



ARTS: Litter Bugs: revisionary and phylogenetic research on the least studied true bug infraorder (Insecta: Hemiptera: Dipsocoromorpha)

Litter Bug Newsletter – January 2014

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Project goals

Many of you have seen the objectives or the entire proposal for this NSF ARTS project before, but just in case please see below:

1. Assemble the largest worldwide collection of Dipsocoromorpha or litter bugs (~15,000 specimens).
2. Produce integrative taxonomic revisions of genera and species of Schizopteridae.
3. Test family-level concepts of the 5 recognized families of Dipsocoromorpha, the monophyly of the infraorder, and the classification of Schizopteridae.
4. Test hypotheses on the stepwise evolution of elytra and genital and abdominal asymmetry.

As most of you are aware, the project was launched a few months after our preferred start date and is active since July 1, 2013. The project duration is 3 years.

UCR Crew : Introductions

Two new graduate students started researching on Dipsocoromorpha this summer: **Stephanie Léon** is a MSc student who is involved in documenting wing



Stephanie Léon

Alex Knyshov

Rochelle Hoey-Chamberlain

venation patterns across Dipsocoromorpha, a taxonomic revision of a subgenus of *Schizoptera* Fieber, and a molecular phylogenetic analysis focusing on Schizopteridae. **Alexander Knyshov** is

a first year PhD student interested in comparative morphology of male genitalic features in Dipsocoromorpha, but he will also work on a taxonomic revision of the *Corixidea* genus group, and be involved in the overall phylogenetic analysis of Dipsocoromorpha. **Rochelle Hoey-Chamberlain** worked as a Lab Assistant in the Weirauch Lab and has recently joined the lab as an Assistant Specialist. Her research on Dipsos will be part-time. She will be engaged in taxonomic revisions and phylogenetic projects, but will also help oversee undergrad students in the lab and is involved in specimen processing, curation, and documentation.

Since July 2013, three undergrads were involved in specimen sorting: **Andrew Freedman** helped during the summer, but is now back at his undergrad institution. **Bridget Gonzales** and **Bryan Vanderveer** are still involved in the project and continue to sort samples and image specimens.



Andrew Freedman

Bridget Gonzales

Bryan Vanderveer

We will continue our “Introductions Column” in the next newsletter with a synopsis of all taxonomic and morphological collaborators involved in this project – so stay tuned!!

Summary of activities since July 2013

Most of our activities have focused on accumulating Dipsocoromorpha, familiarizing ourselves with the taxonomy, systematics, and morphology of the group, and on exploring ways of documenting morphology in these tiny specimens.

- Bulk sample sorting with focus on Malaise traps, yellow pan traps, and leaf litter samples from Mike Sharkey (Thailand and Colombia), Brian Brown (Neotropics), the California Academy of Sciences (Madagascar), the Heraty Lab, the Entomological Research Museum at UCR, and our own collecting trips.



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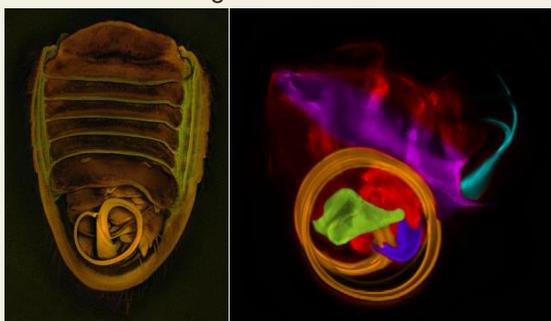
Activities (continued)

- At UCR, we (since April 2013) sorted 1,185 samples and retrieved 1,570 Schizopteridae and 5,884 Ceratocombidae (as of 3rd January 2014).
- About 61% of the trap samples contained Ceratocombidae and ~19% Schizopteridae.
- We started imaging morphospecies representatives of Schizopteridae (habitus dorsal, lateral, and ventral) using a Leica MZ16 digital imaging setup (examples below; left and middle imaged in ethanol, right dry). We are hoping to images ~ 40 specimens/week during the next few months.



cf. *Ogeria* sp. *Peloridinannus* sp. *Corixidea* group sp.

- We started exploring the use of confocal laser microscopy (CLM) and scanning electron microscopy for documentation of male genitalic structures of Schizopteridae (some examples below). CLM will work well for a comparative overview of male genitalic features.



Kokeshia sp. *Pinochius* sp.

- We started imaging wing venation using a Zeiss Axioskop 2 compound microscope to explore wing vein homologies. This will be useful for a comparative paper on wing homologies.



Kokeshia sp. *Hypselosoma* sp.

Research visits in Prague and Geneva

In October 2013, Christiane travelled to Prague (1 week) and Geneva (1 week). At Charles University in Prague, she caught up with collaborators **Pavel Stys** and **Petr Banar**, looked through Pavel's collection of Dipsocoromorpha, and imaged some specimens.



Pavel and Christiane

Petr



Some of the treasures in Pavel's collection

Peter Schwendinger and **John Hollier** were superb hosts at the Museum d'Histoire Naturelle in Geneva that houses the potentially largest worldwide leaf litter sample collection. During only 5 days, Christiane "pulled" ~1,500 specimens of Dipsocoromorpha (~1,300 of them are Schizopteridae) from >30 countries, a thoroughly fun and productive week!



Sample sorting in Geneva



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In December 2013, Christiane traveled to the Field Museum of Natural History (FMNH) in Chicago, the American Museum of Natural History (AMNH) in New York, and the Florida State Collection of Arthropods (FSCA). The visits at the FMNH and FSCA focused on prioritizing bulk samples in both collections and on hands on training with **Robin Delapena** and **Walter Winn**, respectively, who are “pulling” Dipsocoromorpha. The FMNH houses a mind-blowing collection of litter, flight-intercept, and light trap samples and a number of their samples had already been pre-sorted to order, suborder, or even infraorder. Since the beginning of December, Robin has assembled a stellar >1,600 specimens of Dipsocoromorpha from these samples! Both Robin and **Rebekah Baquiran** were fabulous hosts during my short visit in Chicago.



Voccoroda carioca (female paratype) and *Hysipteryx machadoi*

The last stop was at the FSCA, where **Susan Halbert** and Walter Winn were the wonderful hosts. The FSCA houses an amazing collection of Malaise trap and pan trap samples from the New World.

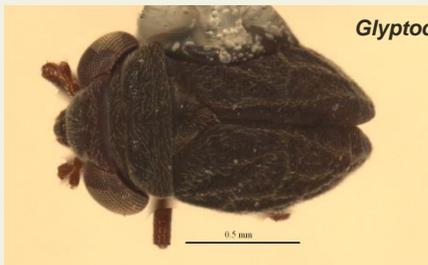


FMNH collection, Robin in action, and a male *Peloridinannus*!



FSCA collection and Walter at work

The days at the AMNH were dedicated to sorting through the collection of pinned Dipsocoromorpha (to get them ready for loan to Riverside) and taking images of holotypes, paratypes and some other specimens identified by Wygodzinsky and Emsley. **Toby Schuh**, **Lily Berniker**, **Ruth Salas**, and **Chris Johnson** were the generous hosts during that visit and Norm Platnick allowed us to use his powerful Leica Imaging System. Some of the images are below.



Glyptocombus sp.

We are looking forward to these collaborations with the FMNH and the FSCA.

Presentations at ESA Austin 2013

Stephanie, Alex, Rochelle and Christiane presented two posters (comparative genitalic morphology / wing vein homology) and one talk (intro to the Dipsocoromorpha project) at the ESA meeting in Austin. Please email Rochelle or Christiane (rochelle.hoeychamberlain@ucr.edu or christiane.weirauch@ucr.edu) for a pdf of these presentations.