3 were in the grasps of large *Lethocerus* water bugs. I observed 2 adult and 18 live juvenile *Rana tarahumarae*. Also observed 4 tadpoles. Visibility into the water was moderate – frogs or tadpoles more than about 0.3 m deep would be difficult to see. I killed several *Lethocerus*. One of the larger *Rana tarahumarae* grunted once, but that was the only *Rana tarahumarae* vocalization while I was there. I left Ledge Pool for Long Pool at about 2025.



**Figure 1:** Small juvenile *Rana tarahumarae* at String of Pools, 26 June.

I arrived at Long Pool #4 at 2030. Both of the larger (40-50 mm SUL) juveniles released at that pool were visible along with a single, live *Hyla arenicolor*. *Belostoma* and *Lethocerus* were abundant. At Long Pool #3, both larger juveniles released there were observed. I photographed one of them. At Long Pool #2, where most of the frogs were released, I counted 5 adults (all the adults released), four larger juveniles, and six small juveniles. Many tadpoles were apparent. No dead frogs were observed; however, I saw several large *Lethocerus* and killed 2-3. One of the larger juvenile *Rana tarahumarae* grunted several times.

At 0945 I arrived back at the upper end of the String of Pools, which currently is a series of 7 small to very small pools or puddles that begin at a spring-fed pool (pool #1, under the flag marking the beginning of String of Pools). Pools 2-6 progress across an open

rocky bedrock area to where the stream course enters a wooded area. The last pool (pool #7) is just inside the wooded reach and is the largest of the pools. All seven of the pools are located in the upstream half of the area that is flagged as String of Pools. At pool #7 I observed 2 adult and 1 small juvenile frogs. At pool #5 there was one small juvenile. At pool #4 I observed 1 live and 1 dead small juvenile *Rana tarahumarae*. Pool #3 supported 2 small juveniles. Pools 3-5 were loaded with Belostomatids, of which I killed a few.

Water conditions at String of Pools are dire. The spring-fed pool is almost dry with no flow into it. Pools 2-6 are small bedrock pools with no flow into them. Pools 4-6 are in the sun most of the day, probably become quite warm, and are likely evaporating rapidly. Pool #7, the biggest pool, is shaded somewhat but still likely to dry out in the near future. Dale Turner and the others that released frogs at String Pools added rocks and branches to the pools, which provide cover for frogs and some shading. That helps, but if the rains do not start soon, String of Pools may dry up in the next week or so. In the afternoons of both the 26<sup>th</sup> and 27<sup>th</sup> there were cloud buildups, and some distant thunder on the 27<sup>th</sup>, but no rain in Big Casa Blanca Canyon.

***Totals for String of Pools, Long Pool, and Ledge Pool for 26 June: 9 adults, 37 live juveniles.*** Relatively few tadpoles were observed.

#### 27 June

At 1545 I began hiking downstream from my camp. One small, live juvenile *Rana tarahumarae* were found in each of pools 2, 3, and 5 of String of Pools. A dead small juvenile frog was observed in pool #3.

On my hike to the Bathtubs I recorded all pools of water. I estimated the size of each pool and attempted to GPS their locations. Between String of Pools and Long Pool, the following waters were observed (all UTM's are NAD 27):

Bedrock pool, about 2 m X 0.2-0.5 m. 0520099E 3505253N

Bedrock pool, about 1.7 m X 0.3 m. 0520208E 3505192 N

Bedrock pool, about 4 m X 1-2 m. 0520198E 3504830N

At Long Pool, pool #2, I observed 2 adult frogs, 4 small juvenile frogs, and 3 dead small juvenile frogs. At pool #3, I observed one 40-50 mm juvenile. At pool #4, 2 40-50 mm juveniles were present.

No surface water was present between Long and Ledge pools. At Ledge Pool, I observed one adult and 14 live, small juvenile frogs. One dead small juvenile was observed.

As I entered the gorge below Ledge Pool my GPS unit was not able to get a fix on surface waters. The following pools were observed between Ledge Pool and the Bathtubs:

Bedrock pool, about 3.3 m X 0.2 m. About 200 m downstream of Ledge Pool. A *Thamnophis cyrtopsis* was found just upstream of this pool.

A series of 4 small (less than 1 X 1 m) bedrock pools, about 100 m downstream of the last pool.

Bedrock pool, about 1.3 m X 0.3-0.6 m. About 100 m downstream of last pools.

Below a recent oak treefall and pour off, there is a large plunge pool, about 3-4 m X 0.6-2 m. The pool is quite deep. There is a rocky slope above it on the southwest and a bedrock chute below it.

Just before the Bathtubs there is a bedrock plunge pool about 2 m X 0.3-1.0 m.

The Bathtubs is a series of 20 distinct bedrock plunge pools with no flow between them. The largest pools in the canyon and currently roughly 90 percent of the Tarahumara frog habitat is in the Bathtubs. The first (upstream pool) is a deep plunge pool with abundant rocky underwater retreats. In this pool, I observed 3 adults, 2 juvenile, and 15 tadpole *Rana tarahumarae*. Also present were one small *Hyla arenicolor* and a large *Kinosternon sonoriense*. This is likely the same mud turtle that we observed on our reconnaissance trip on 22 May. The second pool is a dank 1.2 m X 0.3-0.6 m bedrock pool. No amphibians observed. The third pool is also small – about 1.2 m X 0.3 m, no amphibians. The 4<sup>th</sup> pool is a large and deep plunge pool. Three adult *Rana tarahumarae* observed, one of which was photographed (Figure 2).

The 5<sup>th</sup> pool is about 3-4 m X 0.3-1.1 m. Sixteen dead *Hyla arenicolor* were in this pond with 3 live small juvenile *Rana tarahumarae*. This is probably the *Hyla* die-off reported by those who released frogs in the Bathtubs. They told me they had not placed any *Rana tarahumarae* in this pond, so the juveniles present must have moved to this pond from elsewhere. The pond had some very large *Lethocerus*, which may explain the dead *Hyla*. In general, the Bathtubs appeared to have lower densities of Belostomatids than Long or Ledge Pools, but some very large individual *Lethocerus* were present.

The 6<sup>th</sup> pool is a very large and deep plunge pool. One adult *Rana tarahumarae* and one dead *Hyla* observed. Also present were several large *Lethocerus*. The 7<sup>th</sup> pool is also a large deep pool. I observed two large adult *Rana tarahumarae*. Pool #8 is round and about 2.5 m across. One small juvenile *Rana tarahumarae* present. Pool #9 is about 3.1 m X 0.3-0.6 m. Three dead *Hyla*. Pool #10 is mostly under a large rock. Estimated size is 3 X 2 m. No amphibians observed.



**Figure 2:** Adult *Rana tarahumarae* at pool #4 in the Bathtubs, 27 June.

Pool #11 is “Sycamore” pool (Figure 3), characterized by a sycamore that grows out of the water. It is by far the largest pool in the canyon, probably 10 m X 3-4 m, and very deep. A single adult frog was observed at the downstream end. It hopped out of the water and proceeded about 2 m before coming back to the water. It was eating flies, which are abundant at all of the Bathtub pools.

Pool #12 is a large, deep plunge pool, roughly 6 m X 2-3 m. Two adult *Rana tarahumarae* were visible, one of which was grunting. Pool #13 is about 0.8 m X 0.2-0.3 m. One small juvenile *Rana tarahumarae* was present. Pool #14 is mostly covered by rocks, it is perhaps 2.5 m X 0.6-1.0 m. No amphibians observed. Pool #15 is shallow and 2.5 m X 1.0-2.6 m. No amphibians. Pool #16 is shallow and covered mostly by a large rock. The pool is probably about 2.5 m X 0.3-1.2 m. No amphibians.

Pools 17-20 are a series of pools just above the flag marking the downstream end of the Bathtubs. Each is about 3-4 m X 0.3-2.5 m. No amphibians observed in any of these pools.

I waited until nightfall and then at 2150 began the hike back to String of Pools. Following are my observations of amphibians.

Bathtubs:

**Pool 20:** Two *Hyla arenicolor* calling. Four *Hyla* tadpoles.



**Figure 3:** Pool #11, Sycamore Pool, in the Bathtubs

**Pool 12:** Two adult *Rana tarahumarae*, one which was grunting.

**Pool 11 (Sycamore Pool):** Three adult *Rana tarahumarae*.

**Pool 8:** One small juvenile *Rana tarahumarae*. Another small juvenile being consumed by a large *Lethocerus*.

In a very small (<0.3 m in diameter) pool between pools 7 and 8, there was a single small juvenile *Rana tarahumarae*.

This frog probably immigrated from an adjacent pool.

**Pool 7:** Three large adult *Rana tarahumarae*.

**Pool 6:** One adult *Rana tarahumarae*.

**Pool 5:** Three small juvenile *Rana tarahumarae*. Many large *Lethocerus*.

**Pool 4:** Four adult *Rana tarahumarae*.

**Pool 3:** One live *Hyla*.

**Pool 2:** One live *Hyla*, plus *Hyla* tadpoles.

**Pool 1:** Four adult, one small juvenile, and numerous tadpole *Rana tarahumarae*.

**Total:** 17 live adult, 6 juvenile, and tadpole *Rana tarahumarae*. The day survey yielded 12 adult, 7 juvenile, and 15 tadpoles.

#### Ledge Pool:

**Four live adult and 14 small juvenile *Rana tarahumarae*.** Another small juvenile was observed in the grasp of a large *Lethocerus*. One of the adult frogs was snoring and whining. The day survey yielded one adult and 14 small, live juvenile *Rana tarahumarae*.

#### Long Pool:

**Pool #4:** Two 40-50 mm juvenile *Rana tarahumarae*.

**Pool #3:** One 40-50 mm juvenile *Rana tarahumarae*.

**Pool #2:** Four adult, 2 40-50 mm juveniles, and 2 small juvenile *Rana tarahumarae*. One dead small juvenile *Rana tarahumarae*.

**Total: Four live adult, 5 40-50 juveniles, and 2 small juvenile *Rana tarahumarae*.**  
The day surveys yielded 2 adults, 3 40-50 mm juveniles, and 4 small juvenile frogs.

String of Pools:

**Pool #7:** One adult *Rana tarahumarae*.

**Pool #5:** One small juvenile.

**Pool #4:** One adult.

**Total: Two live adult and one juvenile *Rana tarahumarae*.**

The day survey yielded no adults and 3 live juvenile *Rana tarahumarae*.

If we use the highest count for a pool (whether it be the day or night count), the following 27 June totals for the canyon result:

**Big Casa Blanca Canyon Live Frog Totals for 27 June: 27 adults and 31 juveniles.**

Few tadpoles were observed.

At about 0545 on the 28<sup>th</sup> there was a large bear turning rocks in the pools at String of Pools. I chased it off and replaced the rocks in the pools. The bear did not turn the larger rocks where adult frogs were observed the night before. I left the canyon at about 0615. On the Aqueduct Trail I passed 2 illegal immigrants that were heading towards Tunnel Spring. As the trail dead ends at Bear Spring, they likely had traveled through Big Casa Blanca Canyon. Some evidence of immigrants (trash and camps) were noted in the canyon.

**Recommendations:**

1. It was clear that the very small juveniles, and probably tadpoles, were easy prey for large *Lethocerus*. Dead *Rana tarahumarae* observed were all small juveniles that had probably been predated by this large water bug. Dead treefrogs observed may have also been killed by *Lethocerus*. This time of year the predators and frogs are concentrated in the few remaining pools. In the future, release of tadpoles and small (<40 mm) frogs should probably occur early in the spring or during the monsoons when there is more water in the canyon.
2. String of Pools is questionable as a good release site. Water was dependable there when Steve Hale did his work in Big Casa Blanca in the 1970s and 80s. But despite this being a fairly wet spring, and the canyon looking fairly green for late June, String of Pools is on the verge of drying up. This site may no longer be perennial or suitable for *Rana tarahumarae* reproduction. The next monitors in the canyon should consider moving any remaining frogs at String of Pools to the Bathtubs where most of the permanent pools are.
3. To facilitate monitoring, the 20 pools in the Bathtubs should be diagramed, mapped out, or marked somehow. Based on the descriptions herein, others may not be able to determine at which pools I found or did not find frogs.

4. Other pools between the release sites that could not be GPSed could perhaps be mapped by pacing them off from either Ledge Pool or the upper end of the Bathtubs. But this may become moot once the rains begin and water once again flows through the canyon.
5. This monitoring effort was somewhat adhoc. We need to standardize monitoring techniques (have a form to fill out) and agree as to what should be monitored.
6. For safety reasons (rugged nature of the canyon, illegal traffic, bears), monitoring should be accomplished by two or more individuals.