

Entomological Collections Network Annual Meeting

Saturday November 10th and Sunday November 11th, 2018

Vancouver Convention Center
Vancouver, Canada

Saturday, November 10th, 2018

Vancouver Convention Center, Meeting Room 301?

7:00 am - 8:10 am Registration and Coffee

8:10 am - 8:15 am Welcome and Announcements

CONTRIBUTED TALKS SESSION 1

Moderator: **Gene Hall**, *University of Arizona Insect Collection, Tucson, AZ, USA.*

Timekeeper: XXX

8:15-8:27 am Taxonomy at NCBI and GenBank

Lu Sun

NIH/NLM/NCBI, Bethesda, MD, USA

NCBI taxonomy database contains the names and phylogenetic lineages of more than 160,000 organisms that have molecular data in the NCBI databases. New taxa are added to the Taxonomy database as data are deposited for them. This talk provides a brief introduction to the history and present state of the database and the taxonomy group who is responsible for maintaining and developing it. In this talk I will try to explain our daily operation, submission process, policies on organism names, etc. and how these are related to users esp. taxonomists. I will also demonstrate the use of NCBI taxonomy browser, its newer functions, and related online tools. As we have sought to establish connections between sequence data and museum collections, some examples on how to cooperate in building such connections will be presented. In addition, newly publicized BioCollection database will be introduced. Through this talk, I also hope to answer questions and receive feedback and suggestions from NCBI users in order to provide better service to the research community.

8:27-8:39 am

Excruciating minutia concerning practices of pinning, pointing, and labeling, etc.

Michael L. Ferro

Clemson University Arthropod Collection (CUAC), Clemson University, SC, USA

Standardization of curatorial techniques helps to ensure that specimens and information associated with them can be maintained in an efficient and archival manner. The dry portion of an entomological collection consists of, collectively, millions of separate artifacts physically bound together into small groups by pins. The initial placement of these artifacts on the pin, laterally and vertically, all come with the same “time cost”. However, improper initial placement can result in enormous downstream costs when others have to re-pin or re-point specimens or reposition labels. Results of a survey on pinning, pointing, and labeling practices will be presented. Correct and proper techniques will be demonstrated.

8:39-8:51 am

The Whole Point: a Brief History of Point-Mounted Insect Specimens

Brian H. Reily^{1,2} & M. Andrew Jansen^{1,2}

¹*School of Life Sciences, Arizona State University, Flagstaff, AZ, USA*

²*Western Innovation Research Group (WIRG)*

The study of insects relies heavily upon the use of preserved specimens in collections. This presentation provides an overview of entomological specimen preservation techniques through time with a focus on the history of points. We discuss common means of point production currently in use, analyze the economics of manual point punches, and suggest the adoption of a rarely used method of point production that we argue to be both more ergonomic and more cost effective than manual production methods: laser cutting. We highlight the potential role of commons-based peer production in collections entomology and discuss the need for more readily available makerspaces to meet the needs of today’s entomologists.

8:51-9:03 am

PVA is not OK? A Short Review of Adhesives for Insect Specimens.

Andrew R. Deans & Emily L. Sandall

Frost Entomological Museum, Penn State University, University Park, PA, USA

We recently participated in the the Collections Assessment for Preservation Program, and concerns were raised about our frequent use of polyvinyl acetate (PVAc) emulsion and occasional use of shellac as point-mounting adhesives. Given the pervasiveness of these media in entomology we set out to survey the ECN community for their practices and to review what's known about these adhesives in the collection conservation literature. Here we present the results and offer some early conclusions about adhesives used in entomological collections.

9:03-9:15 am

Coleoptera in the Catalog of Life

R. Edwards DeWalt & Yuri Roskov

Illinois Natural History Survey, Champaign, IL, USA

The Catalogue of Life (CoL, www.catalogueoflife.org) is compiling an index of life on Earth generated from a community of expert taxonomists and other dedicated providers. Deliverables include 12 dynamically progressing monthly editions, an Annual Checklist, and a working classification. Currently, the index includes 1,744,204 extant and 59,284 extinct, valid binomials and many synonyms. Thousands of individual users (museum collection managers, ecologists, teachers, students) find correctly spelled names, synonyms, and classification. Large scale data aggregators (GBIF and occurrence data, BOLD and barcode libraries) harvest species names and a taxonomic backbone to support their data. The current numbers represent only 75% of published species names, leaving the total number to accumulate at 2.2 million! The order Coleoptera is only 66% complete in CoL for living species (260K of estimated 392K species) and we need the help of beetle taxonomists to complete the list. CoL can provide advice, experience, and software tools for creating such lists and can accept multiple formats if you already have digital data. We give your data greater exposure and you get full credit for it. You can browse for Coleoptera on the website and see which groups we most need help with.

9:15-9:27 am

The Visible Impact of Natural History Collections: Death by a Million Acknowledgements

Christopher J. Marshall

Oregon State Arthropod Collection, Oregon State University, Corvallis, OR, USA

A nearly universal challenge faced by natural history collections (small or large) is the need to communicate their importance to audiences that do not necessarily understand their role in science. The audience may be administrators, funding agencies, prospective donors, the general public or even colleagues who work in other branches of biology or science. During this talk I will discuss and critique some of the common ways museums have sought to define their role in science and suggest some novel means by which we might better make it clear how far reaching and critical our resources are for modern specimen-based research.

9:27-9:42 am

BioAlfa ??

Daniel H. Janzen & Winnie Hallwachs

9:42-10:00 am

Coffee Break

MEMBER SYMPOSIUM 1: The Status of Entomology Collections and Survey and Inventory Research in Canada

Organizer/Moderator: Andrew Smith

Timekeeper:

10:00-10:15 am

The scarab beetles of Canada - what a large dataset reveals about the state of collections and collecting in Canada

Andrew B. T. Smith

Canadian Museum of Nature, Ottawa, Ontario, CANADA

A survey and inventory of the Scarabaeoidea (Coleoptera) of Canada and Alaska has been underway for the past five years. During that time, over 70,000 specimens have been authoritatively identified and databased from all of the large collections in eastern Canada and many of the collections in western and central Canada. Using this large dataset some overall trends have emerged - insect collecting efforts increased gradually in Canada from the late 1800s through to World War II, when there was a sharp decrease during the war years. Postwar it took a decade to regain the collecting effort that was seen in the 1930s, and then there was a rapid increase to all-time highs from the 1960s to around the mid 1980s. Since the late 1980s, entomological fieldwork in Canada has largely declined to pre-1930s levels, which is a shocking turn of events considering the importance of biodiversity monitoring in this day and age of species at risk, invasive species, and global warming.

10:15-10:30 am

The role of Canadian insect collections in compiling checklists - lessons learned from the Lepidoptera

Greg Pohl

Natural Resources Canada, Edmonton, Alberta, CANADA

A comprehensive species checklist is an vital baseline for biodiversity research and other species-level work. Arthropod specimens in public collections are the most valuable information sources for compiling such checklists. Ideally, label data from all specimens will eventually be captured electronically, but the cost of doing so is a serious impediment to application of the resulting information. A two-tier strategy for data extraction is presented, where the first stage involves compiling a collection inventory - a table of holdings of each species, in each province or territory. That is then used to prioritize specimen verification and databasing as a second stage. This method was successfully employed to build the Canada-AK Lepidoptera checklist published early in 2018.

10:30-10:45 am

The importance of museum data in the conservation status assessment of arthropods and molluscs by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)

Jennifer Heron¹, Cory Sheffield²

¹British Columbia Ministry of Environment and Climate Change Strategy, Vancouver, British Columbia, CANADA; ²Royal Saskatchewan Museum, Regina, Saskatchewan, CANADA

The status of species at risk in Canada is assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC): a committee of experts composed of 31 voting members, including representatives from each of the 13 provincial and territorial government wildlife agencies, four federal agencies, three non-government science members, one Co-chair from the Aboriginal Traditional Knowledge (ATK) Subcommittee, and 10 Co-chairs of the Species Specialist Subcommittees (SSCs). COSEWIC assesses species adapted from the criteria developed by the International Union for Conservation of Nature and Natural Resources (IUCN). To date, there have been 995 wildlife species assessed by COSEWIC, including 124 mollusc and arthropod species. COSEWIC considers candidate species for priority assessment, however there are numerous challenges to assessing the lesser known and poorly documented arthropods and molluscs. Challenges include lack of natural history information, habitat mapping, taxonomic expertise, search effort (particularly null search effort) and species-specific threats. Museum collections are important sources for assessing a species' status, however collection data are often biased, not databased, incorrectly identified or without specific locality

information. Using examples from COSEWIC assessed species, this talk will provide an overview of the COSEWIC assessment process and criteria, how candidate species are recommended for assessment, challenges to assessing these species groups, the use of museum data for assessment purposes and how Canadians can become more involved with the species assessment process.

10:45-11:00 am

The use of museum specimen data and citizen science data for the conservation status assessment of Canada's bees

Cory Sheffield¹, Jennifer Heron²

¹Royal Saskatchewan Museum, Regina, Saskatchewan, CANADA; ²British Columbia Ministry of Environment and Climate Change Strategy, Vancouver, British Columbia, CANADA.

Native bees have received increasing attention as pollinators of the world's crop plants, especially due to the realization numerous species may be globally declining. However, datasets for most species, including those in Canada, do not necessarily support this trend. In fact, lack of historical collection events and/or lack of accessible data sets resulted in a large portion (ca. 25%) of Canada's bees as "unrankable" (NU) in a recent national General Status of Wildlife Species in Canada assessment. For some taxa, a taxonomic impediment likely also contributes to successful assessment. For bumble bees, the situation is different. These charismatic pollinators are well studied, and relatively easy to identify using traditional taxonomic approaches, resulting in a large North American dataset dating back over 120 years. However, large gaps exist geographically and temporally for many of Canada's bumble bee species. In addition, data sets compiled in the last decade have, in part, been contributed via citizen science activities, including Bumble Bee Watch, iNaturalist, and BugGuide

11:00-11:15 am

Digitizing the Canadian National Collection: a look at capturing the data in Canada's largest collection.

Michelle Locke

Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, CANADA

The Canadian National Collection of Insects, Arachnids, and Nematodes (CNC) has been building its collection in Ottawa since 1886 with the donation of the first specimens by James Fletcher, the first Dominion Entomologist. Since those first days the collection has amassed an estimated 17 million specimens, with over 70% of that material originating in Canada. In an

effort to gain more insight into the biodiversity of Canada and the holdings of the collection, the CNC has started the task of digitizing their specimens. To date, more than 100 people have contributed to digitizing an estimated 1.4 million specimens. This includes imaging labels, transcribing label data, geocoding records, and imaging type specimens. Using this large dataset, we will explore notable trends and discuss what we have learned about executing such a large-scale digitization project. An update on the current activities of the collections will also be provided.

11:15-11:30 am

Recording and investigating terrestrial arthropods in a hyperdiverse Nearctic region - the Entomology collection at the Royal BC Museum

Joel Gibson

Royal British Columbia Museum, Victoria, British Columbia, CANADA

Initially formed in Victoria in 1886, the insect collection of "The Provincial Museum of BC" is now known as the Entomology collection of the Royal BC Museum (RBCM). The collection has remained a part of the museum and its provincial mandate since its inception. The collection has grown to over 500,000 specimens through the efforts of curators, collection managers, research associates, volunteers, and donors. Focussing on the diverse landscapes of British Columbia and the Yukon territory, past and ongoing field work explores the invertebrate biodiversity of mountain peaks, coastal regions, eastern BC plains, Beringia, and urban landscapes. Recent decades have seen an increase in the size and international importance of the collection. Existing holdings and continuing research in Araneae, Odonata, macro-Lepidoptera, Orthoptera, and Diptera are of particular value. Past efforts to digitize and make publicly available specimen data continue today, with much work to be done.

11:30-11:45 am

The insects of Canadensys

Colin Favret

Université de Montréal, Montréal, Québec, CANADA

Canadensys is a network of academic and public natural history collections, including 13 entomological collections. Its core function is to publish on the Internet occurrence data residing in Canada, providing the infrastructure not often available to individual institutions. The

presentation will discuss the context, development, services, and data of Canadensys and its members.

11:45-12:00 pm

A new Quebec insect guide with 2300 illustrated species promotes a regional collection and fosters interest in insects

Étienne Normandin

Université de Montréal, Montréal, Québec, CANADA

The entomological collection of the University of Montréal is one of the best for Quebec's insects, with a holding of over 20k species and 1.5 million specimens. One of our objectives is to increase its visibility by engaging with the community and strengthening our ties with amateur and professional entomologists. After three years of intense work, the book is now finished, published by the University of Montreal Press. It treats 8 classes of terrestrial arthropods, 41 orders, 300 families, and 2300 illustrated species. Specimens were individually selected, remounted and photographed using photo-stacking techniques. An annotated list of published identification keys facilitates locating additional resources to delve deeper into specific identifications. We hope that this book will help bring a love of insects to a broader audience while also promoting our institutional collection. Users of the guide will have photographs of the collection's actual specimens in their hands and any profits from the sale of the book will be returned to the collection

12:00-1:30 pm

Lunch

CONTRIBUTED TALKS SESSION 2:

Organizer/Moderator: Chris Grinter, *California Academy of Sciences, San Francisco, CA, USA*

Timekeeper:

1:30-1:42 pm

Breathing new life into Quaternary insect collections: methodological advances bridge diverse paleontological and contemporary studies

Anna R. Holden^{1,2,3} & Alexey Solodovnikov³

¹American Museum of Natural History, New York, NY, USA. ²La Brea Tar Pits and Museum, Los Angeles, CA, USA. ³Natural History Museum of Denmark, Copenhagen, DENMARK.

Since Charles Darwin's groundbreaking *Origin of Species*, understanding speciation stands at the core of evolutionary biology and systematics. Quaternary entomology is a unique science, which gives us a direct evidence of insect microevolution, just as palaeontology at a larger scale, offers evidence for insect macroevolution. Quaternary entomology emerged as one of the most important disciplines starting in the 19th century, once it became recognized that most fauna were extant and could provide paleoenvironmental data, and flourished from the mid to end of the 20th century. Ironically, it has been on a steep decline over the past two decades, just as microevolutionary research has gained momentum due to advances in genomics. Perhaps the biggest cause of this waning is that Quaternary entomology is a very specialized field that requires an immense interdisciplinary depth of knowledge. In addition, new methods for studying microevolution of modern specimens are developing at a rapid rate, eclipsing resources and attention to Quaternary fauna. It is lamentable that a once-thriving field, which, for example, revolutionized understanding of Quaternary insect species stasis and offered precise data from insect indicators regarding environmental continuity and change, sorely lacks the legacy it deserves. Undoubtedly, the hundreds of publications during the peak of Quaternary entomology offer valuable tests for many hypotheses proposed by neontologists. For example, topics such as phylogeography, endemism, community ecology, landscape genetics and insect response to climate change, all enriched by genomic methods, would also benefit from the very comprehensive documentation of Quaternary insect faunas. Fortunately, recent methodological advances such as a higher-resolution climate extraction technique and the most precise radiocarbon and stable isotopic protocols already bring new life to Quaternary entomology. Potential application of artificial intelligence for faster and more confident automated identifications of thousands of fossil fragments housed in many museum collections, as well as paleoproteomics, will facilitate more connections between Quaternary entomology and the aforementioned lines of research relevant to neontologists. We are confident that these innovations will invigorate Quaternary entomology as a discipline.

1:42-1:54 pm

The Entomological Collection of the Biological Museum, Lund University, Sweden

Jadranka Rota

Biological Museum, Lund University, SWEDEN

The Biological Museum of the Lund University has one of the oldest and largest insect collections in the Nordic countries. The collection was essentially started in 1735 when Killian Stobaeus, who was one of Carl Linnaeus's teachers, donated his insect collection to the university. The collection grew through donations, exchanges, purchases, research expeditions, and additions made by the museum staff. So far we have registered ca. 3.8 million specimens, and our estimate is that at least as many specimens await registration. The collection includes several important historical collections, especially those of C. G. Thomson and J. W. Zetterstedt. In addition to having a lot of material from Sweden and other Nordic countries, as well as the Palaearctic, larger amounts of material come from South Africa and Sri Lanka, while other parts of the world are less well represented. The collection is especially strong in Coleoptera, Diptera, and Hymenoptera. In this presentation I will provide more details on the history and holdings of the collection and an overview of current activities and challenges.

1:54-2:06 pm

Managing a graduate student research collection in the 21st century

M. Andrew Johnston

Hasbrouck Insect Collection, Arizona State University, Tempe, AZ, USA

While some insect collection management techniques have remained nearly unchanged for many generations, growing and managing a personal research collection in the age of genomics, open science, and biodiversity informatics comes with many new opportunities and perhaps responsibilities. This talk walks through my own process of developing a research collection through five years of graduate school and highlights several pragmatic solutions to meet research needs. Integrated protocols for physical storage and open data management are presented for the following three types of specimens: dried pinned material, ethanol molecular vouchers, and whole-body disarticulations.

2:06-2:18 pm

Tracking changes in North American Lepidoptera collecting since the 1800's

Erica Fischer & Anthony Cognato

Michigan State University, Department of Entomology, East Lansing, MI, USA

Insect collections as held by large institutions are representative of the collective efforts of many collectors; these collecting efforts by amateur and professional entomologists have resulted in the most thorough documentation of biodiversity currently available to researchers. Ongoing work to digitize the information held in these collections allows for the study of trends across time and space and on a larger scale than previously possible. Using the data generated through

the NSF-funded LepNet project, this study characterizes collecting efforts focused on butterflies and moths within the United States. Over the course of the last 200 years, the most significant changes can be seen following the end of World War II—potentially due to the influx of veterans using the GI Bill in order to study the biological sciences. As part of their education, these students may have been introduced to creating insect collections. This shift is most evident in families belonging to the “macrolepidoptera”; for “microlepidoptera”, the number of collection events per year is relatively consistent. This is likely due to the relative difficulty of collecting, preserving, and identifying “microleps” for the individual with an undergraduate degree or the lay-collector. The spike in collecting falls sharply by the mid-1990s. This is probably due to a number of interacting factors, and changes in the emphases of the biological sciences may have contributed to the decline.

2:18-2:30 pm

Non-repeatable science across trophic levels: host plant vouchering in entomological research

Anthony M. Deczynski

Clemson University Arthropod Collection, Clemson Univ., Clemson, SC, USA

Specimen vouchering is a necessary part of the entomological research process which is often overlooked by researchers not involved in the collections community. While vouchering of insect specimens is less of an issue for entomological researchers based in museums, vouchering of associated trophic levels including host plants is often poorly represented. In this talk I discuss the importance of vouchering host plants in entomological research and methods for best preserving and associating host data with traditional entomological collections. Potential for vouchering methods of other dendroecological, mycological, malacological, and entomological interactions are also described.

2:30-2:42 pm

Tracking the evolutionary trajectory of key morphological traits across a novel phylogenomic skipper tree-of-life (Lepidoptera, HesperIIDae)

Amanda Widom, Riley Gott, Andrew Warren, Stacey Huber, Kelly Dexter, Akito Kawahara, Emmanuel Toussaint

Florida Museum of Natural History, University of Florida, Gainesville, FL, USA

Skippers are one of the seven recognized butterfly families, and count more than 4000 described species distributed across the globe. Their darting flight and hook-shaped antennae make them

easily identified among other butterflies, albeit their unusual morphology initially led some authors to classify them as moths. In parallel with the international initiative aiming at reconstructing a large-scale anchored phylogenomic tree for the family HesperIIDae, we are gathering data on different morphological traits of interest (antennae and wingspan shape and length) to investigate the evolution of these traits in a phylogenomic framework. For every species of skipper sampled in the tree, a pair of specimens of each sex (when available) was extracted from the collection of the McGuire Center for Lepidoptera and Biodiversity in the Florida Museum of Natural History, arguably the largest collection of skippers in the World. For imaging, we used a sturdy copy stand, a Canon 7D body paired with a 60mm fixed-length lens, color cards for calibration and a glass tabletop for efficient lighting. The dorsal and ventral sides were both imaged, where the specimen is held in line with two axes of scales. The trait data was then analyzed using comparative phylogenomic methods to reconstruct trait evolution along the branches of the skipper tree-of-life. Here, we present preliminary results of this comprehensive project. This study sheds light on the evolution of morphological features within the phylogenetic tree and allow understanding the evolution of skippers in greater details.

2:42-2:54 pm

Collecting Coleoptera in Cambodia: building research partnerships with the Royal University of Phnom Penh through scientific training on Cambodian Coleoptera fauna

Thomas McElrath¹ & Sophany Phauk²

¹Illinois Natural History Survey, Prairie Research Institute, Champaign, IL, USA; ²Cambodian Entomology Initiatives, Royal University of Phnom Penh, Phnom Penh, CAMBODIA

Cambodian insect biodiversity has been vastly understudied. Recent efforts at the Royal University of Phnom Penh, Cambodian Entomology Initiatives, brought about partially due to the USAID-PEER program in recent collaborations with INHS and NSF, have begun to attempt to study focal groups of insects to start to address this problem, including the establishment of a national insect collection. However, much expertise and training are still needed to conduct independent biodiversity research in Cambodia. Through the Catalyzing New Research Partnerships (Cat-NRP) program offered by CRDF Global, we received a grant to offer a Coleoptera identification, collecting, and biodiversity course in Cambodia in partnership with Cambodian Entomology Initiatives. Consisting of field, lab, and lecture components, we collected beetles in the heart of the Indo-Burma Biodiversity hotspot, used modern techniques to preserve and identify them to at least family level, and preliminarily surveyed some of the unknown biodiversity of Cambodia. Future opportunities for collaborations are discussed.

2:54-3:06 pm

Planning and Moving Collections to the First Natural History Museum in the Middle East

David G. Furth

Furth Consulting, Smithsonian Institution, Washington D.C, USA. Steinhardt Museum of Natural History, Tel Aviv, ISRAEL

Active planning to develop a new natural history museum associated with Tel Aviv University began in 2011. This planning involved architectural designing of the new 100, 000 square foot building, moving collections, developing exhibitions, fund raising, etc. The Steinhardt Museum of Natural History is the first full-scale (scientific collections, research, exhibitions, education/outreach) in the Middle East. It houses about 5 million objects, about half of which are entomological. The author has consulted in the entire process, in recent years concentrating on the move of the entomological collections. The process was completed in June 2018 and the Museum opens to the public on July 2, 2018. This talk will detail the planning procedures, including preparation, implementation, and move of the entomological collections into the new Museum building.

3:06-3:20 pm

Coffee Break

MEMBER SYMPOSIUM 2: Tales from the Field: Vol. 3

Organizers/Moderators: Derek Woller *USDA-APHIS-PPQ-S&T-CPHST Phoenix Lab Rangeland Grasshopper and Mormon Cricket Management Team, Phoenix, AZ, USA*, Michael L. Ferro, *Clemson University Arthropod Collection, Clemson Univ., Clemson, SC, USA*

Timekeeper:

Too often, it seems that a majority of scientists tend to be reserved when talking about the fun and enjoyment they have at work. On the other hand, depending on one's perspective, it might be said that mounting 10,000 specimens isn't all that fun. And, for that matter, neither is reviewing papers, databasing, cracking the whip on student workers, etc. BUT, if you're like us, spending some time out in the field makes it all worthwhile! Who hasn't had that moment out in nature where they had a life-changing encounter with an insect, came too close to death, encountered memorable locals, etc.? We bet EVERY one of you has at least one of these tales and we're hoping you can share it with us eventually. For now, though, sit back, listen, and enjoy these entertaining tales from the field told by those who have dared to enjoy their jobs (maybe a little too much in some cases). In case you're curious, abstracts have been withheld to enhance your listening experience because spoilers are no fun!

3:20-3:30 pm

Beware the mighty minuten!

M. Alma Solis

Systematic Entomology Laboratory, USDA, National Museum of Natural History, SI, Washington, DC

3:30-3:40 pm

Wild adventures in the Green Triangle: entomological expeditions in Mount Nimba, Guinea

Luc Leblanc

University of Idaho, William F. Barr Entomological Museum (WFBM)

3:40-3:50 pm

Five Star Hospitality in Putumayo, Colombia

Isa S. Betancourt

Academy of Natural Sciences of Drexel University (ANSP)

3:50-4:00 pm

Floods, scars, and gold miners: adventures in water beetle fieldwork

Andrew Short

University of Kansas

4:00-4:10 pm

The Japanese Entomology Hotel: Pension Suzuran

Akito Y. Kawahara

University of Florida, Florida Museum of Natural History

4:10-4:20 pm

On terrestrial to aquatic transitions

Jennifer C. Girón

University of Kansas

4:20-4:30 pm

Mud, sweat, and southern beeches: a northerner's quest for an out-of-season southern beetle

Thomas McElrath

*Illinois Natural History Survey, Prairie Research Institute, Champaign, IL,
USA*

- 4:30 pm Break
- 5:05 pm ECN Business Meeting
- 6:15-7:30 pm ECN Mixer and Poster Session
Poster Presenters should plan to be near posters for questions
- 7:30-9:00 pm ECN Annual Banquet (Meeting Room 301)

Sunday, November 11th, 2018

Vancouver Convention Center, Meeting Room 301?

7:00 am - 8:15 am Registration and Coffee

MEMBER SYMPOSIUM 3: Collections policies and genetic data in the age of Nagoya

Organizer/Moderator: Olivia Boyd & Chris Marshall *Department of Integrative Biology, Oregon State University, Corvallis, Oregon, USA*

Timekeeper: XXX

- 8:15-8:20 am Introduction by Olivia and Chris
- 8:20-8:40 am The Nagoya Protocol: Access and Benefit Sharing 101

Jon Coddington

*Smithsonian National Museum of Natural History, Washington, DC,
USA*

The Nagoya Protocol (October, 2014) is the “third leg” of the Convention on Biological Diversity (1992). It seeks the “fair and equitable sharing of the benefits arising out of the utilization of genetic resources.” ABS will make the work of the research and collections communities more

complicated. Few countries have been able to implement all the requirements (neither USA nor Canada are parties to Nagoya). Key difficulties are the definition of genetic resources and their ownership, the status of sequence data, and requirements of Access and Benefit-sharing Clearing-House (ABS Clearing-House, ABSCH)

8:45-9:00 am Managing compliance with ABS and the Nagoya Protocol in the Natural History Museum London: designing and implementing New procedures

Chris Lyal

The Natural History Museum, London, England

9:00-9:20 am Biodiversity prospecting in your museum: the Costa Rican Experience

XXXAbstract

Dan Janzen and Winnie Hallwachs

University of Pennsylvania, Philadelphia, Pennsylvania, USA

We will discuss the history of biodiversity prospecting of insects in Costa Rica in the 1990's, and the first INBio contract with Merck, and reflect on how this could be relevant to current attempts to do genome prospecting from your museum collections.

9:20-9:40 am What is GGBN? (Global Genome Biodiversity Network)

Jon Coddington, Katherine Barker, Gabi Droege, Ole Seberg

Smithsonian National Museum of Natural History, Washington, DC, USA

GenBank does genes. GBIF does occurrences. Who does tissues, DNA's, RNA's and other genetic resources? How do you find them? GGBN fills a missing piece in the informatics of modern biodiversity science via an extension to both DarwinCore and ABCD (and MIXs), the modern data models for biodiversity. It has grown >400% in a few years and now indexes ~2M samples, 45K species, 19K genera, and 3800 families.

9:40-9:45 am Questions/comments for Symposium

9:45-10:00 am

Coffee Break

MEMBER SYMPOSIUM 4: Numbers that matter: quantifying “success” in natural history collections

Organizer/Moderator: **Zachary H. Falin**, *KU Biodiversity Institute, Division of Entomology, Lawrence, KS, USA*

Timekeeper: **Maxwell V. L. Barclay**, *Natural History Museum, London, England, UK*

10:00-10:15 am

Introduction: Numbers That Matter Symposium

Zachary H. Falin

Division of Entomology, KU Biodiversity Institute, USA

Curators and collection managers are under increasing pressure to justify the importance of the collections in their care to a diverse array of administrative bodies. This symposium will explore how we attempt to quantify the “success” of our collections for ourselves and for our administrators. We have speakers from a variety of institutions who will discuss their thoughts and experiences: what works, what doesn’t, and perhaps how we might re-think our definitions and metrics of “success” in order to adapt to a changing professional climate. Time permitting, there will be an informal open discussion at the close of the symposium.

10:15-10:20 am

Two Particularly challenging Collections Data Integration Steps

Deborah Paul¹ & Mrs. Nicole Fisher²

¹Florida State University, ² Australian National Insect Collection, CSIRO

All institutions would (sooner rather than later) like to have a complete digital record of their physical collections and publish this information in online databases. Many collections are trying to digitize at least some of their specimen data via in-house staff, students, volunteers, or crowdsourcing. Once the specimen data are published, aggregators like GBIF, ALA, and iDigBio, give local collections data quality feedback about potential data issues (e.g. flipped latitude and longitude values, missing data). Transcriptions done via public participation often need some review or transformations before the data can potentially be merged into the local collections database. It can take months, or even years, for recommended data issues to be addressed by a data provider. To attempt to clarify and categorize data integration challenges,

we combined a survey, symposium, and outreach session at SPNHC-TDWGNZ. Future programs and projects can use this information to enhance the ability of researchers, software developers, and local collections staff to strategically track and improve data quality which is so very critical for sound research. But, world leaders, museum administrators, directors, policy makers, funders, and university leadership also seek to understand qualitatively, quantitatively, and comparatively, what institutions hold -- whether they have been digitized or not. Several major efforts underway right now seek to provide metrics for a better understanding of the status of collections worldwide

10:20-10:35 am

“Selling” Collections

Mark A. Metz

USDA ARS Systematic Entomology Laboratory, USA

Most of us were conditioned to be rational, dispassionate, objective thinking machines, so that our biases do not affect our observations and interpreting our data. Think Spock from Star Trek. We are not. We can compartmentalize as well as any other human. In this, hopefully, humorous presentation, I will offer some methods for promoting healthy communication with our stakeholders. Call it politicizing, call it playing to the audience, call it “spin,” call it whatever you want. The ultimate goal is to pull ourselves out of our compartmentalized worlds and recognize that humans are emotional animals. We all conduct ourselves accordingly, and there’s absolutely nothing wrong with learning and using these skills to support the scientific objects under our care.

10:35-10:55 am

Metrics for Measuring Success of an Entomology Collection at an Ag School- Mississippi State University, USA

Richard L. Brown

Mississippi Entomological Museum, USA

Justifications of the importance to collections at Land Grant universities are affected by separate state appropriations for the university and the experiment station, with the latter also supported by federal Hatch funds. Appeals to higher administrators may involve hiring or retaining collection personnel, increasing operational funds, and increasing space for housing the collection. This presentation involves a justification prepared for higher administrators at

Mississippi State University for moving the entomology collection to a new building on campus and is based in part on the national land-grant mission and the university's strategic plan.

10:55-11:15 am

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Maxwell V. L. Barclay

Natural History Museum, London, UK

11:15-11:30 am

Beyond the status quo: How do we manage for success in entomology collections?

Crystal Maier

Field Museum of Natural History, Chicago, Illinois, USA

As collection managers, we manage things (specimens), people (visitors, volunteers, researchers), and spaces. How do we balance these varied goals to move collections beyond a stable state? What resources are needed to succeed and how do we manage these collections for success? A wide variety of tools are now available to help record and measure success of collections, from project management software, to Google forms and collaborative documents. Here I present an example of how a large collection (The Field Museum of Natural History), implements some of these tools, and how you can adapt them for your own use.

11:30-11:50 am

The Distribution, Size and Digitization Productivity of North American Entomology Collections

Jennifer M. Zaspel^{1,2,5} Akito Kawahara^{3,5}, Lindsie McCabe⁴, and Neil S. Cobb⁴

¹Milwaukee Public Museum, ²Purdue University; ³University of Florida, ⁴Northern Arizona University; ⁵

We review the status of 215 entomology collections in North America with regard to their specimen holdings and digitization efforts. We first compare results from our survey of the largest collections in 2018 with those collections reviewed by Miller (1991) who assessed the status of large collections from 1976 to 1988. We then make comparisons among public collections from Mexico, Canada, and the United States, and examine holdings and digitization efforts for US collections based on size and funding source(s). A summary of digitization productivity for these collections, including the number of transcribed records, images delivered, and the percentage of records that are research-ready (e.g., georeferenced with a

species-level identification) are reported. We conclude with a discussion on how these results can be used to better position North American entomology collections to meet the demand for providing critical biodiversity data and concomitantly ensure their long-term sustainability.

11:50-11:55 am The Abdication of Hope

Michael L. Ferro

Clemson University Arthropod Collection, USA

Despite earnest and honest attempts by generations of researchers and collectors, and despite a continuing and persistent desire to transcend our basest instincts and rise above the petty fray of simple utilitarianism, those advocating the value of insect collections may have to develop a method to measure collection value that embraces the current “resources/status” economy. The speaker will promote the idea and advise against it.

11:55-12:00 am Discussion Lead by Symposium Organizers

12:00-12:05 pm ECN Annual Meeting Concluding Remarks

3:00-6:00 pm Behind-the-Scenes Tour of the collections at the University of British Columbia

CONTRIBUTED POSTERS

Poster sessions run throughout the meeting from 7:30 am on Saturday, November 10th through 12:00 pm on Sunday, November 11th. Poster presenters should stand with their posters during the mixer on Saturday evening to answer questions. Posters must be removed no later than 1:00 pm on Sunday afternoon.

POSTER 1 An Updated Checklist of the Bees (Hymenoptera: Apoidea: Anthophila) of Pennsylvania, United States of America.

Shelby Kilpatrick¹, Jason Gibbs², Martin Mikulas³, Sven-Erik Spichiger³, Nancy Ostiguy¹, David Biddinger⁴ and Margarita López-Uribe¹

¹*Pennsylvania State University, University Park, PA, USA.* ²*University of Manitoba,*

Winnipeg, MB, CANADA. ³Pennsylvania Department of Agriculture, Harrisburg, PA, USA. ⁴Penn State Fruit Research and Extension Center, Biglerville, PA, USA

Checklists provide information about the species found in a defined region and serve as baselines for detecting species range expansions, contractions, or introductions. Documenting the diversity of non-managed, native bee communities is critical for assessing pollination services, ecology, and geographical and temporal changes in distribution and density. We are developing an updated checklist of the bees of the state of Pennsylvania, USA, and compiling information about their natural histories. Since the first checklist was published (2010; 371 species), thousands of additional specimens from the state have been collected and databased, new species have been described in the region, and the taxonomic status of some species has changed. Specimen data from insect collections, databases, scientific literature, and unpublished records are being compared to the original checklist. Information on the sociality, nesting habitat, body size, phenology, and diet of each species is being collected from specimen data, scientific literature, and experts. To date, we have documented 82 new state species records, representing five of the six bee families in North America, for a total of at least 449 species in Pennsylvania. We also highlight new county records and species persistence details. This checklist will provide more thorough baseline data for researchers and the public. The benefits of insect collections, specimen databases, determination and voucher labels, and georeferencing to biodiversity studies and other aspects of biological research will also be discussed.

POSTER 2

Fifteen years, 47 states, and 1.6 million aquatic macroinvertebrates: a priceless collection finds a new home with the University of Minnesota Insect Collection.

James Walker, Correy Hildebrand, Robin Thomson, & Ralph Holzenthal
University of Minnesota Insect Collection, St. Paul, MN, USA

In 2012, the University of Minnesota Insect Collection (UMSP) acquired a significant portion of the USGS National Water Quality Program (NWQP) aquatic macroinvertebrate collection for curation and permanent retention. The collection was donated to the University of Minnesota by the NWQP to ensure its continued existence and to make it available for further research, as it was slated for disposal in spite of its historical and contemporary importance and its excellent curatorial condition, diversity of taxa, and geographic coverage. The collection represents 15 years (1993–2008) of sampling efforts across the USA and contains 1.6 million representatives of all aquatic macroinvertebrate taxa. This collection is currently undergoing taxonomic organization and integration into the UMSP with funding from the National Science Foundation. Specimen vials are receiving barcodes and are being organized into Specify 6, a

digital database searchable and accessible to the scientific community. Upon completion, an invitation will be extended to the community to access the database, borrow material, and/or visit the collection. This poster is an update on our progress.

POSTER 3 Utilizing Large Digitized Entomological Collections: Species Checklist and Assessment of Completeness for Illinois Bees.

Brenna L. Decker¹, Alexandra N. Harmon-Threatt²

¹*Utah State University, Logan, UT, USA.* ²*University of Illinois at Urbana-Champaign, Champaign, IL, USA*

Climate change and landscape alterations may influence biodiversity by shifting species distributions or causing local extirpations. Because these changes may only occur over long periods of time, museum records are needed in order to track such changes. Bees are a group of organisms known to be in decline globally, but tracking regional shifts is difficult. Particularly in Illinois, where there has been significant alterations to the landscape, no bee species checklist is available to compare recent collecting efforts. Specimens housed at the Illinois Natural History Survey, located in Urbana, IL were used to address several issues concerning museum collections and utilizing those collections to detect species distribution shifts and declines. Museum collections have digitized specimens and labels to aid in identifying areas and species for conservation. Inherent in these collection databases are both sampling biases by various collectors through time and data entry errors. After identifying and correcting errors, a state checklist of 455 bee species was completed. Additional comparison of this checklist to sampling conducted over the 2016 and 2017 summers identified potentially declining species and new county and state records. Continued support for museums across the country will aid in furthering our understanding of the impacts to the ecosystem brought on by human and natural influences.

POSTER 4 UC Santa Barbara Natural History Collection Update

Rachel Behm & Katja C. Seltmann

Cheadle Center for Biodiversity and Ecological Research, UC Santa Barbara, Santa Barbara, CA, USA

We are in the second year of a project to revitalize entomology at the University of California, Santa Barbara and have new updates of its impact on the campus to report. The UC Santa Barbara Natural History Collection (UCSB) at the Cheadle Center for Biodiversity and Ecological Restoration formed the UCSB Invertebrate Zoology collection from about 10K

historical specimens that were found in a basement on the UCSB campus. The collection has continued to grow rapidly through Coastal California arthropod survey efforts, donated student collections, and faculty research projects. New results from the project include the formation of an outreach program through the UCSB Extension Department and discovery of several extirpated rare or endangered insects that once occurred on the UCSB campus. We will report on how the discovery of extirpated species on campus has received some press and the development of a collection on campus has raised the profile of entomology and insect conservation in the area.

POSTER 5 Techniques for high resolution, high throughput micro-CT scanning of small Coleoptera

Olivia F. Boyd

Department of Integrative Biology, Oregon State University, Corvallis, Oregon, USA

Micro-CT scanning was used to obtain three dimensional reconstructions of whole carabid beetle specimens for a geometric morphometric study. Some experimentation was required in order to balance the competing objectives of minimizing pre-scanning processing time and cost, damage to specimens, and per unit scan time while maximizing resolution and repeatability. Results from various specimen fixation, preservation, dehydration, staining, and mounting techniques are compared. Optimal scanning parameters for a Bruker SkyScan 1173 are given for the recommended specimen handling methods.

POSTER 6 Lepidoptera Specimen Digitization at the Florida Museum of Natural History

Stacey L. Huber, Geena M. Hill, Trudi Durgee, Anupama Priyadarshini, Andrei Sourakov, Deborah Matthews, Chris A. Hamilton, Hannah L. Owens, Jackie Miller, Andrew Warren, Jaret C. Daniels, & Akito Y. Kawahara

Florida Museum of Natural History, University of Florida, Gainesville, FL, USA

The McGuire Center for Lepidoptera and Biodiversity (MGCL) at the Florida Museum of Natural History serves as both a research facility and a center for education and outreach. Since opening in 2004, the facility has accumulated several million moth and butterfly specimens. Here we present the digitization pipeline for one of the largest and fastest growing collections of Lepidoptera in the world. The digitization efforts at MGCL are part of several NSF-funded projects, including the LepNet TCN (Lepidoptera of North America Network).

POSTER 7

Scarab Beetles and the University of Arizona Insect Collection: Donations and Digitization

Gene Hall

University of Arizona Insect Collection, University of Arizona, Tucson, AZ, USA

The University of Arizona Insect Collection (UAIC), housing the largest collection in the world of Arizona and northern Sonoran Desert insects, recently received multiple donations of scarab beetles, including the extensive Scott McCleve collection of Sonoran Desert Scarabaeidae accrued over 40+ years, greatly enhancing existing holdings and broadening our knowledge of this group of diverse beetles within the region. As part of the digitization initiative at the UAIC, these specimen records and images will be made available to researchers worldwide.

POSTER 8

Highly-multiplexed amplicon sequencing for phylogenomics

Julian R. Dupuis^{1,2}, Forest T. Bremer¹, Daniel Rubinoff¹, Scott M. Geib²

¹University of Hawaii at Manoa, Honolulu, HI, ²USDA-ARS DK1-PBARC, Hilo Hawaii

High-throughput sequencing has fundamentally changed how molecular phylogenetic datasets are assembled, and phylogenomic datasets commonly contain 50-100-fold more loci than those generated using traditional Sanger-based approaches. Here, we demonstrate a new approach for building phylogenomic datasets using single tube, highly multiplexed amplicon sequencing, which we name HiMAP (Highly Multiplexed Amplicon-based Phylogenomics), and present bioinformatic pipelines for locus selection based on genomic and transcriptomic data resources and post-sequencing consensus calling and alignment. This method is inexpensive and amenable to sequencing a large number (hundreds to thousands) of specimens simultaneously, requires minimal hands-on time at the bench (<1/2 day), and data analysis can be accomplished without the need for read mapping or assembly. We demonstrate this approach by sequencing 878 genes in single reactions for 82 species of tephritid fruit flies across seven genera (384 individuals). We focused sampling on the tribe Dacini, a speciose group that not only contains some of the most economically-important agricultural insect pests, but has also repeatedly evolved a similar overall morphology, which is putative Batesian mimicry of *Polistes* wasps. The resulting filtered dataset contained >40,000 phylogenetically-informative characters, and provided unparalleled resolution of the generic relationships in this tribe as well as insight into the evolution of many taxonomically-difficult species groups. By targeting phylogenetically-informative, conserved exons, this approach is particularly useful for shallow- to mid-scale phylogenetic questions and those between the levels of populations and species; this approach will undoubtedly provide a novel and cost-effective methodological lens to investigate the early stages of adaptive diversification in non-model systems