



Mojave Desert Network Selected Large Springs Pilot Study

Texas Spring Springsnail and Benthic Macroinvertebrate Data

Natural Resource Data Series NPS/MOJN/NRDS—2014/703



ON THE COVER

Part of the water collection system near the source of Texas Spring.
Photograph by: Richard Frieze

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Overview

The National Park Service (NPS) Mojave Desert Network Inventory and Monitoring Program (MOJN I&M) is developing a protocol to monitor the hydrology and ecology of large springs in the MOJN parks. The MOJN Selected Large Springs (SLS) protocol will cover springs in Death Valley National Park (DEVA), Great Basin National Park (GRBA), Joshua Tree National Park (JOTR), Lake Mead National Recreation Area (LAKE), Mojave National Preserve (MOJA), and Grand Canyon-Parashant National Monument (PARA). The monitored springs have been selected for their high discharges, stability, biological importance, and in cooperation with park staff to address the parks' resource management priorities.

As part of the SLS protocol, MOJN will collect samples of benthic macroinvertebrates (BMI) and monitor springsnail populations in several springs. The purpose of this monitoring is twofold:

- to provide data regarding the overall health of the aquatic ecosystems in the monitored springs, and
- to monitor the endemic species present in the springs.

These data will be useful in determining the effects of any observed changes in hydrology or vegetation, and will provide baseline information that can be used to evaluate management actions at the springs.

In March of 2012, a MOJN field crew visited Texas Spring in DEVA to test the methods initially proposed for benthic macroinvertebrate (BMI) sampling and springsnail monitoring. This report presents the results of these pilot tests.

Texas Spring

Texas Spring is located in the Furnace Creek area of Death Valley National Park (Figure 1). The spring's discharge was diverted for decades for domestic and municipal water use at Furnace Creek and Cow Creek, leaving the spring ecosystem highly disturbed. The diversion is estimated to have reduced the historic springbrook length by 85% (Threlhoff and Koenig 1999). Currently, the discharge from the historic collection system, an average flow of 680 l/min (Sada and Cooper 2012), is released to the ground surface, where it forms a small pool. This water flows into a spring brook that runs for roughly 200 m before flowing into a narrow, deeply-incised ravine up to 5 m deep (Figure 2). While no records are available, the morphology of the ravine suggests that it was formed by the release of water from the collection system onto the hill slope. The ravine does not appear to be safe to enter. The spring supports approximately 1 km² of riparian vegetation in the source area, and a narrow band of vegetation for approximately 1 km along the ravine. To our knowledge, no published studies have examined the aquatic biology of Texas Spring.

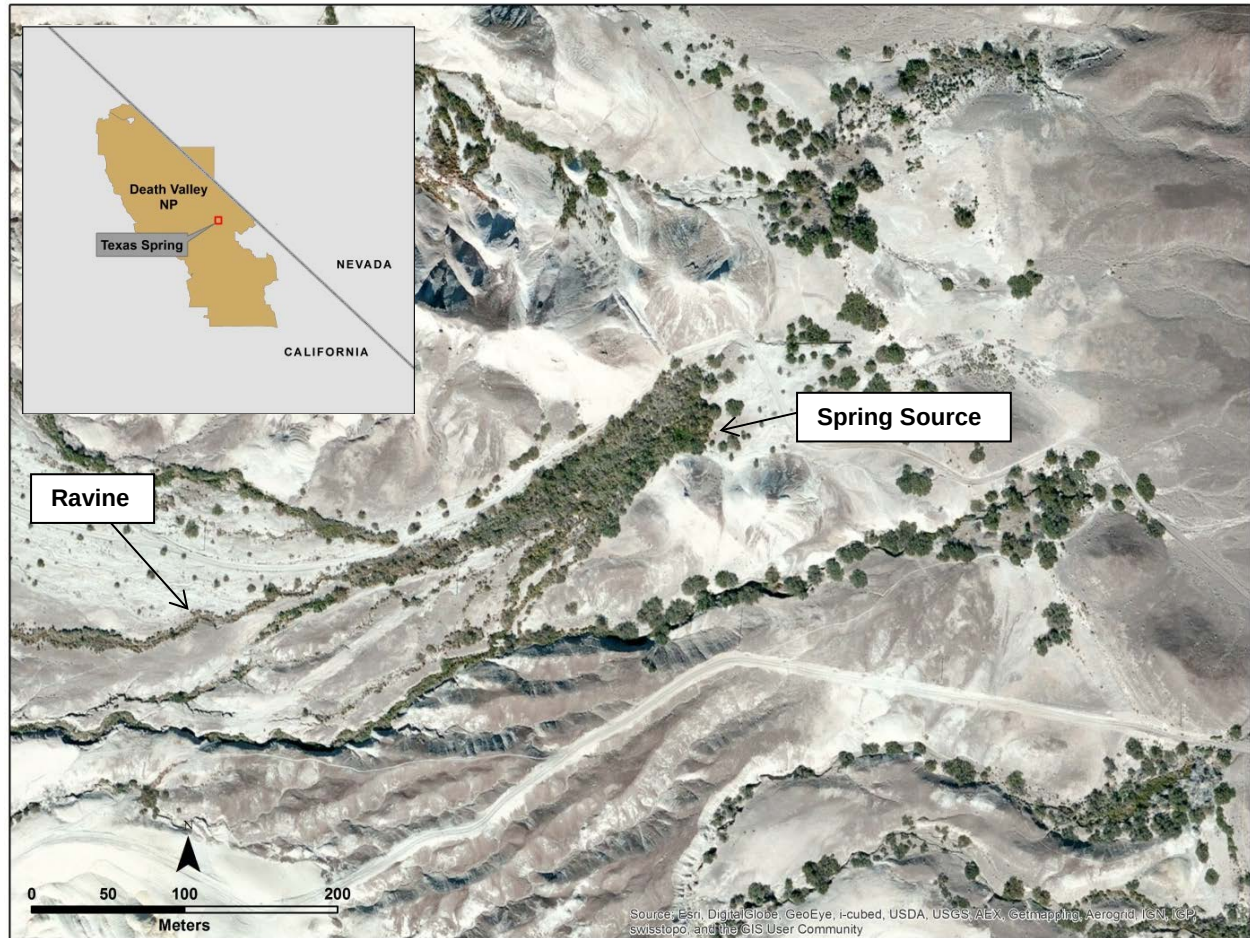


Figure 1. Aerial view of Texas Spring. Inset: Location of Texas Spring within Death Valley National Park.



Figure 2. View to the west of the incised ravine below Texas Spring.

Benthic Macroinvertebrate (BMI): Source Sampling

Methods

BMI sampling occurred on March 23, 2012. The intention of the sampling was to collect BMI in the immediate vicinity of the source rather than in the spring as a whole. Samples were collected at 0m, 2m, 4m, 6m and 8m downstream of the spring source. The springbrook was approximately 2 m wide in the vicinity of the source, so the left, center, or right of the springbrook was chosen for sampling based on the last digit displayed on a digital watch. At each sample location, a kicknet sample was collected by disturbing a 30 cm x 30 cm area of substrate upstream of the net for 30 seconds. The submerged vegetation in the 30 cm x 30 cm area was then jabbed 3 times with the kicknet. The material collected at the five sample locations was combined into a single composite source sample.

Results

The samples in the single composite source sample were preserved in alcohol and shipped to the Utah State University National Aquatic Monitoring Center (NAMC) for processing. There, the samples were sorted, identified to the lowest resolute taxon, and enumerated. Identifications were made by taxonomists certified by the Society for Freshwater Science using the taxonomic keys recommended by the Southwest Association of Freshwater Invertebrate Taxonomists (Richards and Rogers, 2011). The lab split (proportion of the sample enumerated in the lab) was 6.25%. In order to provide a more complete taxa list, the remaining sample was visually searched for 10 minutes for additional taxa. The NAMC's full procedures can be reviewed on their website (www.usu.edu/buglab/SampleProcessing, accessed 16 April 2014). The specimens from the sample are archived by the NAMC under the terms of a long-term loan agreement with the NPS. The results of the sample analyses are shown in Table 1.

The NAMC sent 160 of the springsnail specimens from the sample to Dr. Robert Hershler of the Smithsonian Institution for identification to the species level. He identified them as *Ipnobius robusta* (formerly known as *Tryonia robusta*).

Table 1. Benthic macroinvertebrates found in source sample collected in Texas Spring, Death Valley National Park, California

Phylum	Class	Order	Family	SubFamily	Genus	Species	Number of Individuals in the Sample
Arthropoda	Insecta	Diptera	Ceratopogonidae				32
Arthropoda	Insecta	Diptera	Chironomidae	Chironominae	<i>Polypedilum</i>		16
Arthropoda	Insecta	Diptera	Stratiomyidae				16
Arthropoda	Insecta	Ephemeroptera	Leptohyphidae		<i>Tricorythodes</i>		16
Arthropoda	Insecta	Hemiptera	Gelastocoridae		<i>Gelastocoris</i>		16
Arthropoda	Insecta	Hemiptera	Naucoridae	Naucorinae	<i>Pelocoris</i>	<i>shoshone</i>	17
Arthropoda	Insecta	Odonata	Gomphidae		<i>Erpetogomphus</i>		1
Arthropoda	Insecta	Trichoptera	Helicopsychidae		<i>Helicopsyche</i>		1312
Arthropoda	Malacostraca	Amphipoda	Hyalellidae		<i>Hyalella</i>		1040
Mollusca	Gastropoda	Neotaenioglossa	Hydrobiidae				7312
Mollusca	Gastropoda	Neotaenioglossa	Hydrobiidae		<i>Tryonia</i>	<i>robusta</i>	present
Platyhelminthes	Turbellaria						48

Benthic Macroinvertebrate Discussion

The dominant taxon in the specimen was *Hydrobiidae* (springsnails), identified as the species *Ipnobius robusta*, which is endemic to springs in the Furnace Creek area of DEVA (Hershler et al. 1999). The sample contained 7312 hydrobiids, which corresponds to a nominal population density of $\sim 16,000/\text{m}^2$. *Helicopsyche* (caddisflies) and *Hyaella* (freshwater amphipod) were also common ($>1,000$ individuals) in the sample. *Pelocoris shoshone*, likely the endemic subspecies *Pelocoris shoshone amargosus*, the Amargosa naucorid), was also present. No invasive species were present in the sample or observed by the crew.

Springsnail Monitoring

Methods

While springsnails were included in the benthic macroinvertebrate samples discussed above, MOJN I&M also monitors the density and spatial extent of the springsnail population in Saratoga Spring. The springsnail monitoring method was tested during a visit to Saratoga Spring on March 16, 2012. The method was modified from the one outlined by Sada (2009), and was designed to monitor the extent and density of the springsnail (hydrobiid) population. The monitoring method we used is briefly summarized below:

- The extent of the springsnail population was determined by observing the presence or absence of springsnails at accessible locations. At Texas Spring, springsnails were observed 40 m downstream of the source.
- A measuring tape was stretched along the reach of springbrook where springsnails were present. Monitoring locations, 11 in all, were established at regular 4 m intervals.
- At each monitoring location, a 10 cm x 10 cm quadrat was placed on the spring bottom, and the surface material and loose substrate were brushed into a sieve. The retained material from the sieve was transferred to a sorting tray, and approximately 1 cm of water was added. The number of springsnails in the tray was then counted. All springsnails were returned to the spring.

Results

Table 2 shows the population density of springsnails observed in Texas Spring. The number of springsnails in the source pool was visually estimated due to the difficulty of counting large numbers of specimens in the field. The visually estimated springsnail density for the source pool ($>15,000/\text{m}^2$) is similar to the density of springsnails in the source BMI sample ($\sim 16,000/\text{m}^2$). Springsnails were observed to be densest in areas with sun exposure, visible algae, and sandy substrates. Very few springsnails (fewer than 5 in a quadrat) were observed in areas with hard clay substrates.

Table 2. Observed springsnail population densities.

Distance from Source (m)	Comment	UTM Coordinates Zone 11N, NAD83		Snail Count in 0.01 m ² Quadrat	Substrate
		Easting (m)	Northing (m)		
	Source pool, lots of sunlight	514434	4034677	More than 150 (visual estimate)	Sand, hard, flat rocks
4				38	
8				7	
12	Very shaded			41	Sand, gravel
16	Very shaded			2	Sand, gravel
20	Very shaded			0	Very hard clay
24	Many snails in filamentous algae			30	Sand
28	Few plants			3	Compact, hard clay
32	Few plants			4	Compact, hard clay
36	Naucorids, Odonates, Helicopsychids			0	Compact, hard clay
40	Naucorids, Odonates	514396	4034657	2	Compact, hard clay

Springsnail Monitoring Discussion

The method for determining the extent and population density of springsnails was used successfully at Texas Spring. In future monitoring work, more monitoring locations should be placed in high population density areas near the spring's source. It may be necessary to use smaller quadrats in high population density areas so that the number of individuals can be counted rather than visually estimated.

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