PROGRAM AGENDA, THURSDAY, FEBRUARY 25TH

9:00 AM – 9:20 AM  WELCOME AND INTRODUCTIONS – “BLACK FLIES IN THE DESERT”
John Walz, NABFA President

9:20 AM – 9:40 AM  CADDISFLY MONITORING AND CONTROL STRATEGIES IN THE CENTRAL ARIZONA PROJECT CANAL
Scott D. Bryan, Central Arizona Project, Phoenix, AZ

9:40 AM – 10:00 AM  COMPARING BLACK FLIES AND MOSQUITOES AS HOSTS OF MIDGUT TRICHOMEYCETE FUNGI
Charles E. Beard¹, Claire Bernardo², and Morgan Jones²
¹Clemson University, Clemson, SC
²SC Governor’s School for Science and Mathematics

10:00 AM – 10:20 AM  BIOENGINEERING AND SIMULIIDS: IS THERE MONEY TO BE MADE?
Doug Craig, Department of Biological Sciences, University of Alberta, Edmonton, Alberta, CANADA

10:20 AM – 10:40 AM  BREAK

10:40 AM – 11:00 AM  DIVERSITY AND CLASSIFICATION OF MESOZOIC BLACK FLIES (DIPTERA: SIMULIIDAE): INSIGHTS FROM REMARKABLY WELL-PRESERVED FOSSILS FROM RUSSIA AND MONGOLIA
Douglas C. Currie¹², Mateus Pepinelli¹², Elena D. Lukashevich³
¹Department of Natural History, Royal Ontario Museum, Toronto, ON, CANADA
²Department of Ecology and Evolutionary Biology, University of Toronto, Toronto, ON, CANADA
³Borissiak Paleontological Institute, Russian Academy of Sciences, Moscow, Russia

11:00 AM – 11:20 AM  THE STERILIZING EFFECTS OF PYRIPROXYFEN TREATMENT ON BLACK FLY OVARIAN DEVELOPMENT
Joseph Iburg, Elmer Gray, Raymond Noblet, and Eddie Cupp, University of Georgia, Athens, GA

11:20 AM – 11:40 AM  SIMULIUM JENNINGSI IN MARYLAND: GEOGRAPHICAL ANALYSIS OF A LOCALIZED NUISANCE
Rebecca C. Wilson and William O. Lamp, University of Maryland, College Park, MD

12:00 PM – 1:00 PM  LUNCHEON BUFFET PROVIDED AT RIVERSIDE HOTEL (BRIDGEVIEW ROOM)
1:30 PM – 1:50 PM  GREATER LOS ANGELES COUNTY VECTOR CONTROL DISTRICT (GLACVCD) BLACK FLY PROGRAM UPDATE  
Paul O’Connor, Greater Los Angeles County Vector Control District, Sylmar, CA

1:50 PM – 2:10 PM  NEW TOOLS FOR OLD SPECIMENS: INSIGHTS ON EOCENE BLACK FLY (DIPTERA: SIMULIIDAE) DIVERSITY  
Mateus Pepinelli\textsuperscript{1,2} and Douglas C. Currie\textsuperscript{1,2}  
\textsuperscript{1}Royal Ontario Museum, Department of Natural History, Toronto, ON, CANADA  
\textsuperscript{2}Department of Ecology and Evolutionary Biology, University of Toronto, Toronto, ON, CANADA

2:10 PM – 2:30 PM  AUSTRALIAN BLACK FLY FOSSILS  
Doug Craig, Department of Biological Sciences, University of Alberta, Edmonton, Alberta, CANADA

2:30 PM – 3:00 PM  BREAK

3:00 PM – 3:20 PM  OSAGE PLANT OVERVIEW  
Jacques Dugal, Valent BioSciences Corp.

3:20 PM – 3:40 PM  DOES RIVER CORRIDOR AFFECT CHROMOSOME FORMS WITHIN THE BLACK FLY SIMULIUM ARCTICUM COMPLEX (DIPTERA: SIMULIIDAE)?  
Gerald F. Shields and D. Grant Hokit, Department of Life and Environmental Sciences, Carroll College, Helena, MT

3:40 PM – 4:00 PM  TWIN FALLS COUNTY PEST ABATEMENT DISTRICT UPDATE  
Kirk Tubbs, Twin Falls County Pest Abatement District, Twin Falls, ID

4:00 PM – 4:20 PM  BLACK FLIES ON FACEBOOK  
Aaron Ursenbach, Twin Falls County Pest Abatement District, Twin Falls, ID

6:00 PM  DINNER PROVIDED AT RIVERSIDE HOTEL (PRIME RIB ROOM)

FRIDAY, FEBRUARY 26\textsuperscript{TH}

9:00 AM – 9:30 AM  PENNSYLVANIA BLACK FLY SUPPRESSION PROGRAM UPDATE  
Doug Orr, Pennsylvania Department of Environmental Protection, Black Fly Suppression Program, Harrisburg, PA

9:30 AM – 10:00 AM  MICROBIAL CONTROL OF BLACK FLIES (DIPTERA: SIMULIIDAE) WITH bacillus thuringiensis subsp. israelesensis  
Elmer W. Gray, University of Georgia, Athens, GA
PROGRAM AGENDA, FRIDAY, FEBRUARY 26TH (CONTINUED)

10:00 AM – 10:15 AM  METROPOLITAN MOSQUITO CONTROL DISTRICT (MMCD) BLACK FLY CONTROL PROGRAM UPDATE  
John Walz and Carey LaMere, Metropolitan Mosquito Control District, St. Paul, MN

10:15 AM – 10:45 AM  CADDISFLY CONTROL MEETING RE-CAP  
Chris Bramley, Clark County, Las Vegas, NV

10:45 AM – 11:30 AM  NABFA BUSINESS MEETING

12:00 PM – 1:00 PM  SNACK BUFFET PROVIDED AT RIVERSIDE HOTEL (BRIDGEVIEW ROOM)

President: John Walz  
Program Editor: Carey LaMere  
Program Cover Design: Marty Kirkman/Molly Nee  

.nabfa-blackfly.org
COMPARING BLACK FLIES AND MOSQUITOES AS HOSTS OF MIDGUT TRICHOMYCETE FUNGI

Charles E. Beard\textsuperscript{1}, Claire Bernardo\textsuperscript{1}, and Morgan Jones\textsuperscript{2}
\textsuperscript{1}Clemson University, Clemson, SC
\textsuperscript{2} SC Governor’s School for Science and Mathematics

Black fly midguts are frequently inhabited by trichomycete fungi, as are chironomid midguts. Mosquito midguts do not host trichomycetes fungi in the wild. We questioned the difference in the midguts of these animals. One step was to determine if the midgut is capable of hosting the fungi. Using trichomycete colonized \textit{Simulium innoxium}, we tested whether the fungus could colonize mosquitoes. Four methods of transferring fungi from the black flies to four species of mosquitoes (\textit{Aedes aegypti}, \textit{Aedes albopictus}, \textit{Anopheles quadrimaculatus}, and \textit{Culex quinquefasciatus}) were tested. \textit{Anopheles quadrimaculatus} did not have any attached fungi. Water taken from the black fly vessel and placed with mosquitoes led to fungi in some mosquito midguts, but feeding the mosquitoes dissected black fly guts did not lead to fungal colonization. None of the fungi in mosquitoes survived to reproduce, but they did produce spores in the laboratory black flies. We suspect turnover of the mosquito peritrophic matrix might limit colonization.

CADDISFLY MONITORING AND CONTROL STRATEGIES IN THE CENTRAL ARIZONA PROJECT CANAL

Scott D. Bryan, Central Arizona Project, 23636 N 7\textsuperscript{th} St., Phoenix, AZ 85024 623-869-2474 (W), 602-376-5763 (C); e-mail: @cap-az.com

Although caddisflies have been prevalent in the Central Arizona Project (CAP) canal since its completion in 1993, residents living near the canal did not report nuisance swarms until 2004. The insects were identified as \textit{Smicridea fasciatella}, a common species of caddisfly that is indigenous to the Colorado River. The mass emergence of caddisflies typically occurs during April and September each year, and the swarms become an annoyance because they fly into the mouth, eyes, nose, and ears of people and their pets. Since 2004, CAP has implemented various monitoring and control strategies in an attempt to reduce the impact of the nuisance caddisflies. Monitoring efforts have included the use of artificial substrates (larvae) and sticky cards (adults). Estimates of larval population abundance ranged from 19-35 million caddisflies per mile of canal during the late summer peak. Control strategies have included mechanical control (dropping water levels and scraping the canal liner), biological control (\textit{Bacillus thuringiensis}, grass carp, and channel catfish), and chemical control (insecticidal soap and copper sulfate). Although none of these strategies have proven to be the "silver bullet" for controlling caddisfly populations, stocking juvenile channel catfish has been the most effective and cost efficient management option to-date.

BIOENGINEERING AND SIMULIIDS: IS THERE MONEY TO BE MADE?

Doug Craig, Department of Biological Sciences, University of Alberta, Edmonton, Alberta, CANADA

No abstract submitted
DIVERSITY AND CLASSIFICATION OF MESOZOIC BLACK FLIES (DIPTERA: SIMULIIDAE): INSIGHTS FROM REMARKABLY WELL-PRESERVED FOSSILS FROM RUSSIA AND MONGOLIA

Douglas C. Currie1,2, Mateus Pepinelli1,2, Elena D. Lukashevich3
1 Department of Natural History, Royal Ontario Museum, Toronto, Ontario, Canada
2 Department of Ecology and Evolutionary Biology, University of Toronto, Toronto, Ontario, Canada
3 Borissiak Paleontological Institute, Russian Academy of Sciences, Moscow, Russia

Mesozoic-aged fossils assigned to the Simuliidae are exceedingly rare, consisting of just 6 monotypic genera plus a series of undescribed larvae from the Koonwarra fossil beds of Australia. Analysis of two-dozen previously unstudied impressions from fossil formations in Russia (Khasurty, Baissa, Daya, Obeshchayushchy) and Mongolia (Khutel Kara) provide remarkable new insights about the earliest evolutionary lineages of simulii. High resolution imaging from light- and scanning electronic microscopy, in combination with geometric morphometric analyses of wing-vein configuration, proved critical for evaluating character states. The morphological- and taxonomic diversity of Cretaceous simulii is considerably higher than previously recognized, requiring a re-evaluation of the suprageneric classification of the family.

MICROBIAL CONTROL OF BLACK FLIES (DIPTERA: SIMULIIDAE) WITH BACILLUS THURINGIENSISSUBSP. ISRAELENSIS

Elmer W. Gray, University of Georgia, Entomology Department, Athens, GA 30602, @uga.edu
Dr. Robert Fusco, Entomologist, Mifflintown, PA 17059, @earthlink.net

Black flies (Diptera: Simuliidae) develop in flowing water as larvae and pupae. The adult flies emerge from the water and are widely recognized as significant pests of humans and animals. Black flies also are vectors of the filarial nematode Onchocerca volvulus, the causative agent of human onchocerciasis or river blindness. As a result of their pest status, black fly populations have long been targeted by suppression programs. The most efficient and environmentally acceptable technique to suppress black fly populations is the use of larvicide applications of Bacillus thuringiensis subsp. israelensis (Bti) in rivers and streams where the pests are developing. Larvicide applications are conducted in an Integrated Pest Management manner, and the results of larval and adult surveillance are used to target the pest population in the most efficient manner possible. Many factors (number of larvae present, stage of development, river-flow rate, seston types and levels, waterway characteristics, and potential rainfall) are considered before initiating an effective larvicide application. Successful black fly suppression programs are operated around the world, many of which have involved extensive studies demonstrating the lack of effect that Bti-based larvicides have on non-target species.

THE STERILIZING EFFECTS OF PYRIPROXYFEN TREATMENT ON BLACK FLY OVARIAN DEVELOPMENT

Joseph P. Iburg, Elmer W. Gray, Raymond Noblet and Eddie Cupp, University of Georgia, Athens, GA

Pyriproxyfen is a juvenile hormone analog that is toxic towards numerous arthropods. Previous studies have found that the insect growth regulator can significantly reduce mosquito fecundity following tactile exposure. We wanted to look at the effects this material would have on black fly fecundity. Black flies were exposed to various concentrations of pyriproxyfen by allowing them to contact a surface coated with the material for 10 min. Flies in the treated and control groups were placed into individual petri dishes after 5 days of incubation at 23C. Pyriproxyfen caused significant reductions in ovipositing flies. We also examined the ovaries and the development of offspring over time. The results indicate that pyriproxyfen could be used as an alternate form of black fly control, especially when used in conjunction with attractants.

TOWARDS A PHYLOGENETIC FRAMEWORK FOR SIMULIUM SENSU LATO: INFERENCES FROM ELONGATOR COMPLEX PROTEIN 1 (ECP1) SEQUENCES

John K. Moulton, University of Tennessee, Knoxville, TN

Results of phylogenetic analyses of 2,000+ nucleotides from the gene encoding elongator complex protein 1 (ECP1) acquired from all suitably preserved supraspecific taxa within the genus Simulium Latreille currently available to the author are presented. Approximately 37 subgenera are represented, including several (e.g., Notolepria, Ectemnaspis/Psilopelmia, Thysopelmia/Trichodagmia, & Edwardsellum) housing species that serve as vectors of river blindness in the Americas or Africa. Roughly ten species groups within Simulium sensu stricto are also included in the analyses. Major findings are as follows: Hellichiella Rivosecchi is the sister group to all other Simulium; most
supraspecific groups belong to either of putative sister groups comprised of chiefly ornithophilic or mammalophilic taxa; the Neotropical Simulium segregates form a clade and are the sister group to a clade containing Obuchovia, Boophthora, and Simulium sensu stricto; primary vectors of human onchocerciasis in Africa versus the Americas are distantly related; and several currently recognized supraspecific groups appear untenable, many of which opposed by strong statistical support.

PA BLACK FLY SUPPRESSION PROGRAM UPDATE
Doug Orr, Pennsylvania Department of Environmental Protection, Black Fly Suppression Program, Harrisburg, PA

No abstract submitted

GREATER LOS ANGELES COUNTY VECTOR CONTROL DISTRICT (GLACVCD) BLACK FLY PROGRAM UPDATE
Paul O’Connor, Greater Los Angeles County Vector Control District, Sylmar, CA

No abstract submitted

NEW TOOLS FOR OLD SPECIMENS: INSIGHTS ON EOCENE BLACK FLY (DIPTERA: SIMULIIDAE) DIVERSITY
Mateus Pepinelli1,2, Douglas C. Currie1,2
1Department of Natural History, Royal Ontario Museum, Toronto, Ontario, Canada
2Department of Ecology and Evolutionary Biology, University of Toronto, Toronto, Ontario, Canada

Studies on black fly fossils are relatively rare, consisting mainly of original species descriptions. There are 9 species of simulid currently known from Eocene-aged Baltic and Rovno amber deposits. Although remarkably well preserved, amber inclusions are often difficult to study because of the orientation of a specimen within a piece of amber or the presence of opacities or debris that obscure important character states. The absence of key diagnostic characters, in combination with inadequate descriptions and illustrations of described species, makes the study of new material difficult. We report preliminary analyses of more than 230 new specimens of Baltic amber simullids. New tools such as micro CT scanning and large stereomicroscope scans are critical for revealing hitherto difficult to observe character states. The Baltic amber black fly community is far richer than previously supposed, with questions raised about current generic assignments. We report the first ever prosimuliine from Eocene-aged deposits.

DOES RIVER CORRIDOR AFFECT CHROMOSOME FORMS WITH THE BLACK FLY, SIMULIUM ARCTICUM COMPLEX (DIPTERA: SIMULIIDAE)?
Gerald F. Shields and D. Grant Hokit, Department of Life and Environmental Sciences, Carroll College, Helena, Montana

Chromosomal inversions linked to sex in black flies (Diptera: Simuliidae) are important in the differentiation process and in the Simulium arcticum complex they occur before DNA monophyly of siblings. Nine sibling species and an additional 22 cytotypes have been described for the Simulium arcticum complex. An unresolved question is whether these types spread throughout one drainage or alternatively from one drainage to another. We determined the sex-linked chromosomal configuration of nearly 7,300 male larva of the S. arcticum complex at 46 collection sites in 14 different drainages and asked the question, whether flies in the same drainage are more chromosomally similar than are flies of different drainages. Flies within the same drainage are more chromosomally similar than are flies in different drainages. Comparisons between sites suggest river distance and Euclidian distance are both negatively associated with chromosomal type similarity, although river distance showed the highest similarity comparisons for any given distance. Flies among sites that are 50 km or less are more similar than are flies among sites that are more than 50 km distant. Flies among different drainages are less similar chromosomally even when these sites are closer in Euclidian distance. Flies are chromosomally most similar in streams of equivalent size and particularly if those streams are less than 25 km away in river distance. Most siblings have considerable chromosomal similarities in large, medium and small streams as measured by proportional abundance. However, some cytotypes appear restricted to large rivers while other cytotypes are restricted to medium-sized streams.
TWIN FALLS COUNTY PEST ABATEMENT DISTRICT UPDATE

Kirk Tubbs, Twin Falls County Pest Abatement District, Twin Falls, ID

No abstract submitted

BLACKFLIES ON FACEBOOK

Aaron Ursenbach, Twin Falls County Pest Abatement District, Twin Falls, ID

No abstract submitted

METROPOLITAN MOSQUITO CONTROL DISTRICT (MMCD) BLACK FLY CONTROL PROGRAM UPDATE

John Walz and Carey LaMere, Metropolitan Mosquito Control District, St. Paul, MN

The goal of the Metropolitan Mosquito Control District’s (MMCD) Black Fly Control Program is to reduce pest populations of black flies within the MMCD to tolerable levels. The MMCD monitors 170 small stream sites and 28 large river sites in the 7-county metropolitan area surrounding Minneapolis-St. Paul.

SIMULIUM JENNINGSI IN MARYLAND: GEOGRAPHICAL ANALYSIS OF A LOCALIZED NUISANCE

Rebecca C. Wilson and William O. Lamp, University of Maryland, College Park, MD

In 2013 our lab identified Simulium jenningsi as the black fly species responsible for seemingly localized nuisance swarms in southern Washington County, Maryland. In the following years we began investigating the spatial, environmental, and societal factors associated with the severe nuisance swarms encountered in these communities. Our objectives were to determine the distribution and density patterns of S. jenningsi larvae, investigate the relationship between land use and adult female fly presence, and to assess the resident perception and raise awareness of black flies. Larvae were collected by both hand sampling and artificial substrate. The primary larval source was the Potomac River, and density of colonizing larvae was associated with high flow velocity. Adult flies were found in low numbers in urban habitats and were highest in count in the Pleasant Valley region. Residents in the Pleasant Valley region reported many quality of life concerns related to the black flies. Increasing awareness of black flies in Maryland has increased the geographic span of nuisance complaints reported to our website, mdblackfly.com, suggesting other regions of the state may have large populations of S. jenningsi.