

Abrupt population increase by the leaf-shredding caddisfly *Pycnopsyche guttifer* profoundly changes leaf litter decomposition in streams of eastern Canada

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Abstract

In streams of northern Nova Scotia, Canada, we observed exceptionally rapid mass loss from decomposing leaf litter in spring associated with the previously uncommon shredding caddisfly, *Pycnopsyche guttifer*. Mass loss in the presence of *P. guttifer* followed an approximately linear pattern equivalent to 3.0 - 5.4% d⁻¹, to near zero mass remaining in 30 d. Feeding experiments suggest that an average density of only ~4 *P. guttifer* larvae/bag could produce observed mass loss rates. Larvae began colonizing litter in less than an hour, and reached maximum density in 24 hr. Marked larvae placed 30 cm away from bags of conditioned litter in a stream rarely found it, yet 15-55 unmarked larvae colonized the bags in 24 hr, suggesting random, active searching. *P. guttifer* colonized bags of conditioned litter in 14 of 21 sites on regional streams and rivers in 24 hr; median densities were 3.5 larvae on maple litter (maximum 24) and 8.5 on alder litter (maximum 52). Densities of a second abundant shredder, *Lepidostoma togatum*, did not differ between bags also supporting *P. guttifer* larvae and those without, suggesting no interaction competition between the two species. The abrupt appearance of *Pycnopsyche guttifer* at high densities in fast-running streams and rivers suggests a change in litter processing, from microbially mediated to shredder dominated, is occurring here.