

Smokies Needlefly

Megaleuctra williamsae

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DESCRIPTION

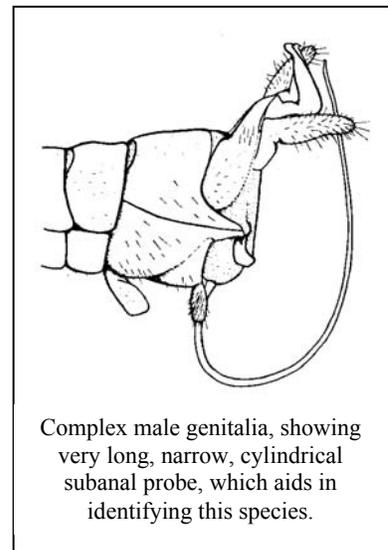
Taxonomy and Basic Description

Megaleuctra williamsae was described in 1941 by John F. Hanson from a single adult male specimen collected in 1938 from Greenbriar Cove, Great Smoky Mountains National Park. Baumann (1973) described the adult female and since their descriptions, both have remained in the genus *Megaleuctra* with no synonymy (name change or revision) for either. The genus *Megaleuctra* was erected by Neave in 1934, and contains six species, all found in North America.



Recently, the placement of the genus *Megaleuctra* into the family Leuctridae (needleflies) has been questioned. However, until research is published, based on molecular evidence, *Megaleuctra* is treated as a relict taxon in the family Leuctridae.

The Smokies needlefly larvae ranges from 12 to 14 mm (0.5 to 0.6 inches) in body length. General body color is brown, with the legs yellowish. The head is wider than the pronotum. The male genitalia is complex with a very long, and narrow, cylindrical subanal probe; the processes on the tenth dorsal plate are flattened laterally and project dorsally; the ninth ventral plate has a broad posterior lobe, a widely notched margin at apex and is abruptly bent downward at base; and the vesicle is large. The ninth sternum of the female is formed into a long, narrow ovipositor.



Complex male genitalia, showing very long, narrow, cylindrical subanal probe, which aids in identifying this species.

Adult needleflies are slender, brown to black stoneflies ranging from 4 to 15 mm (0.2 to 0.6 inches) in length. Adults have one-segmented cerci and typically, the wings are rolled around the body at rest. Distinct from all other Holarctic genera, the genus *Megaleuctra* can be easily distinguished from all other needleflies by the large size, 12 to 15 mm (0.5 to 0.6 inches) in length, and the presence of six veins in the hindwing anal region. This genus is among the rarest of all North American stoneflies, with only two eastern United States species: *Megaleuctra flint* is known from Pennsylvania, Virginia and West Virginia, whereas *M. williamsae* is known from North Carolina, South Carolina, Tennessee and Virginia.

The stoneflies, more than any other order of insects, are typical inhabitants of running waters. Nearly all species occur exclusively in streams, and most are restricted to running water habitats of mountainous regions of the world. Usually, water temperatures of these streams are below 25°C with high dissolved oxygen levels. These requirements allow them to serve as an excellent

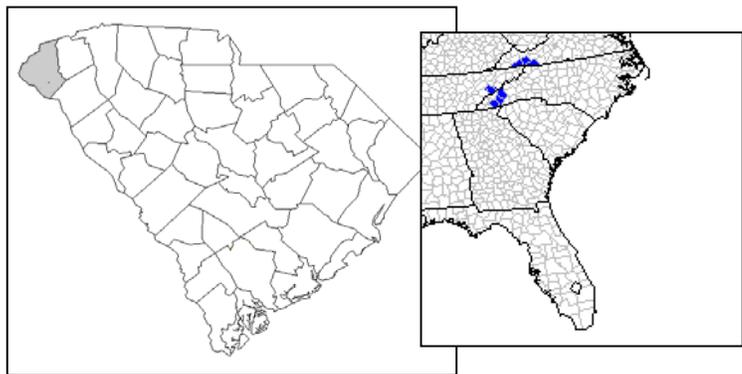
indicator of water quality. They are one of the three orders collectively known as the “EPT” orders of aquatic insects known to be demonstrably affected by declining water quality (Ephemeroptera, the mayflies; Plecoptera, the stoneflies; and Trichoptera, the caddisflies). The water quality ratings for wadeable creeks and streams are calculated using the presence/absence and relative abundance of these “EPT” and other aquatic insects.

Status

The Smokies needlefly is globally ranked as imperiled (G2). This species is currently not ranked in South Carolina, but is under review. The Smokies needlefly is considered critically imperiled (S1) in North Carolina, imperiled to critically imperiled (S1/S2) in Tennessee and imperiled (S2) in Virginia.

POPULATION DISTRIBUTION AND SIZE

The Smokies needlefly has been infrequently recorded from the higher elevations of western North Carolina and South Carolina, eastern Tennessee and southwestern Virginia (Mount Rogers area). Several South Carolina records are available from Oconee County.



Population size has not been determined, but this species occurs as small populations, usually less than 20 nymphs per site.

HABITAT AND NATURAL COMMUNITY REQUIREMENTS

Most stonefly nymphs are herbivores, feeding principally on plant detritus. Even the young nymphs of many carnivorous species feed on fine detritus before switching to animal prey. The families Perlodidae, Perlidae and Chloroperlidae are predominantly predators as older instars. Although some species emerge in autumn, most stoneflies transform to adults in spring or early summer. Mature nymphs often congregate at emergence sites such as piles of rocks, bridge abutments and woody debris. The exuviae (cast skins) of the nymphs are often abundant and can be seen attached to these sites.

Stonefly nymphs occur most commonly in lotic habitats with rocky bottoms with high dissolved oxygen concentrations. Some species are restricted to seeps and springs, others to high gradient coldwater streams.

The nymphs of the Smokies needlefly are restricted to high elevation springs and seeps in relatively undisturbed forested areas (Stewart and Stark 2002). Nymphs sprawl in accumulations of decaying leaves and other debris that is covered with a thin film of flowing water.

CHALLENGES

A major challenge to the Smokies needfly is deforestation, which would result in opening of the canopy of seeps and springs, increasing water temperature and likely reducing food inputs.

Acid deposition, primarily from precipitation, may alter pH conditions of the habitats, potentially eliminating populations. Diversions of surface waters or removal of ground water may alter below ground hydrological patterns of the seeps and springs.

CONSERVATION ACCOMPLISHMENTS

There are no conservation accomplishments to date for this species.

CONSERVATION RECOMMENDATIONS

- Identify extant populations of the Smokies needfly and ensure the protection of the multiple specific habitat types for this species.
- Protect critical habitats for the Smokies needfly from future development and further habitat degradation by following best management practices and protecting riparian areas.
- Promote land stewardship practices through educational programs.
- Encourage responsible land use planning.

MEASURES OF SUCCESS

As research and management needs are identified, projects will be initiated to address those needs.

LITERATURE CITED

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