

Observing Seasonal Differences in Red Hills
Roach Behavior

BIOL 4650 Freshwater Ecology

Alan Vinzant

Tuesday, November 3, 2024

Introduction

The Red Hills area is remarkable for its serpentine soils which allow for perennial pools of water to form through seeping groundwater. These pools remain annually even during periods of sustained drought with little or no rainfall, providing a permanent habitat for the California red hills roach. The unusual nature of the roach's habitat and its restricted distribution puts it at risk of endangerment and extinction, so there is a push to supplement the limited data on the behavior and habitat of the roach in order to better understand this fish.

Our class previously visited the Red Hills on October 10th, at a time when the weather was still warm and there had been little rainfall for an extended period of time. We observed the behavior of the roaches and made rough estimates as to their numbers. I revisited the area on November 17th, after the weather had started to cool and seasonal rains had begun in some surrounding areas. My goal was to repeat our observations and look for contrasts against the previous site visit that could be attributed to the weather. If there was evidence of recent rain in the area, I intended to look for seasonal pools that may have formed and see if any red hills roaches had migrated into the seasonal pools.

Methods

I arrived in the area in the late afternoon on November 17th. The weather was cloudy and the temperature at the time of my arrival was in the low 50s Fahrenheit (the temperature during the November site visit was in the high 70s F). There was no evidence that it had rained recently.

I identified the same pools that we had observed in our previous visit and took water depth measurements at several points. To get population data, I would set my sight on a roughly 3-square-foot patch of water and attempt to count the number of individuals in the area over a 60-second period.

To characterize behavior, I would choose individual fish and follow their behavior for about 60 seconds.

I walked up the path of Serpentine Loop Rd N about half a mile in an attempt to find seasonal pools that may have appeared due to rain, but I didn't find any, and the riverbed west of the observation area was dry.



Figure 1
Observation area,
Red Hills Recreation
Area in Tuolumne
County

Results

Water depth ranged from 0.18 meters to 0.86 meters, with the deepest areas being in the largest pools. At points where water depths were taken both in October and November, water depths did not differ significantly between site visits.

Individual red hills roaches counted within 60 seconds in a 3-square-foot area were 13, 19, 27, and 7, in areas that progressed further from the gravel road. Larger numbers of fish inhabited the larger pools. These numbers were significantly lower than those recorded during October. The population of fish was notably staggered in size, with most individuals fitting into “small,” “medium,” or “large” sizes. There were fewer large roaches than medium, and fewer medium than small. Small roaches made up the largest proportion of the population.

When observing the roaches’ behavior, they stayed near the bottoms of the pools, and rarely came to the surface. They moved very little in general, and would spend extended periods of time in one spot.

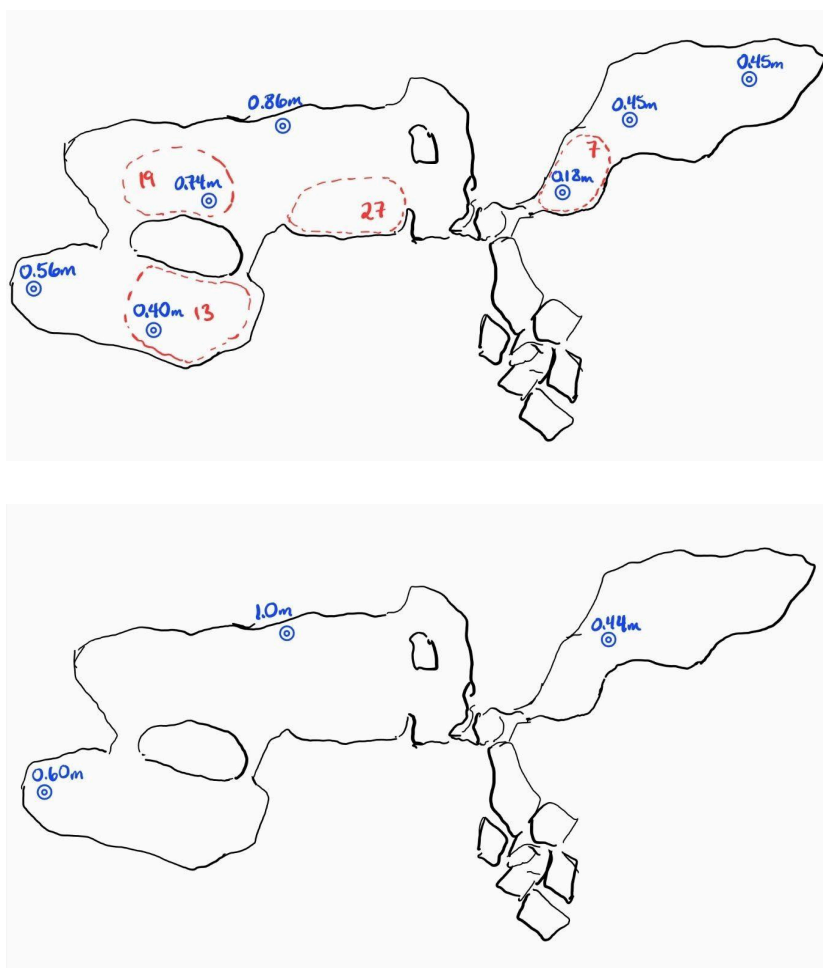


Figure 2

(Top) November 17 site visit. Dotted areas in red represent areas observed to gather population data. The red number within the dotted area is the number of individuals counted in a 60-second period.

Blue dots mark points where water depth was measured. The blue number next to each dot is the measured depth in meters.

(Bottom) October 10th site visit. Blue dots mark points where water depth was measured. The blue number next to each dot is the measured depth in meters.

Trial	Number of individuals observed
1	50
2	30
3	30
4	28

Table 1 Shows the number of red hills roaches counted over a 60-second period while observing a small area.

No seasonal pools were observed, and the seasonal riverbed roughly 0.5 miles west of the pools observed was dry.



Dry seasonal riverbed roughly 0.5 miles west of the observation area

Discussion

There was no notable precipitation in the one month period between site visits (as evidenced by the lack of seasonal pools and the dry riverbed), and water depth in the pools did not change during this period. The pools are not visibly being fed by any other above-ground water source. These observations are consistent with the pools' water source being a seepage of groundwater from the serpentine soil.

The size distribution of the population is consistent with age. If individuals' growth is limited to particular seasons throughout the year, this could create the staggered sizing observed, and it can be assumed that small roaches are 1 year old, medium roaches 2 years old, and large roaches 3 years old.

The number of individuals observed was significantly lower than in October. It was observed that there are progressively fewer individuals of progressively larger size, so some of the decrease in number could be due to young individuals dying off, but I doubt this could account for such a dramatic difference. I think a large part of the difference can be explained by the differences in the fishes' behavior. As the weather cooled, the roaches spent more time near the bottom of the pools. There could have been significantly more roaches present that were simply out of sight under rocks or vegetation near the bottom of the pool. It is also possible that a significant portion of the difference is simply observer error, as the fish can be difficult to count in general. The roaches tend to blend in with the sediment and the glare of the sun on the water's surface makes them difficult to see.

It would be valuable to conduct another visit after significant rainfall in order to see if this affects the sizes or depths of the pools. We could also note any potential migratory behavior of the roaches between perennial pools and seasonal ones. Polarized sunglasses during future visits would likely make taking population data much easier by reducing the glare of the sun on the water's surface.