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SCIENTIFIC NOTE

CHIRONOMUS CALLIGRAPHUS (DIPTERA: CHIRONOMIDAE), A NEW PEST SPECIES IN GEORGIA

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ABSTRACT. Chironomid midges are ubiquitous and ecologically important aquatic insects. However, some species can become pests when they occur in extremely high numbers, particularly those that colonize man-made habitats. *Chironomus calligraphus* is a Neotropical, pan-American species that has recently been found in the Nearctic region. This paper represents the 1st reported occurrence of *C. calligraphus* in Georgia. Extensive larval populations were found in the leaf sheaths and root masses of cattails and in the firm sandy substrates of a wastewater lake at an industrial site in coastal Georgia. *Chironomus calligraphus* was causing a significant economic impact at this site.

KEY WORDS *Chironomus calligraphus*, chironomid midge, Georgia

Chironomid midges are among the most widespread and ecologically important aquatic insects (Merritt et al. 2008). However, many species from this group often become significant pests when they colonize large, man-made habitats (Jacobsen and Perry 2007). An industrial pulp plant in coastal Georgia contacted the University of Georgia Cooperative Extension Service regarding the development of a program to remediate such an occurrence. Extensive swarms of adult midges had become common at this site and caused suspension of routine operations at the facility on several occasions. Three site visits were conducted to the wastewater treatment lake at this facility. Adult and larval specimens of the pest species were collected and identified as *Chironomus calligraphus* Goeldi. This is the 1st time this species has been identified in Georgia.

Chironomus calligraphus is described as a pan-American chironomid with a predominantly Neotropical distribution (Zilli et al. 2008). This species has been identified as 1 of a group of species that have been introduced from the Neotropics to the Nearctic region (Sublette and Mulla 2000). *Chironomus calligraphus* is multivoltine and can produce overlapping cohorts at high environmental temperatures resulting in exponential population growth (Zilli et al. 2008). This species has been found in a wide variety of larval habitats, including eurythermal, eutrophic, and often times man-made systems (Jacobsen and Perry 2007). *Chironomus calligraphus* is described as having a high potential as a nuisance to humans because of its potential for rapid development and colonization of a wide range of habitats (Spies et al. 2002).

The larval habitat associated with this site was a 180-acre lake that served as the settling and cooling component for wastewater treatment. The lake is angularly shaped with 35–40 aeration devices uniformly spread throughout. Wastewater entering the lake was 46°C. Consequently, the water temperature throughout the lake was elevated year round and was conducive to rapid larval development. The lake is directly adjacent to the port and docking area for the facility, thereby supporting a hypothesis proposed by Jacobsen and Perry (2007) that sea transport is a possible method of introduction of the Neotropical species. An extensive nuisance problem had been reported at this site for over 4 years prior to the surveillance reported in this study. Significant efforts had been made to suppress the population with both larvicide and adulticide applications. Larvicide applications had been effective in suppressing the local midge population, but had failed during the 6 months prior to our surveillance. Unfortunately, a proper taxonomic assessment was not conducted prior to the initial suppression activities. The pest species had likely been present at this site for several years prior to its identification.

Initial surveillance efforts were conducted in mid-April; however, significant populations of adult midges had been present sporadically since the previous December. An initial onsite evaluation found adult midges on the vegetation surrounding the wastewater lake. Six floating emergence traps (Merritt et al. 2008) were placed

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in the lake to monitor overnight emergence. The following morning 2 of the traps had captured a significant number of emerging midges. Samples from the emergence traps and from the vegetation were identified as *C. calligraphus*.

Two subsequent surveillance trips were conducted in the following weeks. During the first of these trips, 84 individual Eckman dredge samples were collected from throughout the lake in an effort to delineate the specific area of larval development. Samples were handled as they were in Gray et al. (2011). Consequently, composite samples were evaluated for the presence of midge larvae. Only 3 of these samples contained midge larvae. Most of the samples, representing the majority of the habitat, were composed of a very fine muck material and contained no larvae. The 3 samples that contained larvae were from areas of firm sandy substrates around the perimeter of the lake. Larval specimens from these samples were also identified as *C. calligraphus*.

A 3rd surveillance trip was conducted in an effort to locate a larval population that would correspond with the enormous adult populations that were occasionally observed. While focusing on the firm sandy substrates around the perimeter of the lake, samples were collected from under the edges of the cattail (*Typha* sp.) colonies. The cattail colonies originated along the banks and had begun to colonize portions of the lake's surface. The 2nd site evaluation report described how the cattails could be obscuring the firm, sandy substrates from larvicide applications by preventing larvicide penetration. Sampling during the 3rd surveillance trip found extensive larval populations within the leaf sheaths and root masses of the cattails themselves. This finding represented the 1st time we had found the larvae developing away from the benthic substrates. However, larvae of the midge, *Polypedilum nubifer* (Skuse) have been reported as pests in rice fields, damaging roots and leaves of seedlings (Wang 2000). Both of these findings reinforce the concept that thorough surveillance is essential to solving any pest problem.

Subsequent sampling later that summer found larvae developing on a variety of substrates near the surface including inverted emergence traps, floating power lines, and other substrates in the upper portion of the water column. It is possible the dissolved oxygen levels in this habitat were so low that the larvae developed within the upper portions of the water column or that the muck substrates throughout most of the lake were too fine for the larvae to construct their tubes. The colonies of cattails were repeatedly treated with herbicides and eventually were eliminated. After targeted larvicide applications of 2 products (Vectobac® 12AS and Bactimos PT) containing the larvicidal proteins of *Bacillus thuringiensis* subsp. *israelensis* and the removal of all cattails from this site, chironomid midges were no longer a problem. Larval surveillance conducted 6 months after the removal of the cattails revealed that no midge larvae were present.

These findings represent the 1st reported occurrence of *C. calligraphus* in Georgia. Removal of the predominant larval substrate, the dense colonies of cattails, and the targeted application of a biological larvicide represents a successful implementation of an integrated pest management practice to remediate an economically important pest problem.

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