Identifying the larval sources of nuisance black flies in northwestern Cecil County, Maryland – Final Project Report

November, 21st, 2018

Rebecca Wilson, PhD
University of Maryland, Department of Entomology
rcwilson@umd.edu

Overview

The purpose of this study was to determine larval breeding locations and presence of adult females of the nuisance black fly, *Simulium jenningsi*, in northeastern Cecil County. This study builds upon preliminary sampling conducted in the summer of 2016, which determined female *S. jenningsi* were present near the address of a resident bothered by "gnats" in the town of Rising Sun and that larval *S. jenningsi* could be found in at least one location on the nearby Octoraro Creek. Here, we expanded the list of larval and adult sites and conducted sampling during August, September, and October, 2018.

Three sites on the Octoraro Creek contained abundant larval populations, and the majority of the specimens identifiable to species were *S. jenningsi*. One smaller creek, Basin Run, contained larvae within the *S. jenningsi* species complex. This creek is unlikely to be a major source of nuisance black flies, however, as the larvae belonging to the *S. jenningsi* species complex represented a minority of the specimens and the creek does not support a large population of black fly larvae in general. The Susquehanna River was not sampled due to the high water levels during the study period, but may be an additional source of *S. jenningsi* larvae.

Swarms of *S. jenningsi* were encountered in the Octoraro Lakes and Ridge Road communities in Rising Sun where residents had complained of "gnats." Specimens were also collected in downtown Rising Sun, but in smaller numbers unlikely to result in nuisance complaints. I recommend the former communities as adult monitoring locations for the efficacy of any future management efforts.

Methodology

Adult and larval sampling was conducted during the weeks of August 27th, September 17th, and October 1st, 2018. All specimens were stored in 80% ethanol and morphological identifications were done using Adler et al. 2004.

Sampling of larval and pupal black flies was conducted by wading into riffle habitats and hand-collecting specimens from available substrates. Collections were timed at 15 minutes per site. Pupae and mature larvae were preferentially sampled when found at a site due to the improved taxonomic resolution for these specimens; *S. jenningsi* cannot be identified beyond species complex using taxonomic keys without mature gill histoblasts.

Sampling for host-seeking adult females was conducted by swinging an aerial insect net above the head of the researchers approximately ten minutes after arrival at a sampling site. Researchers stood facing each other and swept the net above the other's head, checking for insects and alternating sweeper after each set of three sweeps. Fly counts reported are from a total of eighteen sweeps. Specimens were identified to species.

Description of larval sampling sites

Octoraro Creek #1 (39.706695, -76.115125) - Access to river from fishing lot off Horseshoe road. Abundant larvae on aquatic vegetation and fallen leaves. The majority of mature larvae and pupae were *S. jenningsi sensu stricto*.

Octoraro Creek #2 (39.690258, -76.128104) - River access at west bank from dead end on Colora road. Abundant larvae on aquatic vegetation and fallen leaves. The majority of mature larvae and pupae were *S. jenningsi sensu stricto*.

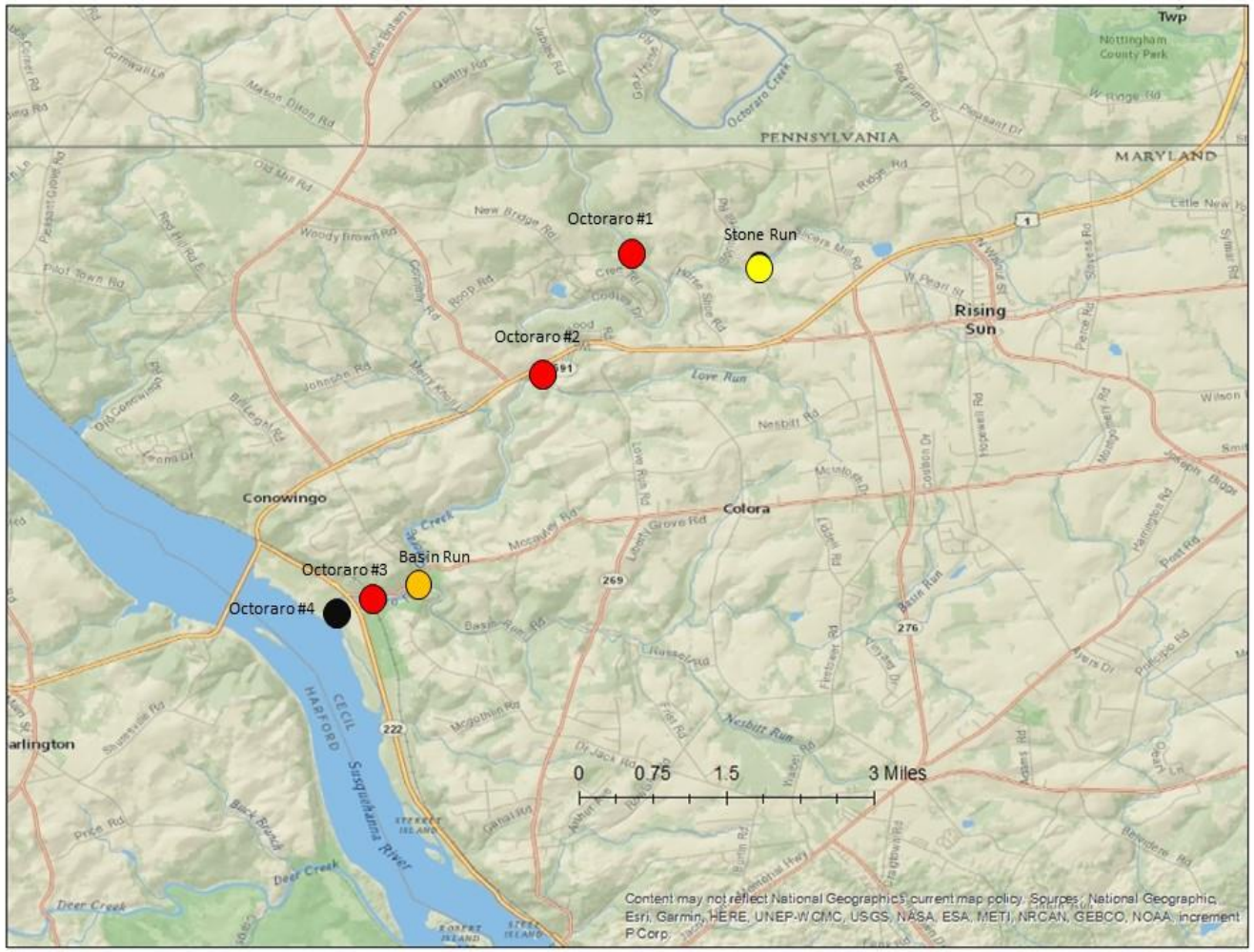
Octoraro Creek #3 - (39.660114, -76.152889) - Parking and river access near base of old pedestrian bridge. Abundant larvae on fallen leaves and rocks. The majority of mature larvae and pupae were *S. jenningsi sensu stricto*.

Octoraro Creek #4 (39.658367, -76.159144) - Walked along the Octoraro Creek bank from the park trail at its mouth to access. At the confluence with the Susquehanna River, Octoraro Creek was muddy-bottomed with no available substrate for black fly colonization. This site was the first riffle encountered from walking upstream along the Octoraro. Cobble-sized rocks and submerged leaves were available as substrate here, but no black fly larvae or pupae were found. This site was only sampled in August, as rising water levels in later months made it hazardous to sample by wading.

Basin Run (39.66202, -76.147315) – Near the fishing lot on Dr. Jack road. Sampling location was near the mouth of Basin Run as it flowed into Octoraro Creek. This area of Octoraro Creek was too high to sample by wading on the dates this site was visited, but may serve as a monitoring location in future years. Basin Run at this sampling location is shallow with a cobble bottom and roughly 10 meters in width. Larvae were present but sparse. No mature larvae or pupae were found on any date, but the majority of the immature larvae were identified as the *S. tuberosum* species complex. Three specimens collected in August were identified as the *S. jenningsi* species complex.

Stone Run (39.705161, -76.101306) - Dirt pullover on Slicers Mill road. A small creek, roughly 6 meters in width. Larvae were abundant in August, but numbers declined in the following months. Nearly all larvae were in the *S. tuberosum* species complex.

A map of black fly larval locations sampled in northwestern Cecil County.



- *S. jenningsi sensu stricto* larvae/pupae collected
- *S. jenningsi* species complex larvae collected
- Larvae/pupae from other species complexes collected
- No larvae/pupae collected

Immature black fly species identified per site

	S. jenningsi sensu stricto	*S. jenningsi* species complex	*S. luggeri sensu stricto*	*S. tuberosum* species complex	*S. venustum* species complex	*S. vittatum* species complex
Octoraro #1	x	x	x	x		x
Octoraro #2	x	x		x		x
Octoraro #3	x	x	x	x		
Basin Run		x		x		
Stone Run				x	x	

Recommended adult monitoring locations

Numbers of adult black flies were generally low on all sampling dates across locations, with the exception of two sites, Octoraro Lakes and Ridge Road, which are detailed below. Counts of *S. jenningsi* collected at these sites were lower than those collected in areas of resident complaints in Washington County. This discrepancy is likely due to the later season sampling conducted in this study, as on average I collected more *S. jenningsi* in June and July in Washington County. These listed sites could be used as future monitoring locations themselves, but with permission a private backyard in proximity to these sites may serve as a more useful indicator of swarm severity as experienced by residents.

Octoraro Lakes (39.703817, -76.125101) – Near a tree-lined pond in a residential community. Swarms were noticeable and moderately annoying to the researchers on August 29th, and were extremely annoying on September 20th.

Sampling Date	August 29th	September 20th	October 4th
S. jenningsi collected per 18 net sweeps	8	38	0

Ridge Road (39.71837, -76.092244) – Tree-lined pullover for a utility complex along a road with rural homes and farms. Swarms were noticeable and moderately annoying on both August 29th and September 20th. On the days visited we did not encounter numbers we would rate as extremely annoying, but this road is home to many residents who are bothered by black flies. It

is likely we did not encounter the worst of the swarm levels that can be found here during the summer.

Sampling Date	August 29th	September 20th	October 4th
S. jenningsi collected per 18 net sweeps	11	12	0

Of note is the lack of nuisance swarms at a location visited closer to the town center of Rising Sun, Stubbs Hill Regional Park (39.694784, -76.065311). At Stubbs Hill, one *S. jenningsi* specimen was collected in August and two were collected in September. Abundance of adult *S. jenningsi* at a location can vary widely between dates and times, but based on my sampling here it does not appear to be a location of high priority for monitoring. Interviews with Rising Sun residents should clarify if the town center is an area of concern, or if the nuisance is primarily restricted to the surrounding rural communities as the sample data suggests.

General recommendations

S. jenningsi larvae are found in larger creeks, at least 6 meters in width (Amrine 1982). Few bodies of water match that description in northwestern Cecil County. The second largest in the region, Octoraro Creek, was found to contain large numbers of immature *S. jenningsi* at three sites along its length in Maryland. Smaller creeks such as Basin Run, which I judged to be one of the larger tributaries to Octoraro Creek, may be able to support some *S. jenningsi* larvae but are unlikely to significantly contribute to the nuisance felt by residents. Stone Run was mentioned to me as a potential source of the nuisance problem by a resident, but it appears too small to meet the habitat requirements for *S. jenningsi*. As such, my recommendation would be to monitor riffles in Octoraro Creek, where *S. jenningsi* is confirmed and is in close proximity to the resident complaints, and the Susquehanna River, which is managed in Pennsylvania and may contain *S. jenningsi* larvae below the Conowingo Dam. The Susquehanna River at this site has fast-flowing water and abundant vegetation for larval attachment. However, *S. jenningsi* is thought to oviposit by dropping eggs directly into the water from flight (Adler et al. 2004), and if the Susquehanna is sandy-bottomed below the dam it may be unsuitable habitat for newly-hatched larvae. Our sampling was limited to sites accessible by wading, but a sampling trip on kayak in the early summer should show if *S. jenningsi* is able to colonize submerged vegetation there.

As a recommendation for a future pilot program in Cecil County, I would start with treating riffles, both sampled in this study and unsampled, along the Maryland length of Octoraro Creek and monitoring adult populations in the communities around Rising Sun where the resident complaints arose from. Based on the numbers of adult *S. jenningsi* encountered at my sampling sites, rural Octoraro Lakes and Ridge Road are better suited as monitoring locations than Stubbs Hill, which is located in the residential area of the town center. Resident complaint locations in both Cecil County and Washington County have served as good indicators of where *S. jenningsi* adults can be found. Despite efforts on the Rising Sun resident-run www.blackflyaction.org to reach out to nearby communities, there are few nuisance reports outside the Rising Sun area. I found only incidental numbers of *S. jenningsi* at sampling locations in the neighboring Colora

and Conowingo. It is likely *S. jenningsi* is present in other towns we have not heard from, but for now only the Rising Sun communities generate resident complaints to support management efforts in the region.

References

Adler, P.H., D.C. Currie, and D.M. Wood. 2004. The black flies (Simuliidae) of North America. Cornell University Press, New York, pp. 941.

Amrine, J. W. 1982. The New River connection to the black fly problem in southern West Virginia. WVU Agricultural and Forestry Experiment Station bulletin 678.