

***Caurinella idahoensis* (Allen 1984)**
Lolo mayfly
Ephemeroptera: Ephemerillidae

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SUMMARY

Caurinella idahoensis is a spiny crawler mayfly known only from a few sites in Idaho and Montana, primarily in the mountainous border region between the two states. Larvae of this species inhabit cobble and rocks in steep forested headwater streams, and are generally found in close association with colonies of blue-green algae. Water quality degradation and stream alteration as the result of heavy recreational use, logging, and road construction may threaten *C. idahoensis* habitat. Global climate change could also threaten this species' habitat in the long-term. Research should focus on understanding the habitat needs of this species and establishing the distribution and population size and stability.

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: Idaho S2 Imperiled; Montana S3 Vulnerable

NatureServe: G1G3 Critically imperiled/Vulnerable

IUCN Red List: N/A

SPECIES PROFILE

DESCRIPTION

Caurinella idahoensis is a mayfly in the family Ephemerellidae (spiny crawler mayflies). This species was first described in 1984 from a single larva collected from a tributary of the Lochsa River in Idaho County, north-central Idaho (Allen 1984). Adults of *C. idahoensis* were not described until 20 years later, from larvae that were caught in the field and reared to adulthood (Jacobus & McCafferty 2004).

Caurinella idahoensis larvae reach ~5-7 mm (0.2-0.28 in.) in length and are light grey to brown dorsally and pale on the underside. The caudal filaments are 3-4.2 mm (0.12-0.17 in.) long, and are light brown with spines and sparse setae (hairs). The head and thorax lack prominent tubercles or projections, and have variable brown patterning. The labrum of the mouthparts has a distinctive dense fringe of fine, short setae, and the legs are covered with long hairlike setae. The hind margins of the femora have long stout setae in elevated sockets. Abdominal segments may have paired pale spots, and abdominal segment nine has a pair of long, toothlike post-lateral

projections with upturned tips. The fringe of setae on the head and the projections on the 9th abdominal segment are unique to this genus.

The body of the adult male is 8.5 mm (0.33 in.) long, with longer forewings (9mm; 0.35 in.) and caudal filaments (11.2 mm; 0.44 in.). Females are 8.1 mm (0.32 in.) long, with forewings and caudal filaments about equal length (9.8 mm [0.39 in.] and 9.5 mm [0.37 in.], respectively) (Jacobus & McCafferty 2004). Adults have tan heads, drab olive bodies, and pale abdomens; the female thorax may be much lighter than that of males. The legs are pale, with a white spot on each trochanter (2nd segment, near the base of the leg). Characteristics of the male genitalia can be used to distinguish this species from other members in the subfamily (Ephemerellinae).

TAXONOMIC STATUS

Caurinella idahoensis Allen. The taxonomic status of this species is accepted as valid. The genus *Caurinella* is monotypic, i.e. *C. idahoensis* is the only species in the genus. Placement of the type specimen in this genus was first proposed by Allen (1984) and later confirmed by Edmunds & Murvosh (1995).

LIFE HISTORY

Caurinella idahoensis is endemic to Idaho and Montana, where it inhabits high-gradient, forested streams near headwater sources. It is generally found in small, steep, relatively fast flowing perennial mountain streams with cobble and gravel substrates. In a recent study (Jacobus & McCafferty 2004), larvae were collected from Brushy Creek in Idaho County, ID at a site 4-5 m (13-16.4 ft) wide and 15-50 cm (5.9-19.7 in) deep. The water was cold (10°C; 50°F), and specimens were collected from a reach where the sun shone directly on the stream.

Larvae were found almost exclusively clinging to rocks at the bases of colonies of blue-green algae (*Nostoc parmelloides*). Based on the morphology of the mouthparts, larvae of *C. idahoensis* are thought to feed by scraping, biting, or shredding particles of detritus, algae, and diatoms, and *Nostoc* colonies may act as filters that make finer particles available to the mayfly larvae (Jacobus & McCafferty 2004). One larva had fragments of a midge larva in its foregut, suggesting that *C. idahoensis* nymphs may be opportunistic carnivores. Field- and laboratory-based observations indicate that larvae may also be territorial. In the field, small cobbles (≤ 9 mm [0.35 in] diameter) generally had only a single larvae; in the lab, larvae inhabiting the same rock were observed pressing themselves together head-to-head until one larva backed away (Jacobus & McCafferty, 2004).

Based on the presence of mature larvae in the field and the timing of adult emergence of field-collected mature larvae in the laboratory, the adult flight period is thought to be from about mid-July to early August (Jacobus & McCafferty 2004).

DISTRIBUTION

Caurinella idahoensis is endemic to western Montana and Idaho, where it inhabits cold, fast flowing, steep, headwater streams, primarily in the Clearwater, Salmon-Challis and Lolo National Forests. In Idaho, *C. idahoensis* has been reported from about twelve scattered locations in the central mountainous part of the state, including Valley, Lemhi, Idaho, and Clearwater counties. In Montana, this species has been found in a few streams in Mineral and Missoula Counties in the region known as the Northern Rocky Mountain Refugium, a mountainous,

forested area around the Idaho-Montana border that was not affected by ice sheets from the north during glacial periods or by lava flows from eruptions to the south and west. It has also been collected from Mineral and Sanders Counties in Montana.

THREATS

Caurinella idahoensis appears to have narrow habitat requirements and its presence in minimally disturbed streams with high water quality and cobble substrate suggests a low tolerance for chemical and thermal pollution as well as siltation. Although many of the isolated, rugged areas in which it has been found are less accessible, the National Forests in which it occurs are subject to heavy recreational use as well as to logging activities and road construction. The impacts of large numbers of people engaging in camping, hiking, driving, fishing, rafting, snowmobiling, mountain biking, boating, and hunting in the area could negatively impact *C. idahoensis* habitat. Unauthorized off-road vehicle use could seriously damage riparian areas and stream bank integrity, leading to increased sedimentation. The water quality in the cold, clear, fast streams this mayfly requires could be altered or impaired by a variety of factors related to logging and roads, including warmed and polluted runoff from roads and highways; increased sedimentation and habitat degradation from logging waste, prescribed burns, and logging roads in the watershed; and contamination from fire retardant.

Caurinella idahoensis is generally present in low numbers at the sites where it has been collected, and the dispersal ability of adults is unknown. Thus, it may also be at risk from stochastic effects that impact small isolated populations, including normal population fluctuations due to flood, drought, disease, predation, and changes in food supply.

Global climate change could also pose a long-term threat to *C. idahoensis*. 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 for development, the survival of *C. idahoensis* 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

Caurinella idahoensis currently receives no federal protection. It is a US Forest Service Species of Concern (SOC), a Species of Greatest Conservation Need in Idaho, and a Potential Species of Concern (PSOC) in Montana.

CONSERVATION NEEDS

Additional surveys are needed to identify new populations of *C. idahoensis*, establish the range and distribution of this species, and assess population abundance and stability at known sites.

RESEARCH NEEDS

Further research into life history, dispersal ability, and habitat requirements of *C. idahoensis* would be valuable.

RESOURCES

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