

***Baetis moqui* (Wiersema, Nelson and Kuehnl 2005)**  
**Moqui minnow mayfly**  
**Ephemeroptera: Baetidae**

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## SUMMARY

*Baetis moqui* is a small minnow mayfly endemic to Utah. This species inhabits fast-flowing rocky substrates in cold, clear, high-gradient streams. *B. moqui* was described as a new species from larvae collected in south-central Utah in 2004, and has been collected from North Creek and Pine Creek in Garfield County in the Escalante Canyon region. Its limited range and requirement for clear fast streams with low sediment loads may affect long-term stability of this species. Global climate change could also threaten this species' habitat in the long-term. Research should focus on understanding the biology of this species and establishing the distribution and population size.

### CONSERVATION STATUS

#### Rankings:

Canada – Species at Risk Act: N/A

Canada – provincial status: N/A

Mexico: N/A

USA – Endangered Species Act: N/A

USA – state status: Utah SNR Not ranked

NatureServe: G1G3 Imperiled

IUCN Red List: N/A

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## SPECIES PROFILE

### DESCRIPTION

*Baetis moqui* is in the family Baetidae (small minnow mayflies). The larvae are 5.8 – 7.0 mm (0.23 – 0.28 in.) in length, with three caudal filaments at the tip of the abdomen. The body is brown, with well-developed wingpads and light and dark patterning on the thorax and abdomen. The antennae are long, extending to at least the first abdominal segment, and are paler at the base and tip compared to the mid-section. *B. moqui* can be distinguished from other North American *Baetis* species based characteristics of the abdominal gills, as gill 1 is extremely reduced or lacking, and the structure of the labial palpi of the mouthparts. Adults of this species have not been described.

### TAXONOMIC STATUS

*Baetis moqui* Wiersema, Nelson and Kuehnl 2005. The taxonomic status of this species is considered valid. The species epithet is taken from an early name for the indigenous Hopi people.

## **LIFE HISTORY**

This species is only known from larvae, which have been collected from cold clear streams draining high elevation (3000 m/9842 feet) peaks dominated by spring snowmelt and summer monsoon rains. Larvae can be found on leaf packs and submerged vegetation at the stream edges, but are more common on fast flowing rocky substrates with a coarse sandy matrix. Larval feeding was not observed, but members of this genus are considered to be collector-gatherers and scrapers, feeding on diatoms and organic detritus.

## **DISTRIBUTION**

Larvae are known only from North Creek and Pine Creek in Garfield county, south-central Utah. Their current range is considered to encompass less than 40 square miles (100 sq. km). Larvae were collected from the type locality in North Creek above North Creek Reservoir. Additional larvae were collected from Pine Creek at the Box Death Hollow trailhead. Larvae were commonly collected from elevations of 2100 - 2500 m (6890 – 8202 feet) in North and Pine Creeks, but were not found above 2500 m (8202 ft.). Additional sampling at several adjacent streams did not reveal *B. moqui*, and no larvae were collected at the confluence of Pine Creek or North Creek with the Escalante River.

## **THREATS**

*Baetis moqui* is a rare endemic species with narrow habitat requirements that is known from only two streams in south-central Utah. Due to its restricted habitat, limited populations, and unknown dispersal ability, *B. moqui* should be considered at risk. *Baetis moqui* larvae appear to have a specific requirement for cold fast flowing waters with extremely low sediment loads. North and Pine Creeks are somewhat unique in that they have lower sedimentation loads than are expected for the region; adjacent nearby streams with overall higher sedimentation loads and turbidity were not shown to support any populations of this species. Both localities are within a few miles of Escalante, which is a very small town but close to Bryce Canyon, Capitol Reef, and Canyonlands National Parks, and Glen Canyon National Recreation Area. Heavy recreational use and road traffic in the watershed may threaten this species, particularly given its apparent intolerance for sediment and turbidity. Populations may have limited dispersal due to restricted areas of appropriate habitat, as larvae were not found in streams that were adjacent but higher in sediment load. Such small isolated populations are also vulnerable to stochastic events, and normal population fluctuations due to disease, predation, and food supply. True population sizes are unknown as this is a newly described species and needs more survey work.

Global climate change could also pose a long-term threat to *B. moqui*. Assessment of climate change trends in North America has already revealed changes in precipitation patterns, stream hydrology, and plant bloom time. Overall, annual mean air temperature increased in North America from 1955-2005, and total annual flow has decreased in many streams in the central Rocky Mountain region throughout the past century at an average rate of 0.2% per year (Rood *et al.* 2005). The effects of global climate change are projected to include warming in the western mountains, causing snowpack and ice to melt earlier in the season (Field *et al.* 2007). This could lead to increased flooding early in the spring and drier summer conditions, particularly in arid western areas where snowmelt sustains stream flows. Spring and summer snow cover has already been documented as decreasing in the western United States, and drought has become more frequent and intense (Intergovernmental Panel on Climate Change 2007). Floods and droughts are projected to increase in frequency and intensity; erosion is also projected to increase

due to decreased soil stability from higher temperatures and reduced soil moisture, and increases in winds and high intensity storms. As a species that requires cold clear streams, the survival of *B. moqui* could be threatened by habitat impairment due to global warming, including increased frequency and severity of seasonal flooding and droughts, reduced snowpack to sustain stream flow, increased erosion and siltation, and increasing air and water temperatures.

#### **CONSERVATION STATUS**

*Baetis moqui* currently receives no federal protection. The Utah Sensitive Species List does not include insects.

#### **CONSERVATION NEEDS**

Necessary actions include monitoring known populations and searching for new ones, and protecting habitat in regions where the species is known to occur.

#### **RESEARCH NEEDS**

Little is known about the biology or distribution of this species. Additional surveys should be conducted to establish the range and distribution of this species and assess its dispersal capacity. Research into life history and habitat management in the area would be valuable.

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## **RESOURCES**

#### **CONTACTS**

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#### **REFERENCES**

Merritt, R. W., K. W. Cummins, and M. B. Berg (eds). 2008. An introduction to the aquatic insects of North America. 4th edition. Kendall/Hunt Publishing Company, Dubuque, Iowa. 1158 pp.

Wiersema, N. A., Nelson, C. R. and Kuehnl, K. F. 2004. A new small minnow mayfly (Ephemeroptera: Baetidae) from Utah, U.S.A. Entomological News 115 (3): 139-145.

#### **WEBSITES**

NatureServe Explorer, [www.natureserve.org/explorer/](http://www.natureserve.org/explorer/) , accessed March 2008