

The 6th Annual Meeting of the North American Black Fly Association



February 6th - 8th 2008
Riverside Resort and Casino
Laughlin, NV

<http://www.zoo.utoronto.ca/nabfa/NABFA.html>

Schedule of Presentations and Events

Wednesday, February 6 (Laughlin Government Center, 101 Civic Way)

- 1:00 – 1:20 pm** Welcome to Laughlin and opening comments, **Chris Bramley**, Clark County Vector Control, **Jay Overmyer**, University of Georgia
- 1:20 – 1:40 pm** Phylogeography and cryptic speciation of the black fly *Prosimulium travisi* in western North America (Diptera: Simuliidae), **Julio Rivera**¹, Douglas C. Currie^{1,2}. ¹ University of Toronto, Toronto, ON, ² Royal Ontario Museum, Toronto, ON
- 1:40 – 2:00 pm** Fractionation of ¹⁵N and ¹³C in black flies: influence of temperature, age and life stage, **Grant Howell**¹, Jay Overmyer¹, Aaron Fisk², ¹University of Georgia, Athens GA; ²University of Windsor, Windsor, ON
- 2:00 – 2:20 pm** Co-feeding transmission of vesicular stomatitis New Jersey Virus by *Simulium vittatum* IS-7 on a cattle host, **Paul Smith**¹, Danny Mead¹, Ray Noblet¹, Luis Rodriguez², ¹University of Georgia, Athens, GA, ²USDA, Plum Island, NY
- 2:20 – 2:40 pm** Potentiation of vesicular stomatitis New Jersey Virus infection by salivary gland extracts of *Simulium vittatum* on a cattle host, **Paul Smith**¹, Danny Mead¹, Ray Noblet¹, Luis Rodriguez², ¹University of Georgia, Athens, GA, ²USDA, Plum Island, NY
- 2:40 – 3:30 pm** **BREAK**
- 3:30 – 3:50 pm** Hunting black flies in New Zealand: ghosts of Gondwana, **Doug Craig**, University of Alberta, Edmonton, Canada
- 3:50 – 4:10 pm** Reproductive status of a sibling and a cytotype in the *Simulium arcticum* complex at the Clearwater River, Missoula County, Montana, **Michelle Norton** and **Gerald F. Shields** Carroll College, Helena, MT
- 4:10 – 4:30 pm** An Overview of the 2007 Pennsylvania Black Fly Suppression Program, **Dave Rebeck** and **Stacey Lash**, Pennsylvania Department of Environmental Protection, Division of Vector Management, Black Fly Suppression Program
- 4:30 – 4:50 pm** Promoting the black fly, **Ken Pruess**, University of Nebraska, Lincoln, NE

6:00 – 8:00 pm

Welcome Reception hosted by Valent Biosciences (Bridgeview Room, Riverside Resort)

Thursday, February 7 (Mirror Room, Riverside Resort and Casino)

Poster Presentations

During Breaks

An assessment of reproductive status of members of the *Simulium arcticum* complex at the Clearwater River, Missoula County, Montana, **Michelle Norton** and **Gerald F. Shields**, Carroll College, Helena, MT

An assessment of reproductive status of members of the *Simulium arcticum* complex at Wise River, Beaverhead County, Montana, **Brooke Christiens** and **Gerald F. Shields**, Carroll College, Helena, MT

9:00 – 9:20 am

Monitoring non-target macroinvertebrates in the Mississippi River
John Walz, Metropolitan Mosquito Control District, Black Fly Control Program, St. Paul, MN

9:20 – 9:40 am

Black fly control in the Southeastern United States, **Elmer Gray**¹ and Kevin Moulton², ¹University of Georgia, Athens, GA, ²University of Tennessee, Knoxville, TN

9:40 – 10:00 am

Effects of algae on ingestion and flick rates of larval *Simulium vittatum* IS-7: update and new hypotheses, **Jay Overmyer**, Elmer Gray, Dave Rouse, Grant Howell, University of Georgia, Athens, GA

10:00 – 10:40 am

BREAK

10:40 – 11:30 am

Unraveling the mystery of an emerging disease in Africa: Buruli Ulcer, **Rich Merritt**, Michigan State University, East Lansing, MI

11:30 am – 1:00 pm

LUNCH (Mirror Room, Riverside Resort and Casino)

1:00 – 1:20 pm

Very weird stuff - gynandromorphs of *Austrosimulium*, **Doug Craig** University of Alberta, Edmonton, Canada

1:20 – 1:40 pm

A data set for which to die, **Gerald Shields**, Carroll College, Helena, MT

1:40 – 2:00 pm	Clark County's black fly program and history for the Colorado River, Chris Bramley , Clark County Vector Control, Las Vegas, NV
2:00 – 2:30 pm	Business Meeting
2:30 – 3:00 pm	BREAK
3:00 pm - ?	Field Trip: Colorado River treatment sites Dinner on your own

Thank You

We would like to thank Stephanie Whitman and Chris Bramley for their help in organizing the local arrangements for this meeting as well as Valent Biosciences for sponsoring the reception and their continued support of NABFA. We would also like to thank the staff of the Riverside Resort and Casino for their help with the meeting facilities.

Abstracts from 2008 NABFA Meeting



Hunting black flies in New Zealand: ghosts of Gondwana

Doug Craig

University of Alberta, Edmonton, Canada

Austrosimulium occurs in Australia, Tasmania and New Zealand. A putative sister taxon *Paraustrosimulium* is wide spread in southern South America. Strong indication that this black fly has Gondwanan provenance. That being said, the presentation will be mainly a travelogue on collecting New Zealand simuliids for a taxonomic revision. Such simuliids, or 'sandflies', as they are locally known, are iconic in New Zealand for their ferocious biting and are celebrated nationally via giant sculptures. A moderately small fauna of some 16 species with only two that are the main biters, some aggregates are proving difficult to deal with morphologically. In large part species are currently recognized, oddly, by pupal cocoon characters. Images of the more definitive species will be shown.

Very weird stuff - gynandromorphs of *Austrosimulium*

Doug Craig

University of Alberta, Edmonton, Canada

Of a collection of some 20, 000 adults of three *Austrosimulium* species attracted to captive penguins, 22 of them were gynandromorphs. That is, mixtures of sexual and other structures. Those of one species (*Aust. dumbletoni*) are the only known males and will be used as the basis for a formal description. The peculiarities of gynandromorphy will be illustrated with some rather explicit images.

Black fly control in the Southeastern US

Elmer W. Gray¹ and Kevin Moulton²

¹University of Georgia, Athens, GA, ²University of Tennessee, Knoxville, TN

Black flies have long been recognized as pests of man and animals in the Southeastern United States. As early as 1886, studies were being conducted in the Lower Mississippi River Valley related to the buffalo-gnat problems occurring in the region. In the 1950's research began to focus on black flies and their involvement in the transmission of *Leucocytozoon smithi* in turkeys. Today most black fly control work in the SE is related to recreational industries and the nuisance problems related to large populations of adults from the *Simulium jenningsi* group. In 2007 two new black fly control programs were initiated in the Southeast. Bright's Creek Golf Club in Mill Spring, NC initiated a

thorough localized suppression program targeting adult populations of the *Simulium jenningsi* complex. Bright's Creek Golf Club is a new golf course and corresponding residential development which endured a significant nuisance problem the previous summer & fall. In Tennessee, experimental applications of *Bacillus thuringiensis* subsp. *israelensis* (B.t.i.) were conducted in the Pigeon River near Pittman Center, TN. This area has endured nuisance populations for several years and has finally received political and financial support from the state legislature. Extensive regulatory hurdles prevented a thorough suppression program from being initiated in 2007 and permitting for 2008 is not complete at this time. Non-target evaluations were required by the fish and game regulatory agency in 2007. Preliminary data indicates that there were no significant differences in non-target populations above and below the treatment sites. Personal observations from local supporters indicate that adult levels were suppressed with limited B.t.i. applications. It is expected that additional suppression programs will be initiated in the Southeast in the coming years as the growing human population collides with significant, localized black fly populations.

Fractionation of ^{15}N and ^{13}C in black flies: influence of temperature, age and life stage

Grant Howell¹, Jay Overmyer¹, Aaron Fisk²

¹University of Georgia, Athens, GA; ² University of Windsor, Windsor, ON

Stable isotope ratios of nitrogen ($\delta^{15}\text{N}$) and carbon ($\delta^{13}\text{C}$) have become useful tools for assessing the feeding ecology of organisms and the trophic structure of food webs. However, environmental variables such as temperature in addition to several variables associated with the organism (i.e. tissue sampled, amino acid composition, quality of food consumed) have been shown to influence stable isotope ratios in reference to diet-tissue fractionation. An additional variable which has not been investigated is developmental stage, which could be important for organisms that feed off of multiple stages (i.e. larva, pupa, adult) of holometabolous aquatic insects. In this study the stable isotope ratios of $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ and diet-tissue fractionation of $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ were investigated over the course of development of the black fly, *Simulium vittatum* IS-7, at various temperatures in a controlled laboratory setting. Initial results indicate that black fly larvae reared at lower temperatures have lower $\delta^{15}\text{N}$ signatures resulting in temperature-specific diet-tissue fractionation factors. However, black fly pupae showed no difference in $\delta^{15}\text{N}$ signatures at the various rearing temperatures. Additional data with adult black flies are forthcoming.

Effects of Algae on ingestion and flick rates of larval *Simulium vittatum* IS-7: update and new hypotheses

Jay Overmyer, Elmer Gray, Dave Rouse, Grant Howell
University of Georgia, Athens, GA

The green alga, *Scenedesmus quadricauda*, has been shown to negatively affect the efficacy of *Bacillus thuringiensis* var. *israelensis* (*Bti*) on larval black flies when present at concentrations > 8,000 cells/ml. However, other species of green algae, such as *Chlorella vulgaris*, have not shown this effect at similar concentrations. In an initial step towards determining the mechanism of reduced *Bti* efficacy by *S. quadricauda*, the flick rate of the cephalic fans on laboratory-reared black fly larvae, *Simulium vittatum* IS-7, and ingestion rate (passage of the algae through the midgut) were assessed. Results showed that the flick rate and ingestion rate of larvae feeding on *S. quadricauda* were significantly faster than larvae feeding on *C. vulgaris*. Potential implications of flick rate and ingestion rate on *Bti* efficacy will be discussed in addition to new hypotheses on this issue.

Reproductive Status of a Sibling and a Cytotype in the *Simulium arcticum* Complex at the Clearwater River, Missoula County, Montana

Michelle Norton and Gerald F. Shields
Carroll College, Helena, Montana

Nine full siblings and 19 cytotypes have been described in the *Simulium arcticum* complex. Four and 12 of these taxa, respectively, have been described from western Montana. The presence of such diversity within what was originally described as a single taxon based on morphological criteria suggests that cytotypes might be emerging from ancestral siblings. The present study involving the sibling, *S. arcticum* sensu stricto and the newly discovered cytotype, IIL-22, is the fourth in a series of studies that test reproductive status by monitoring frequencies of genotypes of autosomal polymorphisms among taxa in temporal and geographic sympatry. *S. arcticum* s. s. and IIL-22 are in genetic equilibrium at the Clearwater River suggesting that *S. arcticum* IIL-22 may be a recently derived cytotype. The unique presence of the IIL-23 and IIL-24 inversions and their strong linkage to the Y chromosomes in both taxa at the Clearwater suggest the possible origin of derivative Y chromosome types.

An Overview of the 2007 Pennsylvania Black Fly Suppression Program

Dave Rebeck and Stacey Lash,
Pennsylvania Department of Environmental Protection, Division of Vector Management,
Black Fly Suppression Program

Thirty-three counties in the Delaware, Ohio and Susquehanna River Basins participated in the 2007 Pennsylvania Black Fly Suppression Program, with two new counties joining the program in July. Program staff collected and identified 4,704 larval/pupal samples and 5,873 adult samples, for a total of 10,577 black fly samples. The PA-DEP Vector Management laboratory identified 229,363 total black flies (183,293 larvae, 24,304 pupae, 21,766 adults) in 22 taxa to provide data for treatment operations. Approximately 2,510 kilometers (1,560 miles) of forty-four rivers and streams were treated from May 3 to September 20. Number of treatments per waterway varied from

one to seventeen. Eleven pilots and nine helicopters logged nearly 500 rotor hours on 100 aerial treatment operations. 450,622 liters (119,042 gallons) of *Bacillus thuringiensis israelensis* (*Bti*) were applied at a total cost of more than \$6.5 million. Targeted black flies included four human pest species in the *Simulium jenningsi* group. Treatments effectively controlled black fly populations, except for some re-occurring problem areas, primarily in the Susquehanna River Basin. The statewide average *S. jenningsi* adult count was only 3.63, well below the program goal of 10 adults per sample. More than three million Pennsylvania residents and tourists benefit from the program each year.

Phylogeography and cryptic speciation of the black fly *Prosimulium travisi* in western North America (Diptera: Simuliidae)

Julio Rivera¹, Douglas C. Currie^{1,2}

¹ University of Toronto, Toronto, ON, ² Royal Ontario Museum, Toronto, ON

Prosimulium travisi Stone, 1952, is a relatively common species of high altitude black fly in western North America. Populations are distributed widely in the cordillera from Alaska and Yukon south to Arizona and New Mexico, with almost half of its present-day range occurring in areas that were recently covered by Wisconsinan-aged glaciers. In order to identify refugial areas, and to determine patterns of postglacial recolonization, a phylogeographic analysis was conducted using variation in the Cytochrome Oxidase I gene. Three hundred and thirteen individuals were analyzed from 56 populations sampled throughout the entire range of the species. Analysis of population relationships suggests that recolonization of the glaciated cordillera was mainly the product of emigration from northern (Beringia) and western (coastal) refugia. In contrast, the contribution from southern refugia was relatively limited. Migratory routes and areas of secondary contact were identified. Populations of *P. travisi* from the highlands of Colorado were found to constitute a genetically distinct sibling species, perhaps suggesting isolation during an earlier glacial cycle. These results are congruent with patterns exhibited by several other cordilleran animal and plant taxa, suggesting that they shared a similar biogeographical history.

A Data Set for Which to Die

Gerald F. Shields,
Carroll College, Helena, MT

This talk discusses preliminary and planned analyses for collections, morphological sorting and cytogenetic analysis of nearly 8,500 larvae of the *Simulium arcticum* complex taken from 186 collections from 55 locations in 19 counties in western Montana during the past eight summers. Analyses of larvae from Idaho, Washington state and Oregon are also included. Five siblings and 12 new cytotypes are described. Siblings

have broad geographic ranges while the ranges of cytotypes run a continuum from several counties to only single sites. A correlation exists between elevation of larval development and taxon type. Siblings are reproductively isolated from one another in sympatry. Some cytotypes are panmictic in sympatry while other siblings and cytotypes may or may not be reproductively isolated in sympatry. We plan an extensive analysis of this huge data set and seek input on ways the data may be properly analyzed.

Monitoring Non-target Macroinvertebrates in the Mississippi River

John Walz

Metropolitan Mosquito Control District, Black Fly Control Program, St. Paul, MN

The Metropolitan Mosquito Control District uses *Bacillus thuringiensis israelensis* to control black fly larvae in approximately 87 kilometers of the Mississippi River in the St. Paul/Minneapolis area. The District monitored the non-target macroinvertebrate community in the river biennially between 1995 and 2005 using 14 plate Hester-Dendy multiplate samplers. Samples were collected monthly from May through September at two stations within the *Bti*-treated reach and in one control station located 20 km upstream of the treatment reach during each year monitoring samples were collected. In this paper we summarize community composition and density data from the 6 years that monitoring data were collected. We conclude that no large-scale changes in the macro-invertebrate community composition or density have occurred as a result of the *Bti* treatments.