

Moretti's Protophila Caddisfly

Protophila morettii

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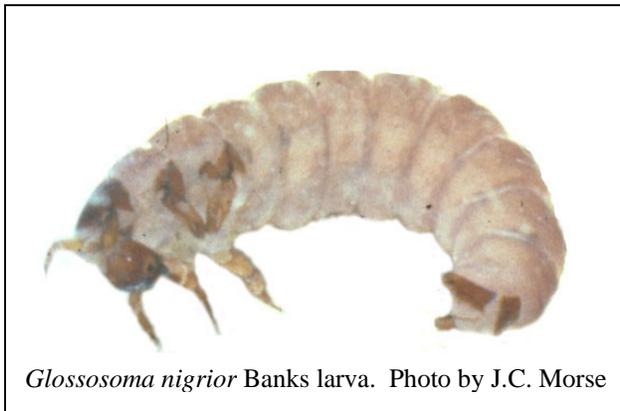
DESCRIPTION

Taxonomy and Basic Description

Protophila morettii was described by John Morse in 1990 from male and female adults collected in South Carolina. Males measure 3.2 to 3.5 mm (0.13 to 0.14 inches) from front of head to tips of folded wings, with forewings each 2.7 to 3.0 mm (0.11 to 0.12 inches) long. Females measure 3.1 to 4.1mm (0.12 to 0.16 inches) from front of head to tips of folded wings, with forewings each 2.9 to 3.8 mm (0.11 to 0.15 inches) long. The eggs, larvae and pupae of this species remain unknown. Species of *Protophila* are members of the subfamily Protophilinae, family Glossosomatidae, order Trichoptera.

The Trichoptera, or caddisflies, are holometabolous insects that are most closely related to Lepidoptera, or moths. Trichoptera eggs, larvae and pupae usually are fully submerged in water and depend on oxygenated water for respiration. Adult caddisflies are aerial/terrestrial, but are rarely found far from water. Adults generally resemble those of their Lepidoptera cousins except, rather than being covered by scales, Trichoptera wings are typically clothed with hair, which is presumably important in repelling water, hence the Latin name *trichos* (hairy) and *ptera* (wings). Trichoptera larvae generally resemble those of Lepidoptera except that caddisflies never have fleshy, crochet-bearing prolegs on middle abdominal segments.

Eggs of caddisflies are round or elliptical and are typically imbedded in a gelatinous matrix called spumaline, with usually several hundred eggs in a single egg mass. Because of the spumaline, little is known about the surface sculpture of the eggs themselves.



Glossosoma nigrior Banks larva. Photo by J.C. Morse



Glossosomatidae adult
(*Glossosoma nigrior* Banks).
Photo by J.C. Morse.

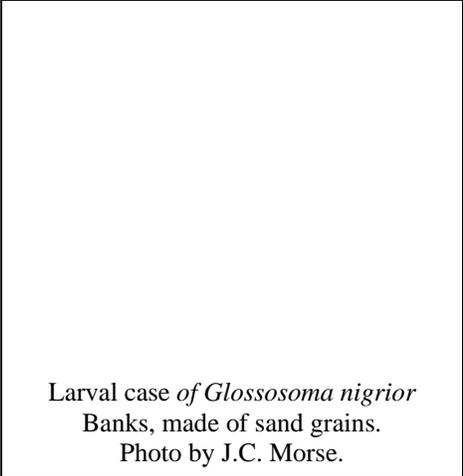
Larvae of caddisfly species vary in shape. Those of Glossosomatidae are tapered at the ends with the mouthparts often oriented nearly in line with the body axis. Mouthparts are always have simple chewing mandibles and antennae are usually inconspicuous. A single eye is present on each side of the head that consists of a tight cluster of stemmata, whereas Lepidoptera larvae generally have six widely spaced stemmata. On the caddisfly thorax, the pronotum is always sclerotized and meso- and metanota may or may not be

sclerotized; *Protophila* larvae have three lightly sclerotized plates on the mesonotum and a pair of small lateral plates on the metanotum. Three pairs of five-segmented legs are always present, each with a single claw. An epimeron called the "fore trochantin" at the anterior base of each

front leg is small and inconspicuous in Glossosomatidae. On the abdomen, a pair of fleshy anal prolegs is partially fused to the body in Glossosomatidae, each bearing a lateral sclerite and single hook-like anal claw.

Glossosomatidae larvae have a band of minute spines on the ventral side of the second abdominal segment or a pair of patches of such spines, not seen in other families.

Sclerites are usually absent from abdominal segments except that larvae of Glossosomatidae and a few other families have a single median tergite on abdominal segment IX. The larva of Glossosomatidae lives in a portable case of sand grains and silk that is domed dorsally and flat ventrally, the head and abdomen protrude on the ventral side from beyond a transverse strap of fine sand.



Larval case of *Glossosoma nigrior*
Banks, made of sand grains.
Photo by J.C. Morse.

The pupa is exarate; although the soft, adult-like appendages are pressed tightly against the body, they are not fused with the body. The mandibles are usually long and adapted for cutting the silken cocoon and pupation shelter. Paired hook plates are present on various caddisfly segments dorsally, apparently used to help the pupa maneuver in the cocoon or shelter; in Glossosomatidae, they occur on the terga of at least the fourth through the seventh abdominal segments. The pupa of Glossosomatidae is contained in a brownish semipermeable cocoon attached at the ends inside the dome-like larval case that has been modified to serve as a pupation shelter by the removal of the ventral strap.

The adult caddisfly mouthparts have no coiled proboscis. Instead, the labium is more or less specialized as a hautellum for sponging liquids. The antennal flagella are long and conspicuous and thread-like. Setal warts are variously shaped and positioned dorsally on the head and thoracic nota of caddisflies; Glossosomatidae adults have a pair of long warts on the mesoscutum and another pair on the mesoscutellum. Tibiae and tarsi are equipped with apical and preapical spurs and spines in specific patterns; Glossosomatidae have two preapical and two apical spurs on each middle and hind leg and usually two apical spurs on each front leg, but Protoptilinae have no spurs on the front legs or these are hairlike. Wings have relatively few crossveins, but most longitudinal veins are present; fore wing anal veins anastomose, looping anteriorly on each other. Male and female genitalia (abdominal segments IX, X, and possibly XI) typically have some external parts that are species-specific and may function as tightly fitting premating isolating mechanisms in copulation.

Thirteen species of *Protoptila* are known from the United States and Canada. The male of Moretti's proptoptila caddisfly resembles those of the Nearctic species *P. lega* Ross, *P. maculata*, and *P. palina* in the slender arms of the apical fork of abdominal sternum VIII and in the unique general shape of abdominal segment X. It differs from these, however, in that Moretti's proptoptila caddisfly has a longer and (in lateral view) straighter sternum VIII with more divergent apical arms, longer downcurved apical processes of segment X, and slender paramere spines each with its apex abruptly downcurved. The female Moretti's proptoptila caddisfly resembles that of these other three species in the long ventral plates of abdominal sternum VIII,

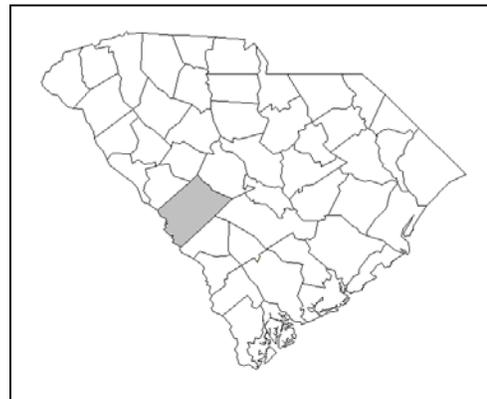
the dome-like band internally above the processus spermathecae, and the long slender apodeme arising from the apex of the venter of the genitalia. It differs from these, however, in that this species has a longer internal ventral apodeme and a pair of dark longitudinal posterior folds of the processus spermathecae that extend anterad only to the level of the posterior edge of the opening of the ductus spermathecae (Morse 1990).

Status

There is only one population known, and it is under significant threat. This species has a global ranking of critically imperiled (G1) ranking. In South Carolina, this species has no official status, but its range is restricted.

POPULATION DISTRIBUTION AND SIZE

Moretti's protoptila caddisfly is known from only Upper Three Runs Creek on the Savannah River Site in Aiken County, South Carolina. Numerous caddisfly collections made throughout South Carolina since 1969 have failed to find other populations of this species, including intensive sampling in the lower reaches of Upper Three Runs Creek (Floyd et al. 1993). Eleven collecting trips were undertaken specifically to find additional populations of this species in seven streams in the major catchment basins of the sandhills of South Carolina from April through July 1988, but none were found. Over 600 adults of this species were captured at ultraviolet light traps set beside Upper Three Runs Creek at Savannah River Site Road 8-1 from 17 March through 15 October during 1976 through 1984 (Morse 1990). No attempts to collect the species from Upper Three Runs Creek at the original upstream site have been made since 1984; therefore, the current status of the species is unknown.



HABITAT AND NATURAL COMMUNITY REQUIREMENTS

The immature stages of Moretti's protoptila caddisfly have never been captured, so that the specific habitat requirements of the species are unknown. Larvae of other species of *Protoptila* graze on periphyton (algae, diatoms, fungi and other biofilm on the surfaces of stones and rooted plants), with mouthparts adapted for scraping these materials from the substrate. Larvae of *Protoptila* live in streams that are somewhat warmer, often larger and slower flowing than other members of Glossosomatidae (Wiggins 1996).

Upper Three Runs Creek has been studied intensively, so that the freshwater insect community is well known (Morse et al. 1980, 1983; Morse 1990; Floyd et al. 1993). Nearly 1,000 species of freshwater insects have been captured in or beside Upper Three Runs Creek and its tributaries since 1976 (unpublished data). Over 123 of these species are caddisflies (Floyd et al. 1993). Besides Moretti's protoptila caddisfly, twenty others caddisfly species in Upper Three Runs

Creek are considered rare, endemic or of limited distribution (Floyd et al. 1993; Morse et al. 1998).

CHALLENGES

The principal tributary of Upper Three Runs Creek is Cedar Creek, whose headwaters arise in the suburbs of the city of Aiken. Since 1984, when the most recent attempts were made to capture specimens of this species, considerable residential development has occurred along this tributary, probably introducing sediments from construction, fertilizers and pesticides from lawns, and petrochemicals from roadways. The resulting reductions in pervious surfaces in the watershed probably also has reduced base flow and accentuated storm surges in the stream. Similar development has occurred along the Upper Three Runs Creek main stem, although to a lesser degree. The status of Moretti's protoptila caddisfly after 20 years of such impact is unknown.

The stability of the only known population of Moretti's protoptila caddisfly and of the other 20 species of rare caddisflies depends on the maintenance of water quality in Upper Three Runs Creek. Clear, cold, well-oxygenated, unpolluted river water is essential. The maintenance of a relatively steady flow also is necessary to promote natural plant growth in the stream; since the substrate is mostly sand and there are no rocks, these plants provide about the only suitable surfaces from which Moretti's protoptila caddisfly probably feeds and the principal habitat for most other aquatic insects in Upper Three Runs Creek (English 1991).

CONSERVATION ACCOMPLISHMENTS

The place where Moretti's protoptila caddisfly has been shown to live is currently protected within the Savannah River Site. However, the quality of the habitat is more directly affected by off-site, upstream activities than by on-site activities.

CONSERVATION RECOMMENDATIONS

- Determine water quality in Upper Three Runs Creek, both upstream of and at the location of Moretti's protoptila caddisfly habitat; protect or restore superior water quality depending on results from this survey.
- Protect critical habitats for Moretti's protoptila caddisfly from future development and further habitat degradation by following best management practices and protecting riparian areas.
- Promote land stewardship practices through educational programs both within and upstream of Upper Three Runs Creek.
- 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

- English, W.R. 1991. Ecosystem dynamics of a South Carolina Sandhills stream. PhD dissertation, Clemson University. Clemson, South Carolina. 118 pp.
- Floyd, M.A., J.C. Morse and J.V. McArthur. 1993. Aquatic insects of Upper Three Runs Creek, Savannah River Site, South Carolina. Part IV: caddisflies (Trichoptera) of the lower reaches. *Journal of Entomological Science*. 28(1):85-95.
- Morse, J.C. 1990 ("1988"). Protophila morettii (Trichoptera: Glossosomatidae), a new caddisfly species from the southeastern United States. *Rivista di Idrobiologia*. 27(2-3):299-308.
- Morse, J.C., J.W. Chapin, D.D. Herlong and R.S. Harvey. 1980. Aquatic insects of Upper Three Runs Creek, Savannah River Plant, South Carolina. Part I: Orders other than Diptera. *Journal of the Georgia Entomological Society*. 15(1):73-101.
- Morse, J.C., J.W. Chapin, D.D. Herlong and R.S. Harvey. 1983. Aquatic insects of Upper Three Runs Creek, Savannah River Plant, South Carolina. Part II: Diptera. *Journal of the Georgia Entomological Society*. 18(3):303-316.
- Morse, J.C., B.P. Stark, W.P. McCafferty and K.J. Tennessen. 1998 ("1997"). Chapter 2. Southern Appalachian and other southeastern streams at risk: implications for mayflies, dragonflies and damselflies, stoneflies, and caddisflies. Pages 17-42. *In: Aquatic Fauna in Peril: the Southeastern Perspective*, G.W. Benz and D.E. Collins, editors. Special Publication 1, Southeast Aquatic Research Institute. Lenz Design and Communications. Decatur, Georgia. 554 pp.
- Ross, H.H. 1941 The caddis flies, or Trichoptera, of Illinois. *Bulletin of the Illinois Natural History Survey*. 23:1-326.
- Wiggins, G.B. 1996. Larvae of the North American Caddisfly Genera (Trichoptera), Second Edition. University of Toronto Press. Toronto, Ontario. 457 pp.