N O T E

First Detections of Swede Midge (Diptera: Cecidomyiidae) in Minnesota[1]

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Swede midge, *Contarinia nasturtii* Kieffer, is an invasive insect pest and is a significant threat to cruciferous vegetables and field crops. Native to Europe and southwestern Asia, *C. nasturtii* was first detected in Ontario in 2000 and quickly spread through Ontario to Quebec (Chen et al. 2011, J. Econ. Entomol. 104:709-716). In the United States, *C. nasturtii* was first confirmed in Niagara County, NY, in 2004, although it is likely that it became established several years before being confirmed (Kikkert et al. 2006, J. Econ. Entomol. 99: 1310–1315). It quickly spread across New York into Massachusetts, New Jersey, and Connecticut (Chen et al. 2007, Crop Prot. 26: 1574–1578; Chen et al. 2009, Entomol. Exp. Appl. 133: 84–91). As of 2015, *C. nasturtii* had been detected in three additional states: Vermont, Ohio, and Michigan (Phillips 2015, http://msue.anr.msu.edu/news/swede_midge_biology_and_management, accessed 16 February 2017). Minnesota became the eighth state to detect *C. nasturti* in 2016.

While detections in recent years have seemed low, it is likely that *C. nasturtii* is established in other areas, given the speed at which it spread after its initial detection. There are a couple reasons to suspect *C. nasturtii* has spread to other areas without yet being detected. The first is the extreme difficulty in identifying *C. nasturtii*. Additionally, larvae feed in groups at sites where plants are actively growing, which results in what has been described as "gall-like distortions, deformed plant tissue, and corky brown scars" (Barnes 1946, Gall Midges of Economic Importance, Vol. I; Gagné 1989, The Plant-Feeding Gall Midges of North America; Kikkert et al. 2006, J. Econ. Entomol. 99: 1310–1315). This damage is

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often mistaken for nutritional issues or mechanical damage, or attributed to other pests.

Minnesota has about 141.6 ha of fresh market brassica crops, but ranks fifth in the country with more than 11,735 ha of canola valued at over $7 million USD (National Agricultural Statistics Service 2017, United States Department of Agriculture NASS http://www.uscanola.com/crop-production/, accessed 16 February 2017). It is important to note that Minnesota shares a border with the number-one producer of canola in the United States, with over 607,000 ha harvested in North Dakota in 2016. In addition, there are 70+ species of plant in the Brassicaceae family that occur in Minnesota, including wild mustard (*Sinapis arvensis* L.), shepherd's purse (*Capsella bursa-pastoris* [L.]), and yellow rocket (*Barbarea vulgaris* W.T. Alton). While *C. nasturtii* is not commonly found on these weedy species, some of these wild species, including shepherd's purse, may be able to serve as alternative hosts (Hallett 2007, J. Econ. Entomol. 100: 1335–1343). Because Swede midge has become a significant pest of crucifer producers in eastern North America, it is anticipated to pose a threat to Minnesota as well. Given these concerns the Minnesota Department of Agriculture (MDA) began monitoring for *C. nasturtii* in vegetable gardens and farms through a pathway-based invasive species survey during the 2016 growing season. The Urban Pathways Survey is funded by the USDA Farm Bill and is designed to monitor for new and emerging pests in our local agriculture through a combination of trapping and visual inspection. MDA staff visit survey sites biweekly throughout the growing season to monitor for pests and interact with growers about pests of concern. The Urban Pathways Survey was first conducted in 2014 by the Pest Detection and Management Unit of the Plant Protection Division of the MDA.

In 2016, pheromone traps were deployed to monitor for *C. nasturtii* in 19 counties across Minnesota (Fig. 1). Trapping sites included community gardens, community-supported agriculture farms, and local farms of various sizes located throughout urban centers in Minnesota. White multiuse Jackson traps with removable sticky liners (Great Lakes IPM, Inc., Vestaburg, MI) were placed approximately 25–30 cm above the ground surface and as close to a host crop as possible (Hallett and Sears 2013, J. Econ. Entomol. 106: 267–276; Baute et al. 2016, Field Crop News, http://fieldcropnews.com/tag/swede-midge/, accessed 16 February 2017). Traps were baited with a pheromone lure specific to *C. nasturtii* (Alpha Scents, Inc., West Linn, OR). Eighty traps were monitored and sticky liners were changed biweekly, June through September. Pheromone baits were changed every 28 d as recommended by the manufacturer.

Sticky card liners were examined for the presence of *C. nasturtii* males and females using a dissecting scope. Insects were screened at the MDA laboratory in St. Paul based on morphological characteristics of wing venation and antennal characters provided in screening aids (Praetorius, Screening Aid for Swede Midge, https://caps.ceris.purdue.edu/dmm/531/. accessed 16 February 2017). Suspect *C. nasturtii*, stuck to cards to forestall damaging the specimens, were sent to Raymond Gagné (Systematic Entomology Laboratory, USDA-ARS, Washington, DC) for authoritative species identification confirmation.

The first specimen confirmed as *C. nasturtii* was a male collected in Hennepin County (44°57′7″N, 93°26′3″W) between 7 and 23 June 2016. A second confirmed specimen was also a male and was collected in Ramsey County (45°0′16″N,

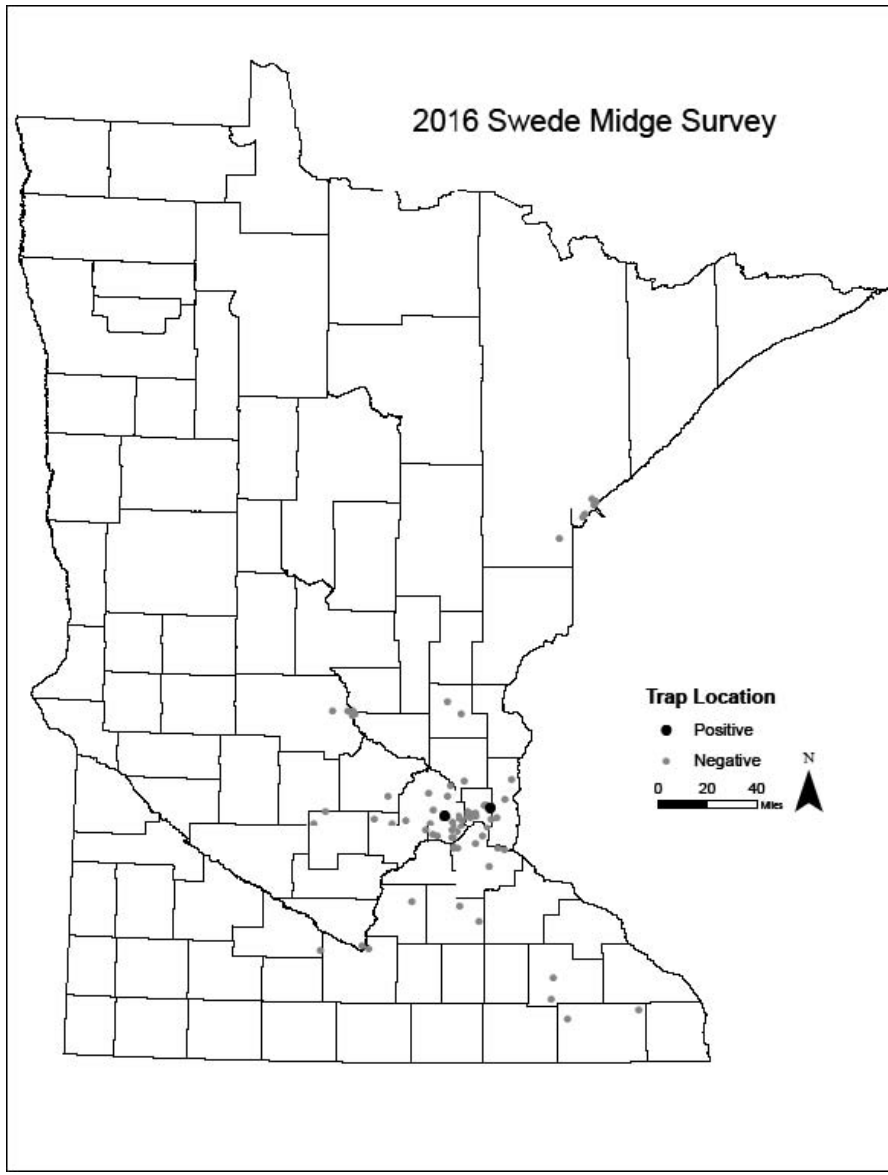

Fig. 1. Sites where traps were located to monitor for Swede midge, *Contarinia nasturtii*, in Minnesota as part of the 2016 Urban Pathways Survey for invasive pests.

92°59′34″W) between18 and 26 July 2016 (Fig. 1). These were the only two specimens confirmed as *C. nasturtii*. It is important to note that because 2016 was the first year that MDA monitored for *C. nasturtii,* we cannot ascertain when the pest actually arrived, or how long it has been present in the state.

Contarinia nasturtii is a serious pest of plants in the Brassicaceae family, with reported crop losses from Ontario as high as 85% (Hallett and Heal 2001, Can. Entomol. 133: 713–715). Given the potential for damage in Minnesota, growers and crop advisors must be diligent in monitoring and detection efforts because once this pest becomes well established in an area, eradication may not be possible (Chen et al. 2011). Although only a few new reports have been documented in recent years, it is likely that this pest may already be established in many brassica-producing areas of the United States. Given the destructive potential of this pest, extension specialists, departments of agriculture, and integrated pest management (IPM) practitioners and consultants should be diligent in monitoring for the midge and consider options to stop its spread before it reaches major brassica-producing areas, such as North Dakota or California, where its arrival could mean losses in the billions of dollars.

The arrival of this pest adds to the complexity of developing integrated management programs for brassica crops. Nevertheless, because chemical interventions in brassica crops are often dictated by the presence of other key pests, it is likely that cultural controls (e.g., crop rotations, postharvest crop destruction, etc.) will be critical in managing population densities below economic damage levels. Now that this pest has been confirmed in Minnesota, it is imperative that brassica research and extension staff develop new monitoring and IPM programs to mitigate the risk of this new pest from becoming well established, and thus maintain populations below economically damaging levels.

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