

Switchgrass gall midge, an emerging Ontario pest

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Damage and Life Stages

Switchgrass (*Panicum virgatum*) production is increasing in Ontario, however this important biomass crop is under threat from a new pest, the switchgrass gall midge (SGM), *Chilophaga virgati* Gagné (Diptera: Cecidomyiidae), which was first detected in Ontario in 2020.

Relatively little is known about this pest, which was first discovered in 2008 in South Dakota.^{1,2} Adults lay eggs in the first internode of reproductive tillers, where larvae develop (Fig. 1). SGM larvae feed gregariously at the base of the peduncle and on axial tissues of the leaf sheath of switchgrass, causing stunting of the tiller internode and premature death of the inflorescence or seed head.¹⁻³ SGM infestation has caused 100% seed losses and biomass yield reductions of 60-70%.²

Thus, SGM is a potential concern to Ontario's switchgrass growers.

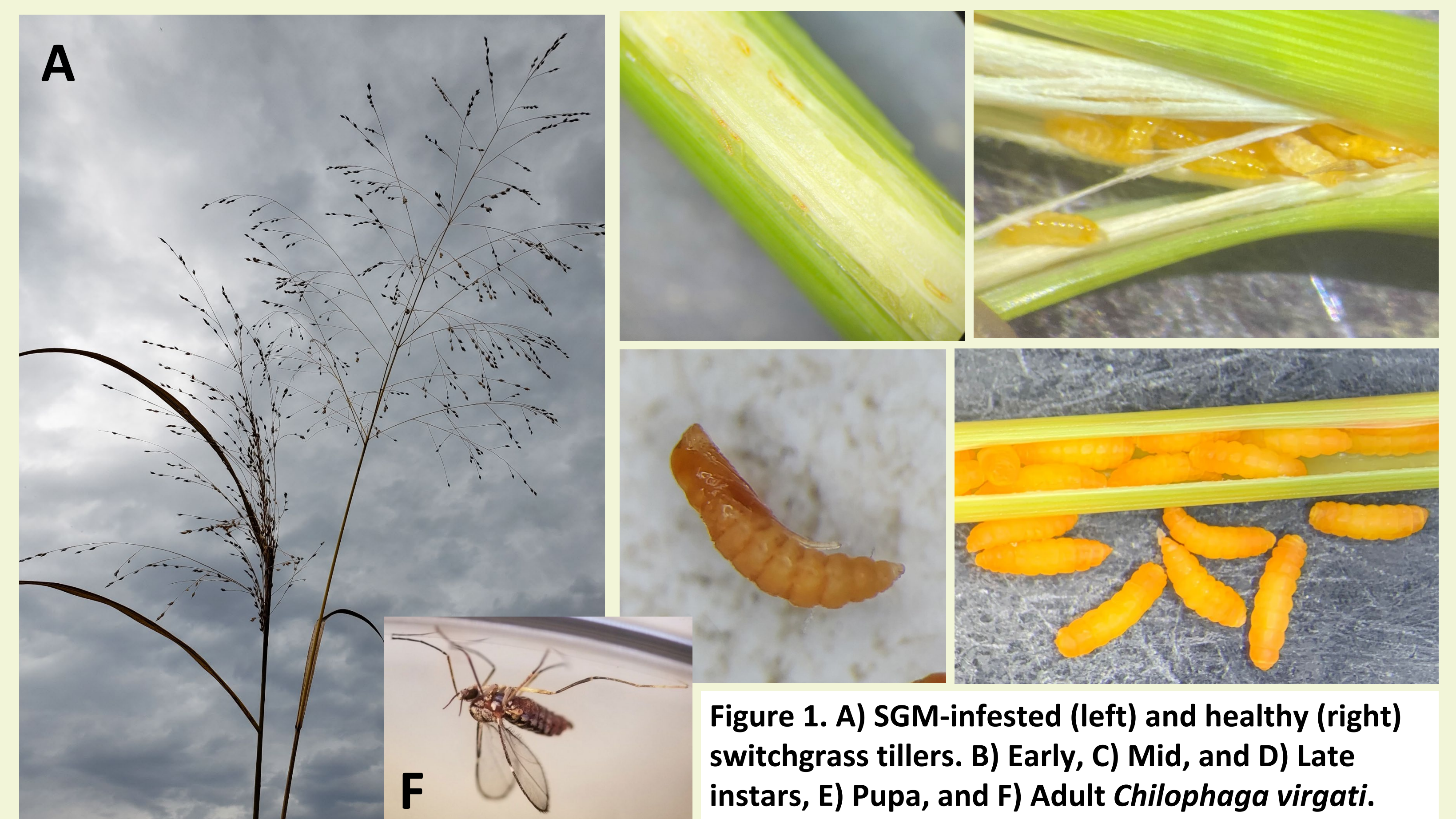


Figure 1. A) SGM-infested (left) and healthy (right) switchgrass tillers. B) Early, C) Mid, and D) Late instars, E) Pupa, and F) Adult *Chilophaga virgati*.

Presence in Ontario

Since 2021, plant samples have been collected from switchgrass fields spanning the geographic limits of the switchgrass-growing region in Ontario to determine the distribution of SGM. At each field, 25 plants showing visible SGM injury were sampled once in July or August. Each plant was dissected in the lab to determine if any SGM life stages were present.

SGM larvae have been found at all sites sampled (Fig. 2), indicating that SGM is distributed across the entire region.

In addition, SGM larvae were found in plants sampled along the entire length of a field in 2022, including the centre of the field.

These observations indicate SGM infests plants throughout switchgrass fields as opposed to the edges only.

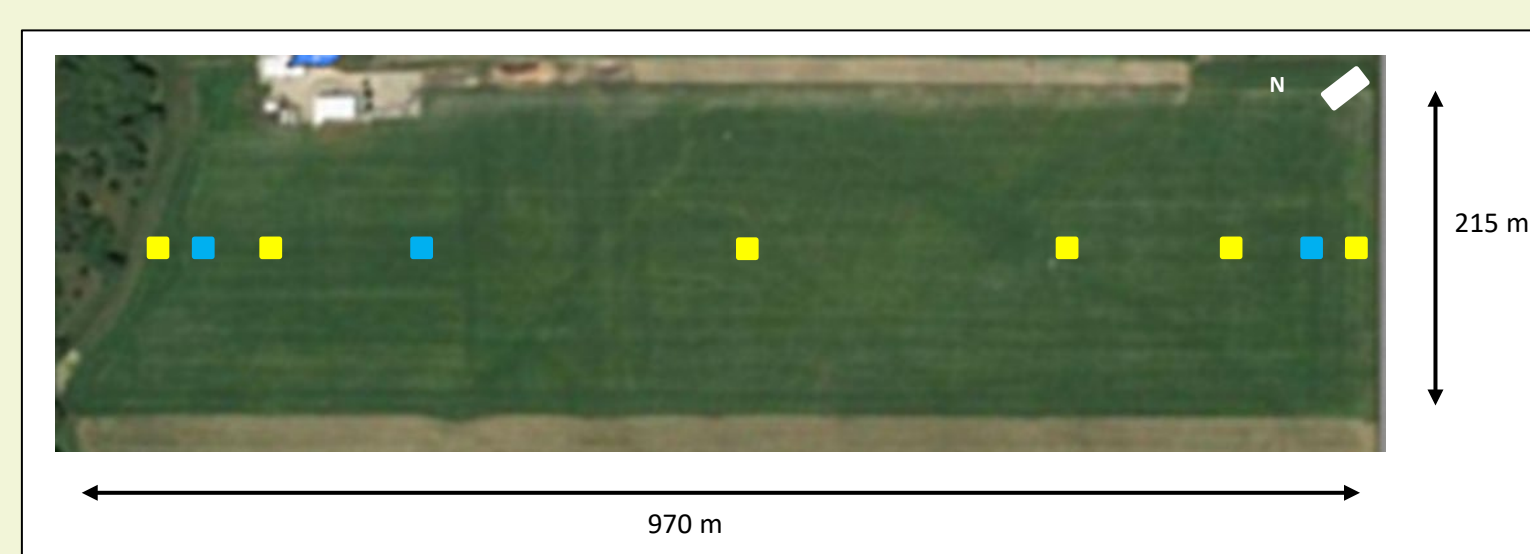


Figure 3. Transect locations where switchgrass gall midge was observed (yellow) or not observed (blue) in a switchgrass field, near St. Marys, Ontario, 2022.

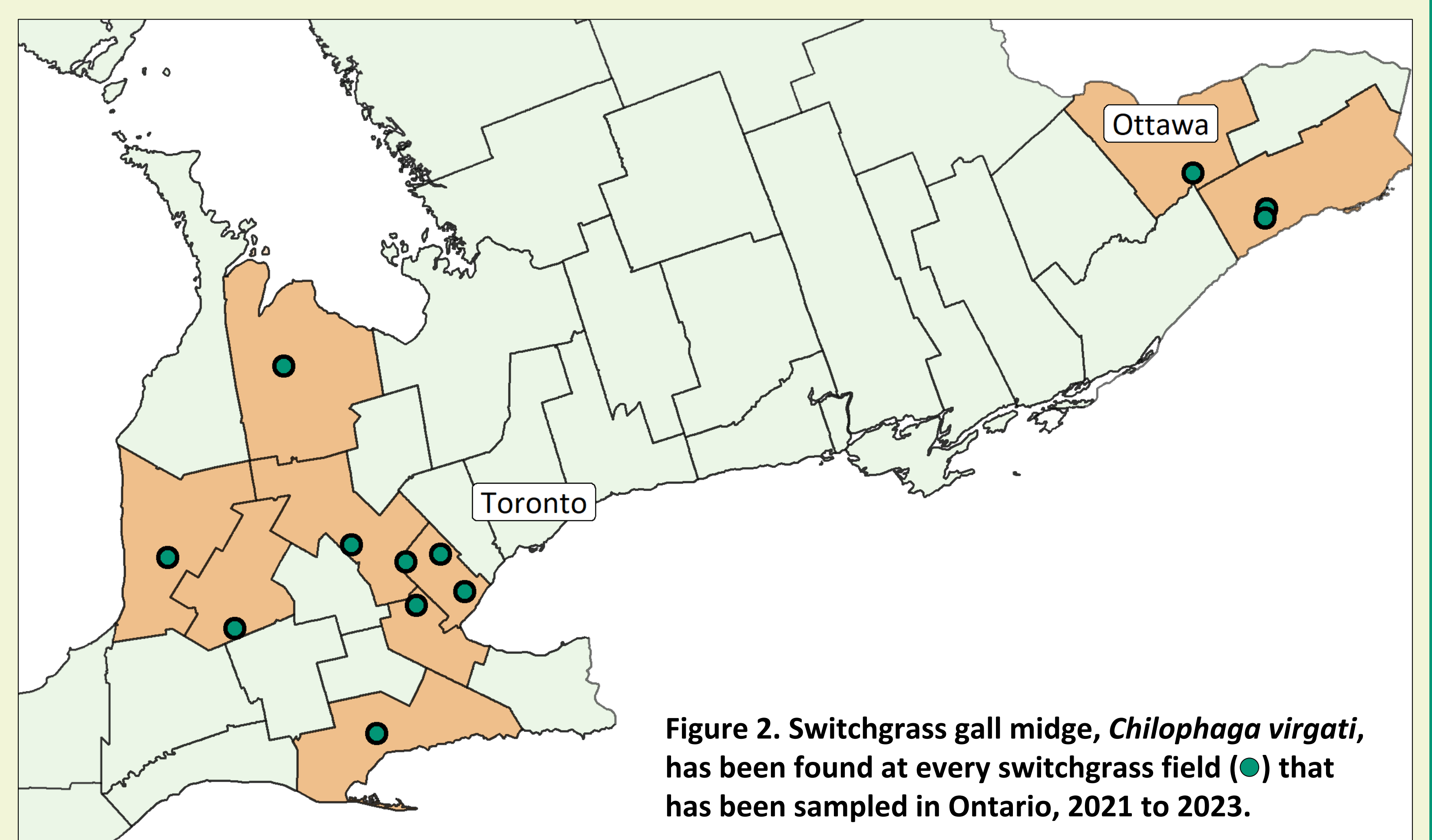


Figure 2. Switchgrass gall midge, *Chilophaga virgati*, has been found at every switchgrass field (●) that has been sampled in Ontario, 2021 to 2023.

Phenology in Ontario

In South Dakota, there are likely two generations of SGM per year², but life cycle and phenological information is sparse. Ontario-specific phenological information is needed to develop appropriate and effective IPM strategies.

Weekly switchgrass samples were collected from field edges of 2-3 fields/year in southern Ontario from May-October. Before SGM damage was visible, plants were chosen haphazardly. Once plants were at R2 stage and SGM damage was visible, only plants with SGM injury were sampled. All tillers were dissected to identify and quantify SGM life stages present. In May-June 2023, uncut plants from the 2022 crop were also sampled at one site. For adult sampling, sticky cards were placed at the edges of each field (2022) or inside mesh cages with overwintered switchgrass plants (2023).

Although data on adult and pupal presence is still limited (Fig. 3), our data are consistent with there being a single generation of SGM per year in Ontario.

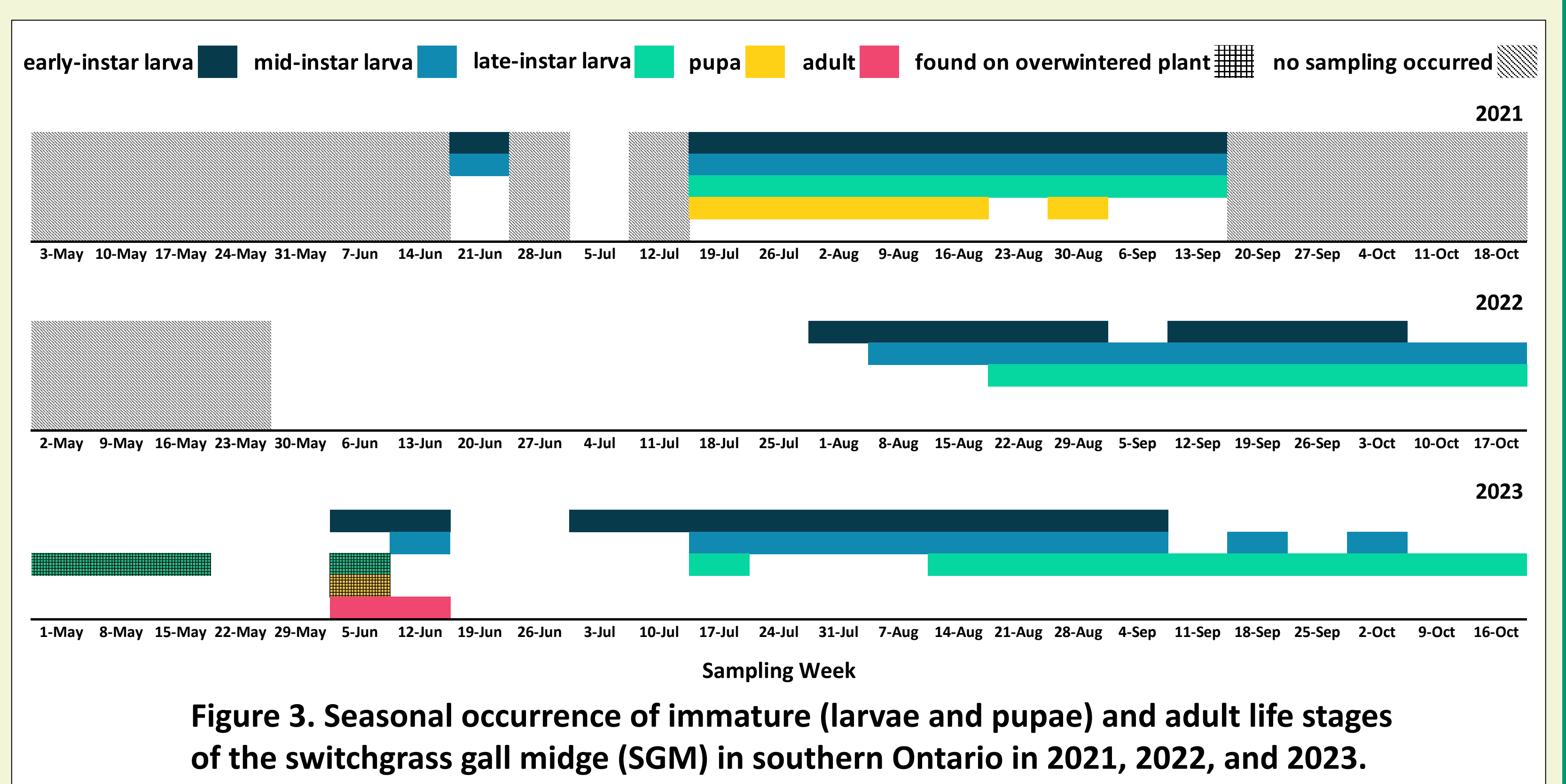


Figure 3. Seasonal occurrence of immature (larvae and pupae) and adult life stages of the switchgrass gall midge (SGM) in southern Ontario in 2021, 2022, and 2023.

Next Steps for Research

We will continue to investigate the distribution, and phenology of SGM in Ontario. As part of this research program, we will also identify and synthesize the female-produced sex pheromone of SGM, and complete morphological and

genetic characterization of SGM and its associated parasitoids. Availability of a pheromone lure is important to determining when adults are present and the number of SGM generations per year.

Knowledge generated from this research will be used to determine the pest status of SGM, as well as to help inform mowing and harvesting regimes, and the development of SGM monitoring and pest management recommendations.

References

1. Boe A, and Gagné RJ. 2011. A new species of gall midge (Diptera: Cecidomyiidae) infesting switchgrass in the Northern Great Plains. *BioEnergy Research* 4: 77–84. 2. Calles Torrez V, Johnson PJ, and Boe A. 2014. The switchgrass gall midge (*Chilophaga virgati* Gagné) in the Northern Great Plains. *BioEnergy Research* 7: 417–423. 3. Johnson PJ, Neerup Buhl P, Calles Torrez V. 2013. A new species of *Platygastrer* Latreille (Hymenoptera: Platygastridae) parasitizing *Chilophaga virgati* Gagné (Diptera: Cecidomyiidae). *Zootaxa* 3630: 184–190.

Acknowledgements

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Photo credits: Fig. 1 A-E) G. Ansell; Fig. 1 F) H. Fraser.