HAMULI

The Newsletter of the International Society of Hymenopterists

volume 2, issue 1 20 January 2011

Dr Michael McLeish and MSc student Frances van der Merwe (University of Stellenbosch) with Dr Simon van Noort (Iziko South African Museum), from left to right respectively, at Ithala Game Reserve in front of a South African near endemic fig species, *Ficus burtt-davyi*.

Figging in KwaZulu-Natal

By: Simon van Noort, Iziko Museums of Cape Town

A combined Iziko Museums of Cape Town and University of Stellenbosch field trip was conducted in October 2010 to sample fig wasps for cuticular hydrocarbons. The focus of the sampling area centered on north-eastern South Africa. Fig species have a tropical distribution and the highest concentration and diversity of South African fig species occurs in Kwazulu-Natal, hence the targeting of this region to maximize return on sampling effort. Participants included Dr Michael McLeish and MSc student Frances van der Merwe (University of Stellenbosch) and Dr Simon van Noort (Iziko South African Museum).

Scientists are only now beginning to comprehensively unravel the evolutionary intricacies of the obligate mutualism between fig wasps and their host fig tree species. We are currently attempting to elucidate the evolutionary processes of this fascinating interaction, both at the macro

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In this issue...

Treasurer's report

By: Craig Brabant, University of Wisconsin, USA

Just a brief note of introduction—my name is Craig Brabant, your (relatively) newly-elected treasurer. I am a Ph.D. dissertator and advisee of Dr. Daniel K. Young at the University of Wisconsin–Madison. I am working hard to finish my taxonomic revision and cladistic analysis of the South American velvet ant genus, *Tallium* André.

I am currently up to date with processing membership renewals as we rapidly approach the end of the first month

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Secretary's report

By: Andy Deans, North Carolina State University

We ended 2010 with 260 active members, including 14 students (see Sharanowski's commentary on page 6), 178 regular, 2 family, 12 life, and 41 institutional members. We have no emeritus members yet, though the constitution lists this category as an option. Below is a synopsis of the minutes from the 2010 ISH symposium at the Entomological Society of America annual meeting.

ISH Symposium and Business Meeting; 12 December 2010, 1:00-5:00pm

Symposium talks covered a variety of research on hymenopteran ecology, biocontrol, taxonomy, collecting methods, field work (Australia, Cuba, Trinidad, USA). The symposium overall was a success, despite early difficulties with room size and A/V, and demonstrated the diversity of research done by the ISH community. Two counts were taken during the symposium talks: 42 people and then 50 people in attendance. Business meeting commenced at 3:30pm, with 28 members in attendance, six of whom were students. Members of the executive each gave their reports before opening up the floor for discussions of business, old and new. Membership issues worth discussing more extensively:

- Need to formalize the membership-sponsorship process, identify specific people for membership.
- Student numbers are too low; consider student awards / prizes / research or travel stipend.
- Look to other societies for ideas of how to recruit and retain student members.

The ballot for president is coming out soon, with three candidates, and the 2014 International Congress of Hymenopterists venue will be chosen soon. The executive has asked for formal proposals from three contenders.

On a final note, as editor of the newsletter I want to thank all the contributors to this issue, which has vastly exceeded all expectations in terms of interest and content. Perhaps it's time to think about advertising space? ❖

Webmaster's report: don't miss a thing with live feeds from hymenopterists.org

By: Katja Seltmann, North Carolina State University

The new open access model for our journal is exciting and none of us want to miss an issue. Keep up to date with the journal from www.hymenotperists.org live feeds. Much simpler than collecting honey bees from a hive, everyone can browse or subscribe. One option is a RSS subscription that will appear in your Web browser bookmarks bar. You can enable this functionality either from our Web site page or directly from the *JHR* Pensoft site. Just double click the "chicklet" found on either page (figure below).

Also, you can always keep up to date with Society news by browsing our live feed on the front page (see figure – 2). This feed displays the last few posts from the society blog but will soon include *JHR* updates. As always, if you have news to post to the blog, please feel free to ask for permission to post or send the post to Andy Deans or Katja Seltmann.

Website traffic is up 259.80% from this time last year with 5,692 visits from 97 countries/territories and we had our first recorded mobile phone visitor from the city of Boston on January 9th, 2011. Perhaps this is the start of a budding society trend? Time to check if ISH is mobile compliant! ❖

Hamuli is published by the International Society of Hymenopterists.
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See page 35 for submission instructions. Deadline for the first issue is January 15, while the deadline for the second issue is July 15. Articles appearing herein should not be considered published for the purposes of zoological nomenclature.

find us on the Web: http://hymenopterists.org

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and micro scale, through phylogenetic reconstruction, phylogeographical analyses, and ecological assessment. The latter includes assessment of the role chemical mediation plays in the interaction and covers investigation of both fig volatiles and fig wasp cuticular hydrocarbons. This is the first time that hydrocarbon signatures are being assessed for fig wasps and novel sampling methods were developed to facilitate their extraction in the field on this trip.

The obligate mutualism between pollinating fig wasps, and their host fig trees (*Ficus*, Moraceae) is an ancient relationship originating around 70–90 Mya and has historically been considered to be a one-to-one relationship. However, increasing evidence suggests the mutualism is not as tight as previously supposed, with records of more than one species of pollinator associated with a single host, and conversely, single pollinator species associated with more than one host fig species. The evolutionary history of the association is highly complex and the extent of co-speciation between fig wasps and their host figs is only now starting to be teased apart. The mutualism depends on the wasp providing a pollination service and the fig tree providing a breeding site for the pollinating wasp's progeny with neither partner being able to reproduce without the other. The non-pollinating wasps are either phytophagous, galling the ovules as do the pollinators, or parasitoids, inquilines or klepto-parasitoids of the gall formers.

The developmental cycle of the fig comprises a number of distinct but inter-connecting stages with fig wasp larval development correlating strongly with fig development. The cycle may encompass anything from three to twenty weeks. Female fig wasps emerging from the fig they have developed in need to locate new receptive figs to continue the reproductive cycle. Figs within a crop are often at the same stage of development, with the consequence that fig

wasps may require a long distance flight of sometimes hundreds of kilometers to locate a tree with receptive figs for oviposition and pollination. These tiny wasps, averaging between one and two millimeters in length, achieve this remarkable feat by using upper air currents for dispersal and then dropping down into the boundary layer to home in on volatile chemicals released by the figs when they are receptive for pollination.

Each fig has hundreds to thousands of tiny flowers lining the inside walls of the central cavity. The only link to the outside world is through a tiny bract-lined opening at the apex of the fig, the ostiole, and it is by means of this passage that the pollinating fig wasp gains access to the florets. The pollinating wasps are uniquely adapted to squeeze their way through the ostiole, having evolved a flattened head and body and many rows of backward pointing mandibular teeth situated on the underside of the head. Once inside the fig cavity, the female proceeds to unload pollen onto the stigmas and inserts her ovipositor down the style of the flower to oviposit within the ovule. The ovary swells up to form a gall and the wasp larvae feed on endosperm tissue in the galled ovary, which would otherwise have

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produced a seed.

Most of the non-pollinators oviposit through the fig wall from the outside of the fig at various stages of fig development. A few non-pollinating fig wasps enter the fig through the ostiole and then exhibit convergent morphological adaptations with the pollinators. The externally ovipositing fig wasps often have extremely long ovipositors, the length of which is related to the wall thickness of their host fig. Fig size varies tremendously across species, and ranges from smaller than a marble to as large as a tennis ball. Towards the end of the fig developmental cycle, all the fig wasps breeding in a particular fig emerge from their galls within a short period of each other. Mating largely takes place within the confines of the fig before the males chew a hole through the fig wall to the exterior to allow the females to escape. Pollinator females actively or passively load up pollen from the ripe anthers before emerging from the fig to search for young receptive figs to complete the cycle.

Fig trees are keystone species providing a resource for a multitude of frugivorous and insectivorous animals. Once the female fig wasps have left the fig, it ripens, changing colour and smell, and becomes attractive to seed or fruit eating birds, bats, monkeys and even lizards. With their asynchronous phenology, fig trees provide an all year round production of figs, providing food in seasons when other fruiting species are not. Frugivores play an important part in the propagation of fig trees, acting as the dispersal agents of the seeds.

Figs exhibit two life cycle strategies. About half of the 755 species are monoecious and the other half are gynodioecious (functionally dioecious with male and female reproductive functions separated between individual trees). In monoecious species, which is likely to be the basal condition, both the female and male reproductive functions are contained in the same fig, but the female and the male reproductive phases are separated by anything up to 20 weeks. Pollinating fig wasps live for only a few days with the result that pollen dispersal is carried out by the pollinator's offspring. Nevertheless, these tiny fig wasps are extremely effective pollen dispersers, ensuring gene flow over hundreds of kilometers.

Many a rutted track was traversed in the quest for success. Over 6000 km was driven on the trip. Many of these kilometers were covered on hectic off-road 4x4 tracks in order to access isolated areas harbouring fig trees. All of this was done in a quest to sample their associated fig wasp faunal assemblages.

Fig trees are considered to be keystone species with a

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wealth of other animals dependent on this resource in the majority of global ecosystems.

The most efficient method to collect fig wasps is to rear specimens from their host figs, however, the success of this procedure is constrained by the ecology of the mutualism. Fig crops are produced randomly throughout the year and individual trees produce crops at different times to each other, both essential traits to ensure the continued cycling of the mutualism. Because of this, most fig trees located during field surveys either have no figs or have figs at the wrong stage of development for fig wasp rearing. On average only one out of every 30 trees has a fig crop at the right stage of development. We located and mapped 446 individual fig trees of 17 species, recording their GPS coordinates, altitude and habitat, 15 of these trees representing 9 species had fig crops suitable for fig wasp rearing.

Sampling has its inherent dangers, not least precariously hanging in trees on cliff edges, such as we needed to do to sample the red-leafed rock-splitting fig, *Ficus ingens*, or entering high risk hijacking areas in remote Zululand on the eastern shores of Lake Sibaya, the only known locality within South Africa for two species of fig, *Ficus bubu* and *F. lingua*, where Fran and Mike sampled figs from *Ficus polita* at Lake Sibaya. A window washing extension pole with pruners fastened on the end is an essential piece of equipment to access figs in the forest canopy and at full 9m extension is an unwieldy beast!

Fig wasps are positively phototropic and negatively geotropic causing them to migrate into the light containers facilitating their separation from their host figs after they have emerged. This emergence tube system dramatically speeds up processing of reared specimens.

The wasps are still alive, critical for successful hydrocarbon extraction and are kept under control by reducing their body temperature in the freezer and operating on an innovative system of cold gel packs under the microscope.

As the main thrust of her MSc, Frances will use chemical profiling targeting cuticular hydrocarbons to elucidate ecological relationships among behaviourally diverse fig wasp species with varying degrees of host-specificity. She will reconcile these associations with fig wasp taxonomy, phylogeny, and host association (host-specificity, species host range, evolution) and elucidate biogeographical variation in the different ecological guilds of fig wasps and the degree to which host fig, environmental factors or geographical distance influence their cuticular hydrocarbon profiles.

The cuticle is the outer-most layer of the insect integument that prevents desiccation. The lipids that protect

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against desiccation contain numerous chemicals including hydrocarbons. The cuticle functions as a species, colony, caste and mate recognition cue, and as such plays a major role in the interaction between insects. The hydrocarbon profile is usually unique for every species. Cuticular hydrocarbons are non-volatile and physical contact needs to take place in order for their signals to be transferred. As a result they can be used as an indication of ecological interactions with other species (van der Merwe pers. comm.).

Ten individual fig wasps of the same species are washed in vials of 100µl hexane for 10 minutes. The wasps are extracted and preserved as voucher specimens in 96% ethanol. The hexane sample is sealed and stored at -5º C. Back in the lab the hexane is evaporated under nitrogen to ± 20 µl and 1 µl of this extract is then injected into a gas chromatograph, which separates out the individual compounds based on their mass, creating a chemical profile of the hydrocarbons. Electron impact mass spectra is then used to positively identify the compounds separated by the GC. This is done by comparing the mass spectra of individual peaks to database records of pure compounds (Frances van der Merwe pers. comm.).

We successfully reared fig wasps from 9 species of fig: *F. ingens, F. glumosa, F. sur, F. burtt-davyi, F. burkei, F. salicifolia, F. polita, F. lutea,* and *F. bizanae*. Ten replicate samples per fig wasp species from each host fig species were collected, which means that 100 specimens of each fig wasp species from each host fig collection were processed. A total of 749 hydrocarbon samples were collected

on this trip, which translates to about 7500 specimens of fig wasps that we collected, identified and washed in hexane! No small feat accomplished by 3 mad scientists!

Innovative strategy was developed by Frances van der Merwe and Michael McLeish to facilitate sampling of cuticular hydrocarbons in the field. A portable field laboratory was set up at each overnight location which varied from rustic research accommodation at Ithala Game Reserve to an open camp site at Mabibi to an outside courtyard en route home. The need to process samples as the fig wasps emerged from their host figs meant there was no respite for almost a month of working 24/7 through weekends and into the night.

The disparate geology, altitude range and habitat within Ithala has resulted in the presence of a diverse fig flora comprising 8 species in the reserve. We mapped 236 individual fig trees, but this number can be multiplied by a factor of at least 10, estimating an abundance of at least 2000 fig trees in the reserve. The floral communities in the reserve are dominated by different fig species depending on both habitat and substrate. The rock splitters *Ficus ingens* & *F. salicifolia* dominate the escarpment in the south of the reserve, with a good representation of *Ficus burkei* and *F. sur* at the base of the escarpment. The rock splitter *F. glumosa* dominates on the granite inselbergs predominant in the east of the reserve, although all 4 rock splitters are present, including a smattering of *F. abutilifolia*. The low lying Riparian habitats in the north section of the reserve are dominated by *F. sycomorus*. *Ficus sur* is present in many of the wetter areas throughout the reserve. *Ficus burtt-davyi* was only recorded in the main camp, but may be present elsewhere along the lower escarpment.

Acknowledgements: This research was funded by a NRF grant awarded to Simon van Noort, a CIB grant awarded to Theresa Wossler & Frances van der Merwe and a Claude Leone Foundation post-doctoral fellowship to Michael McLeish. Many thanks to Ezemvelo KZN Wildlife for granting collecting permits and to Taryn Bigwood, research officer at Ithala, for her kind hospitality and generous provision of her time. For more information on figs and fig wasps see: www.figweb.org. ❖

Ideas for ISH membership continuity and expansion: targeting students

By: Barb Sharanowski, University of Manitoba

At this year's ISH meeting at ESA, I met a new student member who briefly introduced himself right before the presentations began. With my terrible memory I can only recall that he worked on bees, but I forgot his name and did not catch who he worked with. I did not see this person for the remainder of the meeting and regretted not having a chance to have a more thorough discussion. In past business meetings we have discussed ways to increase or sustain membership, particularly among students. It dawned on me that perhaps our society is missing an opportunity to welcome and introduce new members into our society. Below I list a couple of ideas (some new, some old) to increase or sustain new membership, particularly among students. The purpose of this list is to generate further discussion of these and other ideas to ensure the long term viability of our society.

The first idea is to add an "Introduction of New Members" to the agenda of every business meeting. This would not only make new members feel welcome, but would also provide a mechanism for the larger society to initiate discourse with new members. It may also serve to increase attendance among student members at the business meeting.

Andy Austin has mentioned a number of times of having a student award funded by the endowment. In addition to this wonderful idea, I might suggest having an invited student presentation at the ISH meetings at ESA. This could further a sense of participation within the society and might encourage students to keep their membership active throughout their years as a student and as they transition into their careers. Additionally, students can highlight their presentation as an invited talk on their CVs.

Interestingly, we do not have any official student representative on the executive council. While many other similar societies also do not have specific student representation, perhaps this is another way that our society can be innovative. A student representative could be responsible for contacting current student members to offer them a larger voice in the society and utilize the latest technologies for creating and sustaining student networks. Additionally they could be responsible for promoting new membership among students of established members (a mechanism which is sorely needed). Having a specific student representative promotes activity within the Society among students and encourages participation and continued membership.

While these are only a few ideas, I hope that it stimulates further conversation and perhaps future implementation of mechanisms that will actively work to secure and maintain membership, particularly among students. ❖

A new model for the *Journal of Hymenoptera Research*

By: Jim Woolley, Texas A&M University, past president

After over two years of exploring the alternatives, discussions with ISH members, and negotiations with potential publishers, we are happy to announce that effective January 1, 2011, the *Journal of Hymenoptera Research* (Impact Factor 0.676) will be published electronically and in print by Pensoft Publichers, Sofia, Bulgaria (www.pensoft.net/journals/jhr/). Pensoft is also the publisher of *ZooKeys*, *PhytoKeys* and *BioRisk*, as well as some other Society journals. Like these journals, JHR will now be open access and beginning with volume 20 (2011), it will be available on-line to anyone with an internet connection and a browser. ISH is the first scientific society to make this arrangement with Pensoft. As many of you know, Pensoft is a leader in the rapidly changing world of scientific publication. This new arrangement offers a well developed XML-based workflow for submission, editorial work,

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Track permit and long-term loan conditions associated with specimens

By: Andy Austin, University of Adelaide, Australia

One of the problems that occurs with bulk Malaise, pan-trap and other material that is passed around various groups and institutions is that the conditions associated with the permit under which the material was collected (or the loan form under which it was borrow) is often lost, as the information is not transferred from one worker to another. The conditions specified on collecting permits and loan forms vary greatly from country to country and even from state to state within a country. They may include a simple statement that any holotypes need to be deposited into a recognised collection in the country of origin, to quite complex arrangements that specify exactly where holotypes need to be deposited and/or that a specific proportion of the material collected needs to be returned to the country of origin once it is identified.

The problem arises when material collected under a specific permit is passed around among workers and institutions and, at some point, the information associated with the permit becomes disassociated from the material, with obvious consequences – the holotypes go to the wrong institution, institutions keep material that they should not, *etc*., *etc*. One thing we sometimes forget is that permits are legal documents for which the person who was originally issued the permit is responsible.

I have seen several cases this year associated with material collected in Australia where types have gone to the wrong institution under the terms of the original permit and/or loan form, and in a personal case, where it was difficult to track down the original permit/loan conditions so we could lodge material in the correct collection.

In discussing this problem with colleagues at the December ESA meeting in San Diego, I wondered whether there was a simple solution, in simply putting a code on the data label that refers to the original permit. For example, specimens collected by my colleague Norm Johnson at Ohio State University when he was in Australia last year might have a data label such as:

AUSTRALIA: NSW
Pearly Beach National Park,
longitude/latitude
25-29.iii.2009, N. Johnson
M.T. Permit: OSUC.AusX09

Here the permit field (in blue) means that the OSU collection has a permit logged into their database that can be requested by any third party who has accessed material from that bulk collection. This system would potential work over a longer period of time than the collective memory of the original collector, it would provide accurate information of the conditions of the origin permit and, importantly, it would stay with any bulk samples as they are passed around the taxonomic community. Is this a workable solution to the problem? I would be interested in hearing your views in the next issue of *Hamuli*. ❖

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publication and dissemination, and advanced publication technologies including data publication and semantic tagging and Web enhancement of articles, while maintaining publication of hard copy required under the current ICZN (more about that: http://bit.ly/eJ7vEi). We believe that this move positions our Society to be a major innovator in the rapidly emerging technologies of electronic publication. Not the least of the benefits for us are that abundant full color plates can be included in articles, with no restrictions or additional charges involved. Here's how it'll work:

- ISH dues will remain $45 per year for members. ISH members are entitled to publish in *JHR* at a discounted rate, obtain a subscription to *Hamuli*, have access to the ISH list-server, and can vote in ISH elections.
- *JHR* will be open-access
- ISH members may publish at cost in *JHR*, the rate is currently $20 US per page. The page charges include a wide range of services on the publisher's side, including highly automated online editorial management system, mandatory registration of all new taxa in ZooBank, publishing a semantically enhanced HTML version, XML and automated dissemination of content to indexers and aggregators of biodiversity information.
- Non-members may publish in JHR at $30 per page
- ISH members may purchase hard copies of *JHR* for an additional $45 per year (in addition to the dues), plus $15 mailing costs. The price of $45 includes all issues with a maximum total number of 300 pages per year. Additional regular issues or supplements published within the same calendar year can be purchased from the publisher direct.
- Rates for Institutional Subscribers that desire to continue to receive hard copies will increase to $120 per year.

This is a truly revolutionary change in the way our Society does business. It positions ISH at the forefront of contemporary scientific publication, and it should revitalize our journal. Send your best manuscripts to Stefan Schmidt, the editor, at Hymenoptera@zsm.mwn.de! We should also recognize that there are some unknown terms

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in the business equation, that will only be solved as the next year or two unfolds and we have a better idea of the size of the new issues, *etc*. Since the cost of publication of hard copies of the journal now depends entirely on the size of issues, the rates for hard copy and institutional subscriptions in particular may need to change. ❖

Hymenopterists' meeting in Stuttgart

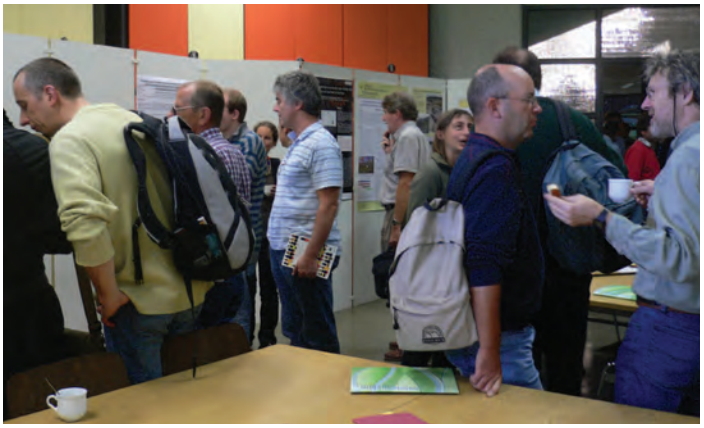
By: Lars Krogmann, State Museum of Natural History Stuttgart, Germany

The Hymenopterists' Meeting in Stuttgart (Stuttgarter Hymenopterologen-Tagung) is one of the largest Hymenoptera conferences in Europe and is held every second year in October at the State Museum of Natural History in Stuttgart (SMNS). The 9th meeting took place from 8-10 October 2010 and was attended by a record-breaking number of 114 participants from 9 countries (previous meetings were usually attended by 70-80 participants). The conference started on Friday, 8 Oct with an ice breaker in a nearby restaurant which provided lots of opportunities for discussions and Swabian food. The scientific programme commenced on Saturday morning with an opening lecture by Christian Schmid-Egger (Berlin) and Stefan Schmidt (Munich) on DNA barcoding of aculeates. On Saturday and Sunday 26 talks covered a wide range of topics, including systematics, ecology, physiology, reproduction, pollination, conservation and parasitoid biology. The quality of presentations was very high and we enjoyed intensive and inspiring discussions which extended to the various coffee breaks. The poster programme comprised 13 contributions and for the first time we awarded prizes for the best posters. Hannah Burger (University of Ulm) won the first prize for her poster 'Host-plant recognition by the oligolectic bee *Hoplitis adunca*' and Christian Reichle (University of Ulm) was awarded the second prize for his poster 'Stingless bees (*Scaptotrigona pectoralis*) learn foreign trail pheromones and use them to find food in the field'. The abstracts of oral and poster presentations are published (in English or German) in the periodical *Beiträge der Hymenopterologen-Tagung in Stuttgart* (Krogmann & Schwenninger, eds. 2010. ISSN 1614-3140.)

The best poster prize is awarded to Hannah Burger (University of Ulm).

Over the last two decades the Hymenopterists' Meeting in Stuttgart grew to an important platform for European Hymenopterists and takes place in an informal, relaxed atmosphere. The organization of this meeting would not be possible without the help and support of a number of people and I am grateful to Jack Schwenninger and Volker Mauss (AK Wildbienenkataster), Karin Wolf-Schwenninger (SMNS), Stephan Blank (Deutsches Entomologisches Institut) and my colleagues from the Entomological Department at SMNS.

Participants of the 9th Hymenopterists' Meeting in Stuttgart.



Poster session during the Meeting.

Just a thought: During the meeting I noticed that only a very small number of participants of the Hymenopterists' Meeting in Stuttgart are ISH-members and these seem to be confined to systematists. The majority of participants, *i.e.* those working on ecology (*sensu lato*) are not members of ISH. Why don't we try to attract more hymenopterists from other disciplines to join our society? ❖

Notes from the psychiatric institution: slow recovery from the 7th ICH

By: George Melika, Kőszeg Psychiatric Center for Hymenoptera Research

Happy New Year to all Hymenopterologists out there, …especially to those who made the 7th International Congress of Hymenopterists in Kőszeg (Hungary, 2010; June 20-26) unforgettable with their participation, talks, posters and help in the organization of the meeting (or just with drinking wine and beer and watching the soccer world cup on TV).

I must say to ALL – I am finally back from a psychiatric curing I was forced to undertake after the mega stress I got before and during the congress. Now I am nearly recovered and was able to spend more or less normal Christmas holidays and New Year Eve with my lovely family. I said "nearly recovered" – a man who is stupid enough to organize a congress for crazy hymenopterologists never would be the same as he was before doing it. That's why I want to forewarn the next organizer from doing the same mistakes which might cause mental incurable wounds in your brain.

With 140 participants from 37 countries from all over continents, 88 talks and 83 posters, we definitely had here in Kőszeg, one of the biggest hymenopterologists congress of all times. Except for a few "Hymenoptera mammoths" we had here the cream of world hymenopterology and much more. Many PhD students participated in their first important international meeting and presented quite nice talks and posters. Participants were able to listen to different topics of hymenopterology: morphology, biological control and economic entomology, faunistics, DNA barcoding, taxonomy, systematics and biogeography, higher-level phylogeny of Hymenoptera, cynipoids, and their communities. In fact, all aspects of Hymenoptera research were successfully presented. Scientific publications, informatics, necessity of electronic databases in Hymenoptera were especially emphasized at the meeting.

For the first time in the history of Hymenopterologists' congress, live remote talks were given, particularly by Dr. Kurt Pickett from Vermont (USA), which is opening a new era in running such meetings.

It was amazing for many participants to listen some talks given by Big Guns for the second, or third time. They brought up for listeners nice memories from Sun City's casinos, bars and hippos of Pilanesberg National Park Area (2006) and the Great Wall of China near Beijing (2002), or even funny jumping grey kangaroos in the vicinity of Canberra (1999). But *repetitio est mater studiorum*, other words, in English, shut up and listen. Actually some hymenopterist machos were smart enough to avoid it and had choose other programmes instead of the congress participation: the bolded eucharitid eagle from Riverside went to Brunei for collecting trip, a cotton picker from North Carolina decided to spend his time with a newly borne kid, the old Canadian proctoman decided to go for collecting trip as well.

But it was also amazing to read some posters about beetles damaging pastures in marvelous mountains of Zagross and about the population dynamics of alfalfa weevil (continuation about hymenopteran parasitoids in the next poster in four years, at the next hymenopterists meeting). Anyway, for general view it is good to know something about beetles as well, not only wasps ...

All together, the talks and posters at the meeting were great and useful for the wide range of interests and research foci of many hymenopterists attended the congress. Of course that listening to talks and checking posters was just a secondary or even tertiary activity for many participants—the main issue was drinking beer (wine) and watching soccer. Reminder for the next organizer: never organize such a meeting during any kind of world cup! But if so, than try to organize it in a small town, like Köszeg—than it is quite easy to find and collect people in the nearby tough pubs. Just one must to know that hymenopterists like and prefer those heavy-metal motherf*<bleep> pubs. Actually, all those pubs in Kőszeg are still closed, either for partial or total demolishing or for hyper profit they got during the 10 days of conference and thus the staff is still on Hawaii.

If the future organizer obtained and planning some "refreshments" for the post-congress events, such as collecting trips, than never propose even a glass for tasting before—for a hymenopterologist doesn't matter whether he is dealing with one liter or one hectoliter of wine—both quantities are nearly equal and would be consumed in a very short time.

Also try to avoid BBQs during the meeting, especially far away from the main venue, otherwise you will be faced with quite a hard task to collect people afterwards, during the night, in the forest. In Kőszeg we were happy and were able to rescue last missing guys till the next session in the morning.

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Post-congress collecting trips are great and welcomed by all participants. However, it must be quite a bizarre scene for an outsider observer: 100 or so crazy mad people running all over with sweeping nets, with switching onto a double-speed after the traditional Hungarian morning cup of Palinka (plum brandy), trampling the grass, breaking shrubs, digging for ants, collecting caterpillars for rearing, shaking trees and crying in unknown languages … furious. Once the organizer released them, than it is nearly impossible to collect those mad guys again. Thus, the organizer

must have something very attractive in his haversack, like a good fish soup or a delicious wild boar stew (of course, with some beer and an extra cup of palinka) – the only way one can get together again those mad people. And of course, for the organizer would be much better to avoid visiting the collecting site for the next three years till the devastated ecosystem will be somehow recovered.

If somebody would like to refresh memories from the congress—most welcome to visit… and download a documentary made by John Noyes! It is great!

I would like to express my great thanks to very many colleagues abroad and in Hungary who helped me with the organizing the congress, without whom it would be impossible to launch this meeting. They are so many that it will take too long for listing them—just thanks to all!

All together it was a nice party; it was nice to meet many colleagues again and meet new faces and hope to see you All at the next hymenopterists meeting held wherever it will be held! And it would be definitely much easier to be just a guest and not a host: it is much better to be a parasitoid than a host! ❖

Gall wasp jewelry

Elijah Talamas, The Ohio State University

At first glance this necklace (below) might appear to a typical piece of moose tooth jewelry. Look closely and you will see that hymenopteran elements are also involved. The dark brown beads (inset) are in fact the central chambers of galls formed by cynipoids. The chambers are already hollow and open on the end where the adult wasp emerged; a gentle push through the chamber with a small drill bit is all that is necessary to transform this structure into part of a good luck charm for your next wasp hunt! ❖

On a *Quercus* the young *Cynips* crawls,
in search of a green leaf for galls.
After goring this host,
she flies off to boast
of the tree with the biggest of balls!

—anonymous ISH member

Europe's only gregarious species of *Aleiodes* (Braconidae: Rogadinae)

By: Mark Shaw, National Museums of Scotland

Some of you who attended the 7th International Congress of our Society at Kőszeg, Hungary in June last year might have become aware that one of my objectives in attending was to obtain livestock of the gregarious *Aleiodes* parasitoid of *Cerura* and *Furcula* species (Notodontidae) that occurs in that area—indeed, several of you kindly looked for caterpillars or mummies of its hosts on my behalf. *Aleiodes* is a large genus of almost entirely solitary parasitoids of (mostly) macrolepidoptera, only this one and a North American relative being known to be gregarious, and I had long wanted to look into its abnormal biology.

Of course (as at the 2001 Kőszeg symposium), I couldn't find it myself, but Ika Österblad found a freshly formed *Furcula furcula* mummy on *Salix fragilis* at our first Fertö-Hanság National Park stop (at Nyirkai-Hany, on 26 June), and Jacek Hilszczański found a *Cerura vinula* mummy, also very freshly formed, on *Populus tremula* two days later at a small disused quarry at Cák, near Kőszeg,

The mummy found by Ika in Hungary, photographed after the adults had emerged.

The defensive behaviour of the host, which can delay successful attack for several hours.

Oviposition into the temporarily paralysed host.

Newly emerged males waiting on the mummy for the emergence of the females (being genetically identical evidently dispels aggression).

to which István Mikó had taken us. Both Ika and Jacek very kindly gave the mummies to me: from the *Furcula* one a brood of 14 females 4 males *Aleiodes* duly emerged just as I was about to travel home, but unfortunately the somewhat larger brood in the *Cerura* larva had been totally hyperparasitised, producing just 19 females 5 males of a *Mesochorus* species about 3 weeks later.

The adults from the *Furcula* mummy mated readily, and back in Edinburgh I was able to record the rather remarkable behavioural and developmental characteristics of this species in the course of getting several ovipositions into young larvae of *Furcula bifida*. Adults hatched from the resulting mummies in early autumn, and currently I have a large number of females overwintering to await the young *Cerura* larvae that I hope to offer them in spring – one aim being to see whether the very large (*ca* 50) broods sometimes reared from *Cerura* are the progeny of more than one female. Overwintering in the adult stage occurs widely in this species-group, and I have sometimes kept (well-fed!) adults alive for more than a year without refrigeration.

The name of this species may be *A. pallescens* Hellén, but with some reservation: (i) That species was described

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from non-reared material collected in Finland, and the only rearings of the gregarious species from *Cerura* and *Furcula* that I know of have been in south-central Europe and the Mediterranean; and (ii) the gregarious species (and *A. pallescens*, if it is not the same) belongs to a species group (the other members of which are solitary) in which determination of non-reared material is very difficult. For this reason it would be great if Finnish entomologists, especially in the south of that country, could try to find this gregarious parasitoid of *Cerura* and *Furcula* somewhere reasonably near to the type locality of *A. pallescens*. ❖

White Whale Wasps I. The unknown female of *Odontophotopsis pudica* (Mutillidae)

By: Kevin A. Williams, Utah State University

Although I have an insatiable bloodlust (hemolymph-lust?) for all velvet ants, some species elude me long enough to bring out my inner Captain Ahab. Near my aunt's house in Weed, California, there is a small dusty flat area about the size of a football field. I first collected there on July 9, 2002, where I found *Dasymutilla coccineohirta* and males of the rare *Odontophotopsis pudica*. Over the next few years, I was able to collect both sexes of three additional species: *D. aureola*, *D. californica*, and *Sphaeropthalma unicolor.* The unknown female of *O. pudica* eluded me; I couldn't know what she would look like, except that she would probably be small and brown (like every other nocturnal female mutillid).

Members of the genera *Sphaeropthalma* and *Odontophotopsis* are typically nocturnal in habit. In the mountains of Siskiyou County, however, specimens of *O. pudica* and *S. unicolor* were found before nightfall. In my earlier collecting, numerous males and females of *S. unicolor* and males of *O. pudica* were collected in the roughly one hour interval between sunset and full darkness. For eight years, I visited my aunt at least once each summer in pursuit of the unknown *O. pudica* female. I waited diligently until the late afternoon and trod the dusty flat until the sun retired. Empty-handed, I would then walk back to the house after dark, thoroughly dejected.

Half a year ago, August 15, 2010, I finally collected females of *O. pudica*. Five of these small wasps died by my hand, possibly representing the only curated female specimens. This August, *S. unicolor* and *O. pudica* specimens were both found after dark, even though all previous specimens were found at dusk. These wasps may have been active later in the day because of the abnormally high temperatures that week. Global climate change isn't entirely horrible.

My advisor, James Pitts, has reservations about the generic placement of *O. pudica* and recent phylogenetic studies have shown it to be more closely related to the genus *Photomorphus*. This new-found female looks nothing like any *Odontophotopsis* females, supporting the phylogenetic results. In North America, only 20 of the estimated

Sphaeropthalma arnalduri male.

Odontophotopsis pudica female.

350 nocturnal mutillid species are known from both sexes. Discovering new sex associations will be vital for developing useable classification schemes.

After collecting this female, I need a new White Whale to chase. Right now I'm leaning toward *Sphaeropthalma arnalduri*, an apterous male mutillid known from only 10 specimens that were collected with pitfall traps in Owens Lake Valley, California over 40 years ago. If anybody else has good White Whale stories, chronicling either elation or depression (or both), please submit them for the next edition of *Hamuli*. ❖

How to make a simple photoeclector, anywhere!

By: Elijah Talamas, The Ohio State University

All you need to build a simple photoeclector is a box, two bottles, a roll of tape and a sharp knife. Preferably, one of the bottles is taller than the box, the other bottle is rather small, as in Fig. 1, and the box is in good condition.

First, tape the box closed, and be sure to tape down the interior so that none of the inside flaps will interfere with movement of insects. Second, slice off one corner of the box, leaving a slot approximately 2 cm wide (Fig. 2, A);

Fig. 1. Materials for photoeclector.

this is where both flying and crawling insects can exit the box. Next, cut a hole on the top of the box that can be opened and closed (Fig. 2, B); this is where you empty the contents of your sweep net into the box. Hint: a piece of tape can make a simple handle for this door. Now cut a rectangle from the side of the larger bottle that is the same height as the box with a width of ~1/4 of the bottle's circumference. This bottle will now fit nicely onto the slot on the corner of the box where it should be securely taped, being careful to seal any openings where insects might escape. The smaller bottle will contain ethanol to kill the insects. To attach it, make a bottle connector by cutting out the tops of the bottle caps and taping the threaded sides together (Fig. 2, C).

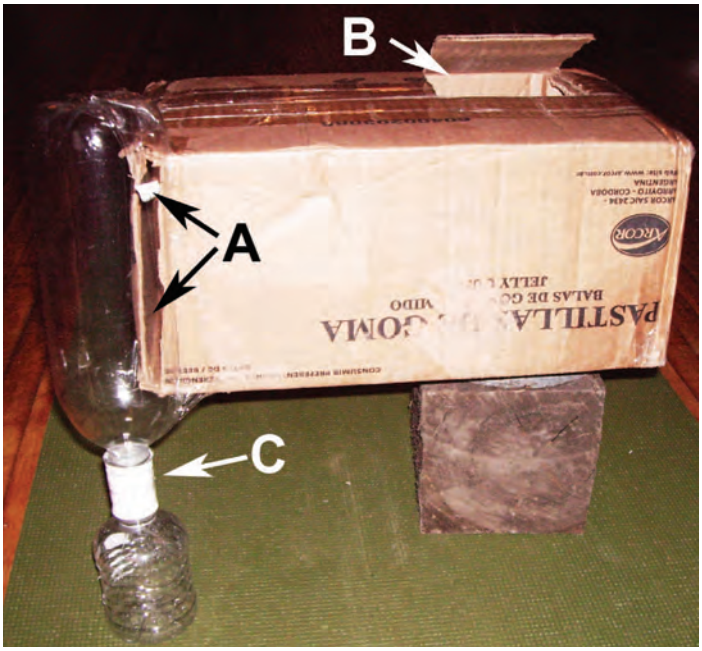

Fig. 2. Completed photoeclector.

Now you can easily remove and replace the lower bottle. The lower bottle extends below the bottom of the box, so the photoeclector will need to rest on the edge of a raised surface while is use. Happy collecting! ❖

Sampling wasps in the cloud forests of Ecuador: Where the Wild Things Are

Scott R. Shaw, University of Wyoming Insect Museum

Last June, for two weeks, we set out for the remote cloud forests of eastern Ecuador, where the real "wild things" are. My goal: to seek and discover new species of parasitoid wasps and to gain a better understanding of their ecological roles in this biologically-complex misty forest. Accompanying me on this wet and muddy adventure were 19 people: botany professor Greg Brown, one graduate assistant, 15 undergraduate students, and two public school science teachers. Together we set out on a voyage of learning and discovery in the cloud-shrouded forested-slopes of the eastern Andes Mountains.

My research in Ecuador, currently funded for three years by the National Science Foundation (NSF), centers on the

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CAPEA project: Caterpillars and Parasitoids of the Eastern Andes. CAPEA is an ongoing, long-term research project dedicated to the inventory of caterpillars, and discovery of information about their life history, food plants and their parasitoids. The goal of CAPEA is to survey and inventory a diverse Ecuadorian community of caterpillars and their associated parasitoids (mostly wasps and flies). We also aim to sample specimens for museum research and gather natural history data documenting plant-caterpillar-parasitoid relationships, development rates, and other life cycle information. CAPEA is a multi-university collaborative project involving several scientists at different institutions. My particular role in CAPEA is to study the diverse microscopic wasps that emerge from many of the caterpillars.

Ecuador is at the edge of the "biological frontier" when it comes to our understanding of tropical plants, insects, and their ecological interactions. On the slopes of the

equatorial Andes, home for many unique and still-undiscovered species, most plants and insects remain poorly studied. Our study site is the Yanayacu Biological Station (YBS), located at 2200 meters elevation in the Quijos Valley, Napo Province, in the Andes Mountains of northeastern Ecuador. Yanayacu is situated just barely south of the equator (00°35.9'S, 77°53.4'W) in one of the world's

last remaining unexplored swathes of high-elevation cloud forest (www.yanayacu.org). The lichen and moss-covered trees are virtually teeming with mysterious and undiscovered life forms.

Discovering such new organisms is in some ways more challenging than finding "a needle in a haystack"—the forest is vast and uncharted, and the microscopic insects we are searching for may be no larger than the lead at the tip of a pencil. We are assisted in the search by a research

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Where did the wasps and bees go? Notes on decreasing Aculeata in Hong Kong

By: Christophe Barthélémy, Sai Kung Country Park, Hong Kong

Not so long ago I received a circular email send by Christo Starr describing how he noticed that various Polistine wasps were less abundant or even had disappeared from one of his usual "hunting grounds." This prompted responses from biologists all over the world who generally noticed a similar trend in the abundance of social vespids. Casual observation and records have shown a similar phenomenon in Hong Kong. Indeed my garden used to be host to 18 of the 25 species of the local social wasps. However, in the past few years some have totally disappeared, while the numbers for others have reduced drastically. Additionally, figures obtained with a resident Malaise trap (set in my garden) confirmed this trend. The Malaise trap was set in my garden and orientated to the south-east. The garden is a piece of reclaimed land on an old and disused *Citrus* spp. orchard at the fringes of a mature secondary forest. The trap was first set in February 2004 and left *in situ* up to now. There were four interruptions during this period, the first from end of June 2004 to mid September 2004, the second from mid October 2004 to mid April 2005, the third from mid June 2005 to the third week of June 2008 and the last one from mid July 2010 to end of August 2010. I collected the sampling bottle on an irregular basis, with trapping periods lasting from one week to several months depending on the season.

I sorted the species in 16 families and two un-identified groups, namely: Vespidae, Pompilidae, Sapygidae, Scoliidae, Mutillidae, Sphecidae, Crabronidae, Ampulicidae, Apidae, Anthophoridae, Halictidae, Colletidae, Chrysididae, Bethylidae, Tiphiidae, unidentified Apiformes and Unidentified Spheciformes. By dividing the total number of specimens by the number of days the sampling bottle was up I obtained an average daily catch which was then computed into the graph. Similarly, by dividing the number of families caught by the same number of days I obtained a "diversity" ratio, also computed into the graph (Fig. 1). For clarity purposes this ratio is timed by 10 on the graph.

The graph clearly shows that in Hong Kong the peak activity for Aculeata is around mid May both in terms of numbers caught and diversity, with a secondary peak in July. In May 2004 the average daily number of specimens caught was around 11, in May 2005 it was about six, in May 2009 it was about five and it dropped to less than four

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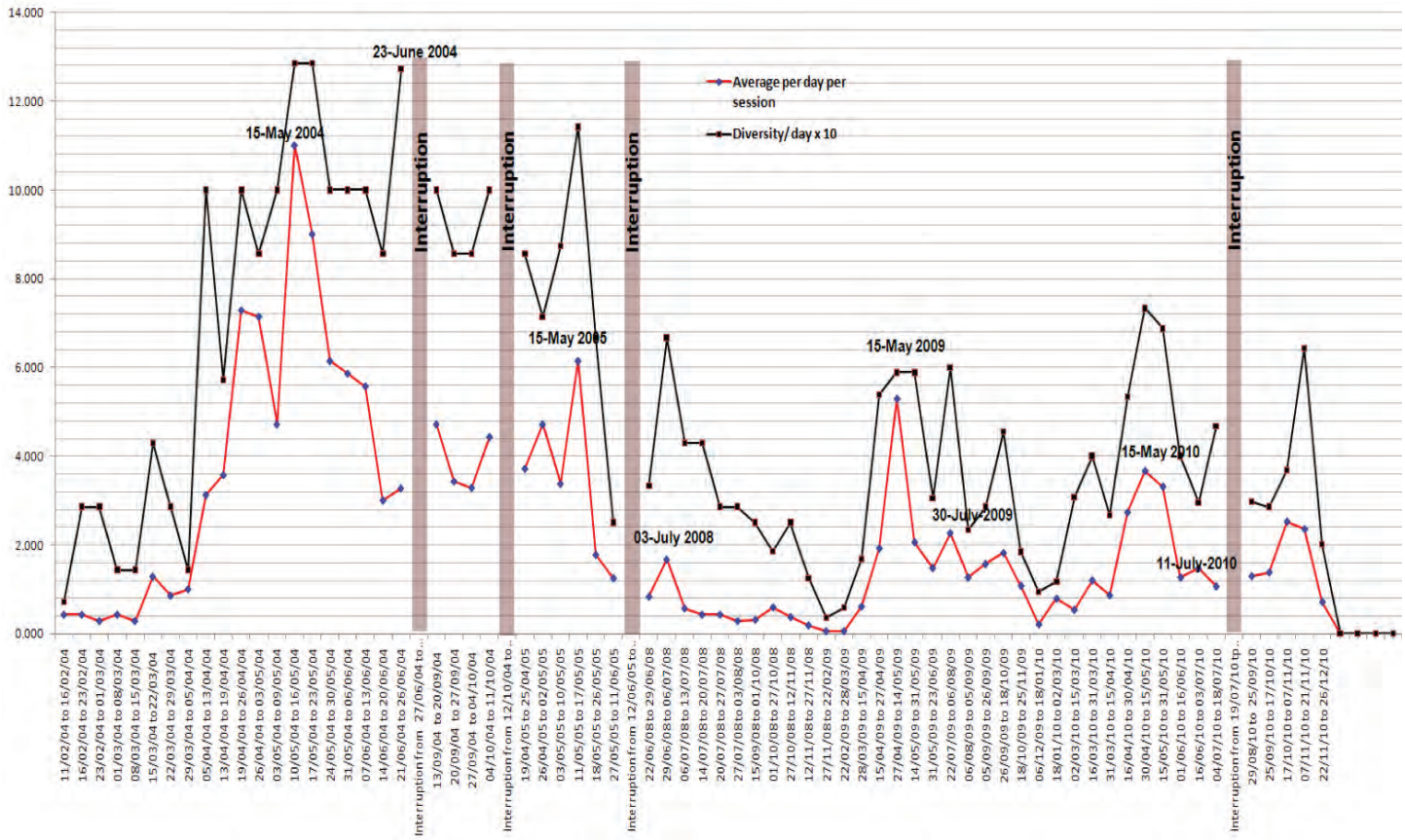

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in May 2010. The diversity ratio follows more or less the same trend at 1.3 the first year, 1.1 the second year, 0.6 the third year and 0.7 the last year.

It could be argued that this decrease in numbers is a consequence of the destructive nature of the resident trap. However, the long interruption between June 2005 and June 2008 did not show any recovery of either species or diversity and the numbers for May 2009 are lower than those for May 2005. One exception being May 2010 where the diversity ratio was around 0.7, higher than in May 2009 where it stood at less than 0.6, but the average daily number of specimens was lower than the previous year.

The mean yearly temperatures have not substantially changed since 2004, nor has the mean humidity levels as shown in Fig. 2 (graph derived from the values given by the Hong Kong Observatory. For clarity purposes the relative humidity values have been divided by five and the rainfall values by 100). However, rainfall has been fluctuating substantially but these variations do not correlate with the downward trend of Aculeata numbers caught in the Malaise trap. No pesticides have been used in the area for the past 30 years.

Many hypotheses could be put forward to explain this reduction in numbers and diversity, such as an increase in air pollutants, the spread of viral or fungal activity or even an increase in parasitism, but to confirm or infirm this, one would require substantial detailed analyses of the biology of Aculeata and of the environmental factors in Hong Kong, work that has yet to be completed.

For the time being this will remain unexplained, and hopefully it is just a periodical phenomenon. My trap will remain set and additional data will give us a more precise picture of what is really happening. ❖

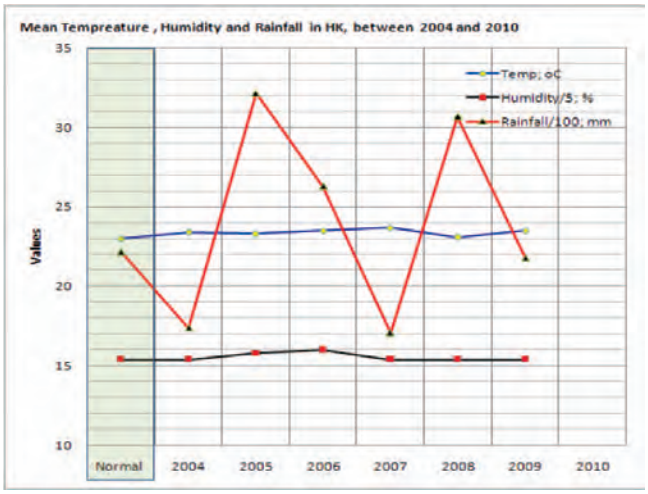

Fig. 2. Mean temperature, humidity and rainfall in Hong Kong between 2004 and 2010

Digitization of the Hymenoptera collection at the Zoological Museum, University of Turku, Finland

By: Ilari E. Sääksjärvi, Anssi Teräs (Åbo Akademi University), Riikka Elo, Liisa Puhakka, Veikko Rinne & Jukka Salmela, Department of Biology, University of Turku, Finland

The Zoological Museum of the University of Turku (ZMUT) holds the second largest natural history collection in Finland. The first major zoological collections of the museum were purchased by Turun Suomalainen Yliopistoseura (Turku Finnish University Society) during 1920–1921. These specimens form the basis of the museum's scientific collections. In addition, ZMUT holds some older collections, e.g. those of J.R. Sahlberg, which originally belonged to the Royal Academy of Turku (established in 1640). Unfortunately, most of the older collections were destroyed in the Great Fire of Turku in 1827.

At present, scientific collections of the museum include approximately 3.5 million zoological samples and especially the spider, soil arthropod, beetle, butterfly and moth, true bug, sawfly and parasitoid wasp collections include much unique material from all over the world. In addition, the zoological collections of the Åbo Akademi University (ZMAA) are currently deposited at ZMUT. These collections are curated and researched in collaboration and include approximately 200,000 zoological samples (below). The current research projects of the museum focus especially on the diversity, taxonomy and systematics of

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Besides of new material, the ZMUT collection includes some interesting old Hymenoptera collections. This drawer is from the Runar Forsius collection and includes gigantic *Pepsis* species.

The digitization of the natural history collections of the Zoological Museums of the University of Turku and Åbo Akademi University was initiated by photographing the Runar Forsius' collection type specimens. Photographs taken of each individual are based on the characteristics of the species group in question. These figures illustrate a partial set for a sawfly specimen (*Tenthredo angustiannulata* Malaise, 1945). Additional images taken but not pictured: wing and ovipositor.

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Holarctic, Neotropical (especially Amazonian) and Indo-Australian arthropods. Most of the current research emphasis of the staff is focused on little-known arthropods, especially Ichneumonidae parasitoid wasps, spiders, soil mites and true bugs.

The museum's type collections (together with the type collections of ZMAA) include a large number of type specimens. The type collections are of interest to Hymenoptera researchers as the museum holds some important older Hymenoptera collections (*e.g.* the collection of Runar Forsius, see below). Also, the private Ichneumonidae collection of Reijo Jussila is located in Turku and part of it is deposited at ZMUT. Plans have been made for its rapid digitization and data basing.

In 2010, the museum started the digital imaging and data basing of type specimens and entomological notebooks. The current project is funded by the Finnish Ministry of Education, and includes three full-time technicians working on the digitization of the collections. The main aim of the current project is to make the type collection available for the entomological community. At present, we are planning a new internet portal for proper presentation of the specimens in close collaboration with the Herbarium of the University of Turku.

During the initiation of the project the main emphasis is on the digitization of the museum's Hymenoptera collection. For example, the large Hymenoptera collection of Runar Forsius (1884–1935) includes a large number of type specimens. Forsius was a medical doctor by profession but gained reputation as an amateur entomologist interested especially on sawflies (left). He collected a large private collection of Hymenoptera and identified a lot of material collected by other researchers. His collection was one of the largest private collections of Hymenoptera and contained species from all over the world. In addition to the material collected by Forsius, his collection also includes a large number of specimens collected by other entomologists, *e.g.* those collected by René Edmond Malaise (1892–1978). In fact, Forsius based many of his *c.* 120 scientific publications on specimens collected by other entomologists. Many foreign researchers and institutions sent material to Forsius for identification, among them *e.g.* the British Museum.

Most of Forsius' publications deal with sawflies, and their geographical scope is wide. Among other subjects, he published interesting early faunistic and taxonomic studies on Afrotropical (*e.g.* Forsius 1919, 1928b, 1930, 1933, 1934), Australian (Forsius 1929a) and Oriental species (*e.g.* Forsius 1925, 1928a, 1929b, 1931). A larger study

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on the Forsius collection, including a list of the types and publications is currently in preparation by Teräs *et al*.

Layer photos of the types are taken using an Olympus SZX16 stereomicroscope attached to an Olympus E520 digital camera. The photos are captured using the programmes Deep Focus 3.1 and Quick PHOTO CAMERA 2.3, and combined using the programme Combine ZP. The range of magnification used for the photos is 7x-115x. The type specimens are mainly photographed from the side and from above, and also additional photos of *e.g.* the head, wing and antenna are taken. ❖

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There is a rainbow hidden in wings of small Hymenoptera

By: Christer Hansson, Department of Entomology, the Natural History Museum, London, UK; Ekaterina Shevtsova, Department of Biology, Lund University, Sweden

On the 7th International Congress of Hymenopterists in Kőszeg we had the great pleasure to present wing interference patterns (WIPs), a new discovery in the wings of small Hymenoptera that is also applicable to other groups of (small) insects with transparent wings. The talk was received with great interest from the audience. After the presentation and during the poster session we got many questions and encouraging comments from our fellow hymenopterists. At the time of our talk nothing was published about WIPs, but we had a manuscript in the submission process by then. This manuscript is now published in the *Proceedings of the National Academy of Sciences, USA*, and the article "Stable structural color patterns displayed on transparent insect wings", by Ekaterina Shevtsova, Christer Hansson, Daniel Janzen, and Jostein Kjærandsen can be downloaded as a PDF (http://dx.doi.org/10.1073/pnas.1017393108). Those interested (which we hope will be many!) can read this for a detailed account of this newly discovered character system, but if you want a shorter version, here goes.

Insects with thin and transparent wings (*e.g.* small Hymenoptera and Diptera) display bright structural colour patterns on their wings if these are held against a dark background. The colours are the effect of interference of refracted light beams, and areas of different thickness of the wing produce different interference colours. The extremely thin wing membranes are highly microstructured and have a distinct topography with hills, valleys, plains, etc. and these features together with venation and pigmentation produce diverse colourful wing patterns. These patterns are clearly visible in dead and dry insects as well as in living against a dark background, and are also visible against, *e.g.* a green leaf. They are very faint against a white background and disappear completely if the wings are placed in any embedding or oily medium. In nature they are as distinct as the colour patterns on butterfly

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Fig. 1. The encyrtid *Metaphycus* sp. (Chalcidoidea) has non-pigmented and seemingly colourless wings, but seen against a dark background the rainbow hidden in the wings suddenly appears. Photo Ekaterina Shevtsova.

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wings, given the necessary light and background conditions—which some of the photos in our publication show. We therefore assume that they are exposed to the same selection forces as butterfly wings.

Some species of tiny parasitic wasps with clear and non-pigmented wings display sexually dimorphic WIPs. In our *PNAS* publication we show wings of two species of *Achrysocharoides* (Eulophidae), where males have distinct species-specific interference patterns, whereas the female patterns are similar between species. This suggests that sexual selection is one of the driving forces for the evolution of these patterns.

Our initial findings suggest that WIPs are potential tools in several research fields and we look forward to seeing more exciting wing patterns from many groups of Hymenoptera. It is our hope that other scientists will find our discovery as useful and exciting as we do.

Anyone eager to see more pictures of WIPs please visit our website (www.wipbarcode.com). ❖

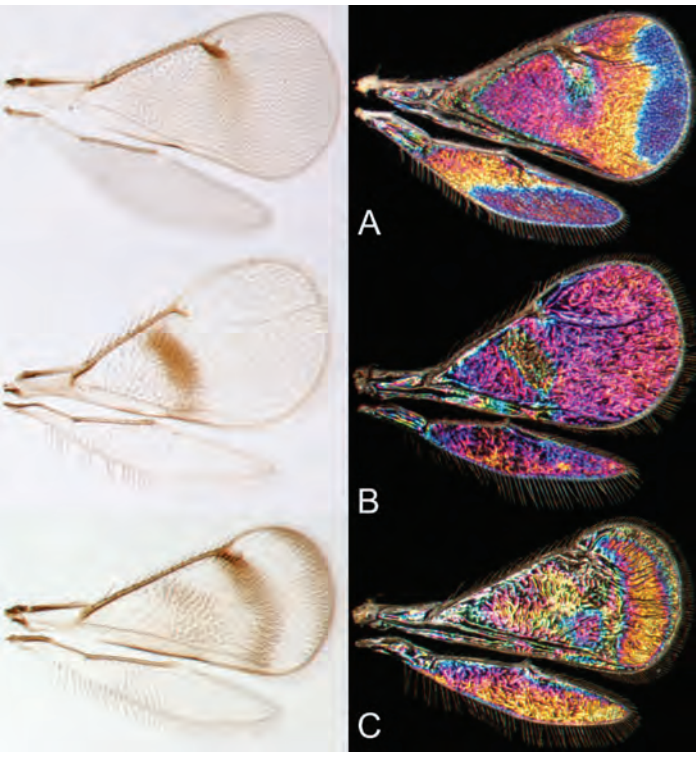

Fig. 2. Three examples of how we are used to see wings to the left, and to the right how the same wings appear against a dark background. The species are all Eulophidae (Chalcidoidea), from top to bottom: *Neochrysocharis formosa*, *Asecodes reticulatum*, *Closterocerus trifasciatus*. Photo Ekaterina Shevtsova.

Don't forget to *RENEW* your ISH membership for 2011!

Collecting Bears… or The Life and Death of a Malaise Trap

By: Marla Schwarzfeld, Department of Biological Sciences, University of Alberta, Edmonton, Canada

Preamble

It often happens in science that the most well-laid plans or experiments don't work out quite as the researcher intended. However, in many of these cases, opportunities arise to investigate an entirely unanticipated research question. At this point, the prudent researcher rewrites the introduction/methods section of the ensuing manuscript, to give the impression that this is what they had in mind all along…

Introduction

Black bears (*Ursus americanus shzitdisturbor*) are ubiquitous in Canada's boreal forest ecosystems. Due to their ecological importance and large, furry, rotund demeanor, they have been the subject of many studies, mostly through techniques such as hair-snag traps, scat surveys, radio-collaring, wrestling, etc. However the practicality of assessing black bear seasonality and behaviour through the use of Malaise traps has yet to be investigated.

Methods (or How to Catch Bears Instead of Bugs)

1. Decide on a lovely balanced experimental design. Choose Malaise trap sites with great care and set up traps.
2. Go away for a week or so.
3. Return to site. Pick trap up off the ground and record bear damage. Salvage insect sample if possible. Repair trap with duct tape, staples, string, or needle and thread (mosquito repellent is recommended for extended periods of field-sewing). If necessary, replace with new trap.
4. Go away again, and watch reruns of "Mork & Mindy" while spending hours sewing up ripped traps.
5. Repeat from Step 3.

Results and Discussion (or Not All Bears Are Equal)

A variety of complicated statistical analyses found that black bears can be divided into three discrete groups, as follows:

The Curious Bear: This bear is most common early in the season, but makes occasional appearances throughout the summer. It appears to have no real interest in the contents of the Malaise trap. Rather it is excited to have found a new toy, and enjoys ripping, biting and tearing down

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traps, occasionally knocking down associated saplings. This is the bear most likely to result in a complete lack of an insect sample.

The Alcoholic Bear: This is a wiser, more efficient bear, most commonly observed later in the season. It has learned that the nectar of the gods is located in the collecting head of a Malaise trap. It obtains the alcohol by repeatedly biting the collecting head and then meanders off into the woods with all the grace of an inebriated 300 kg tardigrade. Insect samples from these traps can be essentially complete, but the lack of a quick death means most specimens will have a leg/antenna of a neighboring specimen permanently clamped in their mandibles.

The Friendly Bear: This is a well-intentioned, responsible, sober bear. It leaves a few small bite marks, or a slight claw slash, just enough to let you know it was there, before carrying on its way to do whatever it is bears do. Basically, it's just saying "what's up, hominids?"

Conclusions

To my knowledge, this is the first study to successfully categorize bear behaviour using Malaise traps as bait. Future research may include modifying the traps to make them even more attractive to bears (cherry vodka in lieu of ethanol?), while reducing all those pesky bugs that keep getting in there. Incidentally, despite my best intentions, many traps did collect bugs instead of bears … if anyone is interested in residue material from Alberta's boreal forest, please contact me! ❖

In the field *Ursinus* surveys
a distant, defenseless Malaise
mmmmm ... insect stew!
(major shreddings ensue)
the *whole transect* then catches his gaze ...

Sample upon sample consumed,
the bear doesn't know that he's doomed—
to vomit all day
that fermented puree
Will he do it again? Yes, that's assumed.

—anonymous ISH member

Five stings in one day

By: Chris Starr, University of the West Indies

The local *Athens Observer* newspaper in Georgia carried a story one day about one of its reporters who had received about 30 stings from a colony of yellowjackets and was rushed unconscious to the hospital. When he came around, he asked the doctor how close he had come, and the doctor just showed him his EKG and pointed to a flat-line area.

Well, that struck me as just a bit far-fetched. A healthy person couldn't really die from just 30 stings, could he? But the very next day I was in the field, working with my paper wasps, and happened to get five stings over the course of about an hour. With that fifth sting, I could feel my heart starting to beat irregularly. So I quit work for the day and never did find out what six stings could do to me. (excerpted from *Like a Magpie: A Sort of an Autobiography*, available at ckstarr.net) ❖

2010 Project Report – Hymenoptera Survey of Gunung Mulu National Park, Sarawak

By: Chris Darling, Royal Ontario Museum (ROM)

About a year ago in *Skaphion*, the newsletter of the Platygastroidea Planetary Biodiversity Inventory project, I reported on the initiation of an insect sampling program at Gunung Mulu NP (Volume 4(3)). The primary focus of the sampling program was Platygastroidea and Chalcidoidea, but of course there were a lot of collateral specimens collected. To briefly summarize, in October 2009 Norm Johnson (Ohio State University) and I established a series of 16 Malaise and SLAM traps (see http://bugdorm.megaview.com.tw) in a variety of habitats at the park; ran yellow pan traps at most of these localities; and arranged with the park management to continue running the Malaise and SLAM traps, to pan trap on a monthly basis for the upcoming year, and to sort the samples (for more details see http://bit.ly/i6tRaD (PDF)). In addition, the first samples of parasitic Hymenoptera were brought to the Royal Ontario Museum in December 2009 under the aegis of research and export permits issued by the Sarawak Forestry Department.

The main in-country goals of the project for 2010 were to 1) continue the sampling programme, with monthly collections from the Malaise/SLAM traps, 2) to pan trap in most localities for 2-day periods every month, and to 3) clean and fraction the samples and to remove all Hymenoptera (except ants!) from both the coarse and fine fractions. These activities were coordinated by Ellen MacArthur, a park employee who was contracted to work half-time for the PBI project in 2010. At the ROM, we began sorting the samples to broad taxonomic groups, with priority given to the Platygastroidea. Without going into the gory details, suffice it to say that most of the larger Aculeata were pinned or pointed, and the following taxa were sorted and stored in ethanol: Ichneumonoidea (there are way too many of the these!), Chalcidoidea, Cynipoidea, Platygastroidea + Proctotrupoidea + Ceraphronoidea, Evaniidae, and small Aculeata (mainly Chrysidoidea). I am confident that these specimens will eventually be available for study but we are currently encumbered by the rather restrictive terms of the export permits. Sarawak Forestry seems very open to discussing mutually beneficial arrangements for the study and final disposition of specimens. And Sarawak Forestry has also indicated that they will provide permits for the export of the "residue" samples (viz. with the Hymenoptera removed) so there should be specimens of non-hamulate Insecta available for study in the not-to-distant future.

I returned to Sarawak in August to resupply the project, to help with the sorting and sampling, to prepare a progress report for Sarawak Forestry and to request additional export permits for Hymenoptera and finally, to hand-carry the next set of samples to the ROM. August is the height of the dry(er) season at Mulu and I had hoped to augment the collections with some sweep samples. During my 50 days in the park from October to December 2009 there was not a single opportunity to sweep! It rained virtually every afternoon and the vegetation never dried out enough in the mornings. I guess that is what is to be expected in a place that receives about 5 meters of rain a year! Well, it turned out to be a rather rainy August as the figure below demonstrates. Needless to say, the sweep net did not get a good workout! On the positive side, this does justify using passive means of collecting, *i.e.*, traps, in these persistently damp to wet tropical forests. Not too surprisingly given the weather, the Malaise trap samples are not that large but again on the positive side that meant that the traps could be run for a full month, or longer, without having to change the collecting bottle. But of course what most of us are interested in is diversity rather than abundance!

On a procedural note, I have become increasingly concerned about transporting collections preserved in ethanol on airlines because of issues related to flammability. A number of colleagues refuse to bring specimens in their luggage, preferring to have them shipped by mail or courier, which is not really practical from Sarawak and even if it was it would entail some risk of loss. We recently had issues of flammability when we wanted to display alcohol-preserved specimens—jars of fishes, frogs and

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pickled bats—in the ROM galleries. The solution was to use a commercial preservative that was non-flammable, Glydant or DMDM Hydantoin (http://en.wikipedia.org/wiki/DMDM_hydantoin) in the public galleries. After some experiments at the ROM, I decided to use Glydant for transporting the specimens that I brought back from Mulu in August. I simply decanted about ½ of the approx. 80% ethanol in the Whirlpacs and replaced this with 10% Glydant prior to shipment. The resultant mixture was non-flammable and on return to the ROM (elapsed time approx. 1 week) the specimens were transferred back to 80% ethanol. The specimens appear to be fine and many large and small specimens have been mounted and compared with those that were not transferred to Glydant. To those of you with a more perverse bent, we have yet to try to recover DNA from these specimens, but this should be possible based on the published literature (references available on request).

Currently, at the ROM we have the Hymenoptera from 137 samples from this sampling program, 65 Malaise/SLAM trap samples and 72 pan trap samples. These represent 58% and 89%, respectively, of the samples collected by mid-August, or about 6 months worth of Malaise/SLAM samples and 9 months of pan trap samples. The following table will give you some idea of the distribution of specimens among major groups for a few of these samples (n=9): ACUL, Aculeata - ants; EVAN, Evaniidae (OK, it is not a major group!); PPC, Proctotrupoidea, Platygastroidea, Ceraphronoidea (perhaps not even a group); CHAL, Chalcidoidea; CYNIP, Cynipoidea; ICH, Ichneumonoidea.

Type	Duration	ACUL	EVAN	PPC	CHAL	CYNIP	ICH
Malaise	1 month	90	5	272	65	41	310
Malaise	1 month	180	20	570	120	60	~600
Malaise	1 month	57	7	246	70	28	283
SLAM	1 month	16	1	222	40	5	70
SLAM	2 months	25	2	165	40	12	~150
YPT	50x2 days	13	0	26	30	1	60
YPT	50x2 days	2	0	30	20	0	10
YPT	50x2 days	2	0	50	50	0	10
YPT	50x2 days	25	2	20	25	2	20
Ontario MT	~ 1 month	93	0	279	198	60	273

These data do confirm two of my general observations about the sampling programme: 1) the Malaise traps outperform the SLAM traps and 2) PPC are much more abundant than CHAL (very sad!). In addition, my general impression has been that parasitic Hymenoptera were not all that abundant in the monthly MT and SLAM samples. However, a quick comparison with some Malaise trap

samples collected in Ontario (Darling and Packer, 1988. *Can. Ent.* 120:787-796) suggests that this may not be the case (last line in table above). But this is a very cursory analysis and more importantly, it is diversity that really interests most of us. I should note that one of the more interesting finds were a reasonable number of specimens

of Embolemidae, a family not currently represented in the ROM collection.

To date, all of the sampling sites established in 2009 are still active and the traps are holding up remarkably well to the heat and humidity. A few samples have been lost due

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to falling branches and flooding but the major problem has been with "rats" chewing through the collecting bottles at the higher elevations (1400 meters). Rather remarkably, only one trap has been stolen and only one trap has been vandalized (a mesh square cut out of the centre panel) in the approx. 150 trap-months of sampling.

We currently don't have a clear "exit strategy" from the sampling programme. The park is continuing to support the work both by providing staff time and space and given the vagaries of the weather (El Niño/La Niña effects are felt in the park) it seems like a good idea to continue the sampling programme for perhaps another 6 months! I will return to the park for 3 weeks in February/March, 2011

and will have a better idea of future plans at that time.

Needless to say, it is one of my highest priorities to get these, and other specimens that the ROM has collected in Southeast Asia, into the hands of interested taxonomists. I have already been in contact with some of you (which is why we have some data on Evaniidae!) and we will entertain requests to "fast track" taxa that are being actively studied. And yes, John, we are pulling out the bloody Eucharitidae for you! ❖

Lessons from field work with ants

By: Ann B. Mayo, University of Texas – Arlington

I am a graduate student studying the ecology of the seed harvesting ant, *Pogonomyrmex comanche* (Hymenoptera: Formicidae) in the tall grass prairie of North Central Texas. I am new to the study of ants and this is the first time I have taken on an intensive field project. I have found the methods and other information in the literature to sometimes lack helpful details. My naiveté has led me to some humorous experiences but also to some insights.

The Use of Pitfall Traps.—Last Spring, I took a seminar in Biodiversity and took on a project to assess the ant biodiversity in my study sites in Fort Worth, Texas. Although there are a variety of methods for collecting ants and some debate concerning which method or combination of methods is the best, pitfall traps seemed to be a good way to start. I set out 120 pitfall traps in two areas of the Fort Worth Nature Center and Refuge and began identifying ants. The pitfall traps consisted of two plastic cups (mouth diameter of 2 cm), one nested inside the other, set flush with the soil surface and with a plastic cover (to prevent debris and rain entering the cups and to reduce evaporation of the killing fluid) supported a few millimeters above the cup rim by nails. For the seminar project, I collected in March, April, and May 2010, finding few species in March and many more species and considerably more ants by May so I had some weak support for seasonality.

Based on this preliminary work, I decided to continue the pitfall trapping through the summer to establish the ant assemblage and if any particular ant species were dominant (of course, I thought *P. comanche* would be). I continued sampling once a month through the summer (continuing the sampling through this next Fall 2011).

Early on, I ran into a few problems: deer stepped on the traps, breaking them; raccoons pulled them up, moved them, ran off with them, and tore them apart; and other burrowing mammals pushed them out of the ground. You might imagine I spent some time wondering what happened to my traps.

The lesson for field ecologists, which is rarely emphasized in more general science education, is that out in the real world, controls are hard to come by. Nature reacts to what we do and has its own mission and nature's mission is not answering our questions. This combination of factors makes field methods more challenging than the literature often leads one to believe. So, learn to "think" like your research subject and its community: be prepared.

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In the summer I came up with the additional problem that pitfall traps, plastic ones anyway, melt in the prairie summer and the lids sometimes focused the sun's rays such as to burn a hole through one or even both cups. Mostly, this event just meant that the cups were misshapen but the holes meant missing samples or unequal sampling. This event also underlines what we know and so often do not take account: thermal ecology matters, both in the employment of field methods and to the activity of the ants.

Collecting Ants with an Aspirator.—The aspirator, another easy and often used technique, is a very handy way to collect many ants quickly. I have three areas in the Fort Worth Nature Center, Fort Worth, Texas where my study species, *P. comanche*, is nesting. One area is separated from the other two by 800 meters of post oak forest. I have another population of *P. comanche* in Arlington, Texas. The geographic relationships among these colonies raise many questions: How are these populations related genetically? Do the ants in the different areas of the Fort Worth Nature Center constitute different populations, a metapopulation, or the same population? Do they use the same lek?

Based on these questions and because I was getting some basic population characteristics such as the number and locations of active nests, I mapped the nests and collected some ants for the possibility of DNA work. At each nest, I collected about 20–30 ants using an aspirator. Since *P. comanche* nests in very fine sandy soil, I aspirated a lot of sand and my throat became irritated. As I continued to get my samples, I aspirated a huge wad of sand which I spit out. Within a few seconds my tongue began to hurt. I had aspirated an ant and not just any ant, a *Pogonomyrmex* with some of the worst venom in Formicidae! I looked down the tube and there were five more ants coming up. I tore the aspirator apart and found that the screen covering the end of the tube, which is supposed to prevent this misadventure, had slipped and was hanging by a corner.

Other field work lessons.—Always check your equipment before use. Never, never aspirate the ants themselves. This is a mistake similar to the one Darwin made in grabbing a third beetle with one in each hand: he threw one into his mouth where it did something disgusting and he subsequently dropped all three. Tom Eisner (*For Love of Insects*) also talks about tasting insects to determine their chemicals but says he finally decided this was not a good idea.

Interestingly, the sting on my tongue was not nearly as painful nor long lasting as the stings I had gotten on my arms and legs which lasted 2-3 days, were red, swollen and hurt as though I had just been stung the whole time. Though *P. comanche* doesn't sting as readily as *P. barbatus*, the stings of *P. comanche* are much worse. It is reported that *P. maricopa* (which I have encountered in Big Bend National Park) has the most venomous sting of any ant. This is a dangerous genus. Another lesson here is know your genus and species and dress appropriately for ant work, as Deborah Gordon so readily details in *Ants at Work*.

Directionality in Foraging.—It has been unclear to me whether *P. comanche* uses a trunk trail or an individual, diffuse foraging strategy. Some days it looks decidedly one way and on other days, the other. They certainly set pheromone trails to bait stations of tuna and pecan sandies and fall in in a steady line until the bait is gone.

To try to figure out if they use a particular pattern, I monitored a nest by marking the point at which the foragers left the entrance and crater area with a brightly colored pebble. After a period of time, I measured the angles of the forager's path from the entrance to that pebble to analyze this for directionality. It was a particularly warm day and the ants were very active and moving fast. I set the markers and began recording the angles. As I went around the markers, I noticed a pebble very far from the nest. I knew I had not placed that marker there but it was near the bag of all the pebbles so I perhaps I had dropped it. Then I noticed more pebbles far from the entrance on the opposite side of the nest. These I could not have just dropped. They had been moved. As my eyes swung around the remaining markers I saw two patrollers with mandibles agape determinedly grappling with the markers and moving them, sometimes working singly, sometimes together. It was wonderful to see how they went at those obstructions (de-

The pebbles used to mark the forager's path: The pink are the pebbles I used as markers. The black thing is a meat thermometer I used to get internal nest temperature. The black dot in the center is the nest entrance.

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spite it ruined some of my data collection) because indeed this is what the pebbles were to the ants.

That the pebbles were obstructions became apparent as foragers leaving the nest moved quickly on a specific path. When the forager encountered a pebble, it was as though the forager literally ran into it – that is, ran right up to it and stopped abruptly as though this were totally unexpected and had not been seen or noticed by the ant until the last possible moment. Once they encountered the pebble, the forager either went immediately over it or around it but stayed on the exact same directional path and not just the same angle.

This is yet another lesson in the response of nature to

P. comanche forager

what I thought were simple ways to get at research questions. Despite the loss of a few data points, these events do yield some useful insights about ant communication and behavior. The patrollers removed pebbles but only off the crater and seemingly into less used or currently unused areas as far as the foragers were concerned. The pebbles were not removed merely to the edge of the crater nor did they appear to be in a middens pile or other specific area suggesting that such new or unusual obstructions are dealt with differently. The behavior of the foragers suggests that their orientation is set to a particular direction and, at least close to the nest entrance, they do not veer from that direction. Also, in avoiding an obstruction, the foragers immediately regain the exact, original direction. How they do so at this early point may be due to visual cues and yet they do not seem very visually aware in terms of noting and avoiding the obstruction in the first place (as though they had a message about the direction which did not include this obstruction). At some distance from the nest (½-1 meter), the foragers begin the more active searching phase noted by the typical behavioral changes to a slower pace and much turning.

All in all, it is quite apparent, that like many other organisms, *P. comanche* does not read the *American Naturalist* nor *Myrmecological News* nor any other journal. Unfortunately, I do. And all the brilliant articles myrmecologists have written haven't really prepared me for field work, though I hope they will aid me in the analysis of the data. Meanwhile, perhaps the stings of *P. comanche* will be more effective in motivating my research than my impending proposal defense. Wish me luck! Girl, am I gonna need it!

Any thoughts, suggestions, and such can be sent to me at amayo@uta.edu. Thanks so much. ❖

3 Hymenoptera Haiku

by Kobayashi Issa (1763-1828)

kakurega wo hachi mo oboete kaeru nari

secluded house—
the bees also memorize
the way back

deru ya ina mimizu wa ari ni hikare keri

just coming out
the earthworm dragged off
by ants

mitsu-bachi ya tonari ni kaseba arare-bachi

honeybees—
but right next door
hornets

Vapor coating parasitic wasps for scanning electron microscopy

Ana Dal Molin, Department of Entomology, and E. Ann Ellis and Michael W. Pendleton Microscopy & Imaging Center, Texas A&M University

Many of the structures we have to study, especially when dealing with minute parasitic Hymenoptera, can only be properly analyzed with the aid of an electron microscope. Samples for conventional scanning electron microscopy (SEM) must be dry and conductive. Sputter coating with gold or palladium/gold is a commonly utilized technique to achieve conductivity of the specimen for SEM. This conductivity provides a path to ground for those beam electrons that would otherwise produce a surface charge on the specimen, resulting in artifacts on the image such as halo effects, bright lines in the direction of the beam scan, or blurry edges. While sputter coating works well for thin flat specimens, this technique does not provide a good ground path for specimens which have hairs and jointed structures that cannot be coated over all their outer surfaces. During sputter coating, the metal particles are applied to the specimen primarily from the direction of the target (the gold or other metal to be coated) to the specimen, so surfaces of complicated specimens that do not face the target are not well coated. Various methods of moving and rotating the specimen during the sputter coating process can only somewhat compensate for this incomplete application of metal to the specimen. These coating imperfections can produce charging artifacts on images of the specimen. Attempts made to compensate for these imperfections by sputter coating a thick layer of metal to the specimens results in the loss of their original coloring and in some cases the loss of fine surface detail. Often the material is often considered “lost” or “destroyed” after this procedure, because the metal coating cannot be easily removed.

A low cost alternative to sputter coating is the forgotten methodology of vapor fixation and coating. Osmium tetroxide vapor was utilized for fixation studies of spermatogenesis in arthropods in 1884 [1] for light microscopy. In 1945 osmium vapor coating was used to fix tissue culture cells for observation by transmission electron microscopy [2]. Not only did the osmium vapors fix and stabilize tissue but evenly coated all of the surfaces of samples with a conductive metal in areas difficult to reach with sputtering or vacuum evaporation techniques.

For small and complex insect surfaces such as antennae sections or other articulated structures, this evenly applied conductive metal vapor coating provides a superb ground path which minimizes charging artifacts during observation using the SEM.

Fig. 1. Example of vapor-coating apparatus. 1, beaker or Erlenmeyer bottle with hot water; 2, bottle cap with coating metal; 3, stubs with specimens to be coated.

Our vapor coating procedure uses simple apparatus in a properly functioning fume hood with a flow rate of 100 ft/min. The apparatus (Fig. 1) consists of a glass (not plastic) Petri dish (top and bottom) or a glass Petri dish for a bottom and an appropriately sized glass beaker for a top to form a small container. Before coating begins, the samples (on stubs) are placed in the container bottom and the desired coating solution is added to the bottle cap near the samples. The top of the container is then placed over the bottom to form a vapor chamber during coating. A beaker of hot water is placed on top of this container to facilitate the coating process.

Either osmium tetroxide (OsO_4) or ruthenium tetroxide (RuO_4) solutions can be used to vapor coat specimens. A solution of 4% aqueous osmium tetroxide can be added directly to the bottle cap in the container bottom to which the top is added (along with the beaker of hot water) and then coating will usually be completed in about 15 minutes. Ruthenium tetroxide is prepared in the bottle cap within the container by adding 1 ml of 10% (wt/vol) sodium hypochlorite to 0.02g of ruthenium chloride. The resulting reaction in the cap is rapid so the top of the container should be applied quickly along with the beaker of

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Fig 2. Micrograph of *Thysanus ater* head following vapor coating with ruthenium using JEOL JSM-6400 SEM secondary detector, bar = 0.05 mm.

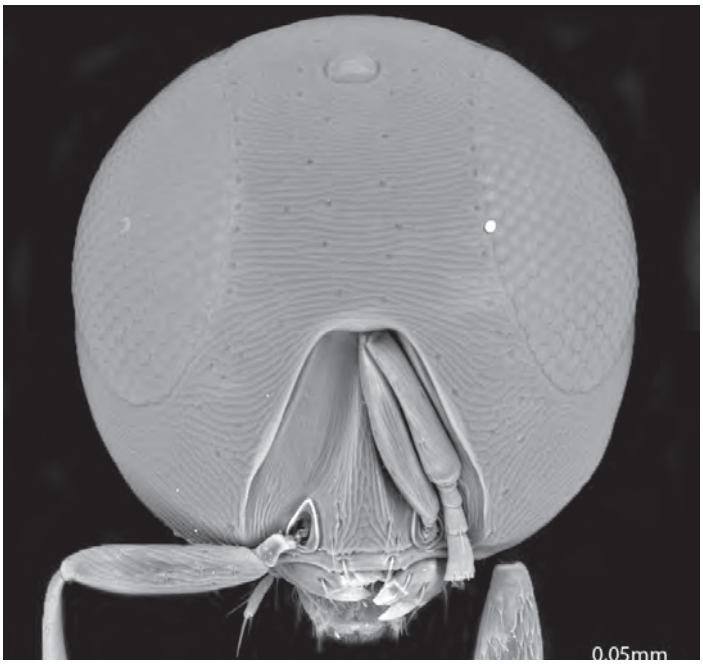

Fig 3. Micrograph of *Signiphora* sp. Head following vapor coating with ruthenium using Hitachi TM3000 "desktop" SEM with backscatter detector, bar = 0.05 mm.

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hot water to form the vapor chamber because coating will be completed within a few minutes (less than 5 minutes in the case of Signiphoridae and Aphelinidae). Both ruthenium chloride and sodium hypochlorite are available from Sigma-Aldrich, St. Louis, MO.

Although this process has been described for use with non-biological materials in a previous publication [3], this technique can produce good results for many biological specimens. For minute parasitic Hymenoptera, the image (Fig. 2) of the head of *Thysanus ater* demonstrates the structural detail achieved with ruthenium vapor coating using a secondary detector and the image (Fig. 3) of the head of *Signiphora* sp. also demonstrates the high resolution possible with ruthenium vapor coating using a backscatter detector. Note the ruthenium coating did not interfere with the detection of zinc in the mandibular teeth.

Ruthenium or osmium vapor coating offers advantages compared to sputter coating because the vapor coating equipment costs far less (in microscopy centers, osmium tetroxide and ruthenium tetroxide are common leftovers from TEM preparations), it is relatively fast, produces an even coating over the entire surface of the sample providing a better ground path for complex samples, and because it is a very fine coating, damage is reduced, especially when compared to sputter coating delicate specimens. Vapor coating will need to be re-applied to samples after a week or two because of oxidation, but the samples can be re-coated many times if needed. ❖

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Amazing wasps of Amazonia - are there ichneumonids in the tropics?

By: Ilari E. Sääksjärvi, Zoological Museum, Section of Biodiversity and Environmental Science, Department of Biology, University of Turku, Finland

As most hymenopterists know, the parasitoid wasp family Ichneumonidae is one of the largest animal families that have ever lived on Earth. Townes (1969) estimated that there might be about 60,000 species of ichneumonids. This figure was used by other researchers until Gauld (2000) proposed that the real size of the family could exceed 100,000 species. One of the main problems in estimating species richness of Ichneumonidae is our weak

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knowledge on the tropical components of this fascinating group of parasitoids. The aim of the present article is to describe shortly the work on tropical Ichneumonidae that is conducted at the University of Turku, Finland. This research was started in 1998 in close collaboration with Ian Gauld who was the supervisor of the author during his PhD studies. This project concentrated initially mainly on the subfamilies Pimplinae and Rhyssinae and resulted in a large collection of rain forest ichneumonids collected by Malaise trapping and the first study on the diversity of Amazonian Ichneumonidae (Sääksjärvi, 2003). The main results of the thesis were published as a series of scientific papers (Sääksjärvi *et al*. 2003, 2004a, 2004b, 2006).

We are continuing actively our work in the tropics. Nowadays, the team, which is based at the Zoological Museum, University of Turku, includes two PhD students and many undergraduates collaborating in different phases of the research. Both PhD students of the team are studying mainly Western Amazonian samples. Anu Veijalainen is concentrating on morphological and molecular identification of certain groups of Neotropical Ichneumonidae. Our Peruvian PhD student, Isrrael Gómez Avila, has just started a PhD study on multitrophic interactions between Amazonian caterpillars, parasitoids and hyperparasitoids. This is the first study of the team which will be based mainly on rearing data and contains components dealing with chemical ecology. Another Peruvian young researcher working in the team is Carol Castillo. She is concentrating especially on the diversity of Ichneumonidae in the Peruvian Andean and Amazonian interface. We are also working with canopy fogging samples collected by Terry Erwin. In addition to these study questions we continue the taxonomical projects in order to describe at least part of the species we are finding (for some recent taxonomical works of the team see *e.g*. Palacio *et al*. 2007, Gómez *et al.* 2009, Bordera *et al*. 2010, Broad *et al*. 2010). Research is done in collaboration especially with Santiago Bordera, Gavin Broad, Terry Erwin, Edgard Palacio, Juha-Pekka Salminen, Michael Sharkey and Niklas Wahlberg.

Our research team forms part of a larger group of researchers called The University of Turku Amazon Research Team (UTU-ART). It is a multidisciplinary research team with about 30 years of history/experience in Amazonian biology, geology and geography (see http://www.sci.utu.fi/sivustot/amazon/) and provides an ideal research environment for our team on Amazonian parasitoids. The early studies of UTU-ART showed that the lowland rainforests of Amazonia are more heterogeneous than previously thought (see *e.g*. Salo *et al*. 1986, Tuomisto *et al*. 1995, Schulman *et al*. 2007). As a result of the active geological history, the non-inundated rain forests of the western Amazonia consist of a mosaic of floristically differentiated forest types and the floristic similarity patterns are highly correlated both between plant groups and with similarity patterns in local edaphic conditions at various spatial scales (*e.g*. Tuomisto *et al*. 1995, 2003).

In accordance with the research traditions of UTU-ART, also our ichneumonological samples are collected with a lot of background information. We hope that by this way we will eventually be able to understand at least something about complicated factors affecting the diversity and biogeography of tropical Ichneumonidae. All of our Amazonian Malaise samples contain *e.g*. exact information on the forest types in question. For example, we have sampled about 200 Malaise trap months in close vicinity of the Peruvian Amazonian city of Iquitos. Almost all of these samples have been collected in close collaboration with the botanists of the UTU-ART. They have studied botanical transects at the very same trap localities in order to gain a good image on the forest types (edaphic conditions, floristic patterns, geological history) and to provide the entomological samples a good amount of background information (see *e.g.* Sääksjärvi *et al*. 2006). Obviously, specialization to different kinds of edaphic conditions contributes to the

Fig. 1. One of our study plots in Peruvian Amazonia. This rain forest grows on extremely nutrient poor white sand soil and maintains endemic species. Photo: Ilari E. Sääksjärvi.

high diversity of plants in Amazonia. A question relevant for study of tropical parasitoid diversity, systematics and taxonomy, in our opinion, is whether such specialization is also observable and to what extent among parasitoid insects which are not directly dependent on local edaphic conditions. This is one of the large questions we are little

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by little trying to answer here in Finland.

This year we are starting a new large-scale field programme in Amazonia. We have also started the digitalization of our Hymenoptera collection (see the article of Sääksjärvi *et al*. on page 17). This project will finally include also the Amazonian ichneumonids. In addition, we are planning a new website for our team, including themes especially on Neotropical parasitoids but also on tropical biology and Amazonia in general. We hope to get the web pages published this year, so we could better share our findings with other Hymenoptera researchers.

So, are there ichneumonids in the tropics? The answer to this question is yes, there definitely are ichneumonids in the tropics. We think that we still need a lot of information from tropical rain forests to be able to agree or disagree with the famous anomalous latitudinal species richness gradient of Ichneumonidae. Sampling tropical Ichneumonidae certainly requires a lot of effort, even on a local scale. With a total sampling effort of almost 200 Malaise trap months and about 25,000 ichneumonid specimens, many species still appear to remain unsampled in one of our main study localities. This is one of the reasons why we have decided to start a rearing programme in the very same Amazonian rain forest plot. At the same time, other sampling techniques will be applied and we are already also planning a new field programme some hundreds of kilometers away from our main study location.

Based on our samples, it is evident that some subfamilies are quite rare or even totally missing from Amazonian rain forest habitats. However, at the same time there are other subfamilies which are overwhelmingly rich in these forests, much more diverse than was previously thought. Amazonia is revealing its cryptic secrets little by little; we just need to analyze them with great care and continue to spend a lot of time in the field. We are literally exploring unknown worlds dominated by small-sized but amazing amazonians. ❖

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Hymenoptera Anatomy Ontology (HAO) - report on the second workshop

The HAO Team, North Carolina State University

On October 13–17th we held an HAO workshop in Raleigh, co-sponsored by the Encyclopedia of Life's Biosynthesis Center (BioSynC), which brought together ~20 national and international hymenopterists and small group of technical experts. The topic was "Integrating ontologies with biodiversity research: an example from Hymenoptera and the EOL," and our goals were to 1) add and discuss

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content specific to Hymenoptera anatomy and 2) develop ways in which we can integrate the ontology into a number of Web services, including the EOL. Information about the participants and some specifics about the meeting are available on the HAO wiki (http://hymao.org). Overall we had *great* discussions (arguments?) about a number of issues during both the morphology section (days 1-3) and the technical section (days 4 & 5).

During the morphology section we focused on both building the ontology and teaching users how to navigate and contribute. We talked about issues such as whether/how to choose preferred terms for anatomical structures, how to define wing veins and head areas (*e.g.* the limits of the gena), and did a lot of work in taxon-focused groups to audit present HAO content. Though we encountered some difficulties, *e.g.* trying to detach ourselves from thinking about homology, we made clear progress and at least sowed the seeds for upcoming HAO domain/content meetings.

The technical section consisted of a smaller group of bioinformaticians and ontologists. We heard from David Osumi-Sutherland about the *Drosophila* gross anatomy ontology and from Gary Merrill on the philosophy behind building a good ontology. We also talked about integrating the HAO with the EOL and other online services (Morphster, Plazi, *etc*.) while brain-storming future directions and enrichment of the ontology.

The meeting was fruitful in identifying "use-cases" for potential applications of the HAO, some of which have made it to the final stages of development. For example an advanced service for comparing your taxonomic or descriptive publications against the HAO is almost complete (available soon through the Hymenoptera Glossary portal: http://glossary.hymao.org/). This application will help authors identify potential conflicts in their use of the descriptive lexicon for Hymenoptera.

All of the days concluded with great dinners and drinks, which inspired even more conversation—either extending the day's arguments or going into more light-hearted, dinner subjects. All-in-all the meeting went great and we really appreciate and thank all of the participants for their enthusiasm and expertise throughout the meeting!

You can learn more about the HAO by visiting the HAO blog (http://hymao.blogspot.com), signing up for the listserv (http://lists.hymenopterists.org/listinfo.cgi/hao-hymenopterists.org), visiting the Hymenoptera Glossary (http://glossary.hymao.org) or reading about the project in a recently published PLoS ONE article (doi:10.1371/journal.pone.0015991). ❖

Where the Bee Sucks, There Suck I
by William Shakespeare
(from *The Tempest*, Act 5, scene 1)

Where the bee sucks, there suck I:
In a cowslip's bell I lie;
There I couch when owls do cry.
On the bat's back I do fly
After summer merrily.
Merrily, merrily shall I live now
Under the blossom that hangs on the bough.

Hym. Megachilidae. *Osmia* sp. (three males and one female). Photo by: Vladimir Kazenas

There once was a bee from Nantucket,
who found pollen so rich that she stuck it
in each cranny and nook
she knew where to look,
then went back to the nest for a bucket.

—anonymous ISH member

Testing slam traps in Belize

By: Gavin Broad, Dept. of Entomology, the Natural History Museum

A group of us from the Natural History Museum spent most of May collecting in Belize, in the Chiquibul forest. The main objectives were to develop protocols for collecting specimens so as to maximise benefits to the frozen (molecular) and pinned collections, and to ensure traceability of specimens, their products and published sequences. But we also took with us a bunch of slam traps, to have a play with and test in the field. Slam traps are made by a Taiwanese company, BugDorm, and are interception traps along the lines of a Malaise trap but far quicker and simpler to erect. The frame gives the trap rigidity so you can place them easily over log piles or hoist them up a tree, or just position them on the ground as you might a Malaise trap. If the position isn't great then they are very easily moved. They can intercept from any direction, with a central collecting jar, but the 'roof' area is very small, which we thought would probably limit the number of Hymenoptera we would catch.

Here are a couple of the traps that we set (we employed ten):

As you can see, the trap comes with an optional 'pitfall' appendage that might be useful when hanging your trap up a tree. We found that this lower collecting bottle quickly filled with water, and leaves if you didn't cover it with a mesh.

But how many specimens did we catch? Not many. The Malaise traps were much more efficient at catching Hymenoptera than the slam traps, as shown below.

On average, a Malaise trap caught just over 30 Hymenoptera per day, whereas a slam trap caught six. Clearly, Hymenoptera are too active and use their wings too much to be caught by a trap covering a small catching area. Beetles, on the other hand, are bumbling enough to wander into slam traps fairly frequently. Just looking at ichneumonids, my main group of interest, the situation was even

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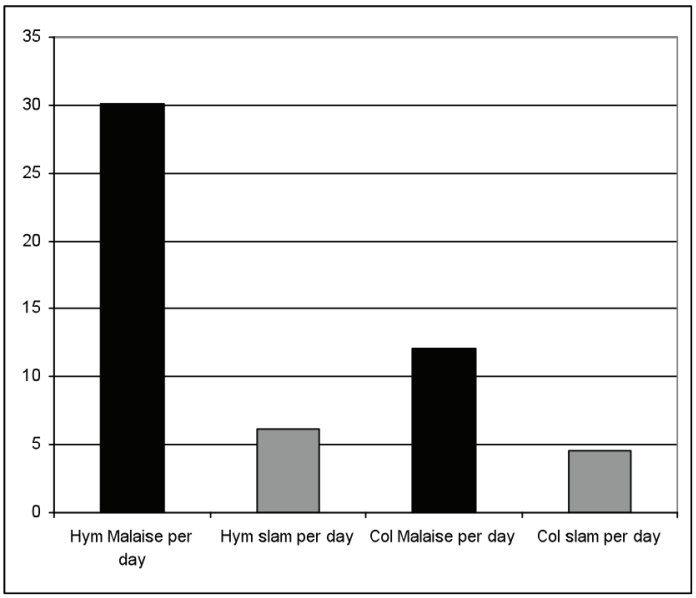

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worse, with 1.5 specimens per Malaise trap day and 0.03 per slam trap day. Put another way, we would have needed to erect 47.5 slam traps to sample ichneumonids as effectively as we did with one Malaise trap. As we employed 16 Malaise traps, this would have been an awful lot of slam traps. Malaise traps are neither 47.5 times more difficult to erect than slam traps nor do they take up 47.5 times more luggage space than slam traps. The sampling efficiency was much better for Coleoptera, for which a Malaise trap was only three times as effective as a slam trap. For coleopterists there is probably much to recommend slam traps (particularly the ability to easily place them over dead wood, which proved rather effective in Belize) but for hymenopterists there isn't. Or have any readers found these to be effective for their groups of interest? ❖

GigaPanning specimen drawers for remote curation and outreach

By: Andy Deans, NCSU Insect Museum, Raleigh, NC, USA

We recently initiated an effort at the NCSU Insect Museum to scan all the drawers in the pinned collection (about 2,700 of them) at relatively high resolution (~200 megapixels) using GigaPan technology and to publish these images in a browsable, user-friendly way to the Web. The primarily purposes of this project are to: 1) avail our entire collection virtually, in a manner that is analogous to a taxonomist perusing drawers with his or her naked eyes, 2) enable the annotation of these images so as to accrue feedback on our curation and taxonomic determinations, and 3) to create a bank of images that could be used to educate people about the wonderful world of insect diversity. We've made it through half the collection already, including our entire Hymenoptera holdings, and published a proceedings paper about the methods and early results (see Bertone & Deans 2010).

Our Hymenoptera collection is comprised of 350 drawers, which hold between 80,000-100,000 specimens. This taxon has not been the strength of the NCSU Insect Collection historically (we had three generations of Auchenorrhyncha experts as directors before me!), but it certainly is the fastest growing section. About 30,000 of these specimens are part of the T.B. Mitchell collection, which serve as vouchers for his well-known *The Bees of the Eastern United States* (available as PDFs here: http://insectmuseum.org/mitchell.php). We would love to get

Pompilidae drawer 7 in the NCSU Insect Museum. Top: whole drawer scan, available at: http://gigapan.org/gigapans/61933/ Bottom: partial zoom (about 60%) of specimen located near the middle of the above drawer. The resolution is high enough to view some diagnostic characters of large specimens or the collecting event data of very small specimens, which is about as good as one could do with the naked eye.

more feedback from hymenopterists—determinations, comments, advice, loan requests, *etc*.—especially as comments or snapshots through the GigaPan website (requires that you register). All of the Hymenoptera drawer images can be viewed at http://gigapan.org/ (just search the site for NCSU or Hymenoptera). Can you find any gems? Can you find misidentified specimens? ❖

Reference:

- Bertone, M.A. & A. R. Deans. 2010. Remote curation through GigaPans: examples from the NCSU Insect Museum. *Proceedings of the Fine International Conference on Gigapixel Imaging for Science, November 11–13 2010*. < http://bit.ly/NcsuGigapan >

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team of undergraduate students and science teachers, funded by supplemental NSF-REU (Research Experience for Undergraduates) and RET (Research Experience for Teachers) grants. Searching for caterpillars by hand and eye is quite challenging, requiring careful inspection of foliage for feeding damage, silk traces, and frass. In addition to hand-sampling of caterpillars, we are using Malaise traps and yellow pan traps to inventory the flying insects along trails. By utilizing diverse sampling methods we are gaining a broader understanding of the entire insect community at Yanayacu.

One productive caterpillar-sampling method is the "beating sheet" approach. A cloth sheet supported by a wooden frame is held by one person under a branch, while another person "beats" the leaves and branches with a bamboo stick. Any caterpillars on that plant are dislodged and fall on the sheet, where they are collected into plastic bags. Returning to the research station with a day's catch of caterpillars, the bagged larvae are coded, tagged, and hung on clothes lines in the Maquina, our caterpillar research building. The "Maquina" (the Machine) is the insectary or caterpillar-rearing shed for the CAPEA project. Literally a live Caterpillar Zoo—the "maquina" is the "machine" that produces specimens, data, and photographs for the CAPEA research project. Each live caterpillar must be kept clean and fed new leaves daily, all changes monitored and recorded, until the caterpillar either metamorphoses to an adult moth or butterfly, or until it is killed by an emerging parasitic wasp or fly. Whatever the result—whether moth, butterfly, wasp, or fly—the emerging adult insect is preserved and labeled for museum research. So far, more than 40,000 individual caterpillars have been raised and recorded! A carnival-assortment of caterpillars can be viewed at the University of Nevada ecologist Lee Dyer's CAPEA website (www.caterpillars.org).

Over the last two summers we increased student participation by teaching a new UW study-abroad course: Cloud Forest Ecology in Ecuador. The class provides UW students with a unique opportunity to live in the cloud forest, study and participate in on-going tropical research, and to experience for themselves the thrill of discovering new life forms. HP-4152-1 is a UW Honors Program Senior Seminar, taught at Yanayacu in June 2009 and 2010, and scheduled again for May 2011. Co-taught with UW botany professor Greg Brown, experiential-learning class allows UW students to study forest ecology at a high-elevation cloud forest in the Andes Mountains. During travel to the forest study site, students visit the ancient city of Quito, providing cultural experiences for University Studies Program (USP C1 credit). The diverse experiences of last summer's students and teachers have been chronicled by science teacher Jennifer Donovan at Experiential Science Education for Teachers website (http://yanayacu.weebly.com/).

As I write this article it is a frigid 0º in Laramie, and the dew-splattered leaves of Yanayacu seem unimaginably distant. Yet it is somehow comforting to remember that somewhere near the equator, in that timeless wilderness where day lengths vary less than 20 minutes over the year, there at Yanayacu, it is still drizzling warm rain, mist drifts over the treetops, and mysterious and undiscovered "wild things" are still flying along emerald pathways. Next May we plan to return to the mossy Andean hillsides to search for more of life's mysteries. ❖

The Wasp

by Ogden Nash

The wasp and all his numerous family
I look upon as a major calamity.
He throws open his nest with prodigality,
But I distrust his waspitality.

Above and below: vespid wasps in Peru. Photos by: Trish Mullins

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of 2011. I would like to remind everyone that we are able to process your membership renewals, page charges, requests for JHR copies, etc. in a variety of ways, including online via PayPal, a completed membership/renewal form sent to me by email or fax, or by cash or check via the postal service. I am also happy to take payment information over the phone. In addition, I now have the capability to physically swipe a credit or debit card when such an opportunity arises.

It has taken a few months to complete the transition to new bank accounts here in Madison and to find a new partner for processing credit card payments. During this time, the assistance of Joseph Fortier, the outgoing treasurer, and Justin Schmidt, former treasurer and secretary, was invaluable. I sincerely thank Joe and Justin, as well as the rest of the ISH officers for their help and patience in the past few months. Feel free to contact me via email or telephone with any questions or concerns and please send in those 2011 membership/renewal forms! ❖

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